ICTS

I) Astronomy and Astrophysics:

II) Energy:

III) Engineering:

IV) Environmental Sciences, Oceanography and Polar Research:

V) Health Sciences and Biotechnology:

VI) Materials:

VII) Social Sciences and Humanities:

VIII) TIC:

I) Astronomy and Astrophysics

- ***Calar Alto Astronomical Observatory (CAHA)***
- ***Gran Telescopio de Canarias(GTC)***
- ***IRAM Radio Telescope Pico Veleta (IRAM)***
- ***Canfranc Underground Laboratory (LSC)***
- ***Roque de los Muchachos Observatory (ORM)***
- ***Teide Observatory(OT)***
- ***Yebes Observatory (CAY)***

KEY INFORMATION

Full Name:	**Calar Alto Astronomical Observatory**
Acronym:	CAHA
Website	http://www.caha.es
Description:	The German-Spanish Astronomical Center at Calar Alto is located in the Sierra de Los Filabres (Andalucía, Southern Spain) north of Almeria. It is operated jointly by the Max-Planck-Institut für Astronomie (MPIA) in Heidelberg, Germany, and the Instituto de Astrofísica de Andalucía (CSIC) in Granada/Spain. Calar Alto provides three telescopes with apertures of 1.23m, 2.2m and 3.5m to the general community. This RI is an ICTS (Unique Scientific and Technological Infrastructure), included in the Spanish National Roadmap for RIs.
Keywords:	Astronomy, astrophysics, telescope, astronomical instrumentation, optical, infrared.
Type of use:	Research / Science
Type of RI:	Single-sited
RI Category:	Telescopes Data Archives, Data Repositories and Collections Astro-particle and neutrino detectors and observatories In situ Earth Observatories
Main scientific domain:	Physics, Astronomy, Astrophysics and Mathematics
Hosting Organization:	MPG CSIC - Consejo Superior de Investigaciones Científicas
Location:	Spain - Almería - C/ Jesús Durbán Remón, 2-2
Main Status:	Operational since 1975
Contact:	José Mª Quintana (director@caha.es)

RESEARCH SERVICES:

- Access to Telescope with 3.5m aperture
- Access to Telescope with 2.2m aperture
- Access to Telescope with 1.23m aperture
- Access to scientific public data base

EQUIPMENT:

- 3.5m/LAICA - Large field-of-view optical imager for the 3.5m telescope
- 3.5m/MOSCA - Optical spectrograph (with multiobject masks) with imaging capabilities for the 3.5m telescope
- 3.5m/PMAS - Integral field spectrograph for the 3.5m telescope
- 3.5m/TWIN - Optical long-slit spectrograph for the 3.5m telescope
- 3.5m/O2000 - Near-infrared imager, large field of view, for the 3.5m telescope
- 3.5m/Carmenes - Optical and near-infrared high-resolution spectrograph for the 3.5m telescope, under development
- 2.2m/BUSCA - Optical imager for the 2.2m telescope
- 2.2m/CAFOS - Optical spectrograph with imaging and polarimetry capabilities for the 2.2m telescope
- 2.2m/Astralux - High-spatial resolution imager (Lucky Imaging technique) for the 2.2m telescope
- 2.2m/CAFE - High-spectral resolution spectrograph (echelle) for the 2.2m telescope
- 2.2m/PANIC - Near-infrared, large field of view for the 2.2m telescope (and for the 3.5m), under development
- 1.23m/CCDcamera - Optical camera for the 1.23m telescope
- GAW - Cherenkov telescopes and detectors, under deveolpment
- CAHA/archive - CAHA archive, with all observations since 2011 and other previous data

KEY INFORMATION

Full Name:	**Gran Telescopio Canarias (GTC)**
Acronym:	GTC
Website	http://www.gtc.iac.es
Description:	The Gran Telescopio CANARIAS (GTC), is a 10.4m telescope with a segmented primary mirror. It is located in one of the top astronomical sites in the Northern Hemisphere: the Observatorio del Roque de los Muchachos (ORM, La Palma, Canary Islands). (GTC is currently the largest and one of the most advanced optical and infra-red telescopes in the world. Its primary mirror consists of 36 individual hexagonal segments that together act as a single mirror. The light collecting mirror surface area of GTC is equivalent to that of a telescope with a 10.4m diameter single monolithic mirror. Thanks to its huge collecting area and advanced engineering the GTC classes amongst the best performing telescopes for astronomical research. The GTC is a Spanish initiative leaded by the Instituto de Astrofísica de Canarias (IAC). The project is actively supported by the Spanish Government and the Local Government from the Canary Islands through the European Funds for Regional Development (ERDF) provided by the European Union. The project also includes the participation of Mexico (Instituto de Astronomía de la Universidad Nacional Autónoma de México (IA-UNAM) and Instituto Nacional de Astrofísica, Óptica y Electrónica (INAOE) and the US University of Florida (UFL). This RI is an ICTS (Unique Scientific and Technological Infrastructure), included in the Spanish National Roadmap for RIs.
Keywords:	Optical astronomy. Infrared astronomy
Type of use:	Research / Science
Type of RI:	Single-sited
RI Category:	Telescopes
Main Scientific Domain:	Physics, Astronomy, Astrophysics and Mathematics
Hosting Organization:	GRANTECAN, S.L.
Location:	Spain - Breña Baja - Cuesta de San José, s/n
Main Status:	Operational since 2009
Contact:	Pedro Álvarez (pedro.alvarez@gtc.iac.es)

RESEARCH SERVICES:

- Access to telescope time in service or visitors modes:
  - Spanish telescope time: Access to GTC use (telescope and science instruments) by the Spanish community through CAT
  - UF telescope time: Access to GTC use (telescope and science instruments) by the University of Florida
  - Mexico telescope time: Access to GTC use (telescope and science instruments) by the Mexican community
  - ITP telescope time: Access to GTC use (telescope and science instruments) by the international community at the IAC observatories
  - Guaranteed time: Access to GTC use (telescope and science instruments) as payment for instrument development
  - ESO/GTC science time: Access to use the telescope for technical works as an in-kind payment for the entrance of Spain to the ESO organization

EQUIPMENT:

- A segmented primary mirror telescope of 10.4 m. in diameter.
- Instruments:
  - OSIRIS: Optical image with broad and narrow band filters and multy-object spectroscopy with resolution up to 2500. It is an imager and spectrograph for the optical wavelength range, located in the Nasmyth-B focus of GTC. Apart from the standard broad-band imaging and long-slit spectroscopic capability, it provides additional capability such as the narrow-band tunable filters imaging, charge-shuffling and multi-object spectroscopy. OSIRIS covers the wavelength range from 0.365 to 1.05 µm with a field of view of 7.8 x 8.5 arcmin (7.8 x 7.8 arcmin unvignetted), and 8 x 5.2 arcmin, for direct imaging and low resolution spectroscopy respectively.
  - CanariCam: it is a mid-infrared (7.5 - 25 micron) imager with spectroscopic, coronagraphic, and polarimetric capabilities, which will be mounted at one of the Nasmyth foci of the GTC. It is designed to work as a diffraction-limited imager at 8 microns. The instrument uses a Raytheon 320x240 Si:As detector which covers a field of view of ~26"x19" on the sky. Most mechanism motors and optics are inside a cryostat which is cooled down to 28K using a He cryo-cooler system. Temperature control of the detector ensures that its optimum operating temperature (~9K) is stable in the mK range.

KEY INFORMATION

Full Name:	**IRAM Radio Telescope Pico Veleta**
Acronym:	IRAM
Website	http://www.iram-institute.org/
Description:	The 30-meter telescope on Pico Veleta in the Spanish Sierra Nevada is one of the two radio astronomy facilities operated by IRAM. Built in only four years (1980 to 1984) at an elevation of 2850 meters, it is one of today's largest and most sensitive radio telescopes for tracing millimeter waves. The telescope is a classic single dish parabolic antenna, which allows the exploration of extended cosmic objects such as nearby galaxies and interstellar clouds. Due to its large surface, the 30-meter telescope is unrivalled in its sensitivity and is well adapted to detect weak sources. The surface of the parabola is adjusted to a precision of 55 micrometers, corresponding to the width of a human hair. This RI is an ICTS (Unique Scientific and Technological Infrastructure), included in the Spanish National Roadmap for RIs.
Keywords:	Astronomy, astrophysics, telescope, astronomical instrumentation
Type of use:	Research / Science
Type of RI:	Single-sited
RI Category:	Telescopes
Main Scientific Domain:	Physics, Astronomy, Astrophysics and Mathematics
Hosting Organization:	Institut de Radioastronomie Millimétrique (IRAM)
Location:	Spain - Granada - Sierra Nevada
Main Status:	Operational since 1984
Contact:	Juan Peñalver (penalver@iram.es)

RESEARCH SERVICES:

- IRAM-PV - Access to the radio astronomical telescope, including logistical, technological, scientific support and training.

EQUIPMENT:

- IRAM-PV - 30 m parabolic antenna with alt-azimuth mounting. Wavelength range: 3-0.8 mm, max. angular resolution 7.5 arcsec (at 350 GHz)

KEY INFORMATION

Full Name:	**Canfranc Underground Laboratory**
Acronym:	LSC
Website	http://www.lsc-canfranc.es
Description:	The Canfranc Underground Laboratory (LSC) is a facility for Underground Science. It is conceived as a Consortium of the Spanish Ministry of Economy and Competitiveness, the Aragon Regional Government and the University of Zaragoza. Located under the Pyrenees mountain El Tobazo, the over burden at the site provides 850 maximum meters shielding from cosmic rays and offers a low background environment for the next generation of experiments exploring the frontiers of particle and astroparticle physics. Other sciences can also profit from the unique underground location, such as geodynamics, environmental sciences, biology, etc. This RI is an ICTS (Unique Scientific and Technological Infrastructure), included in the Spanish National Roadmap for RIs.
Keywords:	Astroparticle, neutrinos, dark matter, geodynamics
Type of use:	Research / Science
Type of RI:	Single-sited
RI Category:	Astro-particle and neutrino detectors and observatories Underground Laboratories High Energy Physics Facilities Solid Earth Observatories, including Seismological Monitoring Stations In situ Earth Observatories
Main Scientific Domain:	Physics, Astronomy, Astrophysics and Mathematics
Hosting Organization:	Canfranc Underground Laboratory Consortium
Location:	Spain-Zaragoza-Canfranc
Main Status:	Operational since 2010
Contact:	Alessandro Bettini (bettini@lsc-canfranc.es)

RESEARCH SERVICES:

- Support to users and General services - The LSC supports the installation of the experimental apparatuses, built by the users, provides general services (power, water, gases) and also specialised services
- Low background screening - Experiments underground need to use material and components as clean as possible from radioactive traces. The screening is performed with a set of hyper-pure Ge counters. The service can be used also by other users (environment, industrial products, etc.)
- Electroforming - Extremely clean Copper components are produced by building atom by atom

EQUIPMENT:

- HP-Ge detectors - Hyper pure Ge detectors are used for producing gamma spectra in samples for the experiments and from the environment (air, water, etc.)
- Liquid Ar TPC - Used for dark matter search
- NaI hyper pure detectors - Used for dark matter searches
- Scintillating bolometers - Used for rare venets searches
- High pressure Xe TPC - Used for searching for neutrino less double beta decay
- Laser Michelson interefrometers - High resolution geodynamic continuous monitoring. A two-component strain-meter to measure small scale deformation over distances of 70 m inside the Earth
- Broad band accelerometers - Part of the TOPO IBERIA network
- GPS stations - Two GPS stations, which continuously record surface movement, which can be correlated to the strain measurements and the local seismic activity

KEY INFORMATION

Full Name:	**Roque de los Muchachos Observatory**
Acronym:	ORM
Website	http://www.iac.es/orm
Description:	The Observatorio del Roque de los Muchachos (ORM) is situated on the edge of the Caldera de Taburiente National Park, 2.396 m. above sea level in the municipality of Garafía (on the island of La Palma). It is home to one of the most extensive fleets of telescopes to be found anywhere in the world. Conditions at the Observatory are ideal not only for night time observations but also for Solar Physics. The Observatory also attracts researchers in High Energy Astrophysics. The ORM Residence is a suite of facilities (including day and night-time dormitories, a kitchen and dining room, reception and living and games rooms), which is available for use by scientific and technical staff linked to the Observatory. Following the International Agreement on Cooperation in Astrophysics (1979), more than 60 research institutions from almost 20 countries have installed their telescopes and instruments for astrophysical research at the Canary Islands' Observatories (Teide Observatory and Roque de los Muchachos Observatory). The following telescopes are accessible at Roque de los Muchachos Observatory: Gran Telescopio CANARIAS (GTC), William Herschel Telescope (WHT), Telescopio Nazionale Galileo (TNG), Nordic Optical Telescope (NOT), Isaac Newton Telescope (INT), Liverpool Telescope (LT), MERCATOR, Automatic Transit Circle (ATC), Swedish Solar Telescope (SST), Dutch Open Telescope (DOT), MAGIC I and MAGIC II, SuperWASP, JKT and DIMMA. This RI is an ICTS (Unique Scientific and Technological Infrastructure), included in the Spanish National Roadmap for RIs.
Keywords:	Astronomy, astrophysics, telescope, astronomical instrumentation, optical, infrared, high-energies
Type of use:	Research / Science
Type of RI:	Single-sited
RI Category:	Telescopes
Main Scientific Domain:	Physics, Astronomy, Astrophysics and Mathematics
Hosting Organization:	IAC
Location:	Spain – Canary Islands-La Palma -
Main Status:	In operation since 1979
Contact:	Francisco Sánchez (director@iac.es)

RESEARCH SERVICES:

- Access to telescope observing time - Access to telescope observing time.

EQUIPMENT:

- Gran Telescopio CANARIAS - The Gran Telescopio CANARIAS (GTC) is a 10,4 metres primary mirror reflecting telescope. It is designed to incorporate the most up-to-date technology and it is one of the most advanced telescopes in the world and the largest of the optical-infrared. GTC have the following Day One instruments: OSIRIS (an optical camera and multi-object spectrograph) and CanariCam (a thermal infrared (IR) camera and spectrograph with polarimetry and coronography capabilities). These two instruments have been developed by consortia formed by several research centers. The consortium that developed OSIRIS was leaded by the Instituto de Astrofísica de Canarias (IAC), with the participation of the IA-UNAM, IFCA and IAA. CanariCam was built by the Universidad de Florida. The next common-user scientific instrument is being built for the GTC: a multi-object spectrograph in the near infrared called EMIR. This is the first of the instruments adopted to be installed in the GTC after the date of Day One, which is also called second-generation instruments. EMIR is being developed by a consortium led by the IAC. Another second-generation instrument, being developed by the University of Florida, is CIRCE: an infrared camera that will also work in the near-infrared range (1 - 2.5 Î¼ m), which provides the GTC capacity in the IR image before the arrival of EMIR. FRIDA is another instrument for GTC that is being developed. FRIDA, will make use of the Adaptive Optics system of the GTC, will be able to take pictures in broadband and narrowband. Besides, FRIDA will allow comprehensive field spectroscopy in the spectral range of 0.9 - 2.5 Î¼m. Its development is led by the Universidad Nacional de México UNAM.
- William Herschel Telescope - The 4.2m William Herschel Telescope is equipped with state-of-the-art instruments and allow a broad range of scientific projects to be carried out. The WHT offers a broad range of instruments for optical and near-IR imaging and spectroscopy. Several are unique and highly competitive. The multi-object fibre spectrograph, AF2/WYFFOS, is a powerful tool for surveying the physics of stellar systems and galaxy clusters. The adaptive-optics (AO) system, together with the optical integral field spectrograph, OASIS, offers a unique facility for recording the spectra of extended objects in exquisite spatial detail. It also offers diffraction-limited NIR imaging. The near-IR spectrograph, LIRIS, offers the highly competitive option of near-IR multi-object spectroscopy as well imaging and long-slit spectroscopy. On the ISIS optical spectrograph, ING commissioned a high-speed spectroscopic capability using novel L3CCD technology, providing virtually zero dead time and zero read noise, ideal for measuring rapidly-varying objects in the universe. An image slicer is available to allow opening the slit without degrading the spectral resolution. The red arm of ISIS is equipped with a low-fringing CCD. The other common-user instruments are the prime- focus wide-field image, featuring a wide-set of filters, and the recently-

commissioned ACAM imager/ spectrograph, which is permanently mounted at a folded-Cassegrain focus and is ideally suited for target-of-opportunity observations.

- Telescopio Nazionale Galileo - The 3.58m telescope is an Italian facility located at the Roque de Los Muchachos Observatory in La Palma (Spain). It is dedicated to astrophysical observations at visual and near infrared wavelengths and offers a remarkably complete set of instruments for imaging and spectroscopic observations. An advantage relative to other telescopes of the same class is that all the instruments are always on-line and quickly selectable by the users who may, therefore, organize their observations in a very flexible way. The oversubscription rate is, on average, a factor 2.5, with about 1/3 of the requests coming from international (i.e. non-Italian, non-Spanish) teams. The scientific production of TNG has been steadily increasing in the last 7 years. The publication rate is one of the largest for 4m class telescopes worldwide and corresponds to one refereed paper every 5 nights of useful observing time over the full life of the facility. Focal plane instruments: DOLORES (a multi-mode imager/spectrometer at visual wavelengths), NICS (a multi-mode imager/spectrometer at infrared wavelengths) and SARG (a high resolution spectrograph at visual wavelengths). A high resolution spectrograph at IR wavelength (GIANOS) will become soon operative.
- Nordic Optical Telescope - NOT is a modern 2.5m telescope, operated by a multi-national staff at the world-class site of Roque de Los Muchachos Observatory, La Palma, Canary Islands. NOT is the main northern-hemisphere facility for Nordic astronomers (Denmark, Finland, Iceland, Norway, and Sweden) and is renowned as a highly efficient, user-friendly facility with excellent image quality, down to 0.3" under optimum conditions. The NOT instrument suite is tailored to capitalise on its strengths: We offer direct imaging and low-resolution spectroscopy with a wide choice of filters, grisms, and polarimetric options through the focal-reducer instruments ALFOSC (optical, 2Kx2K CCD) and NOTCam (near-IR, 1Kx1K Hawaii array). The 4Kx4K direct CCD camera MOSCA offers the highest UV sensitivity of any telescope/ camera combination at the observatory. The fibre-coupled, high-resolution optical spectrograph FIES (R = 60,000), located in a stabilised room off the telescope, can yield radial velocities with errors below 10 m/s and is in much demand for studies of extrasolar planets.
- Isaac Newton Telescope - The INT offers wide-field optical imaging and intermediate-resolution spectroscopy. This combination makes the telescope particularly well-suited for research into stars and stellar systems, and nearby galaxies. The WFC has a broad range of broad-band and narrow-band filters, and has good U-band sensitivity.
- Liverpool Telescope - The Liverpool Telescope is a fully robotic 2 metre aperture optical and near infra-red telescope. It is the largest fully robotic telescope in the world, and offers unique rapid- response capabilities for optical studies of transient sources or follow-up of sources detected at other wavelengths. The instrumentation offered consists of two optical CCD cameras (one optimised for high time-resolution studies), an infra-red camera, an imaging optical polarimeter and an optical, fibre-fed double-beam spectrograph.

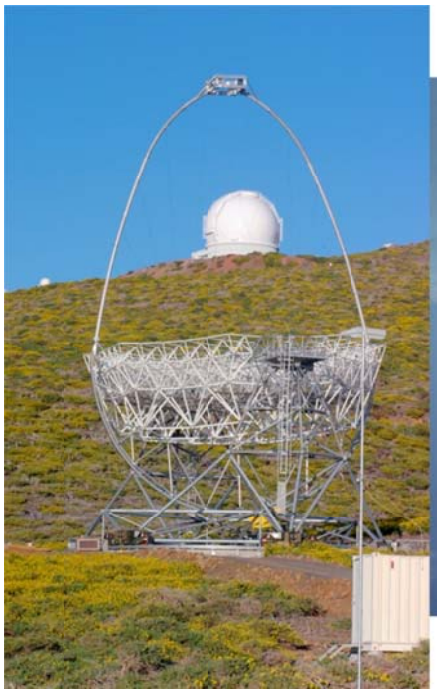
- MERCATOR - The Mercator Telescope is a 1.2 m quasi-robotic telescope which scientific niche is focussed on monitoring variable celestial phenomena with a large range in typical time-scales (pulsating stars, gravitational lenses, Gamma Ray Bursts, active Galactic Nuclei). Currently, it is equipped with 2 permanently installed instruments, both operating in the visible part of the electromagnetic spectrum. The Nasmyth focus of the MERCATOR telescope is equipped with a two-channel photometer called P7-2000. The photometer allows for quasi-simultaneous measurements in the 7 colors of the Geneva photometric system (340nm-590nm) of stars till magnitude 13 with a precision between 0.1% and 1%. Alternatively the instrument can be blocked on a specific filter and fast photometry of relatively bright stars becomes possible. A CCD camera called MEROPE has been also installed at the Cassegrain focal plane. This camera has a filterwheel with 16 positions and can be used for 2D-photometry and imaging of fainter objects in a broader part of the electromagnetic spectrum (330nm-760nm). The field of view of this instrument is 6.5 arcmin squared with a spatial resolution of 0.2 arcseconds per CCD pixel. A high efficiency, high-resolution spectrograph, HERMES, is also available.
- Automatic Transit Circle - The Automatic Transit Circle (ATC) is an old meridian circle built by Grubb-Parsons in 1950 but completely refurbished and automatized in the 70's of the past century by the Copenhagen University Observatory (CUO). It main task is to observe evenly bodies at their transit across the meridian. The instrument observes robotically without any observer in charge. Only need a daily remote maintenance and authorization to observe (green light) from the observer. Twice a year are performed mechanical and electronic maintenance by specialist personnel travelling to the ORM. The ATC have an useful aperture of 176 mm and a focal length of 2664 mm. The declination circle is in glass with an outer diameter of 732 mm and graduated every 5'. The position of the circle is read by six CCD cameras with a precision of a few of tenths of arsec.
- Swedish 1m Solar Telescope - The SST is located on La Palma at an altitude of 2400 m in the Observatorio del Roque de los Muchachos. It is currently (2010) the largest solar telescope in Europe. Its main goal and asset is high spatial resolution. The SST reaches the 'dream-limit' of solar physics with diffraction-limited 0.1- arcsecond resolution in blue light. Recent progress in detector technology and image restoration has allowed record-high temporal resolution (~1s) while maintaining spatial resolution. The SST is run by the University of Stockholm. Several other institutes contribute financially to get observing time. The telescope has adaptive optics and tip-tilt correction integrated in the light path. The adaptive optics was set for an upgrade to higher order (about 90 modes) in 2012. An observer can choose between two main observing modes: spectroscopy or imaging. There are basic optical setups with possibilities for individual changes or additions. Instrumentation is as follows: TRIPPEL (a spectrograph with polarimetric capabilities), Blue imaging (<500 nm, four fast-readout 2k x 2k CCD cameras are used with interference filters for passbands of diagnostic interest - like different positions in the Ca II H line), and Red imaging and polarimetry (>500 nm; the

Crisp Imaging Spectro-Polarimeter (CRISP) was installed in 2008. This Fabry-Pérot-based high-transmission and fast-tuning system is an imaging full-Stokes polarimeter that can scan spectral lines. Detectors are several 37-frames/s Sarnoff CCDs with very low readout noise).

- Dutch Open Telescope - The Dutch Open Telescope (DOT) is an innovative 45-cm solar telescope on an open 15-m steel tower and uses wind to flush the telescope and its surroundings. It successfully demonstrated the open-telescope technology that is now widely used for the design of future instruments. The DOT is a multi-wavelength tomographic imager and operates at the wavelengths of Ca II H (396.8nm), G-band (430.5nm), blue continuum (432.0nm, 450.5 nm), red continuum (654nm), H-alpha (656.3nm) and Barium (455.4nm). Together they sample the regime from deep photosphere through low chromosphere into the high chromosphere. The DOT is the premier source for high-resolution image sequences and the only source for routinely obtained high-resolution H-alpha image data. Standard DOT data consists of co-spatial image sequences synchronously taken in these wavelengths with identical cameras during up to 14 hours in up to a 15-second sampling cadence, including line profile sampling of the H-alpha line with velocity maps. The wide field covers up to 100x100 arcseconds and when combined the data gives a 3D tomographic representation of the solar photo- and chromosphere. Despite its medium aperture, the DOT is one of the world's sharpest solar telescopes. It does not rely on Adaptive Optics but uses instead speckle reconstruction, which ensures uniform, consistent correction of atmospheric turbulence over the full field of view. The image sharpness reaches the theoretical telescope resolution in medium seeing conditions, revealing details in the solar photosphere down to 170-km in size, resulting in the famous DOT movies which nowadays are a must in understanding the highly dynamical solar processes.
- MAGIC - MAGIC is a system of two imaging atmospheric Cherenkov telescopes or IACTs. The project is funded primarily by the funding agencies BMFB (Germany), MPG (Germany), INFN (Italy), MINECO (Spain), and the ETH Zurich (Switzerland). The cosmos and its evolution are studied using all radiation, in particular electromagnetic waves. The observable spectrum extends from radio waves to infrared, visible, ultraviolet, X-ray, gammarays and finally very high energy gamma rays (starting at energies of 10 GeV). Observations at visible wavelengths (.5 to 1 micrometer) have a history of centuries, gamma astronomy by satellites (keV to few GeV) and ground-based telescopes (above 300 GeV) are end-of-20th century newcomers. The II 17m MAGIC telescopes can detect very high energy gamma rays in a range of energies where no other telescope in the world can operate, so they open up a brand new window into the universe.
- SuperWASP - SuperWASP is an extremely wide field robotic camera. As its name suggests SuperWASP is designed to detect extrasolar planets via the transit technique around relatively bright stars. SuperWASP is used as a survey instrument - capable of imaging the entire visible sky every 45 minutes or so. The instrument is managed by a Consortium of UK and Spanish based astronomers (the WASP Consortium). The data

rate from the instrument is so large that the Consortium have developed a dedicated reduction pipeline and archive for the extracted light curves. After a short propriety period the data is available to the general astronomical community. SuperWASP is composed of up to eight individual cameras each having a 200mm f1.8 lens imaging onto a thermoelectrically cooled 2048x2048 pixel thinned CCD detector. This gives it an angular scale of about 14 arc seconds per pixel. At this scale even at dark moon the night sky is sufficiently bright that our magnitude limit for the exoplanet work is about 13th magnitude (which matches the high resolution spectroscopic capabilities of 10m sized telescopes).

- DIMMA - Both astronomical site selection and design for the next future large telescopes, plus the need to define flexible schedule programs as operational schemes for the telescopes at the observatory require systematic measurements of the night-seeing and meteorology. The first completely unmanned Differential Image Motion Monitor Automático (DIMMA) has been developed by the Sky Quality Group of the IAC and installed both at the Roque de los Muchachos Teide Observatories. DIMMA operation allows to obtain and to supervise meteorological and seeing data from remote sites.



KEY INFORMATION

Full Name:	**Teide Observatory**
Acronym:	OT
Website	http://www.iac.es/ot
Description:	Astrophysics in the Canaries began (in the early 1960s) at this Observatory. It is situated 2.390 metres above sea level in Izaña, an area of Tenerife that lies across three municipal districts - La Orotava, Fasnia and Güímar. The first telescope for studying zodiacal light, light dispersed by interplanetary material, entered service here in 1964. Its geographical location (between the eastern and western solar observatories), together with the clarity and excellent quality of the sky, mean that the Observatorio del Teide is ideally suited for studying the sun. For this reason it is home to Europe's finest solar telescopes. The Observatorio del Teide Residence, which has been in operation since January 1990, is a suite of facilities (including day and night-time dormitories, a kitchen and dining room, reception, living and games rooms, garages, a transformer station, power generator and solar panel park), which is available for use by scientific and technical staff linked to the Observatory. The Instituto de Astrofísica de Canarias organises visits to the Observatory for colleges and groups as part of a public education campaign designed to make knowledge about astronomy accessible to everyone. The Observatorio del Teide has a Visitor Centre housed in an empty dome, which has been equipped to teach visitors about science. The centre has a capacity of around forty people and is used to explain what an observatory is, how telescopes work and the importance of Astronomy for the human race. Following the International Agreement on Cooperation in Astrophysics (1979), more than 60 research institutions from almost 20 countries have installed their telescopes and instruments for astrophysical research at the Canary Islands' Observatories (Teide Observatory and Roque de los Muchachos Observatory). The following telescopes are accessible at Teide Observatory: Carlos Sánchez Telescope (TCS), IAC80 Telescope, Optical Ground Station (OGS), GREGOR, THEMIS, Vacuum Tower Telescope (VTT), Solar Laboratory, Cosmic Microwave Background Experiments, Bradford Robotic Telescopes, Stella Robotic Telescopes, Optical Telescope Array (OTA), XO telescopes, DIMMA, SHABAR, SONG, MONS, EarthShine, TAD and EAST. This RI is an ICTS (Unique Scientific and Technological Infrastructure), included in the Spanish National Roadmap for RIs.
Keywords:	Astronomy, astrophysics, telescope, astronomical instrumentation, optical, infrared, CMB
Type of use:	Research / Science
Type of RI:	Single-sited
RI Category:	Telescopes
Main Scientific Domain:	Physics, Astronomy, Astrophysics and Mathematics
Hosting Organization:	Instituto Astrofísico de Canarias

Location:	Spain - Santa Cruz de Tenerife - Teide Observatory
Main Status:	Operational since 1964
Contact:	Francisco Sánchez (director@iac.es)

RESEARCH SERVICES:

- Access to telescope observing time - Access to telescope observing time.

EQUIPMENT:

- Carlos Sánchez Telescope - The Carlos Sánchez Telescope (TCS), installed at the Observatorio del Teide (OT), has a primary mirror diameter of 1.52 m. The TCS was designed and constructed under the direction of Prof. J. Ring (ICSTM), in collaboration with other groups from the United Kingdom and the Instituto de Astrofísica de Canarias (IAC). Operative since 1972, originally it was designed as an infrared flux collector, being one of the first thin mirror telescopes. TCS is owned by the IAC since 1982, the year in which it was transferred by the SERC (Science and Engineering Research Council), the original owner of the telescope. This telescope is focussed on night-time observations in the infrared range, although it perfectly allows optical observations. Surprisingly, in spite of its low cost, at present it is still among the largest and most productive infrared telescopes in the world. Moreover, the TCS has been used as a test bed to acquire the necessary experience to tackle the construction of large telescopes. Instruments: CAIN-III and FastCam.
- Optical Ground Station - The Optical Ground Station (OGS), installed in the Teide observatory 2400 above the sea level, was built as part of ESA long term efforts for research in the field of inter-satellite optical communications. The original purpose of the station, equipped with a telescope (1m aperture), is to perform the in-orbit test of laser telecommunications terminals on board of satellites in Low Earth Orbit and Geostationary Orbit. Since 2001, the ESA survey of Space Debris in the Geostationary Orbit and the Geostationary Transfer Orbit is also being carried out with a devoted wide field camera attached to the Ritchey-Chretien focus. Furthermore, approximately a third of the observing time is used for basic astronomical research from ESA and IAC science teams with dedicated instruments either in the coudé or in the Ritchey-Chretien foci. Several nights per month are devoted to SSA programmes. Finally, experiments in quantum teleportation are routinely made at this telescope.
- IAC80 Telescope - The IAC-80, located at the Observatory del Teide, has been completely designed and built by the Instituto de Astrofísica de Canarias (IAC) and it was the first of this class developed in Spain. In 1980 the IAC started its development, was finally installed at the OT in 1991. This telescope has an equatorial German mount, with an effective focal ratio of f/11.3 and effective focal length of 9.02 m and a primary mirror of diameter 82 cm. The instrumentation is installed at the Cassegrain primary focus.

- GREGOR - The VTT and the GREGOR are operated by four German institutes: the Astrophysikalisches Institut Potsdam, the Kiepenheuer-Institut für Sonnenphysik (Freiburg, chair), the Max-Planck-Institut für Sonnensystemforschung (Lindau), and the Universitäts-Sternwarte Göttingen. The telescope is used for scientific observations from mid April through mid December. Typically 30 to 40 observing campaigns are carried out every year. GREGOR is a new solar telescope with a 1.5 m aperture at the Teide Observatory, Tenerife, Spain. The project is undertaken by a predominantly German consortium, consisting of the Kiepenheuer Institut für Sonnenphysik, the Astrophysikalisches Institut Potsdam, the Universitäts-Sternwarte Göttingen, and other national and international Partners. GREGOR is designed for high-precision measurements of the magnetic field and the gas motion in the solar photosphere and chromosphere with a resolution of 70 km on the Sun, and for high resolution stellar spectroscopy.
- Solar Laboratory - The SolarLab is a peculiar telescopic installation owned by the IAC, that contains a total of three instruments which operate continuously (on a daily basis and in some cases for more than 25 years) over day and night-time and with a unique and precise scientific observing program. The owners of the instruments are different but the IAC researchers are responsible for their operation and actively participate in their scientific exploitation through the different established consortia. The primary objective is the study of the Sun's interior through the unique tools provided by Helioseismology. In recent years, the scientific scope was extended by the incorporation of instruments devoted to Asteroseismology, Planetary transits and Earthshine monitoring.
- CMB Experiments - The aim of the project is to determine the angular power spectrum of Cosmic Microwave Background (CMB) in angular scales from a few degrees to several arcminutes. The primordial matter density fluctuations that originated the present structure of the Universe left imprinted spatial variations in the CMB radiation. From high sensitivity maps of this radiation we aim to constrain the most relevant cosmological parameters: total energy/matter density, density of cold dark matter, density of baryonic matter, the Hubble constant, density of dark energy, neutrino density, reionization epoch, etc. The QUIJOTE (Q-U-I JOint TEnerife) CMB Experiment is a scientific collaboration between the Instituto de Astrofísica de Canarias (Tenerife, Spain), the Instituto de Física de Cantabria (Santander, Spain), the Departamento de Ingenieria de COMunicaciones (Santander, Spain), the Jodrell Bank Observatory (Manchester, UK), the Cavendish Laboratory (Cambridge,UK), and the IDOM company (Spain). It started operations in November 2012, and it consists in two telescopes and three instruments dedicated to measure the polarization of the microwave sky in the frequency range between 11 GHz and 40GHz, and at angular scales of 1°.
- Bradford Robotic Telescope - The Bradford Robotic Telescope (BRT) is an autonomous astronomical telescope located at Teide Observatory, Tenerife in the Canary Islands. It is owned by the University of Bradford and was built between 2002 and 2004 for remote use by schools and individuals worldwide.

- STELLA Robotic Telescope - STELLA (abbreviation for STELLar Activity) is a long-term project for observing and monitoring activity tracers on cool stars with two robotic telescopes. STELLA is an observatory hosting two robotic telescopes (STELLA-I and STELLA-II) that operate in fully unattended mode. The building itself is automatic, and the telescopes decide about the best observing strategy on the fly. STELLA-I is equipped with an optical CCD imager & photometer (WIFSIP) and an AO testbed, while STELLA-II fiberfeeds the STELLA echelle spectrograph. STELLA is a project of the Leibniz-Institut für Astrophysik Potsdam (AIP) in collaboration with the Instituto de Astrofísica de Canarias (IAC) and is located at the Teide Observatory on the Canarian island of Tenerife, Spain. P.I. is Klaus G. Strassmeier.
- Optical Telescope Array - OTA is composed of two automatic capsules with a meteorological station, two 16'' (=40, 64 cm) F10 Schmidt- Cassegrain reflecting telescopes, two robotic telescope mounts with a margin of error of less than 5 arcseconds and an "All Sky" camera.
- Vacuum Tower Telescope. - The VTT is a classical solar telescope: two coelostat mirrors at the top feed the sunlight into the telescope. The primary mirror has a diameter of 70 cm and a focal length of 46 m. The main advantage of the coelostat system is the non-rotating solar image in the laboratory. The VTT offers several spacious optical laboratories for all kinds of optical setups. Some of the laboratories are used for permanent installations, but there is always room for specialized or dedicated instruments. An adaptive-optics system is permanently installed and available to all focal plane instruments. This leads to a substantial improvement of the image quality, reaching a spatial resolution of up to 0.5 arcsec even with exposure times of up to 10 sec. The VTT is one of only a few solar telescopes world-wide that have adaptive optics permanently installed. The VTT is equipped with a state-of-the-art instrumentation to perform imaging and spectropolarimetric measurements: Fast CCDs can be used for high cadence imaging. Sophisticated instruments include

  (a) POLIS, a spectropolarimeter for the iron line pair at 630.2 nm with simultaneous intensity profiles for Ca II H.

  (b) TIP, a spectropolarimeter for the near Infrared (up to 2 micrometer).

  (c) TESOS, a 2D spectrometer based on three Fabry-Perot-Interferometers achieving a spectral resolution of 250000.

  (d) Echelle spectrograph, which allows to measure the line intensity profiles simultaneously in three different optical wavelength bands. Certain combinations of intruments allow for simultaneous muti-wavelength observations, in order to retrieve information from different layers of the solar atmosphere.

KEY INFORMATION

Full Name:	**Yebes Observatory**
Acronym:	CAY
Website	http://www.fomento.es/MFOM/LANG_CASTELLANO/DIRECCIONES_GENERALES/instituto_GEOGRAFICO/Astronomia/Instalaciones/cay/
Description:	The Observatory of Yebes is operated by the Instituto Geográfico Nacional (a Direction General of the Ministry for Public Works, 'Ministerio de Fomento'). The site is at a height of approximately 930 m above sea level in the Guadalajara province (about 80 km away from Madrid). With three geodetic techniques (radioastronomy, gravimetry, and permanent station for reception of the global navigation satellite system, GNSS), the Observatory of Yebes is at present the fundamental geodetic station in Spain. The design and construction of a new generation Satellite Laser Ranging (SLR) system will complement the station with a fourth geodetic measurement technique (there are only 7 of such 4-technique geodetic stations in the world). The Yebes Observatory is very well framed in the international context. The 40-m radiotelescope is one of the most important nodes of the European VLBI Network (EVN), and it is an observing station of the International VLBI Service (IVS). The 13,2-m radiotelescope is part of the RAEGE, which is itself one of the most important components of the VLBI2010 Geodetic Observing System (VGOS) and of the Geodetic Global Observing Systems (GGOS). The gravimetry station, designed for gravimeter intercomparisons, is being inserted in the International Gravity Reference System (IGRS). The observatory also hosts a very well equipped laboratory for the development of state of the art low noise amplifiers, a laboratory for the development of radio receivers.
Keywords:	Astronomy, astrophysics, telescope, astronomical instrumentation, optical, infrared, CMB
Type of use:	Research / Science
Type of RI:	Single-sited
RI Category:	Telescopes
Main Scientific Domain:	Physics, Astronomy, Astrophysics
Hosting Organization:	Instituto Geográfico Nacional (a Directorate General of the Spanish Ministry for Public Works)
Location:	Cerro de la Palera, s/n - 19141 Yebes- Guadalajara
Main Status:	Operational since 1964
Contact:	Rafael Bachiller (r.bachiller@oan.es)

RESEARCH SERVICES:

- Astronomical Observations (VLBI and single dish): Usual astronomical observations to be carried out in coordination with the European VLBI Network, or in single dish mode.
- Geodetic Radioastronomy Observations: Observations of radiostronomy of geodetic interest (Earth pole motion, tectonic plates motion, Reference Systems, etc).
- Measurements of antennas, feeds and reflectors: The Yebes anechoic chamber allows the characterization of the whole feeding system of an antenna. High degree of flexibility.
- Gravimetry measurements: Production of an extensive data base which available to every interested scientist.
- Inter-comparisons of gravimeters: The gravimetry station can be used to install visiting gravimeters which can be compared to the ones installed in Yebes.
- Time and Frequency calibration: The Hydrogen masers and GPS equipment can be used to calibrate time and frequency instrumentation.
- Characterization of microwave and millimeter instrumentation: The microwave, millimeter and cryogenic instrumentation can be used for accurate characterization of radiofrequency performance of different components.

EQUIPMENT:

- Radiotelescope of 40 m: The 40 m. radio telescope has been recently opened for centimetre and millimetre waves that is devoted to Very Long Baseline Interferometry (VLBI) and single dish observations.
- Radiotelescope of 13,2 m . Central node of the RAEGE Network: The Yebes Observatory is the central node of the RAEGE network which includes other radiotelescopes in the Azores and in the Canaries. RAEGE is itself part of the VLBI2010 Global Observing System (VGOS)
- Anechoic chamber: The anechoic chamber is unique in Spain for its broad frequency operation band width (2- 140 GHz).
- Gravimetry station: Gravimetry pavillion hosting several (relative and absolute) gravimeters and free pillars to install visiting gravimeters for inter-comparisons.
- Time and Frequency Laboratory: Time and frequency laboratory hosting two hydrogen maser atomic clocks used for time reference calibration.
- Microwave and millimeter Cryogenic Laboratory: Laboratories equipped with microwave, millimeter and cryogenic instrumentation for the characterization of microwave and millimeter components. The frequency range extends from DC to 50GHz.The characterization can be extended in the temperature range from room temperature to cryogenic (20 K).

ENERGY

- ***Solar Platform of Almería (PSA)***
- ***Flexible Heliac TJ-II***
- ***National Center for Hydrogen and Fuel Cell Technology Experimentation (CNHPC)***

KEY INFORMATION

Full Name:	**Solar Platform of Almería**
Acronym:	PSA
Website	http://www.psa.es
Description:	Owned by CIEMAT (Public Research Center on Energy and Environment. Founded in 1981. Objective is the development of 'concentrating solar technologies'. This RI is an ICTS (Unique Scientific and Technological Infrastructure), included in the Spanish National Roadmap for RIs.
Keywords:	Solar energy, solar thermal electricity, water desalination, materials testing
Type of use:	Research / Science
Type of RI:	Single-sited
RI Category:	Energy Engineering Facilities (Non nuclear)
Main scientific domain:	Engineering and Energy
Hosting Organization:	Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas (CIEMAT)
Location:	04200 Tabernas | Almería Spain
Main Status:	Operational since 1981
Contact:	Sixto Malato Rodríguez (direccion@psa.es)

RESEARCH SERVICES:

- Testing and characterization of parabolic trough solar collectors
- Testing and characterization of heliostats
- Testing and characterization of receiver for power tower
- Testing and characterization of dish-Stirling systems
- Testing and characterization of linear Fresnel solar collectors
- Testing and characterization of thermal energy storage systems
- Testing and characterization of solar-driven water desalination systems
- Testing and characterization of solar-driven water detoxification systems
- Testing and characterization of solar-driven water disinfection systems
- Testing and characterization of solar-powered reactors for industrial processes

EQUIPMENT:

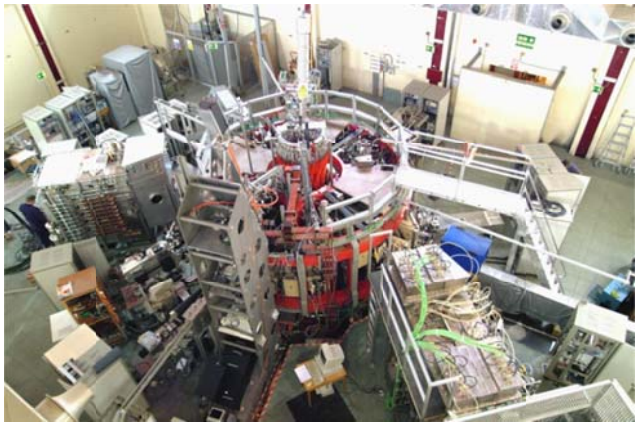
- CESA-1 Central receiver system- 7 MW CRS-type central receiver system for testing of receivers, heliostats, thermal storage systems
- CRS Central receiver system - 3 MW CRS-type central receiver system for testing of receivers, heliostats, thermal storage systems, control algorithms
- DCS Distributed collector system- 2 MW Parabolic trough system for testing of collectors, mirrors, absorber tubes, thermal storage systems, control algorithms
- DISTAL-Dish-Stirling testing system - Parabolic dishes for testing of components as Stirling engine or mirrors
- Solar Furnace - Parabolic dish for high-temperature testing of materials or solarization of high-temperature industrial processes.
- Water Detox Loop - Compound-parabolic collector system plus chemistry lab aimed to study water detoxification processes
- Water Desinf Loop - Compound-parabolic collector system plus chemistry lab aimed to study water disinfection processes
- DESAL test facility - Solar-driven Multi-Stage Water distillation plant for development of that technology by testing of several components
- FRESDEMO test facility - Pilot-scale linear-Fresnel solar collector aimed to testing and characterization of several components

SOCIETAL GRAND CHALLENGES:

- Secure, clean and efficient energy
- Climate action, resource efficiency and raw materials

KEY INFORMATION

Full Name:	**Flexible Heliac TJ-II**
Acronym:	TJ-II
Website	http://www-fusion.ciemat.es/New_fusion/es/TJII/
Description:	The flexible heliac TJ-II is a plasma physics device oriented to Fusion Energy research. The heliac, from "helical axis" is a "stellarator" device, which differs from the mainline "tokamaks" in the way the confining magnetic configuration is achieved. TJ-Ii is a mid size device, with a major radius of 4,5 m , a minor radius of 0,2 m and a magnetic field of 1 Tesla. It is located at CIEMAT, national centre for energy and environment research and operates in the framework of the Contract of association with EURATOM. This RI is an ICTS (Unique Scientific and Technological Infrastructure), included in the Spanish National Roadmap for RIs.
Keywords:	Plasma physics, electromagnetism, nonlinear physics
Type of use:	Research / Science
Type of RI:	Single-sited
RI Category:	Nuclear Research Facilities
Main scientific domain:	Physics, Astronomy, Astrophysics and Mathematics
Hosting Organization:	CIEMAT
Location:	Spain - Madrid - Av Complutense 40
Main Status:	Operational since 1998
Contact:	Joaquín Sánchez (joaquin.sanchez@ciemat.es)



RESEARCH SERVICES:

- High temperature plasma - The concept of service is not well suited to a fusion research experiment: users come to TJ-II with proposals for plasma experiments or proposals to test new instrumentation techniques

EQUIPMENT:

- Thomson scattering system - Rubi laser based, uses two dimensional intensified cameras. Obtains density and Temperature profile along a full plasma diameter
- Infrared interferometer - based on a CO2/HeNe dual system, provides line integrated electron density
- Microwave interferometer - same as above, with a 140 GHz beam, useful for lower densities
- Microwave reflectometer - Several systems: swept frequency for electron density profile measurements, stationary frequency system for turbulence studies. Operates in the range 30-70 Ghz
- Bolometry cameras - metal bolometers for tomography of the global radiation emission
- Soft X ray cameras - several linear cameras for tomography of the SXR emission, linked to the product of electron density and temperature.
- VUV spectrometers - Monitoring of line emission from impurities
- UV-Visible spectrometers - Monitoring of line emission from impurities
- Neutral particle analyzer - Determines the ion temperature from the energy distribution of escaping neutrals, generated by charge exchange reactions
- Doppler spectroscopy - measures plasma rotation, from line shift, and ion temperature, from line broadening
- Heavy Ion beam Probe - Based on a Cesium beam at 200 KV , used for internal plasma potential measurements
- Langmuir Probes - used to monitor edge parameters
- Fast visible cameras - able to measure in the range of 100.000 frames/s, used for turbulence studies.
- Laser Blow of injector - Injects selected trace impurities, used for measurement of the particle confinement time
- Lithium injector - used for edge spectroscopy oriented to measurement of electron density and temperature
- Helium injector - used for edge spectroscopy oriented to measurement of electron density and temperature
- Microwave radiometer - 20-60 Ghz radiometer, measures the electron temperature

SOCIETAL GRAND CHALLENGES:

- Secure, clean and efficient energy

KEY INFORMATION

Full Name:	**National Center for Hydrogen and Fuel Cell Technology Experimentation**
Acronym:	CNHPC
Website	http://www.cnh2.es
Description:	The National Hydrogen Centre (CNH2) is a new Scientific Research and Technology Development facility (ICTS), devoted to scientific and technology research in all fields related to hydrogen and fuel cells technologies. The Centre has been created as a Consortium between Spanish Ministry of Economy and Competitiveness and Castilla-La Mancha Government. They held each one the 50% of the Consortium. The CNH2 is on duty of national research, technology and industrial community and open to international collaboration. The Consortium was established on December 21, 2007 and the headquarters are located in Puertollano (Ciudad Real). The objectives of the CNH2 are to direct national strategy in these technologies, carry out technological development and innovation and promote projects that will serve to demonstrate the efficiency and reliability of these technologies and to incorporate them into the national and international energy system, which in turn serves to stimulate the industrial and energy sectors. The CNH2 will focus its activities on producing, storing, purifying and distributing hydrogen generated fundamentally from renewable sources, working with high, medium and low-temperature fuel cell technologies, integrating systems and demonstrating these systems at pilot scale at its facilities. This RI is an ICTS (Unique Scientific and Technological Infrastructure), included in the Spanish National Roadmap for RIs
Keywords:	Hydrogen and fuel cell technologies, experimentation, energy storage, energy carrier, renewables
Type of use:	Research / Science
Type of RI:	Single-sited
RI Category:	Energy Engineering Facilities (non nuclear)
Main Scientific Domain:	Engineering and Energy Chemistry and material sciences
Hosting Organization:	National Center for Hydrogen and Fuel Cell Technology Experimentation Consortium
Location:	Spain - Puertollano - Fernando el Santo
Main Status:	Under Construction
Contact:	Manuel Montes (manuel.montes@cnethpc.es)

RESEARCH SERVICES:

- Electrolyser test bench - A testing system for alkaline electrolysers
- Microgrid test of hydrogen systems - Microgrid test of hydrogen systems
- Hydrogen simulation-SW - Simulation software of hydrogen systems
- Engineering - Engineering related to hydrogen and fuel cell technologies
- Safety - Safety know-how on hydrogen
- Fuel cell test bench - Test stand for fuel cell research and development
- Systems Integration - Systems Integration

EQUIPMENT:

- Electrolyser Test Bench - Alkaline Type, Up to 12 Kw
- Microgrid I - Called CNH2-M1: Up to 19 Kw,it encompasses renewable sources (microwind and photovoltaics) with hydrogen storage systems and batteries.
- Microgrid II - Called CNH2-M2: Up to 38 Kw, it encompasses DC power generators with high pressure hydrogen storage systems and batteries.
- Computational Fluid Dynamics (CFD) software. - Fluent and Comsol software.
- PEM Fuel Cell Test Bench - For low and high temperature Proton Exchange Membrane Fuel Cells (PEMFC)

SOCIETAL GRAND CHALLENGES:

- Secure, clean and efficient energy
- Smart, green and integrated transport

Engineering

- ***Unique Infrastructures for Civil Engineering (CEDEX)***
- ***El Pardo Model Basin (CEHIPAR)***
- ***Large Scale Wave Flume of the Maritime Engineering Laboratory (CIEM)***
- ***Great Maritime Engineering Tank of Cantabria (GTIM)***

KEY INFORMATION

Full Name:	**Unique Infrastructures for Civil Engineering**
Acronym:	CEDEX
Website	http://www.cedex.es
Description:	The large-scale CEDEX installations are diverse civil engineering infrastructures for carrying out experiments and tests in the areas of materials, natural resources, the environment, civil construction, conservation of cultural and historic heritage, transport and land planning. Some of the most significant facilities include the seismic simulator, the wave tank, ship manoeuvres simulation equipment, the railway caisson, the road surface testing track, the physical hydraulic models unit, a laboratory for isotopic applications. CEDEX is an autonomous body within the Ministry of Public Works, which is also functionally attached to the Ministry of Environment and Rural and Marine Affairs. Its principal function is to provide high-level technical assistance in civil engineering and public works through its various specialist units. The degree of specialization among its staff, the uniqueness of some of its facilities, the great variety of civil engineering and environmental issues it addresses, and its growing cooperation with similar institutions overseas, make CEDEX a cutting-edge international body that can apply the most recent innovations in solving the numerous problems existing in its areas of specialization, particularly significantly in those where engineering must be combined with inherent environmental aspects, in order to achieve sustainable development.
Keywords:	Materials, geothecnic, railway, structures, marine, maritime, hydraulics, roads
Type of use:	Research / Science
Type of RI:	Single-sited
RI Category:	Earth, Ocean, Marine, Freshwater, and Atmosphere Data Centres Environmental Management Infrastructures, Civil Engineering Research Infrastructures, Materials Synthesis or Testing Facilities, Earthquake Simulation Laboratories, Marine & Maritime Engineering Facilities
Main Scientific Domain:	Engineering and Energy, Earth and Environmental Sciences
Hosting Organization:	CEDEX, Centro de Estudios y Experimentación de Obras Públicas
Location:	Spain - Madrid - Avenida de Alfonso XII 3 y 5
Main Status:	In operation since 1958
Contact:	Mariano Navas (mariano.navas@cedex.es)

RESEARCH SERVICES:

- Infrastructure Performance - Any research can be addressed through: Engineers and scientists with extensive experience and high qualifications; Cutting edge laboratories; Simulation Systems; Field Instrumentation; High-performance evaluation devices for field data; Data mining; Mathematical and statistical expertise
- Test specification of ETCS constituents Remote cross testing track / train - Specification of Subsets 094 and 076 Use of Subsets 110, 111 and 112 in commercial railway network deployment
- Life Cycle Analysis of Infrastructure - Economic analysis of managing the assets; External Costs Analysis: Accidents, Air pollution, Noise, Climate Change; Material recycling and use of secondary materials; User costs; Sustainability
- Design of Hydraulic Structures - The Hydraulic Laboratory is specialized in the design of hydraulic structures and river engineering by means of physical and numerical modeling

EQUIPMENT:

- Accelerated Pavement Test Track - In a very short period of testing time:
- Comparative Pavement & Material Performance
- Detailed and specific Stress & Strain responses
- Simulation of conditions: Water table level, temperature, insulation, etc
- Improving knowledge and modelization of materials behaviour
- Aid for pavement construction & rehabilitation design

- Eurobalise Laboratory - Certification of ETCS constituentes: Eurobalise, Antenna/BTM and Euroloo
- ISO 17025 accreted laboratory

- Eurocab laboratory - Certification of ETCS On-board (EVC) ISO 17025 accredited laboratory
- Putting in service track-signaling projects
- Train-track integration
- Cross testing RBC / EVC
- Traffic simulation laboratory

- Seismic Simulator -
- 6 DoF seismic simulator, 3x3 meters, 10 tons capacity
- Intended to earthquake reproduction
- Track box - A 21 m long, 5 m wide and 4 m deep installation that allows to test at 1:1 scale either straight or curved complete sections of conventional and high speed lines. It allows the testing of novel track forms, calibration of 3D numerical models, analysis of mixed traffic effects in high speed lines, generation of dynamic loads in ballast and slab tracks, determination of fatigue curves under real load time histories

- Multidirectional wave basin - A 34 x 30 x 1.60 m. facility used for testing ships, offshore structures and three-dimensional models of harbors. Its 72 wave generators can create a 0.58 m wave
- Wave and wind channel at large scale - Dimensions: 90 m x 3.60 m and 6 m with variable depth, adjustable by independent boards. The wave generation system consist of a rotational hydraulics blades with dry backfill. Power 300 Kw Generation of regular and irregular waves of 1.60 m. Wind generation system: Tunnel: length 26 m, width 3.6 m, height of 2.5 to 4.5 variable channel m; fan: 1.5 m; power 315 kW, variable speed. Maximum wind speed: 20 m / s.
- Simulation of ship maneuvering - Main Bridge. Governance and control elements: rudder, telegraph orders to the machine control side propellers and anchors, navigational aid: GPS, LORAN C, radar, VHF, sounder, internal communication and sound signals. Data: tachometer, steering angle magnetic compass, speedometer doppler, ship speed. Synthetic radar image generated by computer with radar performance. Exterior view realistic, high-resolution, presented in surround cylindrical screen 270 ° and 7.5 m radius, with normal vision, lateral, stern or "bird's eye view". Projection system composed of 9 high resolution CRT projectors.
- Hydraulics laboratory - Physical modeling of hydraulic structures and river engineering

KEY INFORMATION

Full Name:	**El Pardo Model Basin**
Acronym:	CEHIPAR
Website	http://www.cehipar.es
Description:	El Pardo Model Basin(CEHIPAR) is a Research Center in the field of Ship Hydrodynamics. It performs studies and experiments on physical and mathematical models. All branches of Ship Hydrodynamics are developed, in particular Resistance, Propulsion, Seakeeping and Maneuverability, as well as Safety studies. Also deals with new energies of wind, wave and currents origins. It belongs to the Spanish Ministry of Defense. This RI is an ICTS (Unique Scientific and Technological Infrastructure), included in the Spanish National Roadmap for RIs
Keywords:	Ship model experimental facilities, ship hydrodynamics, offshore engineering, new energies
Type of use:	Research / Science
Type of RI:	Single-sited
RI Category:	Marine & Maritime Engineering Facilities
Main Scientific Domain:	Engineering and Energy
Hosting Organization:	Canal de Experiencias Hidrodinámicas de El Pardo Spanish Ministry for Defense
Location:	Spain - El Pardo - Carretera de la Sierra s/n
Main Status:	Operational since 1992
Contact:	Luis Palao (lpalaol@cehipar.es)

RESEARCH SERVICES:

- Experiments at Still Water Tank - Resistance tests, Self-propulsion tests, Open water propeller tests,Wake survey tests, Flow lines tests, Sailing yacht tests, Calibration of flow-meters
- Experiments at Cavitation Tunnel - Cavitation observation tests, cavitation inception tests, Erosion tests, Open water tests, Dummy model tests, Calibration of wire-mesh for wake simulation
- Experiments at Seakeeping Basin - Behaviour of ships and floating structures in waves. Regular, irregular and random seas. Offshore structures at sea. Ship survivability after damage, Wind and current energy devices, Captive model manoeuvrability tests
- Experiments at Lake - Free model maneuverability tests
- Computational Fluid Dynamics studies (CFD) - CFD on Resistance, Flow and Wave Pattern configuration. CFD on Propeller and Cavitation Performance. CFD on Seakeeping behavior

EQUIPMENT:

- Resistance dynamometer.
- Propeller dynamometer -
- Six-components dynamometer -
- Underwater videocameras -
- GPS positioning equipment. -
- LD velocimeter -
- Acoustic Hydrophones –
- Computerized Planar Motion Carriage.
- Wave height sensors -
- Pressure transducers -
- Optical tracking systems -
- Segmented model sensors. -
- Particle Image Velocimetry (PIV)
- International Towing Tank Conference (ITTC)
- Cooperative Research Ships(CRS)
- High Speed Video

SOCIETAL GRAND CHALLENGES:

- Secure, clean and efficient energy
- Smart, green and integrated transport

KEY INFORMATION

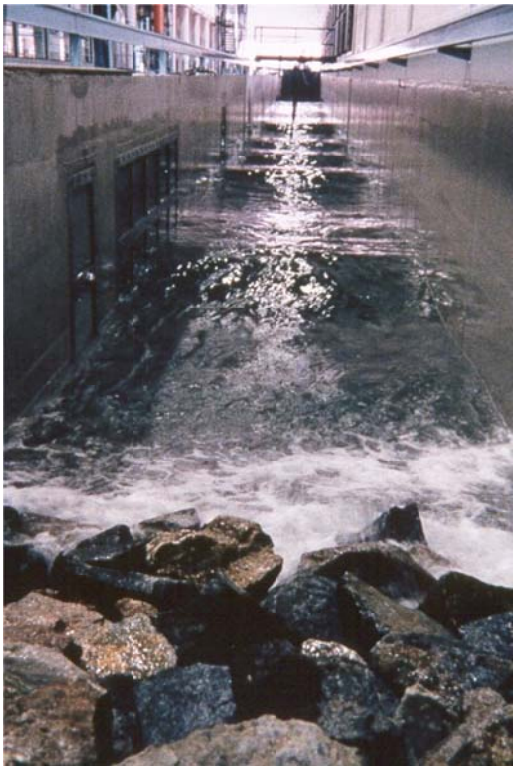
Full Name:	**Large Scale Wave Flume of the Maritime Engineering Laboratory**
Acronym:	CIEMLAB
Website	http://ciemlab.upc.edu
Description:	The Large Scale Wave Flume of the Maritime Engineering Laboratory (LIM) of the Universitat Politècnica de Catalunya (UPC), is an international research facility for controlled hydraulics experiments in coastal, harbour and oceanographic engineering and in other fields such as aquaculture and renewal energy. Many national and international projects have been carried out at the facility since 1993, the year it opened. In 1997, it was recognized as a large-scale facility by the EU'S Directorate-General for Research, and in 2006, as an outstanding science and technology installation (ICTS) by the Spanish Ministry of Science and Education. The CIEMLAB, which is 100m long, 3m wide and up to 7m deep inside the current generator's wells, is a facility of excellence for scaled tests and studies under close-to-real conditions. Typical working scales are between 1:2 and 1:20, although it is also possible to work at the other scales. The larger scale ratios enable the scale effects inherent to all scaled experiments to be reduced. The CIEMLAB is open to the worldwide scientific community through an access programme granted by the EU, the Spanish Ministry and the facility itself.
Keywords:	Waves, currents, physical model, large scale
Type of use:	Research / Science
Type of RI:	Single-sited
RI Category:	Research Facilities
Main Scientific Domain:	Engineering and Energy Earth and Environmental Sciences
Hosting Organization:	Universitat Politècnica de Catalunya (UPC)
Location:	Spain - Barcelona - Jordi Girona 1-3
Main Status:	Operational since 1993
Contact:	Daniel González (daniel.gonzalez-marco@upc.edu)

RESEARCH SERVICES:

- Hydraulic modeling - Hydraulic wave tests (regular and irregular) in 2DV at small scale (> 1:20) and large scale (< 1:20) Hydraulic current tests (regular and irregular) in 2DV at small scale (> 1:20) and large scale (< 1.20) Hydraulic wave/current/mean tests (regular and irregular) in 2DV at small scale (> 1:20) and large scale (< 1:20)
- Hydrodynamic analysis of autonomous submarine vehicles in 2D
- Hydro-morphodynamic analysis of sedimentary deposits in 2DV at large scale < 1:20
- Coastal Engineering tests in intermediate/shallow depths in 2DV at large scale < 1:20
- Breakwater functional and resistance analysis in 2DV at small scale (> 1:20) and large scale (< 1:20)
- Harbor Engineering tests in intermediate/shallow depths in 2DV at small scale > 1:20 and large scale < 1:20
- Analysis of renewable energy wave converters in 2DV at large scale < 1:20
- Hydro-morphodynamic analysis of sedimentary deposits in 2DV at small scale > 1:20
- Coastal Engineering tests in intermediate/shallow depths in 2DV at small scale > 1:20

EQUIPMENT:

- National Instruments PXI equipment - National Instruments PXI equipment distributed along the wave flume and interconnected by a fiber optic system.
- Software Wavelab - Data analysis software Wavelab.
- Software - Software for the control of the wave generator that allows regular and irregular waves to be generated. Additionally, a PC-based active absorption system allows tests to be run on wave series for as long as required, without the effect of spurious model-induced reflections.
- Wedge type - Wave generator, suitable for generating waves in intermediate water conditions, and a bidirectional pumping system whose capacity is 2.000 l/s. The system is hydraulically actuated and PC-controlled, and is a capable of reproducing waves with heights up to 1.6m.
- High resolution cameras - Cameras for the measurement and collection of data.
- Park sensors - 3D laser scanner, load cells, turbidity sensors and profilers and sediment concentration, profiler of funds, echo sounders miniature, acoustic level sensors.
- Pore Pressure sensor - Pressure sensor range 100-250-400 mb.
- ECM - Electromagnetic current meter.
- OBS - Optical backscatter sensor measures suspended solids and turbidity by the optical backscatter method.
- ADV - ADV downlocking /sidelocking. Acoustic Doppler Velocimeter. The vectrino velocimeter measuring water speed using the Doppler effect.
- AWG - Acoustic Wave gauges. The ULS-40D is an acoustic sensor that emits ultrasond pulses that reflect on the measurement object and is received back as an echo.
- RWG - Resistance wave gauges operate on the principle of measuring the current flowing in an immerged probe which consists of a pair of parallel stainless steel wires.



KEY INFORMATION

Full Name:	**Great Maritime Engineering Tank of Cantabria**
Acronym:	GTIM
Website	www.ihcantabria.es
Description:	This basin is unique in Spain and one of the few in the world with the most advanced technology for generating simultaneous waves, currents and wind. It is used for physical and numerical modeling of problems in deep and surface waters, and will enable important developments in offshore and coastal engineering. At three metres in depth, and with a central trench of up to 10 metres, the basin has the capacity for carrying out trials at any depth range, making it possible to experiment at depths equivalent to 1,000 metres at a scale of 1/100. This facility has been designed to integrate a physical modeling system with the tank as its fundamental infrastructure, a numerical simulation system that reproduces conditions in the tank and experimentation channels and a web-based experimental management system that makes it possible to monitor the physical modeling, to carry out numerical simulations and remotely analyze the results. The main goal of the physical modeling system is to carry out testing to measure hydrodynamic and wave-structure interaction processes which can include the sediment transport effects, the effects of tsunamis and the wave-current and wave-wind interaction. The physical modeling system includes: a) generation of multidirectional waves, wind and currents in a large scale capable of operating at many different water depths, from shallow to deep waters; b) a wave/current flume able to generate waves, including longwaves such as tsunamis, and following or opposing currents; c) a large open-area reserve for physical modeling of undefined boundary studies, such as river meanders, estuaries and ports; and d) a cutting edge numerical modeling capacity.
Keywords:	Ship model experimental facilities, ship hydrodynamics, offshore engineering, new energies
Type of use:	Research / Science
Type of RI:	Single-sited
RI Category:	Marine & Maritime Engineering Facilities
Main Scientific Domain:	Engineering and Energy
Hosting Organization:	Fundación Instituto de Hidráulica Ambiental
Location:	Parque Científico y Tecnológico de Cantabria. c/ Isabel Torres Nº 15 Santander 39011

Main Status:	Operational since 2011
Contact:	Iñigo Losada (inigo.losada@unican.es)

RESEARCH SERVICES:

GTIM applications include marine hydrodynamics, flow-structure interaction, coastal engineering, port engineering, maritime works and coastal protection structures, study of tsunamis and coastal risk, offshore technology, safety and reliability of marine structures, offshore platforms, marine renewable energy, floating structures, marine geotechnics, materials engineering for marine environment, design of submarine vehicles, design of oceanographic instrumentation, analysis of constructive systems in the marine environment, as well as nuclear power plant applications and device testing.

EQUIPMENT:

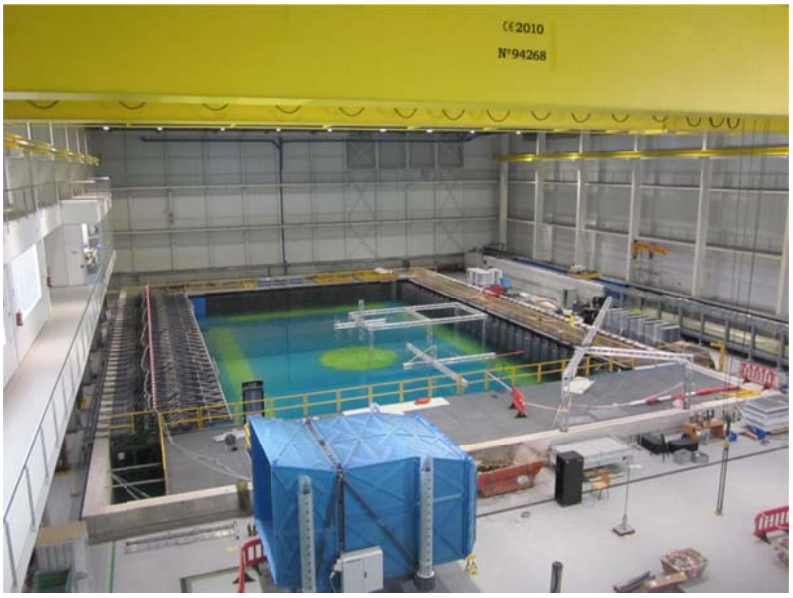
1) Multidirectional Wave :

Length	30 m
Width	44 m
Minimum dept	0.2 m
Maximum depth	3.7 m
Pit	6 m in diameter, 8 m depth, allows testing in maximum depths of almost 12 m. Includes a floating lid for variable depth testing
Maximum available testing area	760 m^2
Wave generation	Segmented system formed by 64 independent wave paddles (0.5m wide and 4.5 m high). Each one is triggered by two articulated arms and a vertical connecting rod. Full 3D active wave absorption. Passive wave absorbers around the full perimeter. Non-linear wave generation, and second order long-wave generation. Lateral panels for directional wave generation with virtual paddles (corner reflection method, increases the width of the wave machine)
Generation mode	Piston and combined
Actuator systems	Hydraulic pistons, configured in 2 interconnected hydraulic groups which are commutable and with Nitrogen accumulators. Ability to disengage and block individually each wave paddle for special applications.

Generated wave characteristics	s (regular wa H_{max} = 1.1 m, T = 3 s (regular waves) H_{m0} = 0.6 m y Tp = 3 s (random waves) (h=3 m) Tp = 0.5 s – 20 s for h= 0.2 to 3.7 m Multidirectional long- and short-crested waves (±45º, ±60º for longer waves)
Current generator	12 thrusters, 900 mm in diameter and 25 kW/thruster
Currents	Nominal design currents 0.2 m/s at a depth of 3 m, which is equivalent to a flow rate of 19.2 m³/s perpendicular to the wave generation device
Wind generator	Group of 9 computer controlled wind fans mounted on a closed portable and variable height frame with a wind stabilisation system and funnel
Wind characteristics	Nominal design wind above 10 m/s, 1 m from the fans covering an area which is 2.3 m wide by 2.3 m high
Power	Wave generator device: 950kW Current generator device: 300 kW Wind generator device: 100 kW
Filling and draining system	Fully automated and controlled, with 4 submersible pumps with a total discharge of 400 l/s available for all facilities in the laboratory
Lifting capacities	10 ton bridge crane spanning the full laboratory length and width

2) Available instrumentation:

Wave and current gauges	Free surface (resistive, capacitive and acoustic), pressure gauges, laser Doppler anemometry, 3D acoustic anemometry, particle image velocimetry, laser induced fluorescence, current meters
Wind gauges	3D acoustic anemometry, 2D velocimetry, particle image velocimetry, laser induced fluorescence
Motion and load measurement	6DOF motion measurements, axial load cells, strain gauges, 6DOF force and torque transducers, infrared motion detectors, gyroscopes, accelerometers, distantiometers, cable potentiometers, laser profilers, digital image sensors
Optical and communications	Digital SLR cameras, digital HD video, high-speed digital cameras, underwater cameras, half-duplex communications, underwater com, ROV


CE2010
N°94268

Environmental Sciences, Oceanography and Polar Research

- ***Spanish Antarctic Station Gabriel de Castilla (BAGC)***
- ***Spanish Antarctic Station BAE Juan Carlos I (BAJCI)***
- ***Research Vessel Cornide de Saavedra***
- ***Research Vessel Sarmiento de Gamboa***
- ***Research Vessel Hespérides***
- ***Doñana Biological Reserve(RBD)***
- ***Oceanic Platform of Canary Islands (PLOCAN)***
- ***Balearic Islands Coastal Observing and Forecasting System (SOCIB)***

KEY INFORMATION

Full Name:	**Spanish Antarctic Station Gabriel de Castilla**
Acronym:	BAGC
Website	http://www.ejercito.mde.es/unidades/Antartica/antartica/index.html
Description:	This RI is an ICTS (Unique Scientific and Technological Infrastructure), included in the Spanish National Roadmap for RIs. Gabriel de Castilla is an Antarctic Base with all the infrastructures and facilities required for research purposes. It provides to the different researchers all the support for their field work: accommodation, food, health care, communications, movement and transport, and specific support for their research projects. The base is operated only during austral summer, when a Base Commander is posted to the area. In Spain, there is a permanent logistics support structure called 'Oficina de la Campaña Antártica' (OCA) that performs its tasks under the direction of the Ops Division of the Army General Staff.
Keywords:	Gabriel de Castilla, Antarctic, Antarctic station, polar research
Type of use:	Research / Science
Type of RI:	Single-sited
RI Category:	Earth, Ocean, Marine, Freshwater, and Atmosphere Data Centres Research Facilities Extreme Conditions Facilities
Main Scientific Domain:	Earth and Environmental Sciences
Hosting Organization:	Spanish Army
Location:	Antarctica - - Deception Island
Main Status:	Operational since 1990
Contact:	Constantino Fernández (cfergar77@et.mde.es)

RESEARCH SERVICES:

- Logistics support - Provided by the Spanish Army.

EQUIPMENT:

- Gabriel de Castilla is an Antarctic Base equipped with all the infrastructures and facilities required for research purposes. It provides to the different researchers all the support for their field work: accommodation, food, health care, communications, movement and transport, and specific support for their investigation projects and researchers.
- The base is operated only during austral summer, when a military team runs this facility under direction of a Base Commander specially appointed for the period. In Spain, there is a permanent logistics support structure called Oficina de la Campaña

Antártica (OCA) that performs its tasks under the direction of the Ops Division of the Army General Staff.

KEY INFORMATION

Full Name:	**Spanish Antarctic Station BAE Juan Carlos I**
Acronym:	BAE JCI
Website	http://www.utm.csic.es/bae.asp?switchlang=2
Description:	This RI is an ICTS (Unique Scientific and Technological Infrastructure), included in the Spanish National Roadmap for RIs. It was opened for scientific use in 1998, and it is fully managed and operated by engineers and technicians from UTM-CSIC since 1999, providing the necessary technical and scientific support and adequate logistics for Spanish National Antarctic research. It is also the starting operational base to sustain other research activities that take place at seasonal camps around the South Shetland Islands, like Byers International Camp and others. The station operates during the austral summer, from November until March, although during the rest of the year the UTM-CSIC keeps continuous recordings from different parameters. The data is sent remotely to the UTM-CSIC facilities in Barcelona.
Keywords:	Antarctic Treaty, Antarctica, Environment, Renewable Energy, Global Change, Geomagnetic Observatory, Marine Ecosystems, Glaciology
Type of use:	Research / Science
Type of RI:	Single-sited
RI Category:	Software Service Facilities Environmental Health Research Facilities Structural Biology Facilities, Acoustic monitoring stations Atmospheric Measurement Facilities Earth Observation satellites Earth, Ocean, Marine, Freshwater, and Atmosphere Data Centres Environmental Management Infrastructures In situ Marine/Freshwater Observatories Solid Earth Observatories, including Seismological Monitoring Stations Electrical and Optical Engineering Facilities
Main Scientific Domain:	Information Science and Technology Biological and Medical Sciences Earth and Environmental Sciences Engineering and Energy
Hosting Organization:	Spanish Ministry of Economy and Competitiveness Agencia Estatal Consejo Superior de Investigaciones Científicas (CSIC)
Location:	Antarctica - Livingston Island (South Shetland Islands) - BAE Juan Carlos I, South-Eastern coast of South Bay, Hurd Peninsula
Main Status:	Operational since 1988
Contact:	Albert Figueras (albert.figueras@utm.csic.es)

RESEARCH SERVICES:

- [01-BAE JCI] Remote data sampling of the atmosphere - Satellite remote sensing, GPS ionosphere studies
- [02-BAE JCI] Direct data sampling of the atmosphere - Meteorological station and sensors
- [03-BAE JCI] Remote data sampling of the interface atmosphere/water and land surface - GPS position ant time, DGPS, RTK, satellite remote sensing, geomagnetic observatory, land seismic station
- [04-BAE JCI] Direct data sampling of the interface atmosphere/water and land surface - Physical properties: thermosalinometry, fluorometry, tide gauge, ice coring, permafrost monitoring station; Sediments: turbidimeter; Organisms: bongo net, lichen monitoring station
- [05-BAE JCI] Remote data sampling of the water column - Physical properties: acoustic current meter; Sediments: turbidimeter
- [06-BAE JCI] Direct data sampling of the water column - Physical properties: CTD and rosette (Niskin bottles) profile systems, radiometer, oxygen sensor, turbidimeter-nephelometer, phtosynthetically active radiation sensor, transmissometer, bathythermograph, flow meter, transparency sensor; Sediments: sediment trap; Organisms: plankton net, plankton counter recorder, electronic multiple sample net, mesozooplankton net
- [11-BAE JCI] Navigation and sensor integration - GPS, heading sensor, gyroscope, Doppler speed log, echo sounder, navigation system, specific navigation system and integration system
- [13-BAE JCI] Information and Communications Technologies - Acquisition of instrumentation and facility data, data integration, data indexing in the data base engines, mapping the data, GIS tools for indexing the metadata, third-party software tools, own-developed software, data link and communications (e-mail management, internet access, VHF communications, etc.)
- [14-BAE JCI] Mooring and submarine observatories operations - Operations and working deck for mooring deployment and recovery; acoustic release system
- [17-BAE JCI] Adaptative mobile laboratories and facilities operations - 10-foot container laboratories and workshops, 20-foot container laboratories and workshops, vehicles management (auxiliary boats, snow bikes, load/unload vehicles)
- [18-BAE JCI] Water laboratory analysis - Seawater and fresh water analysis: espectrofluorometry, espectrofotometry, titrator, salinometry, fluorometry, etc.; Auxiliar equipment for laboratory: pH meter, centrifuge, vacuum pump, autoclave, thermostatic bath, drying oven, culture incubator, freezing facilities, cold laboratory, safety cabinet, oximeter, gas analyser, water purification system, compressed gases distribution system, sea water distribution system, etc.

- [20-BAE JCI] Organisms and fish laboratory analysis - Organisms analysis: Epifluorescence microscope, binocular microscope, scale, fishing hold, fish measuring board, etc.; Auxiliar equipment for laboratory: pH meter, centrifuge, vacuum pump, autoclave, thermostatic bath, drying oven, culture incubator, freezing facilities, cold laboratory, safety cabinet, oximeter, gas analyser, water purification system, compressed gases distribution system, sea water distribution system, etc.
- [21-BAE JCI] Access to the technology, technical assistance service and user support - Access to certain technologies and laboratories, engineer and technician assistance for experiments and campaigns in polar facilities, instrumentation management (maintenance, spares and expendables procurement, calibration, adaptation, operation and repair), quality control of data acquisition and integration
- [22-BAE JCI] Projects and experiments planning, technological consultancy - Feasibility assessment of a proposed scientific scenario in UTM-CSIC RIs or other research facilities, constraints assessment (technological issues, time requirements, human resources, economic costs, etc.), material supply, resources allocation, installation and adaptation of external user equipment on RI facilities, safety assessment
- [23-BAE JCI] Technological Development - Design and prototype for new instrumentation and operations (sensor, acquisition system, mechanical design, power supply, data integration and distribution), technological improvements, system integration (innovation), software development, analysis tools development
- [24-BAE JCI] Logistics - Shipping of material, mobilisation and demobilisation, engineers and technicians travelling and accommodation, material procurement, supplies, scheduling, customs proceedings, warehouses management
- [25-BAE JCI] Training and outreach - Internal training, safety training, technological training for scientists; outreach and dissemination

EQUIPMENT:

- [01-BAE JCI] GPS system - GPS receiver, including DGPS, RTK monitoring, time-frequency GPS base (disciplined OCXO or rubidium clock), GPS time-tagging, radio modem for transmitting the differential corrections
- [03-BAE JCI] Meteorological station - Sensors: atmospheric pressure, temperature, relative air humidity, global radiation, wind speed, wind direction, ultraviolet radiation
- [04-BAE JCI] Geomagnetic station - Fixed station for monitoring the Earth magnetic field
- [05-BAE JCI] Land seismic station - Seismologic monitoring: local earthquakes, ice glacier breaks, volcanic activity, volcanic tremors, regional earthquakes, teleseismicity
- [06-BAE JCI] Thermosalinograph - It determines the sea temperature and conductivity
- [07-BAE JCI] Fluorometer - It is used for measuring parameters of fluorescence of the water
- [09-BAE JCI] Tide gauge - It is an instrument used for measuring the change in sea level

- [10-BAE JCI] Ice core drill - It is used for getting core sample removed from an ice sheet
- [11-BAE JCI] Permafrost monitoring station - Ice depth, compactation and temperature sensors
- [12-BAE JCI] Turbidimeter - It is an optical instrument that measures the turbidity of a fluid containing suspended particles
- [14-BAE JCI] Lichen monitoring station - Monitoring of the growth, humidity and temperature of a lichen area
- [15-BAE JCI] Acoustic current meter - It measures the profile of water current velocities
- [19-BAE JCI] CTD water sampler - It measures conductivity, temperature, depth and it gets seawater samples (Niskin bottles), it can be equipped with other sensors (radiometer, oxygen sensor, turbidimeter-nephelometer, PAR sensor, transmissiometer, etc.)
- [23-BAE JCI] Flow meter - It measures the flow current at a specific point
- [24-BAE JCI] Transparency sensor - It is used to measure the water transparency (i.e. Secchi disc)
- [25-BAE JCI] Sediment trap - It is an instrument used to measure the quantity of sinking particulate organic and inorganic material in aquatic systems (usually installed in mooring systems)
- [32-BAE JCI] Single beam echo sounder - Echo sounder for punctual depth sampling
- [64-BAE JCI] Salinometer - It is an instrument designed to measure the salinity, or dissolved salt content, of a solution
- [66-BAE JCI] Spectrofluorometer - It is an instrument which takes advantage of fluorescent properties of some compounds in order to provide information regarding their concentration and chemical environment in a sample
- [68-BAE JCI] Spectrophotometer - It is the quantitative measurement of the reflection or transmission properties of a material as a function of wavelength
- [72-BAE JCI] Epifluorescence microscope - Optical microscope that uses fluorescence and phosphorescence in addition to, reflection and absorption to study properties of organic or inorganic substances
- [73-BAE JCI] Binocular stereo microscope - It is an optical microscope variant designed for low magnification observation of a sample using incident light illumination rather than transillumination (dissection)

SOCIETAL GRAND CHALLENGES:

- Climate action, resource efficiency and raw materials
- Secure, clean and efficient energy
- Food security, sustainable agriculture, marine research and the bio-economy

KEY INFORMATION

Full Name:	**Oceanographic Research Vessel Cornide de Saavedra**
Acronym:	B/O Cornide de Saavedra
Website	http://www.ieo.es/buques/cornide.htm
Description:	This RI is an ICTS (Unique Scientific and Technological Infrastructure), included in the Spanish National Roadmap for RIs. The R/V Cornide de Saavedra belongs to the Instituto Español de Oceanografía (IEO), and was Spain's first modern off-shore oceanographic research vessel. R/V Cornide de Saavedra is a multi-purpose fishery research vessel which can also conduct oceanographic missions.
Keywords:	Oceanography, fishery research, global change, biodiversity
Type of use:	Research / Science
Type of RI:	Single-sited
RI Category:	Marine & Maritime Engineering Facilities
Main Scientific Domain:	Earth and Environmental Sciences
Hosting Organization:	Instituto Español de Oceanografía (IEO)
Location:	Vigo-Galicia
Main Status:	Operational since 1972
Contact:	Eduardo Balguerías (director@md.ieo.es)

RESEARCH SERVICES:

- Marine biology and fishery studies - These assume the deployment of different types of fishing gear (benthic and pelagic) that adequately guarantee effective means for catching different species. Correct onboard treatment must start with the design of a non-commercial fish keep appropriate to scientific investigation, permitting rapid and effective evaluation of the specimens constituting the sample study. It will be necessary to have holds available for this conservation, a purpose-built tank for living organisms and a laboratory equipped with the means to carry out all the required analyses and scientific procedures. The project will have fishery capability for undertaking scientific missions in the fishing grounds of the Spanish fishing fleet in various oceans, including navigable polar waters. For this reason, the structural mid-ship design must take this vital aspect into account, although the ship is not to be equipped with ice-breaking capabilities.
- Physical oceanography tasks - The study of water mass movements or the measurement of thermal properties, optics and sea acoustics. For this reason, the vessel is equipped with automated hauling and launching of scientific material, the CTD rosette possibly being the most appropriate scientific item.

EQUIPMENT:

- SIMRAD FS20/25 - Net sonar SIMRAD FS20/25 with 1500 m of coaxial wire
- SIMRAD EA600 - SIMRAD EA600 12 kHz single beam hydrographic echo sounder.
- SIMRAD EK60 - Multifrequency SIMRAD EK60 scientific echo sounder with split-beam transducer (18, 38, 70,120 and 200 kHz).
- INMARSAT Fleet 77 - Satellite Communication System INMARSAT Fleet 77 (Global voice, fax, 64kbps ISDN, MPDS).

SOCIETAL GRAND CHALLENGES:

- Climate action, resource efficiency and raw materials

KEY INFORMATION

Full Name:	**Research Vessel B/O Sarmiento de Gamboa**
Acronym:	B/O Sarmiento de Gamboa
Website	http://www.utm.csic.es/sarmiento.asp?switchlang=2
Description:	This RI is an ICTS (Unique Scientific and Technological Infrastructure), included in the Spanish National Roadmap for RIs. It is a 70.5 m multidisciplinary research vessel, operated for science by the UTM-CSIC on behalf of the Ministry of Economy and Competitiveness (MINECO). The design of the ship is focused in global ocean circulation studies, marine biodiversity, fishery resources and climate change, and it is used for different scientific disciplines (geophysics, geology, oceanography, biology, hydrology, fisheries, etc.). It is a silent research vessel in terms of radiated noise to water (due to the diesel-electric propulsion design). The vessel can operate deep sea ROVs and AUVs and it is capable to deploy underwater observatories (using the Dynamic Positioning system). The ship it is especially adapted for large scenarios like multichannel reflection seismics (6.000 m) or long seabed piston corer sampling. All the instrumentation assigned to the ship is state-of-the-art technology in scientific research, the equipment include acoustic instrumentation, geophysical systems, seismic scenarios, seabed sampling instruments, water column sampling devices, fishing gears, and a permanent internet link, which allows data transfer between on-board and on-shore. All the data from scientific equipment and navigation is time-stamped and distributed through the local area network.
Keywords:	Physical oceanography, marine biology, marine geophysics, multichannel reflection seismics, marine geology, biodiversity, deep sea, habitat mapping, fisheries research, climate change, hydrography
Type of use:	Research / Science
Type of RI:	Single-sited
RI Category:	Software Service Facilities Environmental Health Research Facilities Structural Biology Facilities, Acoustic monitoring stations Atmospheric Measurement Facilities Earth Observation satellites Earth, Ocean, Marine, Freshwater, and Atmosphere Data Centres Environmental Management Infrastructures In situ Marine/Freshwater Observatories Solid Earth Observatories, including Seismological Monitoring Stations Electrical and Optical Engineering Facilities
Main Scientific Domain:	Information Science and Technology

	Biological and Medical Sciences Earth and Environmental Sciences Engineering and Energy
Hosting Organization:	Spanish Ministry of Economy and Competitiveness Agencia Estatal Consejo Superior de Investigaciones Científicas (CSIC)
Location:	Spain - Vigo, Pontevedra – It is a mobile RI, usually docked at Vigo port, Rúa Cánovas del Castillo s/n
Main Status:	Operational since 2007
Contact:	Albert Figueras (albert.figueras@utm.csic.es)

RESEARCH SERVICES:

- [02-B/O SdG] Direct data sampling of the atmosphere - Meteorological station and sensors
- [03-B/O SdG] Remote data sampling of the interface atmosphere/water and land surface - GPS position ant time, DGPS, RTK
- [04-B/O SdG] Direct data sampling of the interface atmosphere/water and land surface - Physical properties: thermosalinometry, fluorometry, surface sound velocity sensor; Sediments: turbidimeter; Organisms: bongo net
- [05-B/O SdG] Remote data sampling of the water column - Physical properties: acoustic current meter, acoustic monitoring system; Sediments: turbidimeter; Organisms: biological echo sounder (acoustic biomass estimation)
- [06-B/O SdG] Direct data sampling of the water column - Physical properties: CTD and rosette (Niskin bottles) profile systems (up to 6,000 m of cable, and crane), undulating CTD, LADPC, radiometer, oxygen sensor, turbidimeter-nephelometer, phtosynthetically active radiation sensor, transmissometer, bathythermograph, flow meter, transparency sensor; Sediments: sediment trap; Organisms: Longhurst Hardy Plankton Recorder, Isaacs-Kidd Mid-water Trawl, plankton net, plankton counter recorder, electronic multiple sample net, mesozooplankton net; Fish: fisheries (pelagic and bottom trawling)
- [07-B/O SdG] Remote data sampling of the bottom - Physical properties and sediments: multibeam echo sounder for 3D bathymetry, backscatter and morphology, single beam echo sounder, side scan sonar
- [08-SdG] Direct data sampling of the bottom - Physical properties and sediments: multicorer sampling, box corer sampling, gravity corer sampling, piston corer sampling; Organisms: dredging, coring, epibenthic sledge, Agassiz trawl
- [09-B/O SdG] Remote data sampling of the sub-bottom - Parametric sub-bottom profiler, seismic sources (air gun, sparker, boomer, etc.), seismic reflection sensor (high resolution streamer, multichannel streamer), seismology and wide angle seismic sensor (OBSs); potential field techniques: gravity meter, magnetometer
- [10-B/O SdG] Direct data sampling of the sub-bottom - Piston core sampling, drilling

- [11-B/O SdG] Navigation and sensor integration - GPS, inertial motion unit, heading sensor, gyroscope, Doppler speed log, echo sounder, navigation system, ECDIS, DP, specific navigation system and integration system
- [12-B/O SdG] Telemetry, acoustic positioning and acoustic link - Pinger, net sensor, LBL system, USBL system, acoustic modem
- [13-B/O SdG] Information and Communications Technologies - Acquisition of instrumentation and facility data, data integration, data indexing in the data base engines, mapping the data, GIS tools for indexing the metadata, third-party software tools, own-developed software, data link and communications (e-mail management, internet access, VHF communications, etc.)
- [14-B/O SdG] Mooring and submarine observatories operations - Operations and working deck for mooring deployment and recovery, landers, tripods, OBSs; acoustic release system
- [15-B/O SdG] Drifting buoys operations - Deployment, tracking (using GPS and direction finder devices), and recovery of user drifting buoys
- [16-B/O SdG] ROV, AUV and submersible operations - ROV camera, AUV, adaptative working deck for deep sea ROV operations, dynamic positioning, USBL (underwater position and telemetry)
- [17-B/O SdG] Adaptative mobile laboratories and facilities operations - 10-foot container laboratories and workshops, 20-foot container laboratories and workshops, deck machinery (A-frame gantries, winches, cranes, outriggers, etc.), other specific facilites (seimic gun array frames, etc.), vehicles management (auxiliary boats, load/unload vehicles)
- [18-B/O SdG] Water laboratory analysis - Seawater and fresh water analysis: espectrofluorometry, espectrofotometry, citometry and sorting, scintillation counter, titrator, automated analyser, salinometry, fluorometry, etc.; Auxiliar equipment for laboratory: pH meter, centrifuge, vacuum pump, autoclave, thermostatic bath, thermal steriliser, ultrasonic cleaner, drying oven, culture incubator, freezing facilities, cold laboratory, safety cabinet, laminar air flow module, water purification system, compressed gases distribution system, sea water distribution system, etc.
- [19-B/O SdG] Sediments laboratory analysis - Core logger
- [20-B/O SdG] Organisms and fish laboratory analysis - Organisms analysis: Epifluorescence microscope, binocular microscope, scale, fishing hold, fish measuring board, etc.; Auxiliar equipment for laboratory: pH meter, centrifuge, vacuum pump, autoclave, thermostatic bath, thermal steriliser, ultrasonic cleaner, drying oven, culture incubator, freezing facilities, cold laboratory, safety cabinet, laminar air flow module, water purification system, compressed gases distribution system, sea water distribution system, etc.
- [21-B/O SdG] Access to the technology, technical assistance service and user support - Access to certain technologies and laboratories, engineer and technician assistance for experiments and campaigns (on board the ships and in polar facilities), instrumentation management (maintenance, spares and expendables procurement,

calibration, adaptation, operation and repair), quality control of data acquisition and integration

- [22-B/O SdG] Projects and experiments planning, technological consultancy - Feasibility assessment of a proposed scientific scenario in UTM-CSICRIs or other research facilities, constraints assessment (technological issues, time requirements, human resources, economic costs, etc.), material supply, resources allocation, installation and adaptation of external user equipment on RI facilities, safety assessment
- [23-B/O SdG] Technological Development - Design and prototype for new instrumentation and operations (sensor, acquisition system, mechanical design, power supply, data integration and distribution), technological improvements, system integration (innovation), software development, analysis tools development
- [24-B/O SdG] Logistics - Shipping of material, mobilisation and demobilisation, engineers and technicians travelling and accomodation, material procurement, supplies, schedulling, customs proceedings, warehouses management
- [25-B/O SdG] Training and outreach - Internal training, safety training, technological training for scientists; outreach and dissemination

EQUIPMENT:

- [01-B/O SdG] GPS system - GPS receiver, including DGPS, RTK monitoring, time-frequency GPS base (disciplined OCXO or rubidium clock), GPS time-tagging, radio modem for transmitting the differential corrections
- [03-B/O SdG] Meteorological station - Sensors: atmospheric pressure, temperature, relative air humidity, global radiation, wind speed, wind direction, ultraviolet radiation
- [06-B/O SdG] Thermosalinograph - It determines the sea surface temperature and conductivity from underway vessels
- [07-B/O SdG] Fluorometer - It is used for measuring parameters of fluorescence of the sea surface water
- [08-B/O SdG] Sound velocity sensor - It measures the sound velocity of the sea surface water
- [12-B/O SdG] Turbidimeter - It is an optical instrument that measures the turbidity of a fluid containing suspended particles
- [13-B/O SdG] Bongo net - Zooplankton net biological sampler
- [15-B/O SdG] Acoustic current meter - It measures the profile of water current velocities using the Doppler effect: ADCP (Acoustic Doppler Current Profiler), LADCP (Lowered Acoustic Doppler Current Profiler)
- [17-B/O SdG] Acoustic monitoring system - Acoustic multianalyser system that can monitoring the background noise of a certain area by means of high sensitivity hydrophones, conditioning amplifier, power amplifier, spectrum analyser, etc.
- [18-B/O SdG] Biological echo sounder - Echo sounder used for acoustic biomass estimation

- [19-B/O SdG] CTD water sampler - It measures conductivity, temperature, depth and it gets seawater samples (Niskin bottles), it can be equipped with other sensors (radiometer, oxygen sensor, turbidimeter-nephelometer, PAR sensor, transmissiometer, etc.)
- [20-B/O SdG] Undulating CTD - It is a towed data acquisition vehicle that is equipped with a CTD and other oceanographic monitoring equipment, it can include an Optical Plankton Recorder
- [21-B/O SdG] Radiometer - It is designed to detect and measure the radiant power of electromagnetic radiation
- [22-B/O SdG] Bathytermographic system - It is a expendable probe system that is used for obtaining the temperature structure of the ocean (XBTs), it can be also used for the sound velocity structure (XSVs), and for the conductivity and temperature structure (XCTDs)
- [23-B/O SdG] Flow meter - It meausures the flow current at a specific point
- [24-B/O SdG] Transparency sensor - It is used to measure the water transparency (i.e. Secchi disc)
- [25-B/O SdG] Sediment trap - It is an instrument used to measure the quantity of sinking particulate organic and inorganic material in aquatic systems (usually installed in mooring systems)
- [26-B/O SdG] Longhurst Hardy Plankton Recorder - LHPR: It is a towed plankton sampling system in which the plankton is collected between two layer of fine gauze
- [27-B/O SdG] Multinet plankton sampler - It is a multiple plankton net towed system, the nets can be opened and closed remotely
- [28-B/O SdG] Multinet sampler for horizontal and vertical collections - It is a plankton multinet sampler that can be used towed or in a vertical profile, the nets can be opened and closed remotely
- [29-B/O SdG] Isaacs-Kidd Mid-water Trawl - IKMT: It is an oceanography tool used to collect bathypelagic biological specimens larger than those taken by standard plankton nets
- [30-B/O SdG] Fisheries, pelagic and bottom trawling net - Fishing gear, including the pelagic trawl doors
- [31-B/O SdG] Multibeam echo sounder - Swathe echo sounder for seabed mapping
- [32-B/O SdG] Single beam echo sounder - Echo sounder for punctual depth sampling
- [33-B/O SdG] Side scan sonar - It is a towed system that is used for creating an image of large areas of the seafloor, it is able to provide differences in material and texture type of the seabed due to its acoustic characteristics
- [34-B/O SdG] Multicorer - It is a sediment sampler that allows to get multiple samples of the seabed surface at the same time (up 10 cm)
- [35-B/O SdG] Box corer - It is a sediment sampler that allows minimal disturbance of sediments and a greater sample volume (up to 50-100 cm)

- [36-B/O SdG] Gravity corer - It is a sediment sampler that gets a simple core of the seabed due to the gravity (up to 3-5 m)
- [37-B/O SdG] Piston corer - It is a long heavy tube plunged into the seafloor to extract samples of mud sediment (up to 15-20 m)
- [38-B/O SdG] Rock dredge - It is a large bag made of metal chain links attached to a simple heavy frame that keeps the bag expanded, it is lowered off the back of a ship to the seafloor and dragged along to collect large pieces of rock
- [39-B/O SdG] Epibenthic sledge - An instrument designed to collect benthic and benthopelagic faunas from the deep sea
- [40-B/O SdG] Agassiz trawl - It is a sledge which is towed along the bottom of the sea at any depth, it is used to collect animal from the seafloor
- [41-B/O SdG] Parametric sub-bottom profiler - It utilizes the parametric effect to generate a low frequency secondary signal that can penetrate in the first metres of sediment
- [42-B/O SdG] Air gun - A pneumatic chamber that is pressurized with compressed air (up to 3,000 psi) that is submerged below the water surface, and towed behind a ship to generate a seismic source
- [43-B/O SdG] Air compressor - It is a device that converts power into kinetic energy by compressing and pressurizing air, it is used for providing compressed air to the air guns
- [44-B/O SdG] Air gun controller - An integrator system that is used for triggering and synchronising the air guns, and storing the precise time of the shots
- [45-B/O SdG] High resolution streamer - An array of hydrophones at constant intervals that is towed for studying the first sub-bottom layers
- [46-B/O SdG] Multichannel streamer - Large array of hydrophones (up to 6,000 m) divided in different channels, that is towed for deep reflection seismics
- [47-B/O SdG] Ocean Bottom Seismometer - An OBS is a seismometer that is designed to record the Earth motion under ocean (from man-made sources and natural sources), the instrument is deployed to reach the sea bottom, it includes an hydrophone, and a acoustic release system
- [48-B/O SdG] Gravity meter - It is an instrument used for measuring the local gravitational field of the Earth
- [49-B/O SdG] Magnetometer - It is a measuring instrument used to measure the strength of the Earth magnetic field
- [51-B/O SdG] Inertial Navigation System - It is a navigation aid that uses a computer, motion sensors and rotation sensors to continuously calculate the position, orientation, and velocity a moving object
- [52-B/O SdG] Heading sensor - System that integrates the information of two GPS antennas for calculating the true heading of the ship
- [53-B/O SdG] Gyroscope - It is is a device for measuring the ship orientation
- [54-B/O SdG] Doppler speed log - It is a is a marine electronic device used to measure the speed of a moving vessel

- [55-B/O SdG] Navigation system - It is an electronic system that aids in ship navigation integrating different external sensors
- [56-B/O SdG] Dynamic positioning - It is a computer-controlled system to automatically maintain a vessel's position and heading by using its own propellers and thrusters
- [57-B/O SdG] Pinger - It is an acoustic device used for calculating which is the distance between the instrument lowered with the pinger and the seabed
- [58-B/O SdG] Net sensor - Acoustic sensor for monitoring the fishing gear (or other instrumentation) towed by the ship
- [59-B/O SdG] USBL system - It is an acoustic system used for calculating the position of a deployed instrument from the ranges and bearings measured by the transceiver
- [60-B/O SdG] Acoustic modem - System used for transmitting data in the aquatic environment using encoded acoustic signals
- [61-B/O SdG] Acoustic release system - It is an oceanographic device for the deployment and subsequent recovery of instrumentation from the sea floor, in which the recovery is triggered remotely by an acoustic command signal
- [62-B/O SdG] AUV - Autonomous Unmanned Vehicle, that can be programmed for underwater missions to measure conductivity, temperature, dissolved oxygen, chlorophyll, pH/ORP, turbidity, and can operate a video camera and a side scan sonar
- [63-B/O SdG] ROV video camera - Underwater video camera operated from the ship by means of an umbilical cable, it can work in shallow waters
- [64-B/O SdG] Salinometer - It is an instrument designed to measure the salinity, or dissolved salt content, of a solution
- [65-B/O SdG] Flow cytometry and sorting - It is a biophysical technology employed in cell counting, sorting, biomarker detection and protein engineering, by suspending cells in a stream of fluid and passing them by an electronic detection apparatus
- [66-B/O SdG] Spectrofluorometer - It is an instrument which takes advantage of fluorescent properties of some compounds in order to provide information regarding their concentration and chemical environment in a sample
- [67-B/O SdG] Scintillation counter - It is an instrument for detecting and measuring ionising radiation
- [68-B/O SdG] Spectrophotometer - It is the quantitative measurement of the reflection or transmission properties of a material as a function of wavelength
- [69-B/O SdG] Titrator - It is a laboratory method of quantitative chemical analysis that is used to determine the unknown concentration of an identified analyte
- [70-B/O SdG] Automated analyser - It is a laboratory instrument designed to measure different chemicals and other characteristics in a number of biological samples quickly (nutrients)
- [71-B/O SdG] Core logger - It is an equipment for gathering physical property data in an automated, non-destructive and quality-controlled way of a sediment core (p-wave velocity, gamma density, magnetic susceptibility, electrical resistivity, colour imaging, gamma spectroscopy)

- [72-B/O SdG] Epifluorescence microscope - Optical microscope that uses fluorescence and phosphorescence in addition to, reflection and absorption to study properties of organic or inorganic substances
- [73-B/O SdG] Binocular stereo microscope - It is an optical microscope variant designed for low magnification observation of a sample using incident light illumination rather than transillumination (dissection)

SOCIETAL GRAND CHALLENGES:

- Climate action, resource efficiency and raw materials
- Food security, sustainable agriculture, marine research and the bio-economy

KEY INFORMATION

Full Name:	**Hespérides Research Vessel**
Acronym:	B/O Hespérides
Website	http://www.utm.csic.es/hesperides.asp?switchlang=2
Description:	This RI is an ICTS (Unique Scientific and Technological Infrastructure), included in the Spanish National Roadmap for RIs. It is a 82.5 m long multidisciplinary research vessel with polar capacity that belongs to the Spanish Navy and is operated for science by the UTM-CSIC on behalf of the MINECO. At a yearly basis the vessel goes to Antarctica for scientific research and giving support to the Spanish Antarctic Stations (in Livingston Island and Deception Island). It is also used for mapping the economical exclusive zone of the Spanish waters, and to operate the projects approved by the "Plan Nacional de I+D+i" frame. The ship is prepared for research in oceanography, geology, geophysics, hydrography, benthos mapping, etc. It is equipped with state-of-the-art technology which includes a wide range of acoustic instrumentation (multibeam echo sounders, sub-bottom profiler, biological and hydrographic echo sounders, ADCPs, etc.), geophysical equipment (gravity meters, magnetometers, seismic sources, high resolution streamers, etc.), seabed sampling devices (multicorers, dredges, etc.), water column sampling and analysis instruments (CTDs, towed vehicles, plankton recorders, multi-net sampling systems, etc.), fisheries, and a permanent internet link with on-shore facilities. The ship can be easily adapted to use large instrumentation like ROVs or deep towed vehicles
Keywords:	Physical Oceanography, Marine Biology, Marine Geophysics, Marine Geology, Biodiversity, Deep Sea, Habitat Mapping, Fisheries, Climate Change, Chemical Oceanography, Hydrography, Antarctica
Type of use:	Research / Science
Type of RI:	Single-sited
RI Category:	Software Service Facilities Environmental Health Research Facilities Structural Biology Facilities, Acoustic monitoring stations Atmospheric Measurement Facilities Earth Observation satellites Earth, Ocean, Marine, Freshwater, and Atmosphere Data Centres Environmental Management Infrastructures In situ Marine/Freshwater Observatories Solid Earth Observatories, including Seismological Monitoring Stations Electrical and Optical Engineering Facilities
Main Scientific Domain:	Information Science and Technology

	Biological and Medical Sciences Earth and Environmental Sciences Engineering and Energy
Hosting Organization:	Spanish Ministry of Economy and Competitiveness Agencia Estatal Consejo Superior de Investigaciones Científicas (CSIC)
Location:	Spain - Cartagena - It is a mobile RI, usually docked at Cartagena Navy Dockyard, Arsenal Militar de Cartagena, Calle Real s/n
Main Status:	Operational since 1990
Contact:	Albert Figueras (albert.figueras@utm.csic.es)

RESEARCH SERVICES:

- [01-BIO HESP] Remote data sampling of the atmosphere - Satellite remote sensing
- [02-BIO HESP] Direct data sampling of the atmosphere - Meteorological station and sensors
- [03-BIO HESP] Remote data sampling of the interface atmosphere/water and land surface - GPS position ant time, DGPS, RTK, satellite remote sensing
- [04-BIO HESP] Direct data sampling of the interface atmosphere/water and land surface - Physical properties: thermosalinometry, fluorometry, surface sound velocity sensor; Sediments: turbidimeter; Organisms: bongo net
- [05-BIO HESP] Remote data sampling of the water column - Physical properties: acoustic current meter, front scan sonar, acoustic monitoring system; Sediments: turbidimeter; Organisms: biological echo sounder (acoustic biomass estimation)
- [06-BIO HESP] Direct data sampling of the water column - Physical properties: CTD and rosette (Niskin bottles) profile systems (up to 6,000 m of cable, and crane), undulating CTD, LADPC, radiometer, oxygen sensor, turbidimeter-nephelometer, phtosynthetically active radiation sensor, transmissometer, bathythermograph, flow meter, transparency sensor; Sediments: sediment trap; Organisms: Longhurst Hardy Plankton Recorder, Isaacs-Kidd Mid-water Trawl, plankton net, plankton counter recorder, electronic multiple sample net, mesozooplankton net; Fish: fisheries (pelagic and bottom trawling)
- [07-BIO HESP] Remote data sampling of the bottom - Physical properties and sediments: multibeam echo sounder for 3D bathymetry, backscatter and morphology, single beam echo sounder, side scan sonar
- [08-BIO HESP] Direct data sampling of the bottom - Physical properties and sediments: multicorer sampling, box corer sampling, gravity corer sampling, piston corer sampling; Organisms: dredging, coring, epibenthic sledge, Agassiz trawl
- [09-BIO HESP] Remote data sampling of the sub-bottom - Parametric sub-bottom profiler, seismic sources (air gun, sparker, boomer, etc.), seismic reflection sensor (high resolution streamer), seismology and wide angle seismic sensor (OBSs); potential field techniques: gravity meter, magnetometer

- [10-BIO HESP] Direct data sampling of the sub-bottom - Piston core sampling, drilling, heat flow probe
- [11-BIO HESP] Navigation and sensor integration - GPS, inertial motion unit, heading sensor, gyroscope, Doppler speed log, echo sounder, navigation system, ECDIS, DP, specific navigation system and integration system
- [12-BIO HESP] Telemetry, acoustic positioning and acoustic link - Pinger, net sensor, LBL system, USBL system, acoustic modem
- [13-BIO HESP] Information and Communications Technologies - Acquisition of instrumentation and facility data, data integration, data indexing in the data base engines, mapping the data, GIS tools for indexing the metadata, third-party software tools, own-developed software, data link and communications (e-mail management, internet access, VHF communications, etc.)
- [14-BIO HESP] Mooring and submarine observatories operations - Operations and working deck for mooring deployment and recovery, landers, tripods, OBSs; acoustic release system
- [15-BIO HESP] Drifting buoys operations - Deployment, tracking (using GPS and direction finder devices), and recovery of user drifting buoys
- [16-BIO HESP] ROV, AUV and submersible operations - ROV camera, AUV, adaptive working deck for deep sea ROV operations, dynamic positioning, USBL (underwater position and telemetry)
- [17-BIO HESP] Adaptive mobile laboratories and facilities operations - 10-foot container laboratories and workshops, 20-foot container laboratories and workshops, deck machinery (A-frame gantries, winches, cranes, outriggers, etc.), other specific facilites (seimic gun array frames, etc.), vehicles management (auxiliary boats, load/unload vehicles)
- [18-BIO HESP] Water laboratory analysis - Seawater and fresh water analysis: espectrofluorometry, espectrofotometry, citometry and sorting, scintillation counter, titrator, automated analyser, salinometry, fluorometry, etc.; Auxiliary equipment for laboratory: pH meter, centrifuge, vacuum pump, autoclave, thermostatic bath, ultrasonic cleaner, drying oven, culture incubator, freezing facilities, cold laboratory, safety cabinet, laminar air flow module, water purification system, compressed gases distribution system, sea water distribution system, etc.
- [19-BIO HESP] Sediments laboratory analysis - Core logger
- [20-BIO HESP] Organisms and fish laboratory analysis - Organisms analysis: Epifluorescence microscope, binocular microscope, scale, fishing hold, fish measuring board, etc. Auxiliary equipment for laboratory: pH meter, centrifuge, vacuum pump, autoclave, thermostatic bath, ultrasonic cleaner, drying oven, culture incubator, freezing facilities, cold laboratory, safety cabinet, laminar air flow module, water purification system, compressed gases distribution system, sea water distribution system, etc.
- [21-BIO HESP] Access to the technology, technical assistance service and user support - Access to certain technologies and laboratories, engineer and technician assistance for

experiments and campaigns (on board the ships and in polar facilities), instrumentation management (maintenance, spares and expendables procurement, calibration, adaptation, operation and repair), quality control of data acquisition and integration

- [22-BIO HESP] Projects and experiments planning, technological consultancy - Feasibility assessment of a proposed scientific scenario in UTMCSIC RIs or other research facilities, constraints assessment (technological issues, time requirements, human resources, economic costs, etc.), material supply, resources allocation, installation and adaptation of external user equipment on RI facilities, safety assessment
- [23-BIO HESP] Technological Development - Design and prototype for new instrumentation and operations (sensor, acquisition system, mechanical design, power supply, data integration and distribution), technological improvements, system integration (innovation), software development, analysis tools development
- [24-BIO HESP] Logistics - Shipping of material, mobilisation and demobilisation, engineers and technicians travelling and accommodation, material procurement, supplies, scheduling, customs proceedings, warehouses management
- [25-BIO HESP] Training and outreach - Internal training, safety training, technological training for scientists; outreach and dissemination

EQUIPMENT:

- [01-BIO HESP] GPS system - GPS receiver, including DGPS, RTK monitoring, time-frequency GPS base (disciplined OCXO or rubidium clock), GPS time-tagging, radio modem for transmitting the differential corrections
- [02-BIO HESP] Satellite images receiver and acquisition system - Satellite continuous weather monitoring and high-resolution satellite imagery
- [03-BIO HESP] Meteorological station - Sensors: atmospheric pressure, temperature, relative air humidity, global radiation, wind speed, wind direction, ultraviolet radiation
- [06-BIO HESP] Thermosalinograph - It determines the sea surface temperature and conductivity from underway vessels
- [07-BIO HESP] Fluorometer - It is used for measuring parameters of fluorescence of the sea surface water
- [08-BIO HESP] Sound velocity sensor - It measures the sound velocity of the sea surface water
- [12-BIO HESP] Turbidimeter - It is an optical instrument that measures the turbidity of a fluid containing suspended particles
- [13-BIO HESP] Bongo net - Zooplankton net biological sampler
- [15-BIO HESP] Acoustic current meter - It measures the profile of water current velocities using the Doppler effect: ADCP (Acoustic Doppler Current Profiler), LADCP (Lowered Acoustic Doppler Current Profiler)

- [16-BIO HESP] Front scan sonar - Sonar used for scanning the water column (it can be used for looking for detecting fish blanks or ice packs)
- [17-BIO HESP] Acoustic monitoring system - Acoustic multianalyser system that can monitoring the background noise of a certain area by means of high sensitivity hydrophones, conditioning amplifier, power amplifier, spectrum analyser, etc.
- [18-BIO HESP] Biological echo sounder - Echo sounder used for acoustic biomass estimation
- [19-BIO HESP] CTD water sampler - It measures conductivity, temperature, depth and it gets seawater samples (Niskin bottles), it can be equipped with other sensors (radiometer, oxygen sensor, turbidimeter-nephelometer, PAR sensor, transmissiometer, etc.)
- [20-BIO HESP] Undulating CTD - It is a towed data acquisition vehicle that is equipped with a CTD and other oceanographic monitoring equipment, it can include an Optical Plankton Recorder
- [21-BIO HESP] Radiometer - It is designed to detect and measure the radiant power of electromagnetic radiation
- [22-BIO HESP] Bathytermographic system - It is a expendable probe system that is used for obtaining the temperature structure of the ocean (XBTs), it can be also used for the sound velocity structure (XSVs), and for the conductivity and temperature structure (XCTDs)
- [23-BIO HESP] Flow meter - It measures the flow current at a specific point
- [24-BIO HESP] Transparency sensor - It is used to measure the water transparency (i.e. Secchi disc)
- [25-BIO HESP] Sediment trap - It is an instrument used to measure the quantity of sinking particulate organic and inorganic material in aquatic systems (usually installed in mooring systems)
- [26-BIO HESP] Longhurst Hardy Plankton Recorder - LHPR: It is a towed plankton sampling system in which the plankton is collected between two layer of fine gauze
- [27-BIO HESP] Multinet plankton sampler - It is a multiple plankton net towed system, the nets can be opened and closed remotely
- [28-BIO HESP] Multinet sampler for horizontal and vertical collections - It is a plankton multinet sampler that can be used towed or in a vertical profile, the nets can be opened and closed remotely
- [29-BIO HESP] Isaacs-Kidd Mid-water Trawl - IKMT: It is an oceanography tool used to collect bathypelagic biological specimens larger than those taken by standard plankton nets
- [30-BIO HESP] Fisheries, pelagic and bottom trawling net - Fishing gear, including the pelagic trawl doors
- [31-BIO HESP] Multibeam echo sounder - Swathe echo sounder for seabed mapping
- [32-BIO HESP] Single beam echo sounder - Echo sounder for punctual depth sampling

- [33-BIO HESP] Side scan sonar - It is a towed system that is used for creating an image of large areas of the seafloor, it is able to provide differences in material and texture type of the seabed due to its acoustic characteristics
- [34-BIO HESP] Multicorer - It is a sediment sampler that allows to get multiple samples of the seabed surface at the same time (up 10 cm)
- [35-BIO HESP] Box corer - It is a sediment sampler that allows minimal disturbance of sediments and a greater sample volume (up to 50-100 cm)
- [36-BIO HESP] Gravity corer - It is a sediment sampler that gets a simple core of the seabed due to the gravity (up to 3-5 m)
- [37-BIO HESP] Piston corer - It is a long heavy tube plunged into the seafloor to extract samples of mud sediment (up to 15-20 m)
- [38-BIO HESP] Rock dredge - It is a large bag made of metal chain links attached to a simple heavy frame that keeps the bag expanded, it is lowered off the back of a ship to the seafloor and dragged along to collect large pieces of rock
- [41-BIO HESP] Parametric sub-bottom profiler - It utilises the parametric effect to generate a low frequency secondary signal that can penetrate in the first metres of sediment
- [42-BIO HESP] Air gun - A pneumatic chamber that is pressurized with compressed air (up to 3,000 psi) that is submerged below the water surface, and towed behind a ship to generate a seismic source
- [43-BIO HESP] Air compressor - It is a device that converts power into kinetic energy by compressing and pressurizing air, it is used for providing compressed air to the air guns
- [44-BIO HESP] Air gun controller - An integrator system that is used for triggering and synchronising the air guns, and storing the precise time of the shots
- [45-BIO HESP] High resolution streamer - An array of hydrophones at constant intervals that is towed for studying the first sub-bottom layers
- [47-BIO HESP] Ocean Bottom Seismometer - An OBS is a seismometer that is designed to record the Earth motion under ocean (from man-made sources and natural sources), the instrument is deployed to reach the sea bottom, it includes an hydrophone, and a acoustic release system
- [48-BIO HESP] Gravity meter - It is an instrument used for measuring the local gravitational field of the Earth
- [49-BIO HESP] Magnetometer - It is a measuring instrument used to measure the strength of the Earth magnetic field
- [50-BIO HESP] Heat flow probe - It is an instrument for the measurement of the thermal gradient and the thermal conductivity of the seabed
- [51-BIO HESP] Inertial Navigation System - It is a navigation aid that uses a computer, motion sensors and rotation sensors to continuously calculate the position, orientation, and velocity a moving object
- [52-BIO HESP] Heading sensor - System that integrates the information of two GPS antennas for calculating the true heading of the ship

- [53-BIO HESP] Gyroscope - It is is a device for measuring the ship orientation
- [54-BIO HESP] Doppler speed log - It is a is a marine electronic device used to measure the speed of a moving vessel
- [55-BIO HESP] Navigation system - It is an electronic system that aids in ship navigation integrating different external sensors
- [57-BIO HESP] Pinger - It is an acoustic device used for calculating which is the distance between the instrument lowered with the pinger and the seabed
- [58-BIO HESP] Net sensor - Acoustic sensor for monitoring the fishing gear (or other instrumentation) towed by the ship
- [61-BIO HESP] Acoustic release system - It is an oceanographic device for the deployment and subsequent recovery of instrumentation from the sea floor, in which the recovery is triggered remotely by an acoustic command signal
- [64-BIO HESP] Salinometer - It is an instrument designed to measure the salinity, or dissolved salt content, of a solution
- [65-BIO HESP] Flow cytometry and sorting - It is a biophysical technology employed in cell counting, sorting, biomarker detection and protein engineering, by suspending cells in a stream of fluid and passing them by an electronic detection apparatus
- [66-BIO HESP] Spectrofluorometer - It is an instrument which takes advantage of fluorescent properties of some compounds in order to provide information regarding their concentration and chemical environment in a sample
- [67-BIO HESP] Scintillation counter - It is an instrument for detecting and measuring ionising radiation [68-BIO HESP] Spectrophotometer - It is the quantitative measurement of the reflection or transmission properties of a material as a function of wavelength
- [69-BIO HESP] Titrator - It is a laboratory method of quantitative chemical analysis that is used to determine the unknown concentration of an identified analyte
- [72-BIO HESP] Epifluorescence microscope - Optical microscope that uses fluorescence and phosphorescence in addition to, reflection and absorption to study properties of organic or inorganic substances
- [73-BIO HESP] Binocular stereo microscope - It is an optical microscope variant designed for low magnification observation of a sample using incident light illumination rather than transillumination (dissection)

SOCIETAL GRAND CHALLENGES:

- Climate action, resource efficiency and raw materials
- Food security, sustainable agriculture, marine research and the bio-economy

KEY INFORMATION

Full Name:	**Doñana Biological Reserve**
Acronym:	RBD
Website	http://ebd.csic.es
Description:	Since its creation the EBD-CSIC is in charge of the administration and management of part of the Doñana protected area (Doñana Biological Reserve RBD), is responsible for coordinating all research projects undertaken in the Doñana Natural Area (currently 106,047 ha) and for the execution of the Monitoring Programme of Doñana. Since 2006, the RBD has been considered as a Singular Scientific and Technological Infrastructure (ICTS-RBD) by the Spanish Ministry responsible for Science and Innovation. This responsibility is supported by a team of about 40 technicians, assistants and managers, 20 for monitoring of natural resources and 20 for maintenance of the field stations. This RI is an ICTS (Unique Scientific and Technological Infrastructure), included in the Spanish National Roadmap for RIs
Keywords:	Ecology, biodiversity, endangered species, protected area, monitoring, wetlands, coastal areas, conservation biology, RAMSAR, world heritge site, LTER
Type of use:	Research / Science
Type of RI:	Single-sited
RI Category:	Natural History Collections Databases
Main scientific domain:	Earth and Environmental Sciences
Hosting Organization:	CSIC - Estación Biológica de Doñana CSIC - Consejo Superior de Investigaciones Científicas
Location:	c/ Americo Vespucio | 41092 Seville | Andalucia- Spain
Main Status:	Operational since 1990
Contact:	Juan José Negro (negro@ebd.csic.es)

RESEARCH SERVICES:

- Access and field orientation.
- Assistance for processing the required permits to access the protected area and to take biotic samples
- Access to biotic and abiotic data of the site, collected within the long-term monitoring program
- Logistic assistance and field orientation
- Access to exhaustive data basis on publications and former projects of the site

EQUIPMENT:

- **Field Facilities:**
  - Basic laboratories for sample processing and temporal storage
  - Library and computer services
  - Free accommodation (subject to availability)
  - Vehicles and horses (subject to availability)

- **Other facilities:** Facilities at the EBD-CSIC include several laboratories to implement techniques required in current ecological studies
  - Laboratory of Molecular Ecology,
  - GIS and Remote Sensing,
  - Aquatic Ecology, Chemical Ecology, Ecophysiology and Stable Isotopes

KEY INFORMATION

Full Name:	**Oceanic Platform of the Canary Islands**
Acronym:	PLOCAN
Website	http://www.plocan.eu
Description:	The Oceanic Platform of the Canary Islands (PLOCAN) is a multi-purpose service centre composed of a set of large infrastructures to support research, technology and innovation in the marine and maritime sector in the North-East Central-Atlantic Ocean. The mission of the facility is to promote long-term observation and sustainability of the ocean. It will facilitate multidisciplinary approach, clustering and cost-effective combination of services such as observatories, test site, base for underwater vehicles, training and innovation hub. T he target users are groups both from the public and private sector, international research programs and networks, academia and government. This RI is an ICTS (Unique Scientific and Technological Infrastructure), included in the Spanish National Roadmap for RIs.
Keywords:	Test site, marine energy, oceanic observatory, underwater vehicles, innovation
Type of use:	Research / Science
Type of RI:	Single-sited
RI Category:	Environmental Health Research Facilities Acoustic monitoring stations Earth, Ocean, Marine, Freshwater, and Atmosphere Data Centres In situ Marine/Freshwater Observatories Energy Engineering Facilities (non nuclear)
Main Scientific Domain:	Earth and Environmental Sciences
Hosting Organization:	Oceanic Platform of the Canary Islands (PLOCAN) Consortium
Location:	Spain - Telde - Carretera de Taliarte s/n
Main Status:	Under construction
Operational start year:	2014
Contact:	Octavio Llinás (Octavio.llinas@plocan.eu)

RESEARCH SERVICES:

- Ocean Energy Testsite - In-situ field tests to demonstrate the potential of diverse prototypes of sensors and devices, in order to be able to deliver information for the different phases such as pre-competitive, validation and pre-industrial manufacturability phases.
- Regional Observatory - Open-Ocean seafloor (planned)-water column- surface monitoring infrastructure, locates 60nm North of Gran Canaria – Open to host instrumentation - 0 to 3670m depth
- Coastal Observatory - Near-shore seafloor and water column cabled observing system and offshore platform (under construction) - Designed to host external instrumentation - 100m depth initially
- Underwater Gliders - Underwater glider fleet suited by extended multiparameter payload configuration (physical and optical) for science and operational ocean missions.
- Underwater electrical and communication infrastructure (IECOM) - Electrical and communication grid connection, installed in the testsite, to deliver the electricity generated offshore by devices (operational in 2014)

EQUIPMENT:

- Glider - Autonomous underwater vehicle (AUV) that uses small changes in its buoyancy in conjunction with wings to convert vertical motion to horizontal, and thereby propel itself forward with very low power consumption.
- Boat - 12 m. speedboat for multipurpose coastal sea-operation (Mod. QUER-40 Pro)
- Mini-ROV - Survey Mini-ROV for 100m. depth rate capacity (Mod.Bleeper Pro-AT)

SOCIETAL GRAND CHALLENGES:

- Climate action, resource efficiency and raw materials
- Secure, clean and efficient energy
- Food security, sustainable agriculture, marine research and the bio-economy

KEY INFORMATION

Full Name:	**Balearic Islands Coastal Observing and Forecasting System**
Acronym:	SOCIB
Website	http://www.socib.es
Description:	SOCIB is a multi-platform distributed and integrated system that provides streams of oceanographic data and modelling services to support operational oceanography in a European and international framework, therefore also contributing to the needs of marine and coastal research in a global change context. In line with EuroGOOS, operational oceanography is here understood in a wide sense, including both the systematic longterm. SOCIB, the Coastal Ocean Observing and Forecasting System located in the Balearic Islands, is a new facility of facilities open to international access. SOCIB responds to a change of paradigm in the observation of our oceans and coasts, an observation that has evolved from being centered on a unique platform, the oceanographic ships with data availability being delayed in time, to an observation now based on multi-platform and integrated systems (using buoys, satellites, ships, autonomous underwater vehicles, HF radar, ARGO profilers, etc.), also assuring quasi real time quality controlled data availability for both researchers and society. This change of paradigm is very significant and allows being able to respond to the three key drivers identified by SOCIB back in 2009: (1) science priorities, (2) technology development, (3) response capacity to society needs. Measurements of the seas and their interpretation and dissemination, and also the sustained supply of multidisciplinary data to cover the needs of a wide range of scientific research and societal priorities. This allows a quantitative increase in our understanding of key questions on oceans and climate change, coastal ocean processes, ecosystem variability, sea level rise, etc. and also drives us towards a more science based coastal and ocean management. This RI is an ICTS (Unique Scientific and Technological Infrastructure), included in the Spanish National Roadmap for RIs
Keywords:	Oceanographic data, modelling services, operational oceanography, marine and coastal research, coastal ocean processes, ecosystem variability, sea level rise, coastal and ocean management, buoys, satellites, ships, autonomous underwater vehicles, HF radar, ARGO profilers, quasi real time quality controlled data availability, science based coastal and ocean management, sustainability indicators
Type of use:	Research / Science
Type of RI:	Single-sited

RI Category:	In situ Marine/Freshwater Observatories
Main Scientific Domain:	Earth and Environmental Sciences
Hosting Organization:	Balearic Islands Coastal Observing and Forecasting System (SOCIB) Consortium
Location:	Spain - Palma de Mallorca
Main Status:	Operational since Dec 2012
Contact:	Joaquín Tintoré (jtintore@socib.es)

RESEARCH SERVICES:

- Glider data - Gliders allows the autonomous and sustained collection of CTD data and biogeochemical measurements (fluorescence, oxygen, etc) at high spatial resolutions (1 km) and at low costs compared to conventional methods. Novel studies carried out in the last 2 years in the Mediterranean Sea have confirmed the feasibility of using coastal and deep gliders to monitor the spatial and low frequency variability of the coastal ocean

- HF radar data - Surface currents are identified as a high priority product for coastal ocean observing systems. Shore-based high-frequency (HF) radars that broadcast and then observe back-scattered radio signals from the oceans surface are now a mature technology that has been implemented and is routinely operating in numerous locations worldwide. One installation of a long range HF system (1) with 2 radar stations is deployed at Ibiza Channel to monitor North/South fluxes exchange. Note that to have total currents measurements we need to install 2 radar stations to combine the radial velocity currents, one in Ibiza and the other in Formentera.

- Moorings and met-ocean data - The SOCIB Fixed Station Facility (FSF) is an infrastructure composed of different fixed measurement networks aimed at providing routine point monitoring to scientists, environmental managers, public authorities, etc. The FSF produces long term time-series data of different parameters, both physical and biogeochemical. These data are then available through SOCIB's Data Centre Facility to guide environmental policy decisions, support scientific research and validate and constrain forecast models.

- Argo profilers buoys and surface drifters data - SOCIB mantains a sustained drifters program, in the framework of the Global Drifter Program (GDP), consisting on periodic deployments of SVP platforms to attend scientific needs. A popular use of the data will be surface currents mapping, distribution of eddy kinetic energy and dispersion of surface particles (such as fish larvae and other plankton and buoyant pollutants such as oil spills).

- Beach monitoring facility data - Beach Monitoring Facility products consist of real time data on beach images and weather variables, as well as periodic information on waves, sediments and beach morphology. Coastal systems are sensitive environments where many processes operate at different space-time scales acting nonlinearly. Understanding nearshore processes and the response of coastal systems at all these

scales is increasingly important because beaches are the first barrier in front of coastal flooding and, also, because their economic and social relevance in terms of tourism economy and outdoor recreation. Additionally the increased threat of global warming and the resulting rise in sea level may accelerate coastal erosion problems.

- R/V Catamaran data - A fast catamaran hull with overall length of approximately 24 m (less than 24 m registered LOA) has been constructed. Its design maximizes space, in terms of availability for scientific operations (wet and dry laboratories and an aft platform for one or two 10 foot containers) and accommodation for crew and scientists/technicians, whilst offering high speed capabilities and manoeuvrability. The flexibility of this modern design, in terms of space, speed, stability and layout, gives this vessel the ability to adapt to the goals of different projects making it a valuable tool for the scientific community of the region. The small crew requirements mean operations are at a minimal cost.

- Modelling, ocean forecast and analysis products - Our aim is to advance on the understanding of physical and multidisciplinary processes and their non linear interactions, to detect and quantify changes in coastal systems, to understand the mechanism that regulate them and to forecast their evolution and or adaptation under, for example, different IPCC scenarios. To achieve this goal, the Modeling & Forecasting facility will provide operational forecasting, hindcasting and monitoring of the western Mediterranean, and specifically coastal seas around the Balearic Islands. The SOCIB modeling platform will comprise: Circulation models, forecast ocean currents Weather modeling Ecosystem modeling, provide forecasts and analysis of the ecosystems Wave modeling, to forecast wave conditions globally and locally Satellite data with particular emphasis on development of coastal products

- Balearic islands coastal information (e.g., ESI)

- Data center facility - The Data Centre is the core of SOCIB. Through it, SOCIB is developing and implementing a general data management system to guarantee international standards, quality assurance and inter-operability. The combination of different sources and types of information (time series, profiles, trajectories, grids/meshes, images, acoustic data, etc.) requires appropriate methods to ingest, catalogue, display and distribute this information. The general goal of the SOCIB Data Centre is to provide users with a system to locate and download the data of interest (near real time and delayed mode) and to visualize and manage the information. Following SOCIB principles, data need to be: 1) discoverable and accessible; 2) freely available; 3) interoperable and standardized (Tintoré et al. 2012 and 2013). These principles are in line with the challenges and opportunities of Open Data (European Commission 2010; Reichman et al. 2011; Urban et al. 2012).

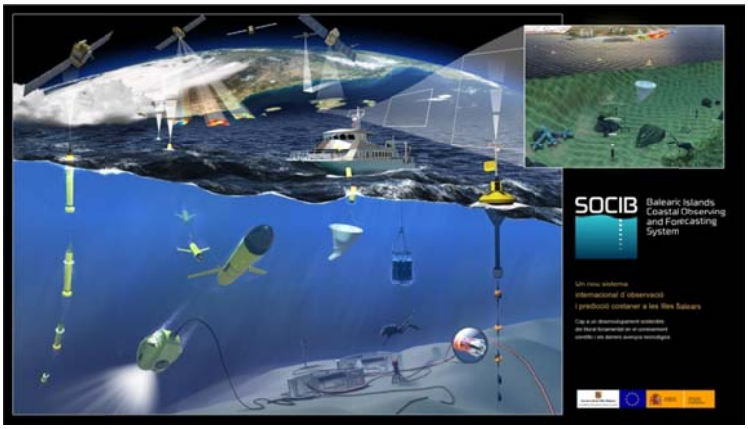
EQUIPMENT:

- gliders - 2 GLIDERS (underwater autonomous vehicles) for profound sampling and long autonomy, and 2 GLIDERS (underwater autonomous vehicles) for mesoscale studies
- R/V Catamaran (24m)
- Pressure chamber

- MOKNESS humble sampling net - MOCNESS consists of a sturdy rectangular frame that carries sensors and controls anywhere from 6 to 20 nets. Research vessel tows MOCNESS at a crawl - 2 to 3 knots. The cable connecting ship and instrument also carries the data and allows scientists to control the instrument's depth. MOCNESS can sample as deep as 6,000 meters (3.7 miles). Sensors report conductivity (salinity), temperature, depth, and chlorophyll, oxygen and light levels.
- CTD profiler - CTD profiler for ocean data sampling

SOCIETAL GRAND CHALLENGES:

- Climate action, resource efficiency and raw materials
- Food security, sustainable agriculture, marine research and the bio-economy



Health Sciences and Biotechnology

- ***Biomaterials Cooperative Research Centre Association (CIC Biomagune)***
- ***Animal Health Research Centre (CISA)***
- ***Nuclear Magnetic Resonance Laboratory (RMN)***

KEY INFORMATION

Full Name:	**Biomaterials Cooperative Research Centre Association**
Acronym:	CIC biomaGUNE
Website	http://www.cicbiomagune.es
Description:	CIC biomaGUNE is a non-profit research organization created to promote scientific research and technological innovation at the highest levels in the Basque Country following the BIOBASQUE policy in order to create a new business sector based on biosciences. This RI is an ICTS (Unique Scientific and Technological Infrastructure), included in the Spanish National Roadmap for RIs.
Keywords:	Research
Type of use:	Research / Science
Type of RI:	Single-sited
RI Category:	Research Facilities Materials Synthesis or Testing Facilities
Main Scientific Domain:	Biological and Medical Sciences Chemistry and Material Sciences
Hosting Organization:	Biomaterials Cooperative Research Centre Association (CIC biomaGUNE)
Location:	Spain - San Sebastián - Paseo Miramón 182, Edificio Empresarial C
Main Status:	Operational since 2006
Contact:	Luis M. Liz-Marzán (llizmarzan@cicbiomagune.es)

RESEARCH SERVICES:

- Molecular Imaging Platform related to ICTS - The Molecular Imaging Platform at CIC BiomaGUNE is housed within 900m² and is an integrated imaging facility that offers state-of-the-art imaging resources in Positron Emission Tomography (PET), Single Photon Emission Computerized Tomography (SPECT), Computerized Tomography (CT) and Magnetic Resonance Imaging (MRI). Including a dedicated animal housing facility for rodents, the Molecular Imaging Facility has been created with the aim of becoming a reference platform in Europe in the field of Molecular Imaging in small animals.
- Colloidal Nanofabrication Platform related to ESMI - The BioNanoPlasmonics Laboratory at CIC BiomaGUNE is dedicated to the synthesis, assembly and applications of various types of nanoparticles with specific functionalities, in particular metal nanoparticles with novel (plasmonic) optical properties. Various characterization methods, including transmission electron microscopy, electrophoretic mobility and several types of optical spectroscopy are available.

EQUIPMENT:

- Transmission electron microscope - JEOL JEM-2100F UHR) equipped with a 2k x 2k CCD camera and state of the art STEM (BF & DF) and EDXSsystems
- UV-vis spectrometer - Cary 5000 Varian, UV-vis-NIR Spectophotometer
- Fluorometer - Fluorolog-TSPC (Horiba-Jovine Ivone). Can measure steady state emission, excitation spectra and kinetic studies from 200-800 nmwavelengths. It also performs lifetime measurements with a detection limit in the ps range.
- Confocal microscope - Laser Scanning Microscope, Zeiss LSM 510
- Dark field microspectrophotometer - Nikon optical microscope coupled to a CCD camera and high performance visible spectrophotometer. Suited for single particle scattering spectroscopy
- Magnetic Resonance Imaging - The MRI Laboratry is equipped with an actively-shielded ultra-refrigerated superconducting 11.7 Tesla magnet, operating at a proton resonance frequency of 500MHz, interfaced to a modern Bruker Avance system.
- Radiochemistry - The radiochemistry platform includes a radiochemistry lab equipped with 5 hot cells which house automatic-remote controlled synthesis modules (suitable for the preparation of PET and SPECT radiotracers), a shielded laminar flow cabinet and state of the art quality control equipment, including radio-HPLC, radio-GC, radio-TLC and gamma spectrometry. The versatility of the equipment allows the synthesis of a wide range of known PET and SPECT radiotracers, as well as the design of new labelled structures to undertake pharmacokinetic and pharmacodynamics studies. The platform, furthermore, includes a fully equipped lab for radioactive metabolite analysis in blood and tissue samples and a cell culture lab for in vitro studies with radiolabelled ligands.
- Nuclear Imaging - The Nuclear Imaging platform offers state-of-the-art imaging resources in Positron Emission Tomography (PET), Single Photon Emission Computerized Tomography (SPECT), Computerized Tomography (CT) and Optical Tomography. It is equipped with small animal dedicated SPECT-CT (microSPECZT-Visio 140) and PET-CT (Explore Vista-CT) cameras and with an optical imaging system. The platform is designed to perform in vivo studies from various imaging modalities in an interleaved fashion from the same animal. The combination of these potent and non-invasive imaging techniques facilitates performing multimodal approaches to biological, physiological and medical problems, obtaining images with significant functional and anatomical information. The platform is furthermore equipped with an autoradiography system for end point high resolution nuclear imaging.

KEY INFORMATION

Full Name:	**Animal Health Research Centre**
Acronym:	CISA
Website	http://wwwsp.inia.es/Investigacion/centros/cisa
Description:	The Animal Health Research Centre (Centro de Investigación en Sanidad Animal, CISA), part of the National Institute for Agricultural and Food Research and Technology (INIA), Ministry of Economy and Competitiveness, is a multidisciplinary research centre created in 1993 to expand the actions of the Ministry of Agriculture, Fisheries and Food in the field of animal health. CISA is a centre for research and surveillance focused on the prevention, diagnosis and control of emerging, re-emerging and transboundary infectious diseases of livestock with economical and sanitary impact, including zoonoses, that may cause restrictions in trade and a serious impact on public health and food security. Its primary mission is to promote advanced research, technology development, cooperation with national and international bodies and technology transfer in the area of animal health, following the strategic priorities agreed by organisations and national and international forums of relevance in the area. CISA is designed in three different work areas: biosecurity (biosafety levels 3 and 3+), environmental health and administration. BSL3 animal facility is part of the focal points in Spain to work with high risk biological agents. Researchers from other institutions and pharmaceutical companies make use of the animal facility to develop specialised BSL3 in vivo experiments. Main activities: ♣ Research in animal science at the highest level. ♣ Activities such as national reference laboratory in Spain and Europe in various diseases of great public health importance. ♣ Collaborative activities and services to various public, private, national and international entities, in the field of research and development in animal health. ♣ Active collaboration with the Ministry of Agriculture, Food and Environment, giving support in certain tasks of the National Reference Laboratories. ♣ Repository of biological materials useful for Spanish research in animal health. ♣ Activities of national and international cooperation including organizing training courses, workshops stays and scientific-technical organization of interlaboratory testing, evaluation and validation of diagnostic and vaccine technologies, technology transfers
Keywords:	Animal health research, animal facilities, biocontainment, biosafety levels 3 and 3+
Type of use:	Research / Science
Type of RI:	Single-sited
RI Category:	Animal facilities Cell Culture Facilities Collections of Biological Resources (e.g. Microorganisms, Biobanks and Seed Banks)

	Environmental Health Research Facilities Research Facilities
Main Scientific Domain:	Biological and Medical Sciences
Hosting Organization:	Instituto Nacional de Investigación y Tecnología Agraria y Alimentaria (INIA) [National Institute for Agricultural and Food Research and Technology]
Location:	Spain - Valdeolmos (Madrid) - Carretera de Algete a El Casar
Main Status:	Operational since 1993
Contact:	Víctor Briones (briones.victor@inia.es)

RESEARCH SERVICES:

- Biosafety level (BSL) 3 and 3+ facility of 10,824 m2, BSL3 animal facility - Researchers from other institutions and pharmaceutical companies make use of the animal facility to develop specialised BSL3 in vivo experiments.
- Sequencing service - Sequencing service for internal and external use.
- Epidemiology and environmental health - Diagnostic studies and evaluation of processes arising from health and environmental toxicants affecting animal populations. Risk assessment and environmental impact of farming, agro-industrial effluents and veterinary medicines affecting intensive or extensive systems of production, or natural populations.
- Advisory activities and services - Technical and scientific advice and training.
- Early diagnosis of most of the important emerging and transboundary infectious diseases - i) Participation in the early warning system; ii) epidemiology and risk assessment studies; iii) participation in surveillance programmes, including production and distribution of biological reagents and diagnostic kits; iv) prevalence studies and characterization of pathogens causing shared diseases (public health, livestock, wildlife) in wild reservoirs; v) harmonization of diagnostic methods through organization of interlaboratory comparison tests at national level; vi) improvement of knowledge and development of new tools for diagnosis of transboundary diseases, specially those at higher risk of entrance; vii) assessment of commercial diagnostics kits, control of biological products.
- European Union (and FAO, under evaluation) Reference Laboratory for African swine fever - Scientific and technical activities as ASF Reference Laboratory include: i) coordination of methods employed, standardization of tests and reagents; ii) harmonization of diagnostic techniques of national reference laboratories (NRLs) of Member states and third countries in Europe, Africa and Asia, diagnosis; iii) production and distribution of serological and virological diagnostic kits and reagents worldwide; iv) training courses and technology transfer, on diagnostic techniques, ASFV characterization and production of reagents; v) international missions through organisms and collaborations; vi), and participation in R&D projects.

EQUIPMENT:

- Biosafety level (BSL) 3 and 3+ facility of 10,824 m2 -
- 42 laboratories and an BLS3 animal facility consisting of 19 individual, multi-species and polyvalent rooms with the capability to shelter fish, small and large animals. The rooms include shower area and animal housing. They are contained through three depression levels which allow for working with aerosol transmissible agents, such as foot and mouth disease, avoiding the risk of spreading to other areas. Researchers from other institutions and pharmaceutical companies make use of the animal facility to develop specialised BSL3 in vivo experiments.
- BSL-2 laboratories - A restricted BSL-2 Area is located outside the BSL facility. This area consists of 10 laboratories equipped with the appropriate infrastructure for epidemiology and risk assessment, toxicological bioassays, sequencing and molecular biology and diagnosis of infectious diseases, including wild life species. This area supports BSL3 studies in the area of epidemiology and risk assessment and is also used by researchers for those specific cases and/or partial studies not requiring BSL3

KEY INFORMATION

Full Name:	**Nuclear Magnetic Resonance Laboratory**
Acronym:	RMN
Website	http://rmn.ub.es/lrb
Description:	The Barcelona NMR Laboratory (LRB) offers access to an 800 MHz, two 600 MHz and three 500 MHz NMR instruments and scientific and technical staff of support. It is located in building designed to house high field NMR spectrometers. Our main singularities are the 800 MHz NMR and the Dynamic Nuclear Polarization instruments. One of the 500 MHz NMR machine is equipped with a HRMAS probe for study biological tissues or gel phase samples. The highest sensitivity, needed for low concentration samples is accomplished with the use of cryoprobes on 800 MHz and one 600 MHz instruments. Our instrumental capability is fully supported by the possibility of access to the expression and purification of labelled proteins laboratory next to our facilities. Our facilities offer a global support including choice and design of experiments, experiment set up. Our machines can be used as a tool to check new methods to be implemented at other labs and instruments. The instrumentation together with the collaboration of a highly trained staff provides support to researchers in diverse areas, mainly: • Biomolecule structure • Interactions (Pharmaceutical research) • Functional Biology • Drug delivery • Structural identification in Organic and Inorganic Chemistry • Food Science and Technology • New methodologies: NMR applications development. This RI is an ICTS (Unique Scientific and Technological Infrastructure), included in the Spanish National Roadmap for RIs.
Keywords:	Nuclear Magnetic Resonance Protein structure determination Drug discovery, High Throughput ligand screening NMR Methodological studies Dynamic nuclear polarization experiments NMR studies in small molecules Food Science and Technology
Type of use:	Research / Science
Type of RI:	Single-sited
RI Category:	Structural Biology Facilities, Research Facilities, Materials Synthesis or Testing Facilities, Genomic, Transcriptomic, Proteomics and Metabolomics Facilities
Main Scientific Domain:	Biological and Medical Sciences, Chemistry and Material Sciences, Earth and Environmental Sciences
Hosting Organization:	University of Barcelona - Scientific and Thecnologic Centers (CCiTUB)
Location:	Spain - Barcelona - Baldiri i Reixac 10
Main Status:	Operational since 2000

Contact:	Miquel Pons (mpons@ub.edu)

RESEARCH SERVICES:

- Spectrometer Time - We provide direct access to our spectrometers to the users with previous experience
- Protein Structure - Access to the advance pulse sequences in the high field NMR spectrometers
- NMR screening techniques. - - receptor-based screening - ligand-based screening
- Training & Spectrometer access - To facilitate the use to the technique to non NMR expert researchers by training and guided use of high performance NMR instrumentation.
- Dynamic nuclear polarization experiments - Study of new radicals and applications
- External services - Give advice on NMR application to pharmaceutical industries

EQUIPMENT:

- Bruker Avance 800 NMR Spectrometer - (year: 2000). RF 4 chanels - 800 MHz Bruker sub-cooled Magnet - 5mm TCI CryoProbe 1H{13C/15N} with Z-Grad (S/N: 7000:1) - 5mm TXI RT 1H{13C/15N} with X,Y,Z-Grad (S/N: 1700:1) - 8mm TXI RT 1H{13C/15N} with Z-Grad (S/N: 1700:1) - Gradients in X, Y, Z
- Bruker Avance 600 MHz Ultra Shielded Spectrometer - (year: 2010). 600 MHz Bruker Ultra Shielded Magnet -RF 5 chanels - 5mm TCI CryoProbe 1H{13C/15N} with Z-Grad (S/N > 6000:1) - Gradient in Z. Nitrogen recover system Spectrometer and CryoProbe acquired with MINECO-ERDF funds
- Bruker Avance 600 MHz Spectrometer - (year: 2000). 600 MHz Bruker Magnet - 5 mm BBFO Probe {BB/19F - 1H/2H}, Zgradients, automatic tunning (ATM) - 5mm TXI RT 1H{13C/15N} with,Z-Grad (S/N: 1700:1) - 5mm TXI RT TXI 1H/13C/31P} with Z-Grad (S/N: 1700:1) - Gradient
- Bruker Avance 500 MHz Spectrometer - (year: 1993) upgraded in 2003. 500 MHz Oxford Instruments magnet - 3-channel Bruker DMX-500, Gradients in Z - 5mm TXI RT 1H{13C/15N} with,Z-Grad (S/N: 900:1) (2003)-HRMAS Probe, gradients in magic angle.
- Varian Inova 500MHz Spectrometer - (year: 1988) upgraded in 1998-2002. 500 MHz Oxford Instruments magnet - 3-channel Varian Inova console - Waveforms generator in all channels for shaped pulses (1998) - Probes: 5mm Penta probe z PFG 1H-13C-15N-31P (2002), z-PFG 5 mmTriple Resonance Probe 1H{13C/15N} (1998) - Carousel Autosampler This instrument is attached to OIMBL's HypersenseTM system.
- Varian VNMRS 500 MHz Spectrometer - (year: 2008) 500 MHz actively shielded Magnex magnet - 2-channel Varian Direct Drive - Waveforms generator in all channels for shaped pulses - Probes: 1H- 19F/15N-31P 5 mm PFG OneNMR Probe (2008); HCN 5mm z-PFG probe (2001),: 5mm Penta probe z-PFG 1H-13C-15N-31P (2002) – SMS Autosampler Spectrometer acquired with MINECO-ERDF funds

- OIMBL's HypersenseTM system for dynamic nuclear polarization experiments - (year: 2007) OIMBL's HypersenseTM system for dynamic nuclear polarization experiments - Oxford Magnet 3,35 Tesla. - This instrument is attached to an NMR spectrometer Varian Inova 500 Instrument acquired with MINECO-ERDF funds.

SOCIETAL GRAND CHALLENGES:

- Food security, sustainable agriculture, marine research and the bio-economy.

Materials:

- ***Alba Synchrotron Light Source (ALBA)***
- ***Center for Ultrashort Ultraintense Pulsed Lasers (CLPU)***
- ***Centro Nacional de Aceleradores (CNA)***
- ***Clean Room of the Microelectronics National Centre (CNM)***
- ***Institute of Optoelectronics Systems and Microtechnology (ISOM)***

KEY INFORMATION

Full Name:	**Alba Synchrotron Light Source**
Acronym:	ALBA
Website	http://www.cells.es
Description:	ALBA is a 3rd Generation Synchrotron Light facility located in Cerdanyola del Vallès, Barcelona, Spain, and it is the newest source in the Mediterranean Area. It is governed by a public consortium created in March 2003: the Consortium for the Construction, Equipping and Exploitation of the Synchrotron Light Source (CELLS), owned and financed in equal part by the Spanish and the Catalonian Administration. ALBA has been identified as a "Singular Technological and Scientific Infrastructure" among the Spanish scientific infrastructures. It is networked with other Synchrotron Light Sources in and outside Europe through common European projects and bilateral collaboration agreements. The facility is based on a chain of accelerators which produce, accelerate up to 3 GeV and store in a synchrotron ring electron beams which emit Synchrotron Light ranging from infrared up to hard X-ray of tens of keVs. Up to 31 ports are available to extract the light as well as the space for the corresponding beamlines and related experimental hutches. Buildings for conventional technical systems and for specialized laboratories complete the facility.
Keywords:	Synchrotron radiation source, X-ray science and technology
Type of use:	Research / Science
Type of RI:	Single-sited
RI Category:	Intense Light Sources Research Facilities
Main Scientific Domain:	Chemistry and Material Sciences Biological and Medical Sciences Physics, Astronomy, Astrophysics and Mathematics Earth and Environmental Sciences Engineering and Energy
Hosting Organization:	Consortium for the Construction, Equipping and Exploitation of the Synchrotron Light Source (CELLS)
Location:	Carretera BP 1413 de Cerdanyola del Vallés a San Cugat del Vallés, KM 3,3 - 08290 CERDANYOLA DEL VALLES- Barcelona- Spain
Main Status:	Operational since 2012
Contact:	Caterina Biscari (cbiscari@cells.es)

RESEARCH SERVICES:

Beamtime Access - ALBA is a public institution serving the academic world and public research institutes.

At the same time one of its strategic priorities is to foster industrial R&D activities through technological transfer and private utilisation of beamtime.

The ALBA vision is to become a centre of excellence in Synchrotron Light Scientific and Industrial applications and to achieve the status of a recognized world class facility in its field.

Its mission is to research in, deliver and maintain methods and techniques with which to conduct cutting edge synchrotron light-based research and development, in such a way that knowledge and added value are pumped into the scientific and industrial communities, particularly the Spanish ones, with the ultimate goal of contributing to the improvement of well-being and progress of society as a whole.

EQUIPMENT:

Beamlines - The initial seven ALBA beamlines can be classified into three groups according to their main scientific application areas:

i) Those devoted to Life Sciences;
ii) Those devoted to Condensed Matter Physics, especially magnetic structures, electronic properties and Nanoscience;
iii) Those devoted to Chemistry with applications in Materials Science and different multidisciplinary areas.

KEY INFORMATION

Full Name:	**Center for Ultrashort Ultraintense Pulsed Lasers**
Acronym:	CLPU
Website	http://www.clpu.es
Description:	The Center for Ultrashort Ultraintense Pulsed Lasers (Centro de Láseres Pulsados Ultracortos Ultraintensos, CLPU) is a national facility specialized in femtosecond laser pulses with peaks powers at Gigawatt, Terawatt and Petawatt levels. The object of the facility is to serve both the scientific community and the industry by providing access to state-of-the art high power lasers, as well as advice, through collaborative research. Our facilities are open to national and international users. This RI is an ICTS (Unique Scientific and Technological Infrastructure), included in the Spanish National Roadmap for RIs.
Keywords:	Laser, ultrashort, ultraintense, femtosecond, pulse
Type of use:	Research / Science
Type of RI:	Single-sited
RI Category:	Intense Light Sources
Main Scientific Domain:	Chemistry and Material Sciences
Hosting Organization:	Ultrashort Ultraintense Pulsed Lasers Consortium
Location:	37185 Villamayor | Salamanca - Spain
Main Status:	Under Construction
Contact:	Luis Roso (roso@usal.es)

RESEARCH SERVICES:

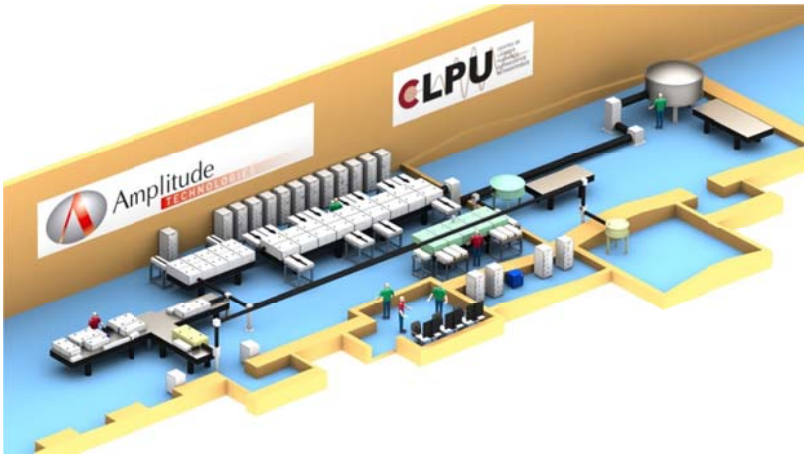
- (Building M3) Lab. 1 Mechatronics workshop and microscopy - The mechatronics laboratory is a fusion of mechanical and electronic workshops. It has been created to serve the laser users at CLPU as well as the companies based in the Scientific Park of University of Salamanca. In the future it will also serve other institutions related with laser technology. The microscopy laboratory provides high resolution microscopy with nanoscale precision.
- (Building M3) Lab. 2 High repetition rate femtosecond laser - The beam of this laser system can be divided to service multiple work stations for: microprocessing of materials, micromachining, laser cleaning, microanalysis of surfaces, electron acceleration and X-ray generation.
- (Building M3) Lab. 3 Carrier envelope phase (CEP) stabilised femtosecond laser. - This laser system is dedicated to experiments of strong-field atomic and molecular physics

in the few-cycle pulse regime, attosecond science, high harmonic generation and XUV radiation applications.

- (Building M3) Lab. 4 VEGA laser system I (20 TW) and VEGA laser system II (200 TW) - The scientific interests of the phase I (20 TW) of the VEGA laser system are: non linear propagation, attoseconds science and surface HHG. The scientific interests of phase II are: electron and ion acceleration and relativistic filamentation.
- (Building M5) VEGA laser system III (PW) - The scientific interests of the petawatt laser system VEGA are: plasma physcis, laboratory astrophysics, electron and ion acceleration, laser induced nuclear processes and vacuum polarization.

EQUIPMENT:

- Lab 1. Vertical continuous-five-axes-milling machine - It can produce pieces of high complexity, from opto-mechanical mounts to customized prototypes.
- Lab 1. Drilling machine, lathe… - All of them for the fabrication of tailor-made complex devices.
- Lab 1. Atomic Force Microscope (AFM) - The AFM provides an image resolution below one nanometer (in z-scale of topography mode) over a maximum scanning area of 80 x 80 mm
- Lab 1. Scanning Electronic Microscope (SEM) - The SEM provides a resolution below 5 nm with magnifications up to one million times.
- Lab 2. CPA laser system - It is a Titanium:sapphire CPA laser system operating at 1 kHz repetition rate witha pulse energy of 7 mJ and 120 femtoseconds of duration.
- Lab 3. Carrier envelope phase (CEP) stabilised femtosecond laser - This laboratory is equuipped with a 1 kHz Titanium:Sapphire CPE laser system delivering 2 mJ in 20 fs pulses, or 0.6 mJ in 6 fs after post-compression, with carrier envelope phase control stabilization.
- Lab 4. VEGA phase I (20 TW) - Titanium:Sapphire CPA laser system operating at 10 Hz repetition rate with a pulse energy of 500 mJ and 25 femtoseconds duration
- Lab 4. VEGA phase II (200 TW) - This system has a pulse energy of 5 Jules, 25 femtoseconds of duration and 10 Hz repetition rate.
- (Building M5) VEGA phase III (PW) - This laser system has a pulse duration of 25 femtoseconds with a pulse energy of 30 Jules and a repetition rate of 1 Hz or single shot.


CLPU
Amplitude


FEMTOSOURCE SYNERGY

KEY INFORMATION

Full Name:	**Centro Nacional de Aceleradores**
Acronym:	CNA
Website	http://www.cna.us.es
Description:	4 joined accelerators, a scanner PET/CT for humans, a scanner PET/CT for animals and a Co-60 irradiator where many techniques, skills and equipment are common to these facilities. Own building with space to house equipment, laboratories, workers and researchers Own budget which allows flexibility for regular operation – Increase in experimental activity of Spanish research groups should increase demand for the use of CNA facilities European cooperation in large projects should allow finding activities in which ""small"" accelerators as CNA can contribute to European large scale facilities Increased activity in PET medical imaging is an opportunity for CNA, which can produce PET radionuclides, synthesize radio-pharmaceuticals and provide PET imaging equipment. It can be important to train highly qualified technicians in medical imaging. National collaborative programs, such as the CONSOLIDER-CPAN project on Particle, Astroparticle and Nuclear Physics, stress the importance of increasing the number of highly specialized technicians increasing the number of highly specialized technicians. CNA is an IAEA collaborator Centre CNA participates in European projects such as DITANET, LA3NET, and oPAC 3 joined accelerators where many techniques, skills and equipment are common to 3 accelerators.
Keywords:	Ion accelerators, nuclear physics, environmental sciences, material sciences, tracking detectors, hot particles, 14C dating, irradiation experiments, archeometry, cultural heritage
Type of use:	Research / Science
Type of RI:	Single-sited
RI Category:	Nuclear Research Facilities
Main Scientific Domain:	Physics, Astronomy, Astrophysics and Mathematics
Hosting Organization:	Centro Nacional de Aceleradores
Location:	Spain - Sevilla - 7, Av. Thomas Alva Edison
Main Status:	Operational since 1999
Contact:	Joaquín Gómez (gomez@us.es)

RESEARCH SERVICES:

- Measurements by IBA techniques - Service of measurements by IBA techniques, which provide multi-elemental analysis by XRF, Channeling, PIGE, PIXE, RBS and NRA methods for experiments such as material science, archaeology, environmental sciences, irradiation experiments, nuclear physics and nuclear instrumentation.
- Production of PET radio-nuclides - Radionuclides used in Positron Emission Tomography
- PET and CT scanners for small animals and humans
- Measurements by Accelerator Mass Spectrometry - Measurements of the content of Plutonium, Iodine, Beryllium and Carbon isotopes have been performed in environmental and historical samples.
- C-14 dating - Associated to AMS, there is a service of 14C dating.

EQUIPMENT:

- 3 MV Tandem Accelerator - Accelerator used to IBA (Ion Beam Analysis) measurements (PIXE, PIGE, NRA, RBS, CHANNELING)
- 1 MV Tandetron Accelerator - Accelerator used to long-life radionuclides mass spectrometry (Pu239-240, I129, Ca41, C14, Be10....)
- Cyclotron 18/9 MeV - Accelerator used to IBA (Ion Beam Analysis) measurements and radionuclides PET production
- PET/CT scanners for small animal and for humans - Scanners for Positron Emission Tomography and Computerized Tomography
- 60Co irradiator - Equipment used to irradiation of aerospace technology by fotons
- MiCaDaS (Mini radiocarbon Dating System) - Accelerator used to C14 dating only

KEY INFORMATION

Full Name:	**Clean Room of the Microelectronics National Centre**
Acronym:	CNM
Website	http://www.imb-cnm.csic.es/index.php?option=com_content&view=article&id=13&Itemid=69&lang=en
Description:	Fully operative Clean Room for the development and fabrication of Micro and Nanointegrated devices. The Institute of Microelectronics of Barcelona (IMB), that is part of National Microelectronics Centre (CNM), belongs to the Spanish Research Council (CSIC) and is the largest public micro/nano electronics research and development centre in Spain. Embedded administratively in CNM-IMB, although having a separate and well defined structure and operating policies, there is the Large Scale Facility called "ICTS Sala Blanca integrada de Micro y Nanofabricación" (ICTS- Integrated Micro and Nanofabrication Clean Room). Micro and Nano Technologies (MNT) and related Microsystems and MEMS devices are horizontal and disruptive ICT technologies with clear impact in all fields of research and social and economic activity as well stated in the European Commission Framework Programme. Clean Rooms like the CNM-IMB ICTS are key infrastructures for carrying out fundamental applied and industrial research in those high tech fields in the south of Europe. This RI is an ICTS (Unique Scientific and Technological Infrastructure), included in the Spanish National Roadmap for RIs
Keywords:	Clean room, Microtechnologies, Nanotechnologies, MEMS, Sensors, actuators, Microsystems, Smart Systems
Type of use:	Research / Science
Type of RI:	Single-sited
RI Category:	Micro- and Nanotechnology facilities
Main scientific domain:	Information Science and Technology Physics, Astronomy, Astrophysics and Mathematics Engineering and Energy
Hosting Organization:	CSIC - Consejo Superior de Investigaciones Científicas
Location:	Spain - Barcelona - Cerdanyola del Vallès, Campus UAB
Main Status:	Operational since 1991
Contact:	Carles Cane (carles.cane@imb-cnm.csic.es)

RESEARCH SERVICES:

- Micro and nano devices fabrication -
- Modelling - Finite element modelling and device and technology simulation
- Sensors and integrated circuit design - Design service for any microelectronics technology open for prototyping and fabrication
- Reverse engineering - Yield and reliability studies and failure analysis via reverse engineering
- Electrical characterisation - Device, subsystems and systems parametric and functional characterisation
- Device packaging and system integration - Packaging, and hybrid integration
- Training to industry and academia - Technology and device training, hands-on for academia and industry

EQUIPMENT:

- Thermal furnaces
- Ion implanters
- LPCVDs, PECVVD
- Metal sputtering
- Metals evaporation
- Dry etching, RIE, DRIE
- Wet etching and cleaning benches
- Contact mask aligners
- Steppers
- e-beam
- Direct laser writing
- Nanoimprint
- FIB
- AFM
- CMP
- Wafer bonding
- Flip chip packaging
- Wire bonding
- SAW dicers
- AF, Acoustic microscopes
- Electrical characterisation probe stations
- Thermal characterisation systems

SOCIETAL GRAND CHALLENGES:

- Climate action, resource efficiency and raw materials
- Secure, clean and efficient energy
- Smart, green and integrated transport
- Health, demographic change and well-being
- Food security, sustainable agriculture, marine research and the bio-economy
- Inclusive, innovative and secure societies

KEY INFORMATION

Full Name:	**Institute of Optoelectronics Systems and Microtechnology**
Acronym:	ISOM
Website	http://www.isom.upm.es/eng/index.php
Description:	ISOM is a multi-departmental research institution devoted to graduate research and education in electrical engineering, which is affiliated to the Universidad Politecnica de Madrid (UPM). The ISOM facilities include a 400 m2 cleanroom (100-1000 class), and 300 m2 of characterization and system development laboratories. The technology processes available at ISOM allow the fabrication and characterization of materials, their technological processing, and the fabrication of integrated electronic, optoelectronic, optic and magnetic devices. At present, ISOM has the capability to fabricate and develop laser and light emitting diodes for instrumentation, environment and optical communications; microwave transistors for high power and temperature applications; infrared photodetectors for civil and military applications; ultraviolet photodetectors for UV solar radiation monitoring and military applications; magnetic sensors for a wide range of applications, and SAW filters for RF and mobile communications.
Keywords:	Nanotechnology, photonics, optoelectronics, semiconductors, magnetics, devices, detectors, sensors, emitters
Type of use:	Research / Science
Type of RI:	Single-sited
RI Category:	Electrical and Optical Engineering Facilities Energy Engineering Facilities (non nuclear) Micro- and Nanotechnology facilities
Main Scientific Domain:	Engineering and Energy Information Science and Technology
Hosting Organization:	Universidad Politecnica de Madrid (UPM)
Location:	Spain - Madrid - Avenida Complutense 30
Main Status:	Operational since 2000
Contact:	Enrique Calleja (calleja@die.upm.es)

RESEARCH SERVICES:

- Joule evaporation deposition (Au, AuGe, AuZn, Ni, etc) - Evaporation by Joule effect of different metals
- e-beam evaporation deposition (Au, Pt, Ti, Al, etc.) - Evaporation by electron beam of different metals.
- Chemical Vapour Deposition (CVD) for isolators (Si-O-N systems) - Deposition of SiN and SiO layers.
- Sputtering for magnetic materials (Fe, Ni, Co, FeNi, etc.) - Deposition of magnetic thin films.
- Molecular Beams Epitaxy (MBE) for semiconductors (AlGaInAs and AlGaInN families) - Growth of Arsenides and Nitrides semiconductor compounds.
- Electrodeposition of Au, Ni, CoP
- Photo and E-Beam (nano) Lithography - Optical lithography and e-beam lithography.
- Reactive Ion Etching (RIE) and Wet Etching - Etching of different materials.
- Optical Characterization - Photoluminescence analysis.
- Optoelectronic Characterization - Characterization of optoelectronic devices (detector, emitters, etc.).
- Electrical and Magnetical Characterization - Hall-effect, VSM.
- Microscopy and Structural Characterization - SEM, AFM and high resolution XRD

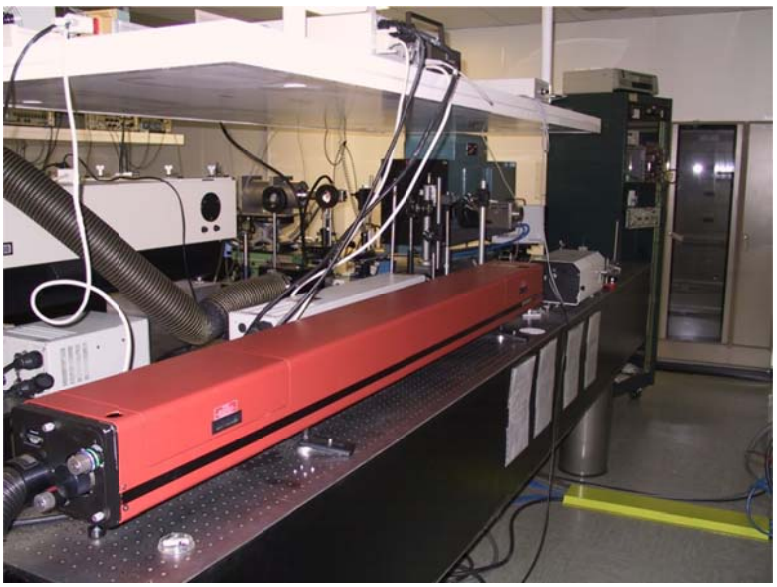
EQUIPMENT:

- Molecular Beam Epitaxy (MBE) Facilities - 4 MBEs systems dedicated to the growth of Arsenides and Nitrides semiconductor compounds.
- Magnetron Sputtering - Systems dedicated to the growth of magnetic heterostructures.
- High resolution nanolithography system (line resolution 10 nm) - Electron beam nanolithography system with line resolution of 10 nm.
- UV Photolithography (resolution >1 µm) - Standard optical enhanced lithography system with resolution >1 Î¼m.
- Metal Deposition (Joule, e-beam) - Joule and e-beam evaporators for metal (Ti, Al, Mo, Ni, Au, etc) deposition.
- Chemical Vapour Deposition (CVD and PECVD) - Systems for depositing dielectric materials (SiN, SiO, etc).
- Reactive Ion Etching (RIE) - Plasma-assisted reactive ion etching system.
- Standard and Rapid Thermal Annealing (RTA) - Systems used for annealing of contacts and re-ordering of different materials.
- High precision blade, diamond Scriber and perfilometer - System for dicing different type of wafers.
- Ultrasonic and Thermocompression Microsoldering - Systems for soldering micro wires.
- High Resolution X-Ray Diffractrometers (HR-XRD) - Systems dedicated to determining crystal structures by performing different types of profiles.
- Scanning Electron Microscope (SEM) with EDAX - System dedicated to obtaining morphology data and chemical analysis.
- Atomic Force Microscope (AFM) - System dedicated to obtain information on the surface morphology.

- Hall Effect system - System dedicated to obtain electrical properties of thin films.
- Microprobe station and systems for RF network analysis (< 20 GHz) - Electrical characterization of devices with frequency up to 20 GHz
- UV, VIS and IR Luminescence (PL) - Photoluminescence systems with cryostat allowing measuring optical properties from 10K to room temperature.
- Vibrating Sample Magnetometer (VSM) - System dedicated to characterize magnetic thin films.
- High Resolution Nomarski Optical Microscope - System dedicated to analyze surface morphology.
- Probe Stations (Low Capacitance) for VLSI and discrete devices - Systems dedicated to electrical characterization of different types of optoelectronic devices.
- Electrical and Optical Characterization at high T (up to 400°C), up to 1 GHz (C-V. I-V, C-f, 1/f noise, T, etc.) - System dedicated to characterize (electrically and optically) semiconductor materials and optoelectronic devices from room temperature up to 400°C and high frequency (up to 1 GHz).
- Thickness Profiler (DecTac) - System dedicated to measure thicknesses.

SOCIETAL GRAND CHALLENGES:

- Secure, clean and efficient energy



Social Sciences and Humanities:

- ***National Research Centre on Human Evolution (CENIEH)***

KEY INFORMATION

Full Name:	**National Research Centre on Human Evolution**
Acronym:	CENIEH
Website	http://www.cenieh.es
Description:	The National Research Centre on Human Evolution (CENIEH) is a RI with open access to the national and international scientific and technological community. Its main field of research is human evolution, palaeobiology, palaeoecology and palaeoeconomy, during the Late Neogene and Quaternary, but the centre also promotes awareness and knowledge transfer to society and encourages and supports collaboration in conducting excavations worldwide. Its equipment and technological offer are specialized in earth sciences and geochronology. Other laboratories provide versatile applications in the fields of geology, archeology, geomaterials, heritage conservation, new materials, and dosimetry. Other services are curation, restoration and management of fossil and lithic collections from excavations in archaeological and paleontological sites. The CENIEH is remarkable for its capacity to store and preserve archaeo-palaeoantological collections.
Keywords:	Human evolution, fossil, collection, research, geochronology, geoarchaeology, paleobiology, archaeology, prehistory, conservation, restauration, heritage, geromaterials, climate change
Type of use:	Research / Science
Type of RI:	Single-sited
RI Category:	Earth, Ocean, Marine, Freshwater, and Atmosphere Data Centres Data Archives, Data Repositories and Collections Research Facilities Collections
Main Scientific Domain:	Humanities and Arts Social Sciences Earth and Environmental Sciences Biological and Medical Sciences
Hosting Organization:	National Research Centre on Human Evolution Consortium
Location:	Spain - Burgos - Paseo Sierra Atapuerca
Main Status:	Operational since 2009
Contact:	Alfredo Pérez (alfredo.perez@cenieh.es)

RESEARCH SERVICES:

- Sample preparation and handling - Analysis of ground, fossil and other materials samples.

- Materials lab experiments - Experiments with all kinds of materials using the CENIEH laboratories: X-Ray labs (DRX and FRX), microscopy (optical and electronical), micro-computed tomography, TGA/DSC, Raman Microscopy and ICP-OES.
- Geochronological Analysis - Analysis using different techniques such as ESR, OSL, Uranium series and Archaeomagnetism.
- Collections consultation and study of fossil material and archaeological tools - Access to consultation of the collections' database.
- Conservation and restoration of heritage - Preventive and curative conservation and restoration of all kind of materials, especially archaeological remains.
- Geology - Geological Sample Preparation (soils, sediments, roks, etc..), thin sections preparation.
- Digital Cartography services - Cartography and 3D models
- Library and documentation - Documentation search and selection of bibliography related to archaeology, palaeoanthropology and related fields.

EQUIPMENT:

- Archaeometry Equipment - X-ray powder Diffractometer; Wavelength dispersive X-Ray fluorescence Spectrometer PANalytical Axios; DXR Confocal Raman microscope Thermo Fisher: Nicolet 6700 Fourier Transform Infrared (FT-IR) Spectrometer; Q600 thermal analyzer TA Instruments (TGA/DSC)TG interface to an F-TIR spectrometer; Portable Raman deltanu Rock Hound and portable Raman multijack
- Computerized Microtomography - MicroCT 80 (Scanco Medical); MIMICS Materialise 13.1 Software
- Microscopy Equipment - Optical microscopy: petrographic microscopes and fluorescence polarization (Olympus BX51), stereo (Olympus SZX16 and SZX10) and metallography (Olympus BX51M); Confocal Laser Microscopy Olympus LEXT OLS3000; Morphologi G3; Scanning Electron Microscopy FEI Quanta-600
- Sample Preparation Equipment - Chemical fume hoods for Hydrofluoric acid and other acids; Circular saws (Barranca Diamonds//Logitech GTS1//Buelher IsoMet 4000 and PetroThin); Dentist drill; Agate Mortars; Sieves; Magnetic Separator (MIH 1311-5); Magnetic Shakers; Shakers; Petron calcimeter; Bernard calcimeter; Milli-Q system; Balances (Mettler XS2002S//PB8000-S/FACT//XS403S//AB265-S/FACT); Ultrasonic bath (RESTCH UR3//Branson IC, 8510); Laser Diffraction Particle Size Analyzer Beckman Coulter LS13320 MW; Glass and teflon material for chemical preparation; Sample divisor (RESTCH PT100); Jaw Crushers (RESTCH BB51 and BB100); Disk Mill (RESTCH RS200); Microwave digestion system (CEM-MARS); Mineral separation by density; Ovens; Furnace (Memmert // Carbolite); Centrifugues (ThermoScientific// Selecta); pH-meters; Pippette aparatus Robinson; Magnifying glasses; Thin Section Polishing Machine (LOGITECH 1PW51-WG2); Stone plitting (ZUBER HSN20); Lapping machine (LOGITECH PM5); Vacuum Impregnation Unit (LOGITECH 1IU30); Vacuum system (LOGITECH VS2); Sieve Shaker (RETSCH AS200); Rotatory Micro riffler (QuantaChrome); Hot Plates (Selecta)

- Archaeomagnetism Equipment - Cryogenic magnetometer, SRM 755-4K, with demagnetizer and ARM system (2G Enterprises).Thermal Demagnetizer model TD48-SC ASC (ASC Scientific). Magnetometer MicroMag 3900 VSM (Princeton Measurements Crop.) with cryostat andfurnace. Kappabridge Susceptometer MFK1-FA (AGICO). Notebook sampling (ASC). Saws. Measuring equipment field susceptibility (Bartington).
- Electron Spin Resonance Equipment - X-band Bruker Electron Spin Resonance (ESR) spectrometer, EMXmicro-6/1 model, connected to a Thermo Scientific NESLAB chiller (ThermoFlex3500 model) to control water cooling temperature. Gammacell 1000 Elite-I 137Cs gamma irradiation source. 2 x Canberra high purity germanium detectors (Extended Range Coaxial -XtRa- and well-type detectors) for high-resolution gamma spectrometry of sediments. Hönle solar simulator (UVACube400 + SOL500). 2 x Canberra in situ field gamma spectrometers with LaBr3: Ce and NaI: Tl probes and InSpector 1000 multi-channel analysers. Accessories associated to the ESR spectrometer: - Programmable goniometer (ER218PG1) – High sensitivity resonator - Standard resonator (ER4102ST) - Digital Temperature Control System (ER 4141VT-M Metal-Transferline Option) to work close to liquid nitrogen temperature (90-100K) - JEOL Finger Dewar (Insertion type dewar ES-UCD3X, V=150 ml) to work at liquid nitrogen temperature (77K)
- Luminescence equipment (OSL) - 2 x Risø automated TL/OSL DA 20 readers with IR / Blue OSL attachments, 90Sr irradiation facilities, heating systems and EMI 9235QB15 PM tubes. - 2 x dual laser single-grain attachment for Risø readers (green (532 nm), 10 mW stabilised DPSS laser and IR diode (830 nm), 140 mW TTL modulated laser). - 1 x blue and IR pulsed optical stimulation unit and photon timer attachment for Risø reader. Low-level beta multicounter system (model Risø GM-25-5). 5-sample gas-flow multicounter unit with lead shealding. In situ Al2O3:C dosimeters (5 x 1mm discs and individual grains).
- Uranium Series Equipment - ThermoFinnigan Neptune Multi-Collector (MC) Inductively Coupled Plasma Mass Spectrometer (ICPMS). - Cetac ASX- 112FR autosampler - Cetac Aridus II nebulizer system - ESI Apex HF nebulizer system with Spiro NewWave UP213 Laser Ablation system. PerkinElmer Optima 5300 DV Optical Emission Spectrometer (OES).
- Collections, Conservation and Restoration Equipment - Olympus STM6 Measuring Microscope; Olympus SZX7TR Microscope; Drawing device and photographic stage with fluorescent illumination equipment is available for the visitors of the collection. Nikon D2X camera, a Nikor AF-S 28-70 mm f/2,8D IF ED objective and a Micro Nikkor AF 105 f/2,8 objective. Olympus SZ61 stereo microscope. Bureau of photographic reproduction Kaiser RB 5055 HF Repro 5589. Nikon D5000 digital SLR camera and Nikkor 60mm macro lens. Showcase CRUMA gas filtration. 10 localized extraction arms FUMEX organic vapors. Millipore water purifier. Vibroincisor. Ultrasonic air. Micromotor.

- Bioenergy Equipment - Master Screen CPX 820983. JAEGER. Oxycon Mobile. JAEGER. Bioimpedancia BIA101. BIASIS. Acelerómetro Armband Sense Wear. BODYMEDIA. Antropómetro HOLTAIN. Estadiometro HOLTAIN. Plicómetro HOLTAIN.
- Cartography Equipment - Stereoscope TOPCON; Stereoscope GEOSCOPE; Planimeter; Air Photo Atlas and Satelite images; Total stations; GPS/GNSS; Ploter EPSON STYLUS PRO 9400; High format pirnter HP Desingjet 110 Plus; Scanner Graphtech CS610 DIN A0+; Digitizer table CalComp Drawing Board V DIN A0; Laser Scanner 3D (tripod and hand); ArcGIS10 (software); Deskpot 10-ArcInfo; Deskpot 10-ArcView; Spatial Analysis for ArcGIS; 3D Analyst for ArcGIS10; Geostatistical Analyst; Stero Analyst; ArcGIS 9.3 (software); Erdas Imagine 11-Advance (software); AutoCAD (software); SpheriStat 3 (software); Oriana 3 (software); SPSS (software)

SOCIETAL GRAND CHALLENGES:

- Health, demographic change and well-being
- Climate action, resource efficiency and raw materials
- Food security, sustainable agriculture, marine research and the bio-economy

TIC:

- ***Barcelona Supercomputing Center- Centro Nacional de Supercomputación/RES (BSC-RES)***
- ***Center for Scientific and Academic Services of Catalonia (CESCA)***
- ***Supercomputing Center of Galicia (CESGA)***
- ***RedIRIS***

KEY INFORMATION

Full Name:	**Barcelona Supercomputing Center- Centro Nacional de Supercomputación/RES**
Acronym:	BSC-CNS/RES Network
Website	http://www.bsc.es
Description:	Barcelona Supercomputing Center – Centro Nacional de Supercomputación, is the National Supercomputing Facility in Spain and was created in 2004 by the Ministry of Education and Science (Spanish Government), Generalitat de Catalunya (local Catalan Government) and Technical University of Catalonia (UPC). BSC-CNS manages supercomputer MareNostrum which offers processing power to R&D Groups via public calls evaluated by an Access Committee. This RI is an ICTS (Unique Scientific and Technological Infrastructure), included in the Spanish National Roadmap for RIs.
Keywords:	Supercomputing, supercomputer, virtual infrastructure, computational time
Type of use:	Research / Science
Type of RI:	Single-sited (BSC) Distributed (RES)
RI Category:	Centralised Computing Facilities
Main Scientific Domain:	Information Science and Technology
Other scientific domains:	Biological and Medical Sciences Earth and Environmental Sciences Physics, Astronomy, Astrophysics and Mathematics Chemistry and Material Sciences Engineering and Energy Social Sciences Humanities and Arts
Hosting Organization:	Barcelona Supercomputing Center Consortium
Location:	Spain - Barcelona - 31, Jordi Girona. Torre Girona Building
Main Status:	Operational since 2004
Contact:	Sergi Girona (sergi.girona@bsc.es) Mateo Valero (mateo.valero@bsc.es)

RESEARCH SERVICES:

- Supercomputing - Access to supercomputers
- User support - Support to the users for administrative and technical doubts
- Mobility - Possibility to travel to the assigned facility or the RES coordination center and receive support on site
- Training - Organization of trainings and seminars and free offer to attend to them
- Dissemination - Dissemination to the scientific community and the general public
- User's Committee - Communication with a User's Committee that represents all the users

EQUIPMENT:

- RES network supercomputers:
  - Marenostrum, , MinoTauro, Altix (BSC)
  - Magerit2 (CesViMa)
  - Altamira (IFCA-UC)
  - La Palma 2 (IAC)
  - Tirant2 (UV)
  - Atlante (ITC)
  - Picasso (UMA)
  - Memento (BIFI-UZ)

SOCIETAL GRAND CHALLENGES:

- Climate action, resource efficiency and raw materials
- Secure, clean and efficient energy
- Smart, green and integrated transport
- Health, demographic change and well-being

KEY INFORMATION

Full Name:	**Center for Scientific and Academic Services of Catalonia**
Acronym:	CESCA
Website	http://www.cesca.cat
Description:	The Centre for Scientific and Academic Services of Catalonia (CESCA), known as the Supercomputing Centre of Catalonia until 2011, is a public consortium created in 1991 through the partnership of the Generalitat (the Catalan regional government), the Catalan Foundation for Research and Innovation (FCRI) and nine Catalan universities and the National Research Council (CSIC). In the year 2000, it was awarded the status of Singular Science and Technology Infrastructure (*Instalación Científico-Técnica Singular* or ICTS) by the Spanish government. CESCA's fundamental aim is to **manage information and communication-based infrastructure** (e-infrastructures) **so as to provide services to the university and research communities,** based on the six areas of activity: scientific high performance computing for both academic and industrial purposes; communication networks; portals and repositories for university-based information and data storage; e-administration (digital certification, incoming/outgoing document registration, voting, etc.); the promotion of the use and benefits of these technologies; and the operation and maintenance of all the Centre's infrastructure.
Keywords:	Supercomputing, High Performance Computing, e-Science, Science and Technology Networks, communication networks, portals, repositories, data storage, e-administration
Type of use:	Research / Science
Type of RI:	Single-sited
RI Category:	Centralised Computing Facilities, Communication Networks Complex Data Facilities, Software Service Facilities
Main scientific domain:	Information Science and Technology, Biological and Medical Sciences, Chemistry and Material Sciences, Engineering
Hosting Organization:	Public consortium Centre for Scientific and Academic Services of Catalonia (CESCA)
Location:	C/Gran Capità, 2-4- Barcelona - Spain
Main Status:	Operational since 1991
Contact:	Miquel Huguet (direccio@cesga.cat)

RESEARCH SERVICES:

- High Performance Computing: composed mainly of supercomputers and data storage infrastructure.
- Drug Design Service: based on a technology support platform for the design of pharmaceuticals, mainly consisting of specialized software.
- The Anella Científica ("Scientific Ring"): a high-performance Research and Education network that fundamentally interconnects universities and research centers inside Catalonia, and also establishes the connectivity to the RedIRIS network.
- Hosting of RedIRIS nodes in Catalonia: CESCA hosts two RedIRIS network nodes in Catalonia.
- Repositories: mainly supported on the e-Information Cluster, where repositories for the scientific community are stored, not only for the dissemination and sharing of research results, but also for browsing content and data that may be useful to one's own activity.

EQUIPMENT:

The infrastructure managed by CESCA is comprised of:

- High Performance Computing servers. CESCA has three servers:
  - HP CP4000 is a distributed memory system, with a peak performance (Rpeak) of 580.80 Gflop/s, and an estimated maximum performance (Rmax) of 356.91 Gflop/s.
  - Bull NovaScale computing cluster is comprised of 14 R422E1 nodes, and 8 R422E2 nodes. It has a peak performance (Rpeak) of 4.05 Tflop/s, and an estimated maximum performance (Rmax) of 3.19 Tflop/s.
  - Altix UV 1000 is a shared memory component, with a peak performance (Rpeak) of 14.30 Tflop/s, and an estimated maximum performance (Rmax) of 12.61 Tflop/s.

- Data storage network.
  It consists of:
  - A NetApp FAS3170 155 TB enclosure (126 TB of high capacity and 29 TB of high performance), with 98 Fibre Channel (FC) 300 GB, 15,000 rpm discs (in 7 racks), and 126 SATA 1 TB, 7,200 rpm discs (9 racks), and two FC 4 Gbps controllers, each with 32 GB of memory (a total of 64 GB).
  - A NetApp FAS2240 enclosure with 144 TB of high capacity (100 net TB), with a total of 72, 2 TB SATA discs in 3 racks, with two 8 Gbps FC controllers with 6 GB of memory.
  - An ADIC Scalar i2000 tape library, which has 288 activated cells; 6 LTO-4 120 MB/s transport repository; 323, 800 GB capacity LTO-4 tapes; and 205 400 GB LTO-3 tapes. Its current capacity is 258 TB, which can be raised to 600 TB.

- Communication equipment for the Anella Científica and CATNIX.
  Anella Científica is a distributed infrastructure: it's partly deployed at CESCA's nodes (Campus Nord and Telvent) and partly based on an external operator. This section only describes CESCA's infrastructure.
  The Anella Científica equipment consists of two Cisco CRS-3 routers, one at each node. The switching equipment available at Campus Nord is a Catalyst 6513, and there is a Catalyst 6509 at Telvent. In 2010, two CRS-3 routers were acquired, and the two Catalyst switches (6513 and 6509) were renewed.
  The Cisco CRS-3 routers are flexible models, with a capacity ranging from 0.32 to 46 Tbps (Multi-Chassis). They have two processors with 4 GB of RAM, and 4 GB of flash memory, a capacity of up to 140 Gbps full duplex per slot, and a modular operating system (IOS-XR). The Campus Nord router is comprised of 4 slots with two 10 Gbps ports, and one with forty-two 1 Gbps ports. The Telvent router has 2 slots with four 10 Gbps ports, and one with forty-two 1 Gbps ports. The 1 Gbps ports are either fibre or copper.

KEY INFORMATION

Full Name:	**Supercomputing Center of Galicia**
Acronym:	CESGA
Website	http://www.cesga.es
Description:	CESGA Foundation was founded in 1993 and it is a non-profit institution whose trustees pertain to the Regional Government of Galicia and to the Spanish National Research Council (CSIC). The mission of CESGA is to perform research in computational science as well as, to boost, spread, and provide services of high performance computing and communications to the communities of Galician researchers and to CSIC, as well as to those companies or institutions that request them. In this way, CESGA contributes by means of technological improvement and innovation to the amelioration of the competitiveness of companies. The most significant functions of the Centre are the conduct of research in computational science, the provision of high performance computing and advanced communications to the user community, the management of the "Science and Technology Network of Galicia", and the promotion of cooperation between companies and institutions. CESGA is certified as a Singular Scientific Technological Installation (ICTS).
Keywords:	Supercomputing, High Performance Computing, Distributed Computing, Grid Computing, Cloud Computing for Science, Scientific Code Development, Scientific Software, Computational Science Services, Computational Models, Computational Simulations, e-Science Infrastructure Monitoring, Grid Metrics, Science and Technology Networks
Type of use:	Research / Science
Type of RI:	Single-sited
RI Category:	Centralised Computing Facilities Communication Networks Complex Data Facilities Software Service Facilities
Main scientific domain:	Information Science and Technology, Physics, Astronomy, Astrophysics and Mathematics Biological and Medical Sciences, Chemistry and Material Sciences, Earth and Environmental Sciences, Engineering and Energy
Hosting Organization:	CSIC - Consejo Superior de Investigaciones Científicas Xunta de Galicia
Location:	15705 Santiago de Compostela | A Coruña - Spain
Main Status:	Operational since 1993
Contact:	Javier García (jgtobio@cesga.es)

RESEARCH SERVICES:

Access to supercomputing hours - Through periodic announcements, CESGA offers access to its resources to researchers of the scientific community of EU countries, the European Economic Area, countries of the CYTED program, and also to researchers with legal residence in any of these countries. The main objective of said announcements is to provide access to CESGA 's resources to research groups or individuals, a priority access to CESGA 's computational resources in order to carry out research projects, acquisition of knowledge, or training in the technologies of use in the installation.

In order to serve ICTS users, CESGA annually makes available 3,000,000 hours of FinisTerrae computation, which is equal to 20% of the total computational hours per year. For more information regarding access to the announcements, please consult the ICTS information page.

EQUIPMENT:

FinisTerrae - The Finisterrae supercomputer installed in the CESGA is an integrated system by nodes by heart shared with an architecture SMP NUMA. Finisterrae is composed by:

- 143 nodes of computation:
  - 142 nodes HP Integrity rx7640 with 16 cores Itanium Montvale and 128 GB by heart each one.
  - 1 node HP Integrity Superdome, with 128 cores Itanium Montvale and 1.024 GB by heart.
- A system of hierarchical storage with:
  - 22 nodes for management of storage with a total of 96 cores of process.
  - 390.000 GB in disk.
  - 2.200.000 GB in robot tape.
  - A network of interconnection between nodes Infiniband 4 x DDR to 20 Gbps.
  - A connection of external network to 10 Gbps.

KEY INFORMATION

Full Name:	**RedIRIS**
Acronym:	RedIRIS
Website	http://www.rediris.es
Description:	RedIRIS, founded in 1988, is the Spanish National Research and Education Network (NREN), which provides advanced connectivity services to more than 400 connected institutions (mainly universities and research centers and research infrastructures). It has approx. 2 million potential users, including 150.000 researchers. RedIRIS has recently deployed its new dark-fibre backbone (RedIRIS-NOVA), covering 12.000 Km, and with more than 50 Points of Presence around the country, including the islands. RedIRIS is connected to the Pan-European Research and Education Network GÉANT, thus ensuring optimal connection with universities and research centers accross the globe. RedIRIS also provides other services (digital identity, mobility, spam filtering, distribution lists, security, multimedia, dissemination, advice and training, etc.). This RI is an ICTS (Unique Scientific and Technological Infrastructure), included in the Spanish National Roadmap for RIs.
Keywords:	Network, connectivity, broadband, lightpath, e-science
Type of use:	Research / Science
Type of RI:	Virtual
RI Category:	Communication Networks Research Facilities
Main Scientific Domain:	Information Science and Technology Also used in: Physics, Astronomy, Astrophysics and Mathematics, Biological and Medical Sciences, Chemistry and Material Sciences, Earth and Environmental Sciences Engineering and Energy, Humanities and Arts, Social Sciences
Hosting Organization:	Red.es
Location:	Plaza Manuel Gómez-Moreno | 28020 Madrid - Spain
Main Status:	Operational since 1988
Contact:	Tomás de Miguel (tomas.demiguel@rediris.es)

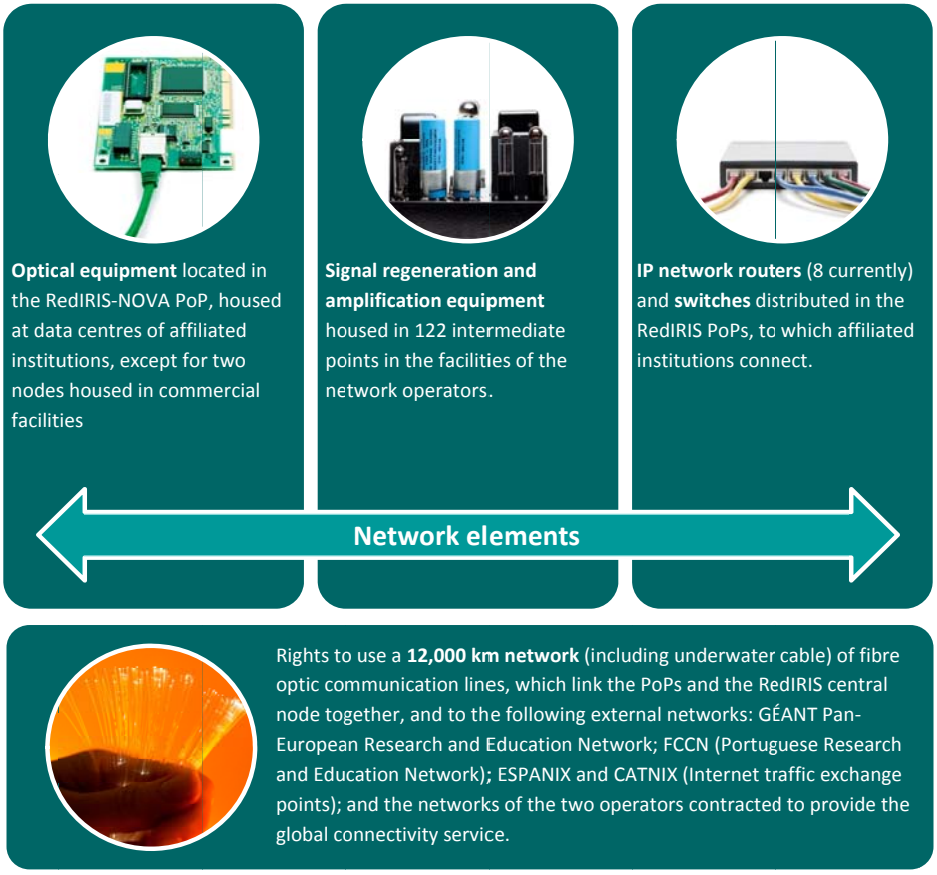
RESEARCH SERVICES:

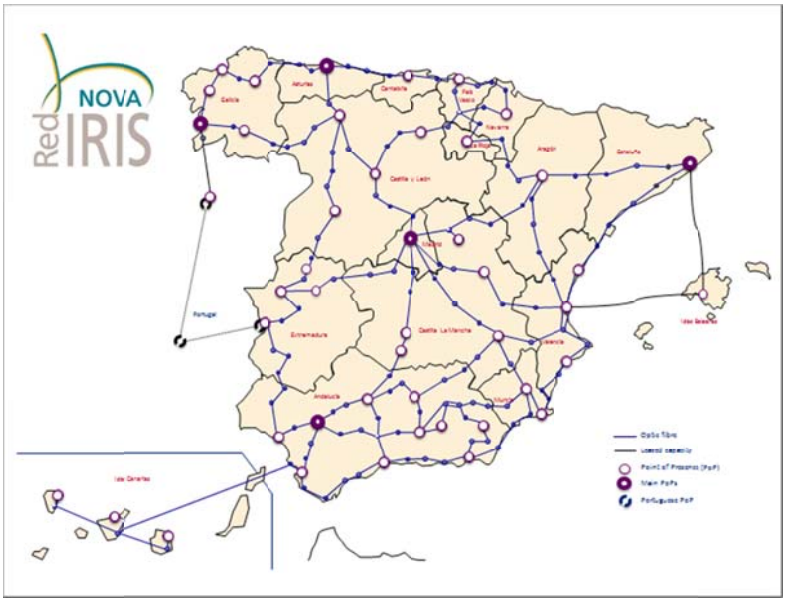
RedIRIS is a horizontal ICTS, providing services to the other ICTS, as well as to Spanish academic and scientific centres. It makes available to them a high capacity advanced communications network (with 10 Gbps connections, that is 10,000 Mbps, compared to 100 Mbps at most for residential connections in Spain). As a result, these centres can transfer and receive large amounts of data and use advanced communications services nationally and internationally, including various Information and Communications Technology services provided by RedIRIS.

EQUIPMENT:

Since November 2011, RedIRIS has been managing a fibre optic backbone infrastructure (for which RedIRIS has an IRU -irrevocable right of use- for 21 years on the mainland and 30 years in the Canary Islands) which connects the RedIRIS central node with another 53 Points of Presence (PoPs) distributed over the national territory and with capacity to deploy up to 80 x 10 G optical channels between any two PoPs. On this optical infrastructure, RedIRIS has deployed an IP mesh network (meaning that each RedIRIS PoP has at least two links, thereby guaranteeing redundancy) with a 40 Gbps backbone.

RedIRIS is composed of the following elements:




NOVA
Red IRIS