


Una manera de hacer Europa



BUENAS PRÁCTICAS

Operaciones Cofinanciadas

**Expansion Work of the Great
Canary Telescope.**

Phase 2:

Canary Islands Government

Programa Operativo de Canarias

Fondo Europeo de Desarrollo Regional

Año 2017

Expansion Work of the Great Canary Telescope. Phase 2:

1) Operation Description

Description of the Great Canary Telescope's Infrastructure

The Great Canary Telescope (GTC) is currently the biggest telescope in the world. Its mirror, 10,4 meters in diameter, consisting of 36 hexagonal segments which make it look like the eye of a big fly, has a huge collecting capacity, and is able to detect the light coming from the ends and the origin of the universe. The mission of the GTC consists of providing astronomical observations on the border of the current optical telescope's capabilities, thus helping a scientific community with wide-ranging interests, and using the available resources as efficiently as possible. In addition, as a distinguished representative of the investigation of technology, GRANTECAN's vision aims to participate in making a culture based on the scientific method, showing society the importance of science and technology as tools to serve a more sustainable future.



The GTC is one of the most sophisticated facilities in Spain and, for this reason, it is part of Spain's Singular Scientific and Technological Infrastructures (ICTS). The GTC, as a cutting-edge facility for astrophysical research, is also considered a priority line in the EU2020 Strategy Programme of Smart Specialisation of the Canary Islands (RIS3).

GRANTECAN is the public company which has created the GTC and is in charge of its operation, its maintenance, and its development. Its staff is composed of 65 people, among whom astronomers, engineers, technicians and administrative officers can be found. GRANTECAN has three bases: the telescope in Roque de los Muchachos Observatory, in La Palma; the Astrophysics Centre in Breña Baja, La Palma; and the offices in the Canary Islands Institute of Astrophysics, in Tenerife.

GRANTECAN is mostly financed by Spain (90%, shared equally between the Central Government and the Canary Islands Government), and by its international partners, Mexico (5%) and the University of Florida (5%). A significant portion of this funding, along the entire GTC's development, has been

obtained by means of the European Fund of Regional Development (ERDF), which has therefore been an essential element in the making of this masterpiece of science and Spanish technology.

The construction of the GTC began in 2000, and its scientific operations in 2009. Since then, the GTC has obtained remarkable scientific results, reflected in more than 300 scientific articles published in specialized magazines. These articles cover several fields of astrophysics, including planets and asteroids in the Solar System, the study of the atmosphere from planets around other stars, the study of physics with regard to extreme objects such as black holes and other interacting compact stars, the great stellar explosions, the evolution of the chemistry of the universe, and the search and study of external galaxies as far as the limits of the universe. In this sense, the GTC is the most powerful time machine, able to go back to the time in which the first stars and galaxies were formed, around 150 million years after the Big Bang, which we now estimate occurred 13,800 million years ago.



[Expansion Project of the GTC, Phase 2](#)

Thanks to these results, the GTC has established itself as the leading edge telescope in the international stage. In order to maintain this competitiveness, the GTC needs to be equipped with increasingly sophisticated tools which can analyse the light of the stars. For this reason, the GTC counts on an ambitious instrumental development plan, approved by committees of international experts. The ERDF funds concerning this report intend to finance most of the GTC's instrumental developments between 2015 and 2019. The project is called "Expansion work of the Great Canary Telescope. Phase 2" and it complements the

improvements previously initiated in the Project “Phase 1”, also co-financed with the ERDF funds. The project includes several actions which are briefly described hereunder.

Along with optical and infrared cameras, which allow one to obtain deep images of the sky, the most powerful tool to study the cosmos is *spectroscopy*. This technique involves a detailed analysis of the different wavelengths (colours) from the stars’ light emission. Due to this, basic physical properties such as its temperature, density, chemical composition, and movement can be determined. The ERDF funds finance the manufacturing and installation of two innovative spectrographs within the GTC, one responsible for analysing in detail the visible light (MEGARA), and another one for the infrared light (MIRADAS), as well as the installation of another spectrograph (HORS). In addition to the exceptional scientific benefits these brand new devices will provide, its development contains innovative technological elements on issues regarding optics, electronics, sensors, and cryogenics, the discipline which studies the set of techniques necessary for cooling materials at very low temperatures.

In order to attach these instruments to the telescope, it is necessary to equip its focal stations with accessible assets which allow its calibration and night observation. The ERDF funds are aimed to complete two focal stations with units for the acquisition and guidance of stars during night observations, and with calibration systems for the tools, as well as to equip the central focus of the Cassegrain telescope with all its elements (including the field rotator).

Furthermore, to optimise the benefit of detectors coming from tools with astronomical purposes, it is necessary to cool them at a very low temperature, in the most extreme case at just a few degrees over absolute zero (-273 degrees centigrade). The ERDF funds also finance the implementation of the liquid helium circuits required for cooling the GTC’s infrared instruments.

The project’s eligible public expenditure is 13,410,000 euros, with a 11,398,500€ support from the ERDF.

In terms of the project's impact, the number of *Main Researchers* who have achieved observing time with the GTC through competitive selection processes is 346: each one leads research teams which in some cases include tens of researchers, both national and also coming from foreign institutions. It is expected that, by introducing new and competitive instruments like those which are under development in the Expansion Project of the GTC, the value of these indicators end up increasing, and that a significant proportion of the GTC's scientific projects are carried out using the new instrumentation.

2) Justification of the best practices criteria and supporting graphic documentation

High dissemination among beneficiaries and the general public

The GTC's scientific user community is the direct beneficiary of its instrumental development. The community is constantly informed about the progress of the actions financed with the ERDF funds through GRANTECAN's website, where one can find sections specifically focused on each of the developing instruments, as well as a "news" home page which highlights the most important related milestones, and a specific website about the programmes financed by the ERDF funds (http://www.gtc.iac.es/gtc/feder_es.php).

Provided below as an example is the website about the project described in this report (<http://www.gtc.iac.es/gtc/FEDER2014-2020.php>).

Financiación FEDER

Gran Telescopio CANARIAS
Observatorio del Roque de los Muchachos
La Palma

INICIO | GTC | INSTRUMENTACIÓN | OBSERVAR | NOTICIAS | MULTIMEDIA | ENLACES

Convocatoria
Acceso Phase-2
Calendario de observaciones
Imágenes del GTC
Cámaras web
Dossier inauguración

Gobierno de Canarias
Consejería de Economía, Industria, Comercio y Conocimiento
Unión Europea

Canarias avanza con Europa
Fondo Europeo de Desarrollo Regional

Ampliación del equipamiento del GTC. Fase 2 (2014-2019)

Presupuesto: 13.410.000 Euros

MEGARA

MEGARA (Multi-Espectrógrafo en GTC de Alta Resolución para Astronomía, in inglés) es el último instrumento que se ha instalado en el GTC (Marzo de 2017). Ha sido financiado con fondos FEDER (Fondo Europeo para el Desarrollo Regional) de los Programas Operativos de Canarias 2007-2013 y 2014-2020. MEGARA tiene como objetivo estudiar tanto estrellas individuales, como el gas que las rodea en nuestra galaxia la Vía Láctea; analizar el movimiento de estrellas y gas en galaxias de todo tipo, e incluso reconstruir la estructura 3D del Universo gracias a su novedosa tecnología.

Presupuesto: 3.385.000 Euros.

MIRADAS

MIRADAS (Mid-resolution InFRARED Astronomical Spectrograph, en inglés) es un instrumento de tercera generación que está siendo integrado actualmente en el laboratorio y se recibirá en el GTC a lo largo de 2019. Ha sido financiado con fondos FEDER (Fondo Europeo para el Desarrollo Regional) de los Programas Operativos de Canarias 2007-2013 y 2014-2020. MIRADAS detectará la luz en el infrarrojo (calor de los objetos celestes) y tendrá como objetivos principales el estudio detallado de estrellas masivas, que junto con otros tipos de estrellas nos ayudarán a comprender la estructura y la historia química de nuestra Galaxia y cómo se formó el propio Universo.

Presupuesto: 6.000.000 Euros.

HORS

HORS (High Optical Resolution Spectrograph, en inglés) es un instrumento que se encuentra actualmente en fase de pruebas después de su integración en GTC (Gran Telescopio Canarias). Su instalación ha sido financiada con fondos FEDER (Fondo Europeo para el Desarrollo Regional) de los Programas Operativos de Canarias 2014-2020. Este nuevo instrumento proporcionará a GTC la capacidad de analizar la luz visible con una resolución diez veces mayor que con cualquiera de los otros instrumentos del telescopio. Cuando

Improvements on the GTC are also notified regularly through specific forums from the scientific astronomical community (e.g. The Spanish Astronomical Society's announcement list), and are presented in international scientific congresses in which GTC users participate. In addition, congresses and special

meetings have been organized in order for the scientific community to thoroughly understand the GTC's development and its instrumentation, and in this way optimise its scientific exploitation.

As for the dissemination amongst the general public, disclosing the GTC, its scientific results, and the importance of astrophysics and science, these are all some of GRANTECAN's priorities, and they are done in different ways, as explained hereafter.

Every year, and in spite of the telescope's remote location, around 8,000 people visit the GTC in person, most of them accompanied by guides with Starlight certification. GRANTECAN is also the primary agent in the "Nuestros alumnos y el Roque de los Muchachos" education programme. It consists of a formative and accessible project which seeks to bring high school students and teachers closer to astrophysical research, by means of lectures at the educational centres and student's visits to the telescopes. Since 2009, 4,800 kids have benefited from the programme, which aims to reach all the centres in La Palma that teach fourth grade. Both in the guided tours and in the student's visits, the relevance of the ERDF funds is clearly shown in the informative posters, visible during the whole tour (see next picture), as well as in the telescope's explanatory video, which points out how important the ERDF funds have been for the GTC. In 2018, another programme will also be implemented, consisting of virtual visits to the telescope over the network, with the possibility of interacting straightaway with professional astrophysicists.



**Ampliación del equipamiento del Gran Telescopio CANARIAS.
Fase 2 (2014-2019)**

Programa Operativo de Canarias FEDER 2014-2020
Objetivo Temático 1 "Potenciar la investigación, el desarrollo
tecnológico y la innovación"

Presupuesto: 13.410.000 €

Comienzo
1/1/2014

Finalización
31/12/2019



Proyecto cofinanciado por el Fondo Europeo de Desarrollo Regional



**FONDO EUROPEO DE
DESARROLLO REGIONAL
(FEDER)**

"Una manera de hacer Europa"

UNIÓN EUROPEA

Actuación: Mejora de la ICTS Gran Telescopio CANARIAS

Programa Operativo Plurirregional de España 2014-2020
Objetivo Temático 1 "Potenciar la investigación, el desarrollo tecnológico y la innovación"
Presupuesto elegible: 2.210.000 €
Tasa de cofinanciación FEDER: 85%
Período de ejecución: enero de 2016 - diciembre de 2021



GOBIERNO DE ESPAÑA
MINISTERIO DE ECONOMÍA, INDUSTRIA Y COMPETITIVIDAD



Infraestructuras
Científicas y Tecnológicas
Espaciales



The GTC has a presence on social media (especially Twitter @GTCtelescope and Facebook @GranTelescopioCanarias), which allows for notifying the telescope's scientific and technological improvements in an agile manner. ERDF funds are advertised through the network, on social media with the help of the funding agency (ACIISI) and the Canary Islands Government. More examples like the following pictures can be found in the links below:

- <https://www.facebook.com/ACIISI/posts/1732663420105762>
- <http://www.gobiernodecanarias.org/noticias/eicc/Conocimiento/94286/ii-fase-gran-telescopio-canarias-cuenta-13-4-millones-euros>
- <https://twitter.com/agenciaiisi/status/983691839520821249>

GTC Telescope retwitteó



ACIISI @agenciaiisi · 23 h

La Fase II del Gran Telescopio Canarias cuenta con 13,4 millones €
Objetivo: dotar al #GRANTECAN de nueva instrumentación científica.
Actuación cofinanciada en un 85% por el Programa Operativo FEDER Canarias
2014-2020

@EcoGobCan @IAC_Astrofisica #ICTSNews bit.ly/2JA3tI5



Ciencia Canaria, AgE de Investigacion y GTC Telescope

Conocimiento

10 de abril del 2018 - 12:46

La II Fase del Gran Telescopio Canarias cuenta con 13,4 millones de euros

Se trata de una actuación cofinanciada en un 85% por Programa Operativo del Fondo Europeo de Desarrollo Regional Canarias 2014-2020

 Imprimir Noticia



Esta actuación de la Consejería de Economía, Industria, Comercio y Conocimiento, con la concesión de un préstamo reembolsables para la financiación de la ampliación del equipamiento del Gran Telescopio Canarias Fase 2 (Grantecan), por importe de 13.410.000 euros, permitirá cumplir con el objetivo de dotar de nueva instrumentación científica a esta Infraestructura Científico Técnico Singular y que cubra las necesidades expresadas por la comunidad científica usuaria del Gran Telescopio de Canarias y de los elementos de soporte que esta nueva instrumentación necesita.



Tras culminar la segunda fase, el Gran Telescopio Canarias quedará dotado con cinco focos operativos (los dos focos nasmyth ya existentes y dos focos cassegrain plegados desarrollados en la primera fase y el cassegrain principal a desarrollar en esta fase) y con instrumentos científicos operativos en cada uno de ellos: OSIRIS, CanariCam (temporalmente), CIRCE (temporalmente), HORS (temporalmente), EMIR, FRIDA, más MEGARA y MIRADAS a ser construidos durante esta segunda fase.

Con este equipamiento el Gran Telescopio de Canarias tendrá capacidad para realizar observaciones astronómicas en el rango visible, infrarrojo próximo e infrarrojo térmico. Con ello se pretende llevar a cabo la totalidad de las recomendaciones realizadas en 2008 y en 2013 por comités de expertos internacionales constituidos para orientar el desarrollo futuro del telescopio.

Las condiciones de estos préstamos reembolsables facilitan las inversiones a través de fondos FEDER. El Gobierno de Canarias aporta la totalidad de la financiación, anticipando las cantidades solicitadas, y una vez justificada la inversión por parte de la empresa y certificada por parte del



ACIISI

@agencialisi

Agencia Canaria de Investigación, Innovación y Sociedad de la Información (ACIISI) del Gobierno de Canarias.

Canarias

gobiernodecanarias.org/aciisi/

Se unió en abril de 2010



ACIISI
@agencialisi

Seguir

#MEGARA, uno de los cinco focos operativos de la II Fase del Gran Telescopio Canarias (GTC) @GTCTelescope

Actuación cofinanciada en un 85% por el Programa Operativo FEDER Canarias 2014-2020.

#ICTSnews #ORMLaPalma #Grantecan #Astrofisica @IAC_Astrofisica bit.ly/2v9iozt



6:20 - 13 abr. 2018

12 Retweets 15 Me gusta



Economía Gobcan, Observatorios de Canarias, FECT_Ciencia y 4 más

12 15



gobcan.es

Inicio 



Gobierno de Canarias
en todo el mundo

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Presidencia del Gobierno	Vicepresidencia / Obras Públicas y Transportes	Economía, Industria, Comercio y Consumo	Presidencia, Justicia e Igualdad	Hacienda	Sanidad
Política Territorial y Sostenibilidad	Empleo, Políticas Sociales y Vivienda	Educación y Universidades	Agricultura, Ganadería, Pesca y Aguas	Turismo, Cultura y Deportes	Seguridad y Emergencias

Economía, Industria, Comercio y Consumo / Conocimiento

Conocimiento
13 de abril del 2018 - 13:00

Megara, uno de los cinco focos operativos de la II Fase del Gran Telescopio Canarias

Se trata de una actuación cofinanciada en un 85% por el Programa Operativo FEDER Canarias 2014-2020

[Imprimir noticia](#) 

MEGARA (Multi-Espectrógrafo en GTC de Alta Resolución para Astronomía, en inglés) es el último instrumento que se ha instalado en el GTC (Marzo de 2017). Ha sido financiado con fondos FEDER (Fondo Europeo para el Desarrollo Regional) de los Programas Operativos de Canarias 2007-2013 y 2014-2020. MEGARA tiene como objetivo estudiar tanto estrellas individuales, como el gas que las rodea en nuestra galaxia la Vía Láctea; analizar el movimiento de estrellas y gas en galaxias de todo tipo, siendo incluso capaz de reconstruir la estructura 3D del Universo gracias a su novedosa tecnología de fibras.



El Gobierno de Canarias ha destinado 13,4 millones de euros para la II Fase del Gran Telescopio Canarias con el objetivo de dotarle de nueva instrumentación científica que cubra las necesidades expresadas por la comunidad científica usuaria del GranTeles y de los elementos de soporte que esta nueva instrumentación necesita.

Tras culminar la II Fase, el Gran Telescopio Canarias quedará dotado con cinco focos. MEGARA (Multi-Espectrógrafo en GTC de Alta Resolución para Astronomía, en inglés) es el último instrumento que se ha instalado en el GTC (Marzo de 2017). Ha sido financiado con fondos FEDER (Fondo Europeo para el Desarrollo Regional) de los Programas Operativos de Canarias 2007-2013 y 2014-2020. MEGARA tiene como objetivo estudiar tanto estrellas individuales, como el gas que las rodea en nuestra galaxia la Vía Láctea; analizar el movimiento de estrellas y gas en galaxias de todo tipo, siendo incluso capaz de reconstruir la estructura 3D del Universo gracias a su novedosa tecnología de fibras.

Acuerdos de Gobierno

Agenda de Actos Públicos

Intervenciones

Sala de prensa online

Redes Sociales

Transparencia

Incidentes 1-1-2 Canarias

ÚLTIMAS NOTICIAS | **LO MÁS LEÍDO**

'Miradas' para el estudio de las estrellas masivas

Más de cien profesionales se dan cita en las Jornadas de Enfermería Cardiovascular

Proyección de 'Las chicas del Amanecer Dorado', que destaca el lado depravado de las

Advertising is also done through the two Canary province newspapers:

La segunda fase del Grantecan ya cuenta con 13,4 millones de euros

Se pretende equipar al telescopio con cinco focos operativos y con instrumentos científicos de última generación

La Opinión | 11.04.2018 | 01:36

El Gran Telescopio Canarias sigue creciendo. El Gobierno autonómico dio a conocer ayer que este complejo para la observación del universo, uno de los más grandes del mundo, recibirá una nueva inyección económica, superior a los 13 millones de euros, para poder mejorar su dotación. Se trata de una actuación cofinanciada en un 85% por el Programa Operativo del Fondo Europeo de Desarrollo Regional Canarias 2014-2020



La segunda fase del Grantecan ya cuenta con 13,4 millones de euros

Esta actuación de la Consejería de Economía, Industria, Comercio y Conocimiento, con la concesión de un préstamo reembolsable para la financiación de la ampliación del equipamiento del Gran Telescopio Canarias Fase 2 (Grantecan), por importe de 13.410.000 euros, "permitirá cumplir con el objetivo de dotar de nueva instrumentación científica a esta infraestructura científico-técnica singular y que cubra las necesidades expresadas por la comunidad científica usuaria del Gran Telescopio de Canarias y de los elementos de soporte que esta nueva instrumentación necesita", indica el ejecutivo.

Tras culminar la segunda fase, el Gran Telescopio Canarias quedará dotado con cinco focos operativos (los dos focos nasmyth ya existentes y dos focos cassegrain plegados desarrollados en la primera fase y el cassegrain principal a desarrollar en esta fase) y con instrumentos científicos operativos en cada uno de ellos: Osiris, CanariCam (temporalmente), Circe (temporalmente), HORS (temporalmente), EMIR, Frida, más Megara y Miradas a ser construidos durante esta segunda fase.

Con este equipamiento el GTC tendrá capacidad para realizar observaciones astronómicas en el rango visible, infrarrojo próximo e infrarrojo térmico. Con ello se pretende llevar a cabo la totalidad de las recomendaciones realizadas en 2008 y en 2013 por comités de expertos internacionales constituidos para orientar el desarrollo futuro del telescopio.

Las condiciones de estos préstamos reembolsables facilitan las inversiones a través de fondos Feder. El **Gobierno de Canarias** aporta la totalidad de la financiación, anticipando las cantidades solicitadas, y una vez justificada la inversión por parte de la empresa y certificada por parte del Gobierno a los fondos europeo, la Unión Europea aporta el 85% y el beneficiario sólo debe devolver el 15% del total del préstamo solicitado.

El proyecto GTC es apoyado activamente por el Gobierno español y el Gobierno Autonómico de las Islas Canarias a través de los fondos Feder proporcionado por la Unión Europea. El proyecto también incluye la participación de México por el Instituto de Astronomía de la Universidad Nacional Autónoma de México (IA-UNAM) y el Instituto Nacional de Astrofísica, Óptica y Electrónica, y de Estados Unidos a través de la Universidad de Florida. Aparte de los edificios del telescopio en el observatorio, la sede principal de la empresa se encuentra en el Centro de Astrofísica La Palma. El grupo de desarrollos se encuentra en las instalaciones del Instituto de Astrofísica de Canarias, en Tenerife.

Contenido para ti



J Balvin solicitó que dos de sus conciertos se celebraran en Canarias
11-04-2018



Etxeberria está "en excedencia"
12-04-2018



Educación estudia dividir en dos la oferta de las oposiciones
11-04-2018



Los presupuestos estatales incluyen tres millones para Las Chumberas
10-04-2018



Qué es la acrilamida y cómo evitarla
11-04-2018



Hiba Aboutk se desnuda para felicitar el cumpleaños a un amigo
11-04-2018

www.laopinion.es
La Opinión
de Tenerife

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CINE



'Star Wars' inspiró los atentados del 11-S,
según Margaret Atwood

La autora de 'El cuento de la criada' cree que los terroristas se basaron en una escena del



'Un sol interior':
Impecable retrato

In the same way, brochures about the Megara instrument will start being handed out to citizens at visits to the GRANTECAN:

El Gran Telescopio de Canarias (GTC) es el más grande del mundo y una de las instalaciones científicas españolas más sofisticadas. Su enorme capacidad colectora de luz permite detectar señales que provienen del origen del Universo. Está situado en el Observatorio del Roque de los Muchachos en Garafía, La Palma.

Desde su primera luz en 2007, ha ido haciendo acopio de instrumentos para ser más competitivo en todas las áreas de la investigación astronómica mundial. A partir de 2009 se han incorporado instrumentos para la observación de la luz visible y para la luz infrarroja que ofrecen información de lo que está ocurriendo en nuestra galaxia o en galaxias muy lejanas.



Inauguración oficial de MEGARA en GTC en julio de 2017

MEGARA es fruto de una colaboración entre GRANTECAN, la Universidad Complutense de Madrid (UCM, España), el Instituto Nacional de Astrofísica, Óptica y Electrónica (INAOE, México), el Instituto de Astrofísica de Andalucía (IAA-CSIC, España) y la Universidad Politécnica de Madrid (UPM, España). Está cofinanciado por el Fondo Europeo de Desarrollo Regional (FEDER).



MEGARA así como muchos de estos instrumentos y otros sistemas del telescopio, han sido financiados o cofinanciados por los fondos FEDER (Fondo Europeo para el Desarrollo Regional), así como otros sistemas del telescopio para mejorar sus capacidades.



Canarias avanza con Europa

FONDO EUROPEO DE DESARROLLO REGIONAL

Logos: Gobierno de Canarias, Unión Europea

MEGARA

UN INSTRUMENTO PARA LOGRAR LO INALCANZABLE EN ASTRONOMÍA

Other supplementary dissemination activities are informative talks about astronomy for the general public imparted by astrophysicists from GRANTECAN, involvement in local and national public events, and a constant presence in the media. The relevance of the ERDF funds is reflected in the logos that accompany the presentations, and it is mentioned whenever necessary.

Finally, a photographic exhibition is being organized that will be held from 30th April to 10th May 2018 in Santa Cruz de la Palma, with the objective of promoting among the general public the importance of the ERDF funds for science and technological development, using the GTC as a case of success. This activity will be complemented by an open doors day throughout the month of May 2018, in which there will be a descriptive video about the telescope emphasizing how important the ERDF funds have been for its development. In addition to these activities, brief descriptive videos about the actions financed with the ERDF funds will be added and distributed via social media. Such actions are being promoted and sponsored by the Canary Islands Ministry of Finance.

Incorporating Innovative Elements

The GTC, as a leading scientific and technological facility, incorporates innovative elements in nearly all its components, being at the forefront of various disciplines such as:

- Mechanical and electronic design
- Optics and optomechanics
- Cryogenics and space
- Computing and software in different platforms
- Automatism, sensors, mechatronics in general

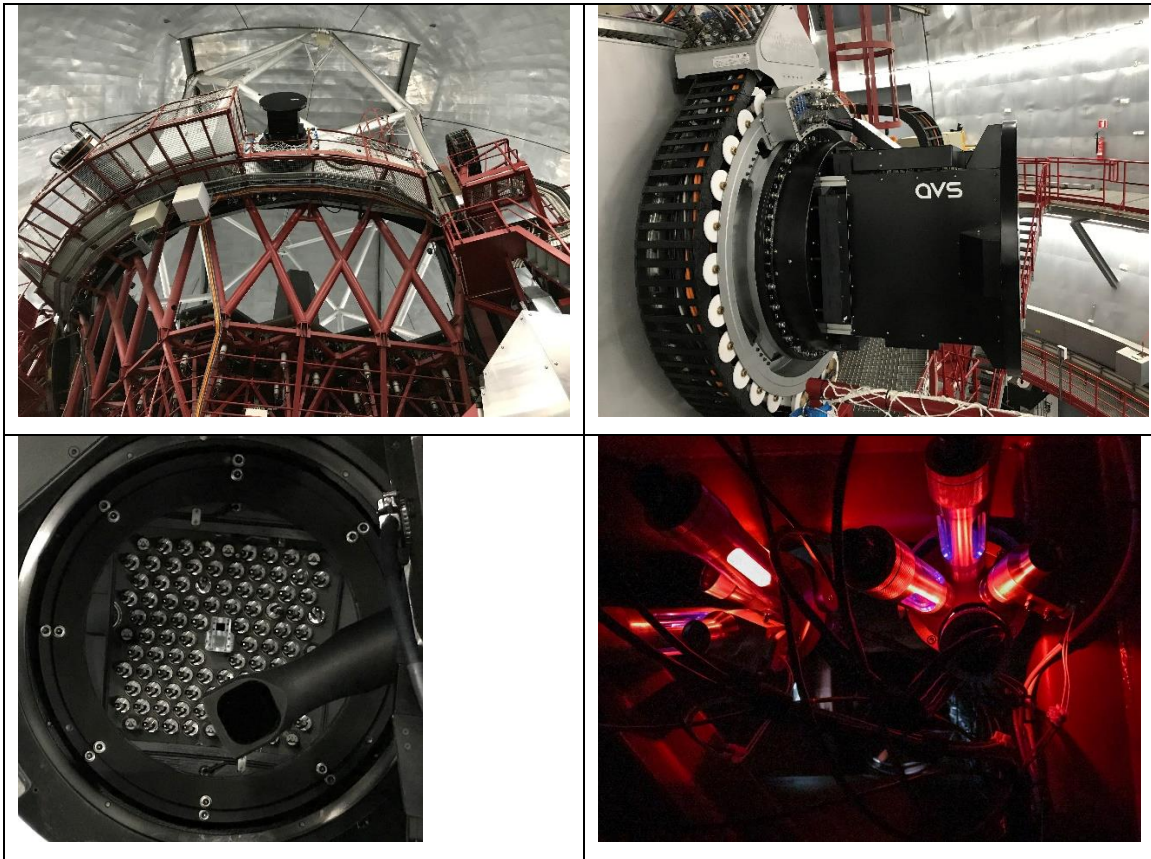
- Project management. Systems engineering. Configuration control
- Real-time control
- Scientific instrumentation
- Astrophysics

In fact, all the instruments and mechanisms developed for the GTC, more specifically those which are being made in the project financed with the ERDF funds, can be considered as unique prototypes specially created for the GTC in order to achieve original, novel and relevant scientific goals, and afterwards fabricated incorporating solutions which are innovative in many cases. Here are two examples: the MEGARA device makes use of the latest technology in optical fibre and dispersive elements, the so-called holographic networks. The liquid helium cooling technique is a recent discipline that continues to evolve, and GRANTECAN actively takes part in implementing innovative solutions in terms of design and implementation of circuits in which helium can preserve its highest level of purity, and in routine maintenance operation.

For these reasons, GRANTECAN is also an opportunity to promote and inspire technological progress in its territorial environment, favouring the creation of companies in the Canaries related to the activities, maintenance and developmental needs in the Roque de los Muchachos Observatory. Besides, GRANTECAN is a unique opportunity for young people to train themselves in jobs at the border of technological developments and investigations in all the aforementioned disciplines. Their training at GRANTECAN provides them with a wealth of knowledge and experience that could hardly occur at other companies, especially on the island of La Palma, where the technological business network is almost non-existent. This fact significantly raises the possibilities amongst the younger crowd of landing a suitable job for their academic background, and it helps to encourage the gradual establishment of a base in La Palma with human potential trained in high technologies.

[Adapting the obtained results to the established objectives](#)

The instrumental development actions supported by the ERDF funds of the programme that this report analyses are being carried out in accordance with the established times and plans. Three out of the seven specific actions have been completed, particularly those corresponding to the manufacturing and installation of the MEGARA instrument and its accessory units, as illustrated in the following picture. This has enabled MEGARA to be offered to the scientific community as of the second half of 2018.



The rest of the actions are progressing in a very satisfactory way, with an efficient use of the resources available.

The primary objective is to provide the GTC with new instruments that can maintain its international competitiveness and the scientific community's to which it serves. The expected impact indicators will be quantitatively measurable as soon as every instrument is offered to the scientific community, through indicators such as the number of requests to access the instrument and, subsequently, the scientific publications deriving from its use.

Contribution to resolving a problem or weakness detected on the area of implementation

The project meets the need to equip the GTC with new instrumentation able to maintain its international competitiveness and leadership. Astrophysics is a constantly evolving science where one continuously finds out natural phenomena that raise new enigmas about the understanding of the universe, and that need an appropriate instrumentation in order for them to be solved.

The impact of the GTC's development operations financed by the ERDF funds is made manifest in a variety of areas summarized below.

- The project aims to provide the Spanish scientific community with a cutting-edge facility in the field of astrophysics, in order to make new, relevant and competitive science on an international level.
- It drives technological and industrial development. In the GTC's construction phase, 70% of the activities have been led by the Spanish industry, and all of the actions have been developed in Europe. The GTC is the first segmented telescope built by the European industry. At the moment, all of the GTC's development projects are made by means of contracts with public research centres and the industry.
- It promotes technology transfer. With these contracts, GRANTECAN prompts the industry to create the new and complex products that it needs, thus generating knowledge that may be applied in other fields.
- It offers international recognition for the island of La Palma and the Canaries in general.

High degree of coverage over the targeted population

The impact on the citizens, in its various components, is as follows:

- It creates local employment (most of GRANTECAN workers are Canary Islanders), and it makes people move, which generates economic activity around GRANTECAN.
- It generates recruitment in local businesses.
- It is a training opportunity for the youth in high tech jobs.
- It contributes directly and indirectly to citizenship education and brings the young people closer to science, inspiring them to choose science-related careers.

Consideration of the horizontal equal-opportunity and non-discrimination policies, as well as social responsibility and environmental sustainability

GRANTECAN, in all its actions and particularly in the staff selection process, advocates for guaranteeing equal opportunities. Some examples of this are the recent workforce recruitments, the gender parity of the GTC's committee, directly elected by GRANTECAN's leaders (http://www.gtc.iac.es/gtc/guc_es.php), and the implementation in 2018 of an online open doors programme for the GTC, which aims primarily at having mainly female scientific interlocutors with the citizens.

The GTC's vision, as mentioned in the introduction, also follows the social responsibility criterion of being an example and promoter amongst society of building a culture based on the scientific method. This effort also includes a maximum environmental sustainability criterion, especially given the GTC's

location, in a highly protected pre-national park area. Examples of this are the careful management of wastes generated by the GTC, which is in a process of continuous improvement, or the next implementation of electric vehicles in GRANTECAN's fleet.

Synergies with other policies or public intervention instruments

All of GRANTECAN's funding is public. In this context, the availability of the ERDF funds has allowed administrations (the Spanish Government and the Canary Islands Government) to channel part of their funding efforts towards the European funding area, complementing contributions that come directly from the General State Budget or the Autonomous Community of the Canary Islands.

3) Financial Reporting

The ERDF support, known as "Expansion work of the Great Canary Telescope. Phase 2 (Pre-14/05)", is formalised in the collaboration agreement between GRANTECAN and the Canarian Agency for Research, Innovation and Information Society (ACIISI) signed on 30th December 2014. The overall cost of the project requested by GRANTECAN, and conceded, is 13,410,000€ with a 11,398,500€ support from the ERDF, and it is being pre-financed by the ACIISI.