

Instrumentación de RF para radioastronomía

40m radiotelescope Yebes

Frequency bands from 2 GHz up to 120 GHz



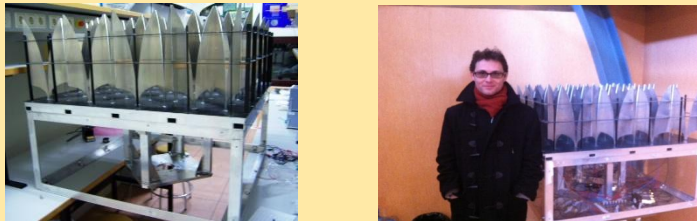
APEX and SOFIA

Frequency bands from 100 GHz up to 2.7 THz



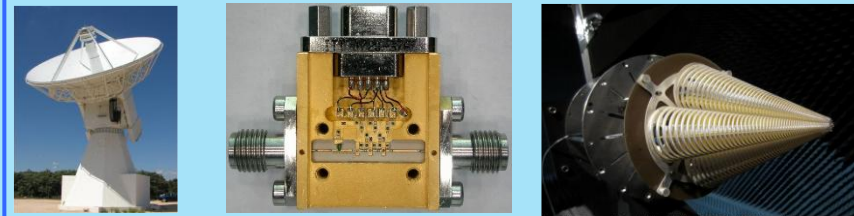
Square Kilometer Array SKA

Frequency band from 300 MHz up to 1 GHz

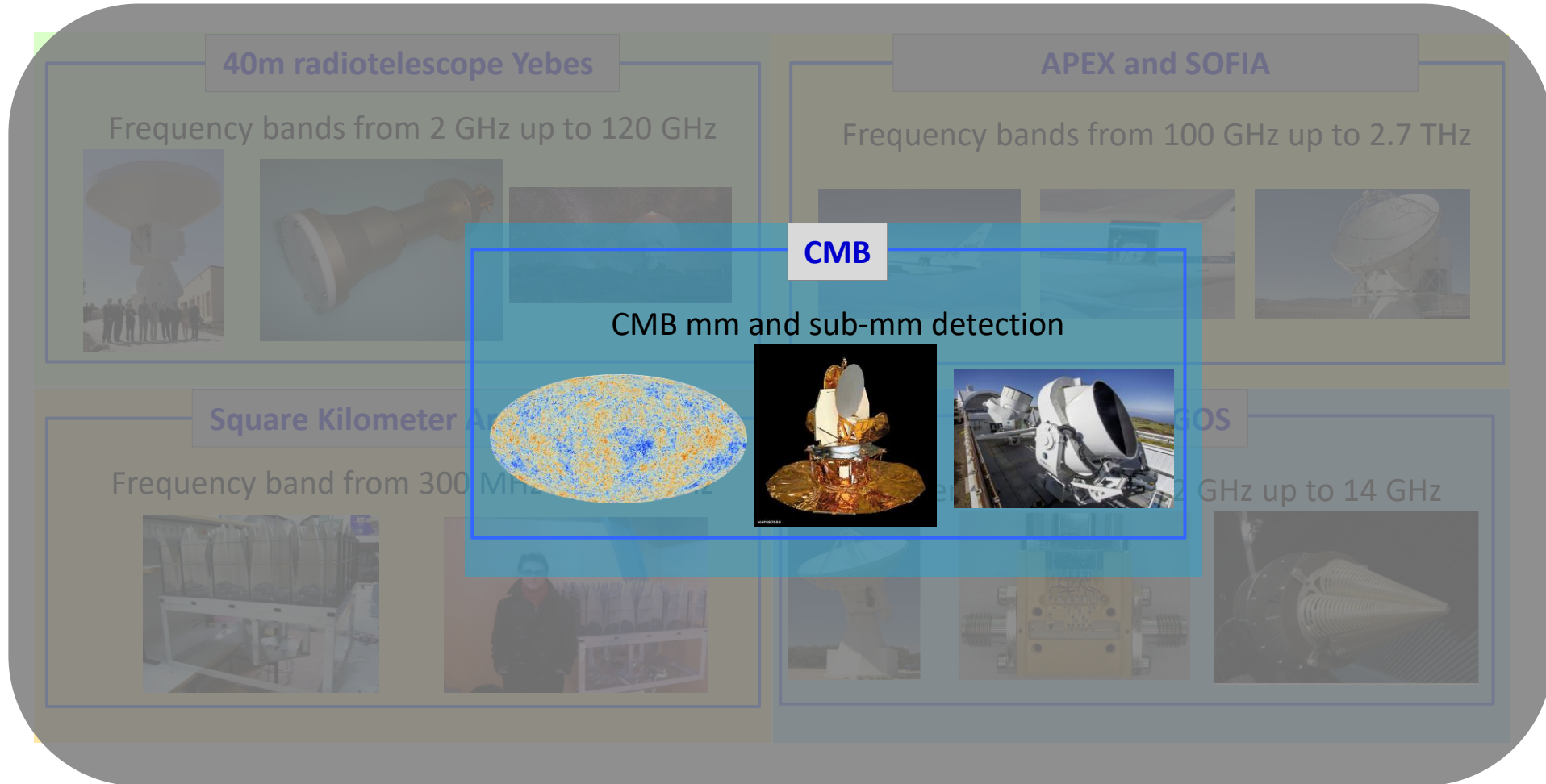


VLBI - VGOS

Frequency bands from 2 GHz up to 14 GHz



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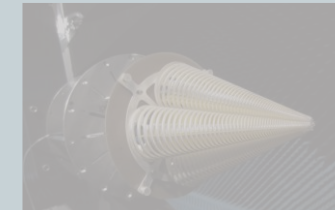
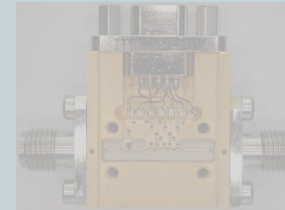
Square Kilometer Array SKA

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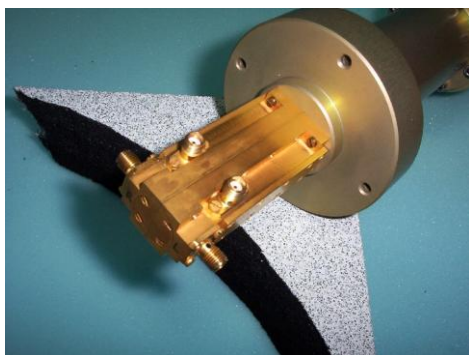


VLBI - VGOS

Frequency bands from 2 GHz up to 14 GHz



Radiotelescopio 40m de Yebes



Objectives

High-frequency branch:

30,45, 80 y 100 GHz, Redshift, Multibeam 3 mm.

Low-frequency branch:

S band VLBI, X band VLBI, 22 GHz

Líneas

Bocinas, lentes, reflectores, GO-PO-GTD, Quasi-óptica

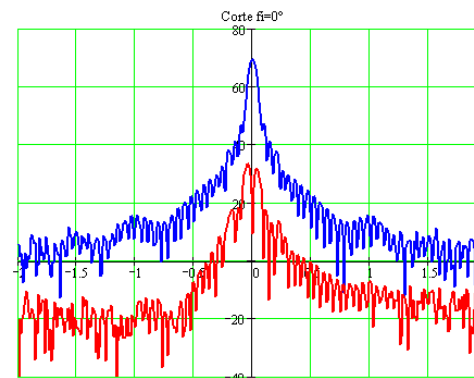
Resultados

Revistas JCR: 9 (7 Q1)

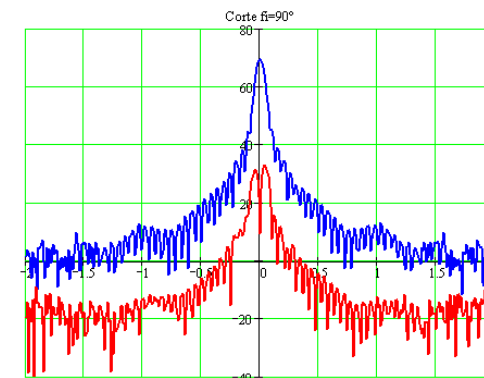
Congresos: 13

Estancias: Telecom Paris (FR, 2000)

Proyectos: 6 art. 83



— RHC
— LHC

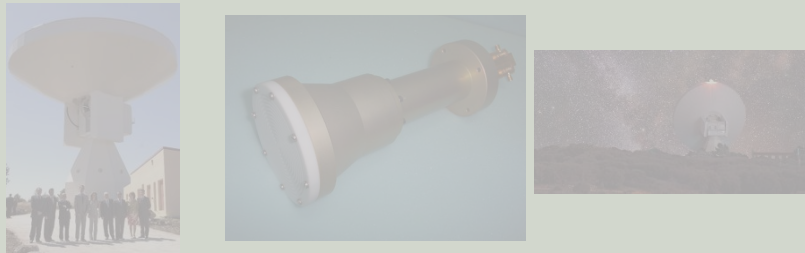


— RHC
— LHC

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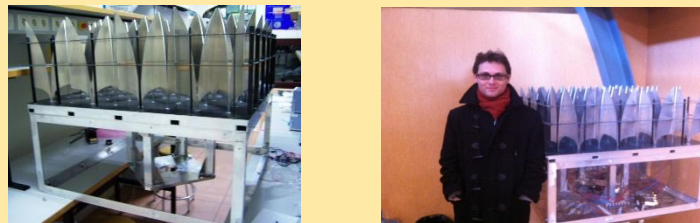
APEX and SOFIA

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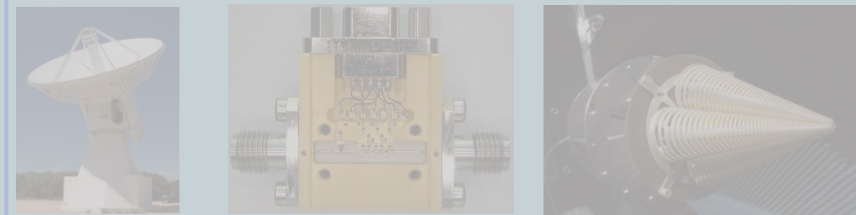
Square Kilometer Array SKA

Frequency band from 300 MHz up to 1 GHz



VLBI - VGOS

Frequency bands from 2 GHz up to 14 GHz



Square Kilometer Array

Objectives

Phased array, 300 MHz-1GHz
Several beams
Sub-tile and tiles, LNA's

Líneas

Phased arrays, ultra wideband antennas, LNA's

Resultados

Tesis: 2

Revistas JCR: 8 Q1

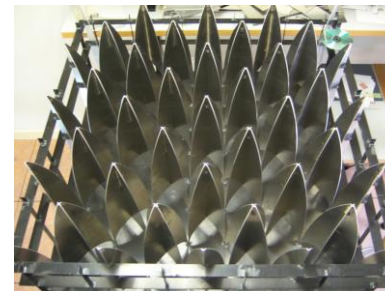
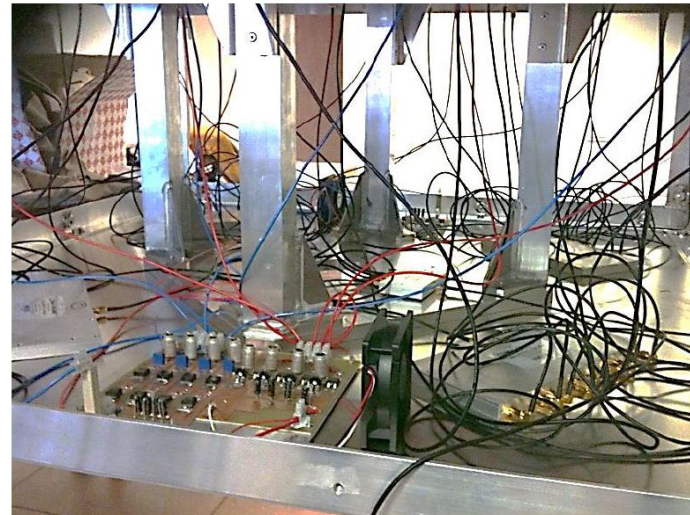
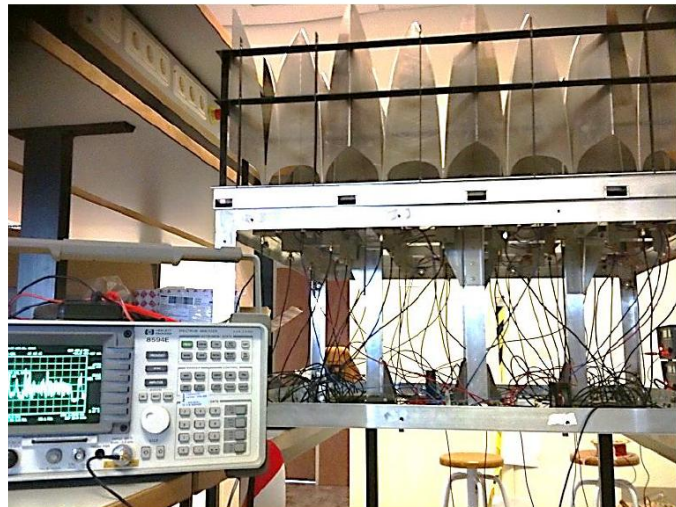
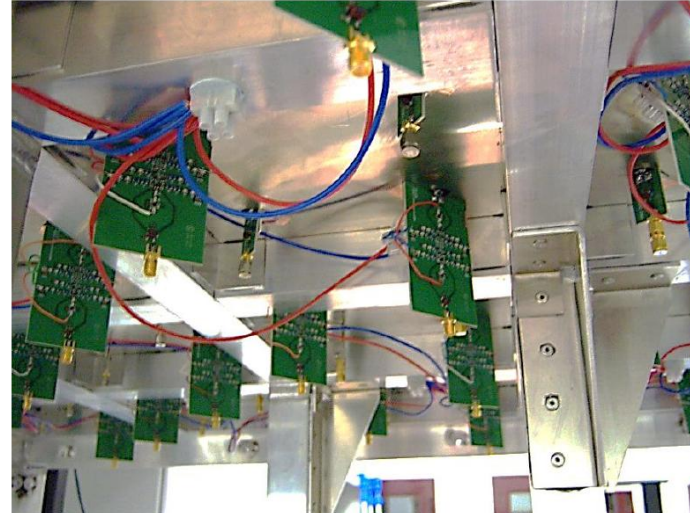
Congresos: 34

Estancias: 2, ASTRON (NL, 2007, 2008), 1 UCL (BE, 2008)

Invited talks: 2

Capítulo de libro: 1

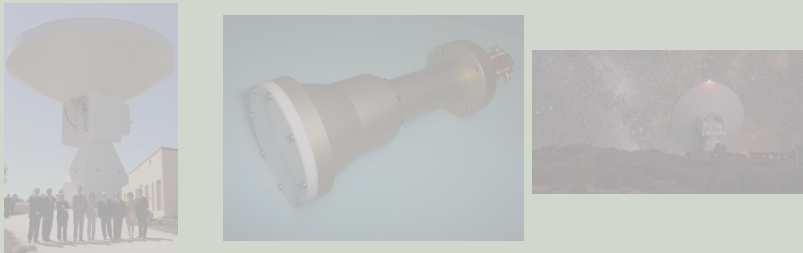
Proyectos: 5 art. 83 (IP), 1 proy. EU (IP)



Instrumentación de RF para radioastronomía

40m radiotelescope Yebes

Frequency bands from 2 GHz up to 120 GHz



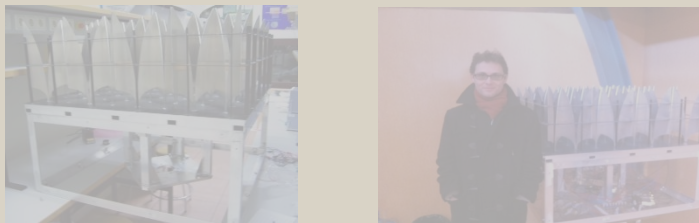
APEX and SOFIA

Frequency bands from 100 GHz up to 2.7 THz



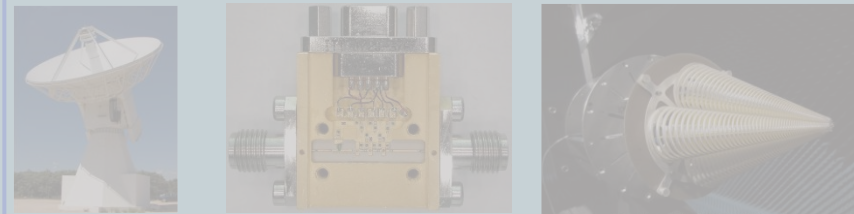
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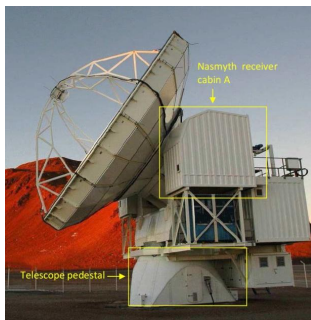
VLBI - VGOS

Frequency bands from 2 GHz up to 14 GHz



Telescopios APEX y SOFIA

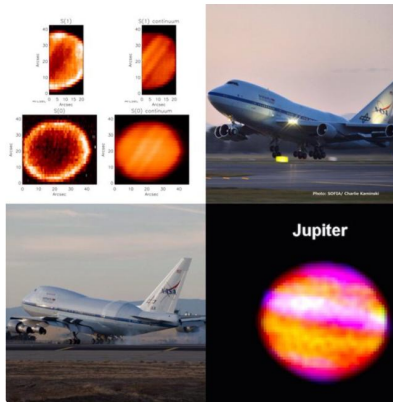
Channel	Frequencies (THz)	Lines of Interest
low-frequency L1 a,b	1.25-1.50 (single pixel)	[NII], CO series, OD,HCN,H ₂ D ⁺
low-frequency L2	1.81-1.91 (single pixel)	NH ₃ ,OH,CO(16-15),[CII]
mid-frequency M a,b	2.5 – 2.7 (single pixel)	OH(² π _{3/2}),HD
high-frequency H	4.7 (single pixel)	[OI]
upGREAT Low Frequency Array (LFA)	1.9 – 2.5 (14 pixels)	OH lines, [CII],CO series, [OI]
upGREAT High Frequency Array (HFA)	4.7 (7 pixels)	[OI]



Objective

Generation of terahertz radiation by mixing two lasers frequencies in a photomixer. The THz Signal (LO signal) is mixed with the astronomical signal in an heterodyne receiver.
Photonic LO working at **room temperature**.

SOFIAtelescope @SOFIAtelescope · 11 mar.
We can use infrared light to understand Jupiter's atmosphere.
[go.nasa.gov/1YGyaWx](https://www.nasa.gov/1YGyaWx) #FridayFeeling #nasabeyond



Líneas

THz, photomixers, reflectors, antennas

Resultados

Tesis: 3 leídas y 1 en curso

Premios: 3 Mejores tesis categorías COIT (2013, 2014, 2014)

Revistas JCR: 19 Q1

Congresos: 42

Estancias: 1, UCSD, (USA, 2010), 3 MPIfR, (AL, 2009, 2010, 2014)

Invited talks: 9

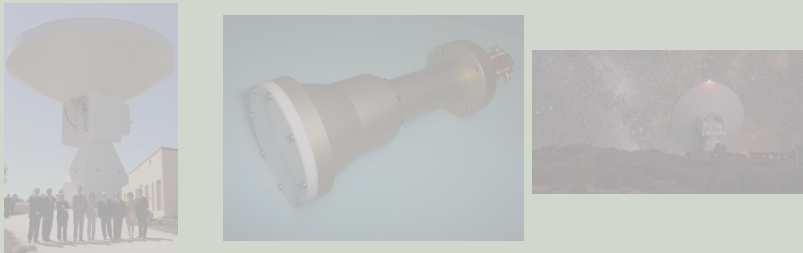
Libro: 1

Proyectos: **3 PN I+D (IP), 1 Proy. EU IPHOS (Co-IP)**

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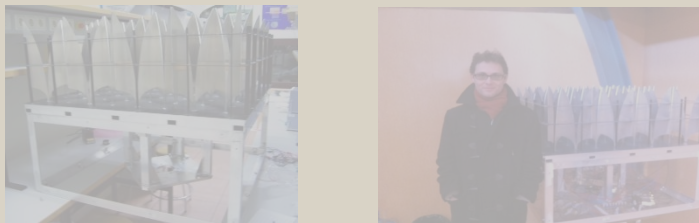
APEX and SOFIA

Frequency bands from 100 GHz up to 2.7 THz



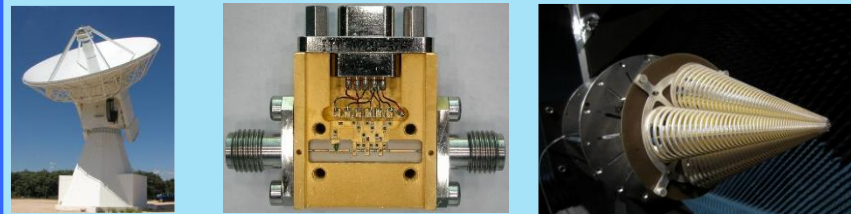
Square Kilometer Array SKA

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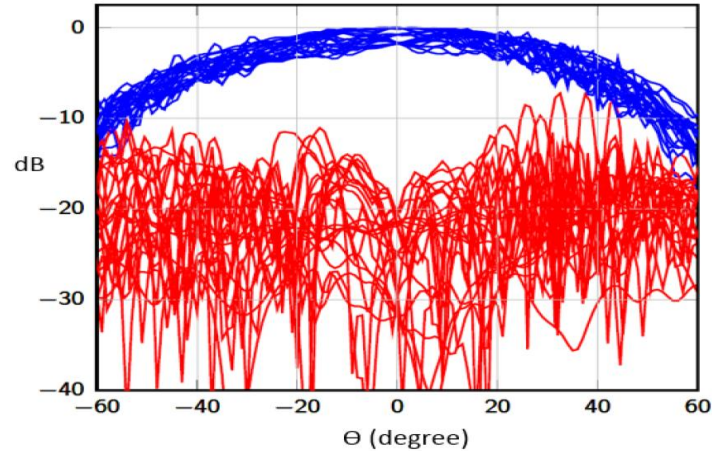


VLBI - VGOS

Frequency bands from 2 GHz up to 14 GHz



DIFRAGEOS VLBI-VGOS



Objective

Feed for VLBI2010 radiotelescope

- Operation band: 2 — 14 GHz
- Minimum gain: 11 dB \pm 1 dB
- Reflector half flare feed angle: 65°
- 16-dB half beamwidth: 65°
- Polarization: double
- Maximum VSWR: 2:1
- RF connectors: female SMA
- 15K cooled option inside a cryostat.

Líneas

Ultrawideband antennas, LNA's,

Resultados

Tesis: 2 en curso

Revistas JCR: 4 Q1

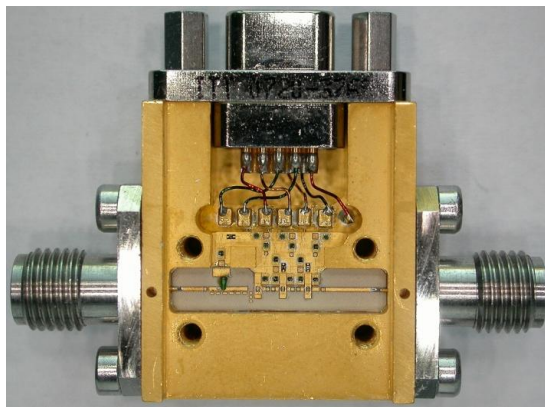
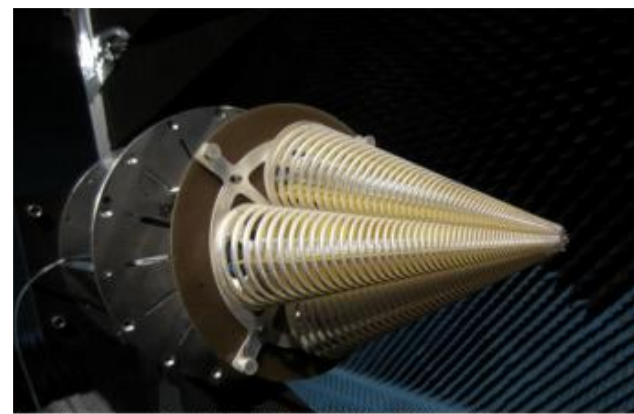
Congresos: 12

Estancias: 1, UST, (USA, 2018), 1 UoO, (NZ, 2017)

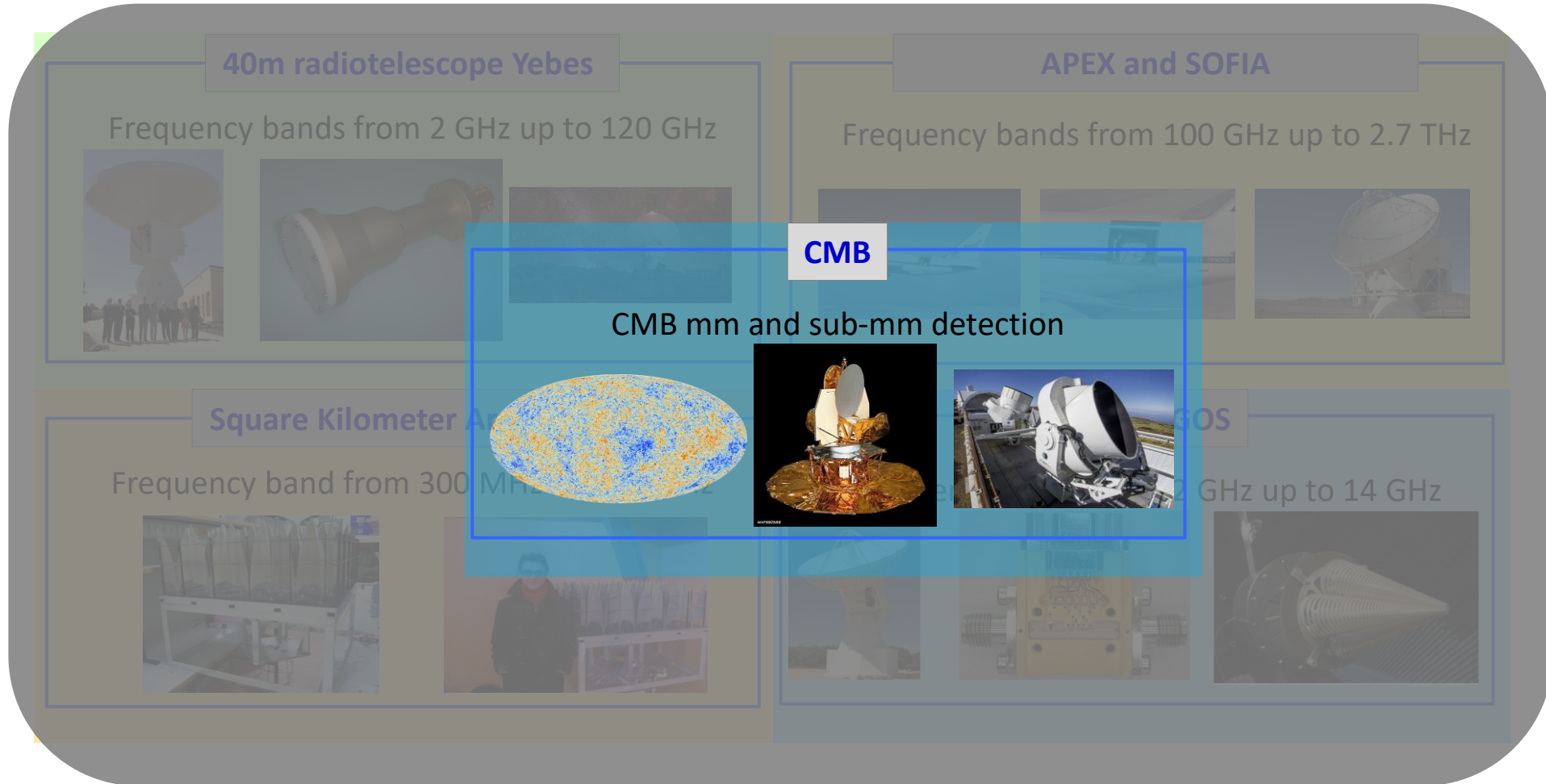
Invited talks: 3

Libro: 1

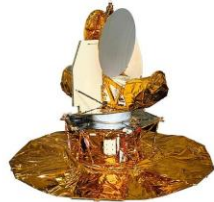
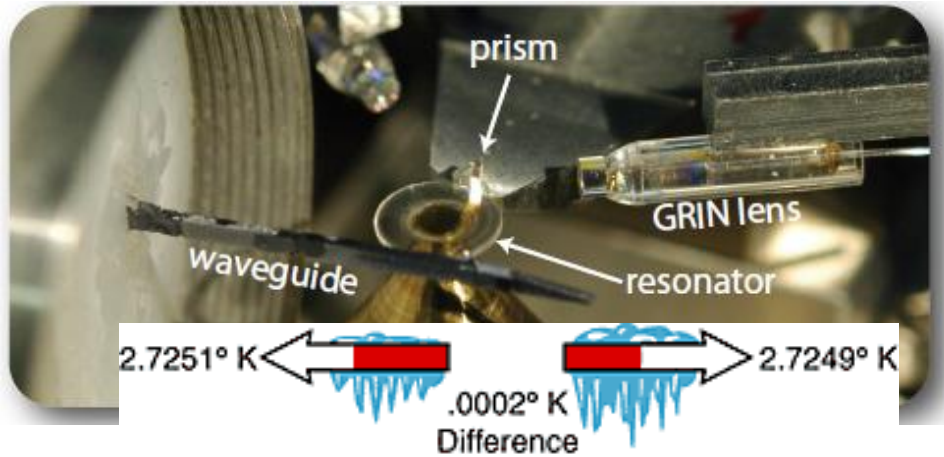
Proyectos: **1 Macrogrupo CAM**



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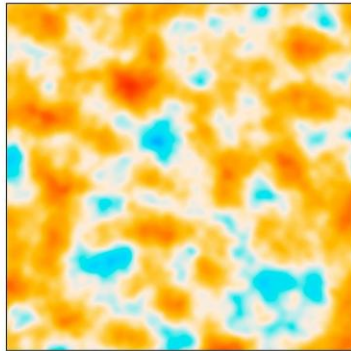


Detección de CMB en bandas mm y sub-mm

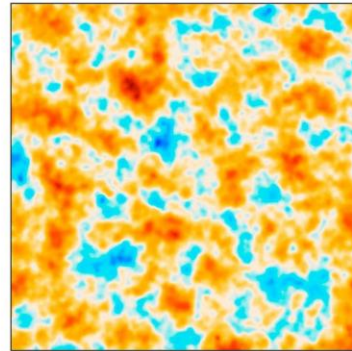


COBE

17/12/2024



WMAP



Planck

Objective

CMB temperature anisotropies detection working at room temperature.

Líneas

Radiómetros, ruido, guías dieléctricas, photomixers, reflectors, antennas

Resultados

Tesis: 2 en curso

Revistas JCR: 4 Q1

Congresos: 21

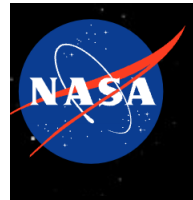
Estancias: 1, UST, (USA, 2018), 1 UoO, (NZ, 2017), 1 MPIfR (AL, 2014), 1 FAU (AL, 2016)

Invited talks: 3

Libro: 1

Proyectos: 1 PN I+D (IP)

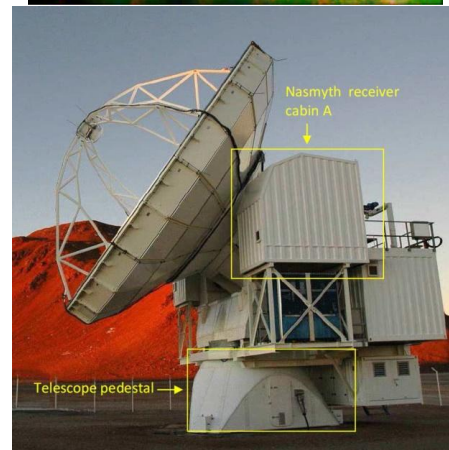
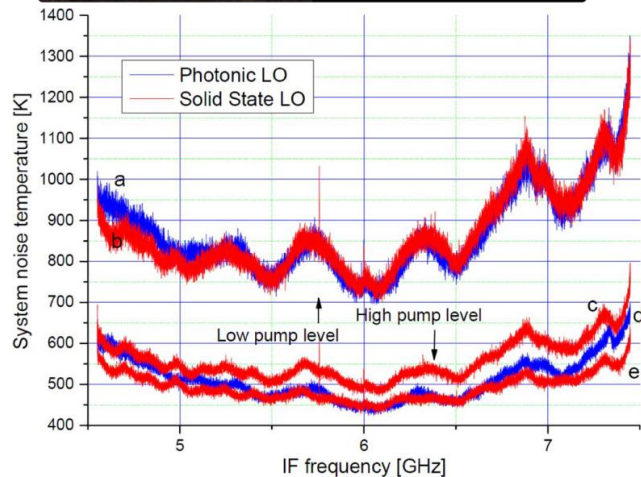
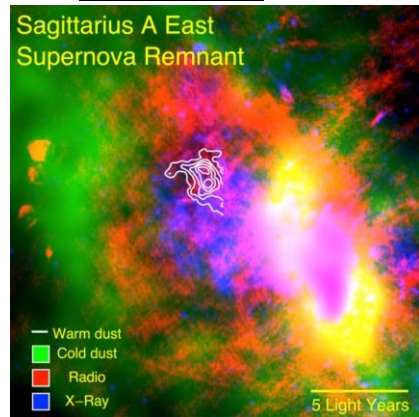
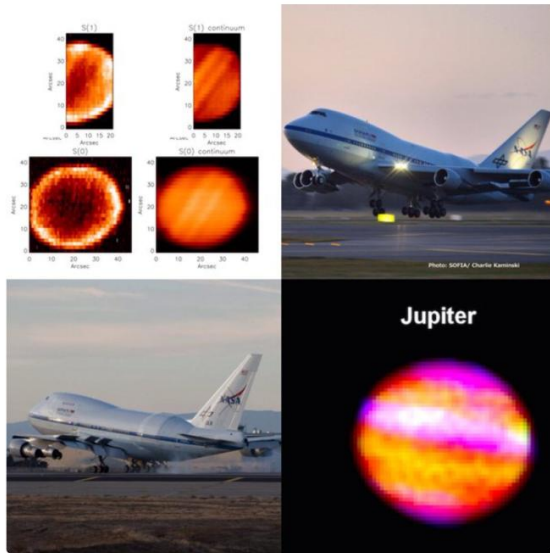
SOFIAtlescope @SOFIAtlescope · 11 mar.
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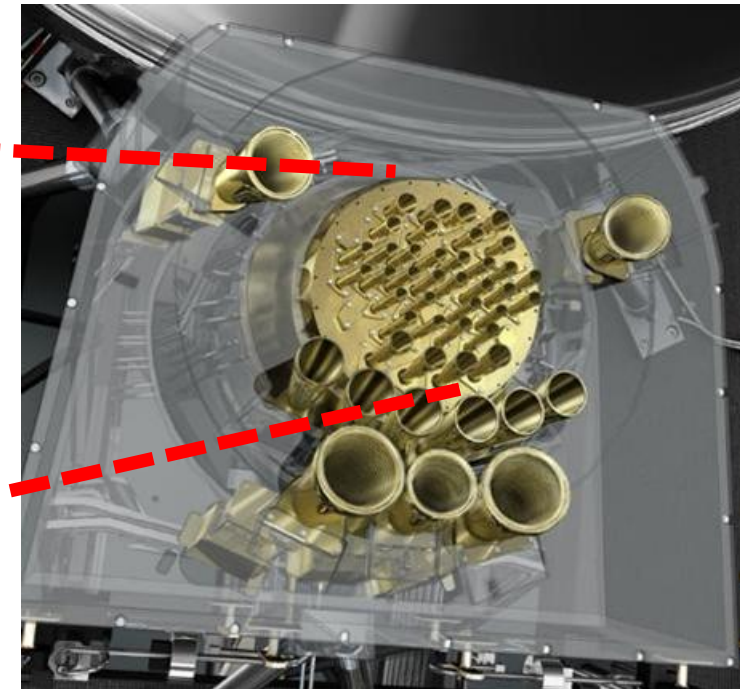
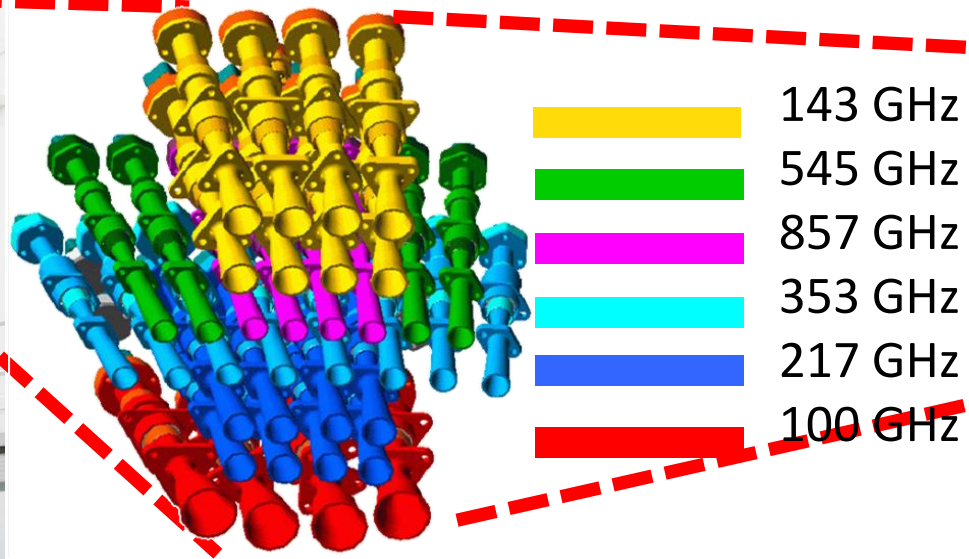
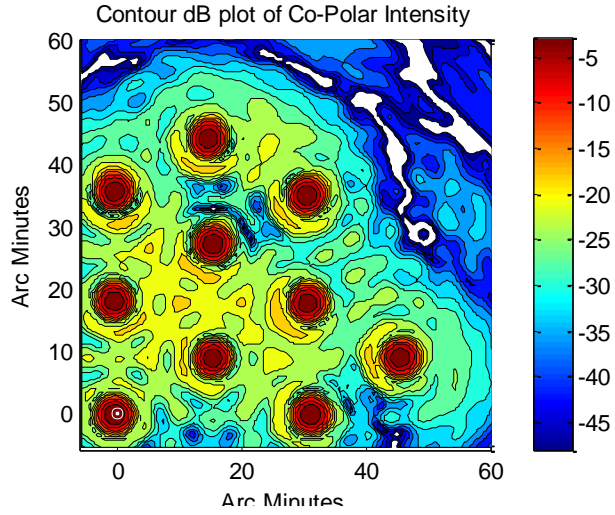
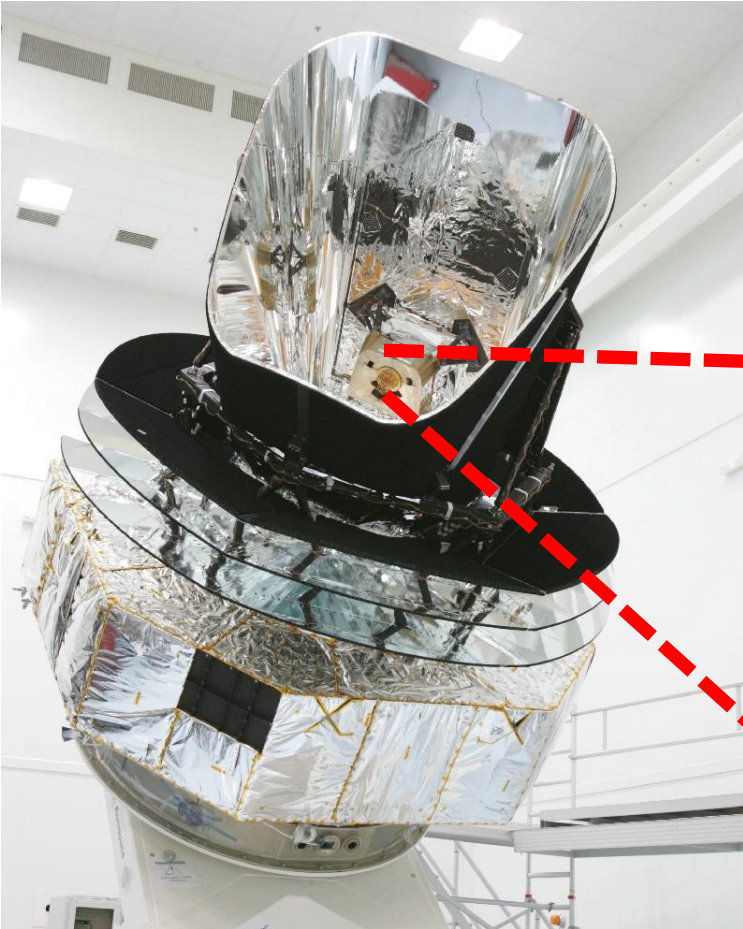
First In-Field Application of a Full Photonic Local Oscillator to Terahertz Astronomy

Results

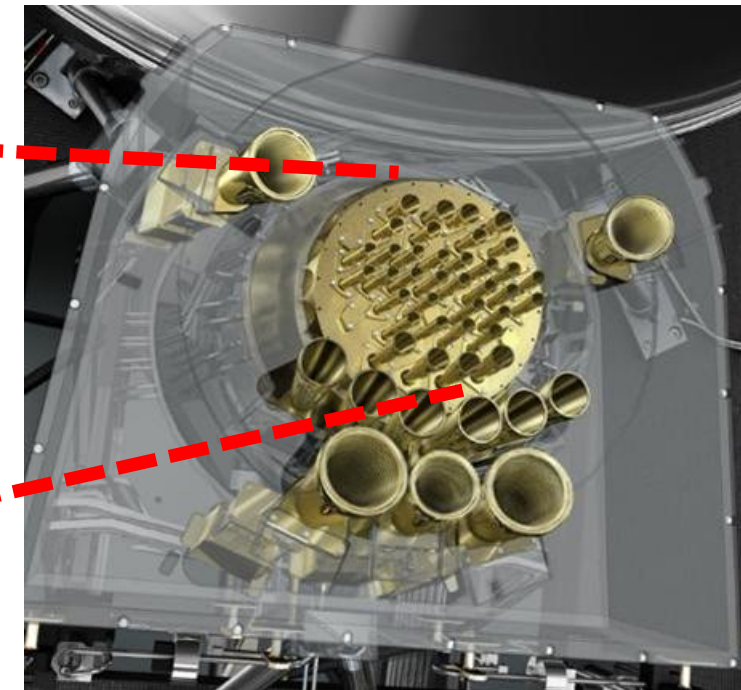
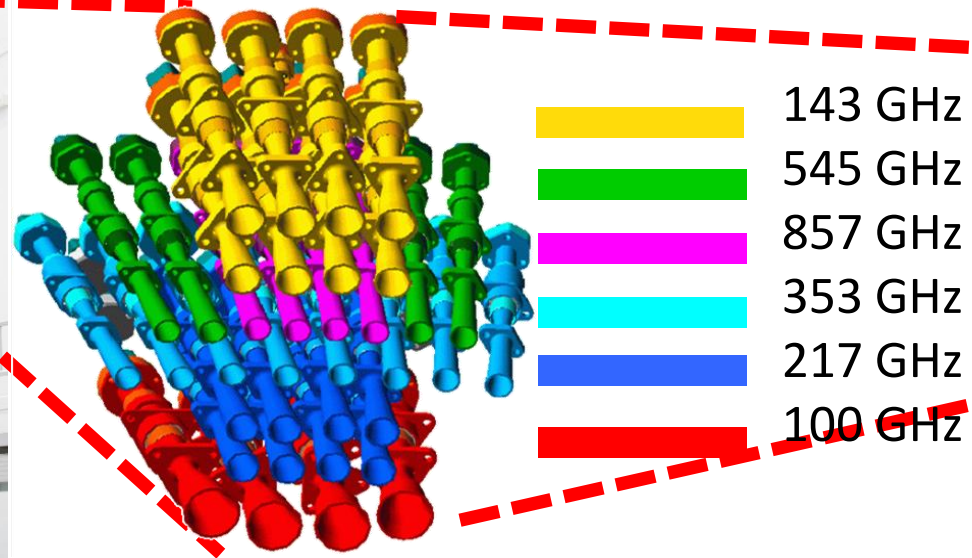
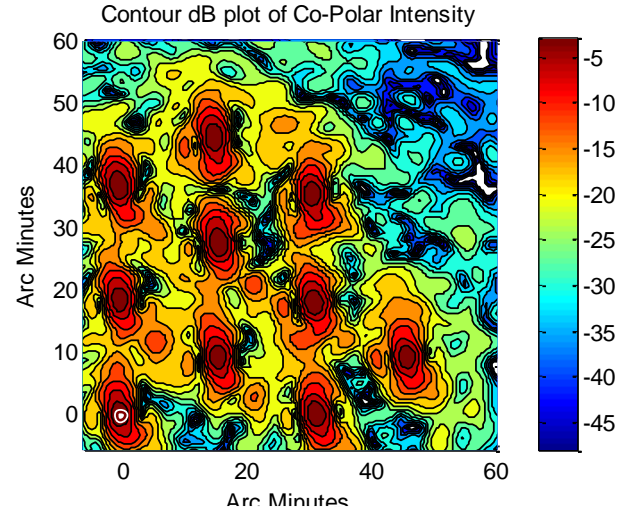
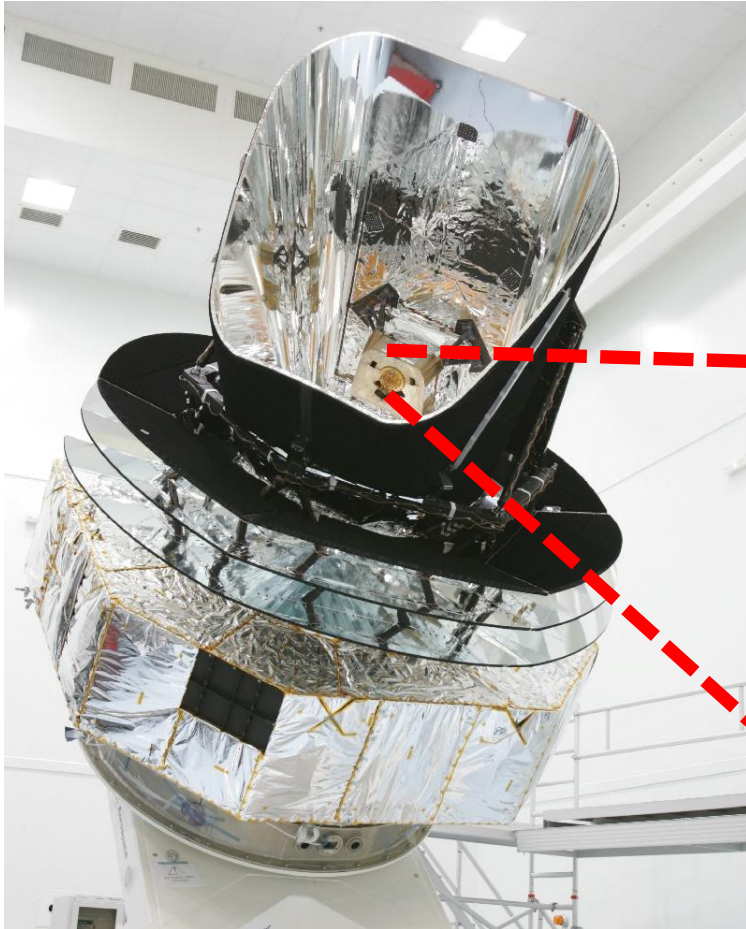
For the first time, we have successfully operated a photonic LO system under the representative field-conditions of a ground-based submm telescope. Using an all-optical system (comb generator) for phase locking of the THz signal a state-of-the-art SIS mixer was pumped at 1.05 THz.



Vanguardia



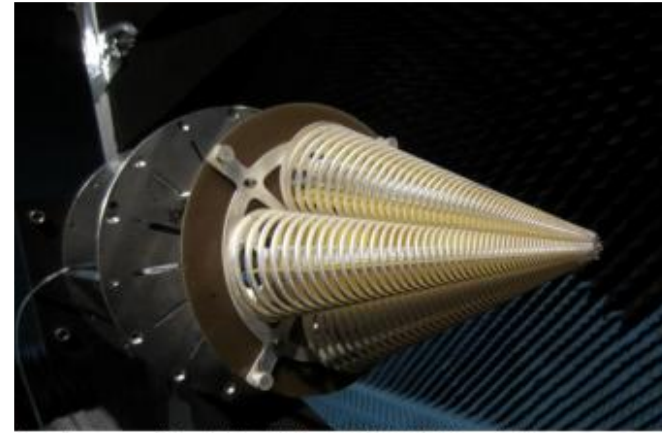
Vanguardia



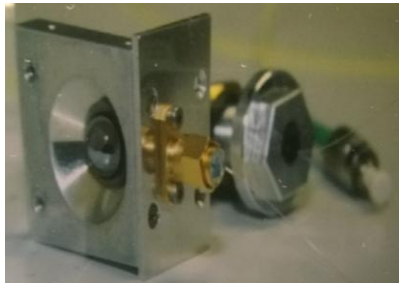
Transferencia de tecnología



Telescopio 40m
Centro de Yebes



DIFRAGEOS CAM



Photonic local
oscillators



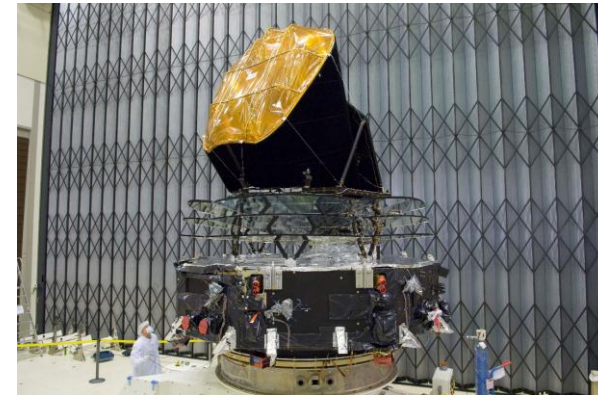
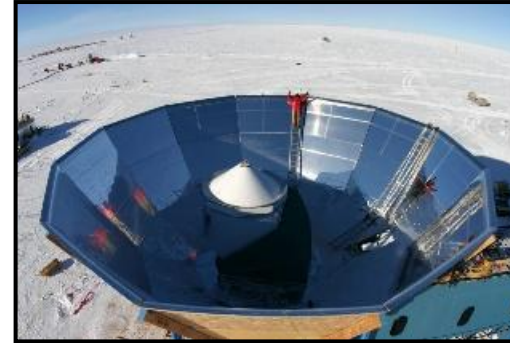
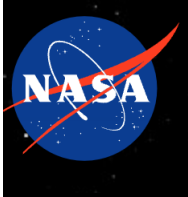
IPHOS FP6



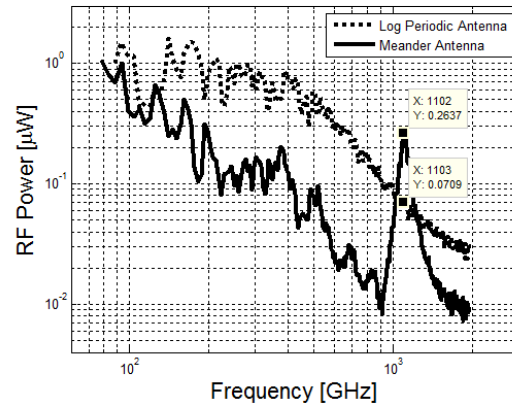
Transferencia de tecnología

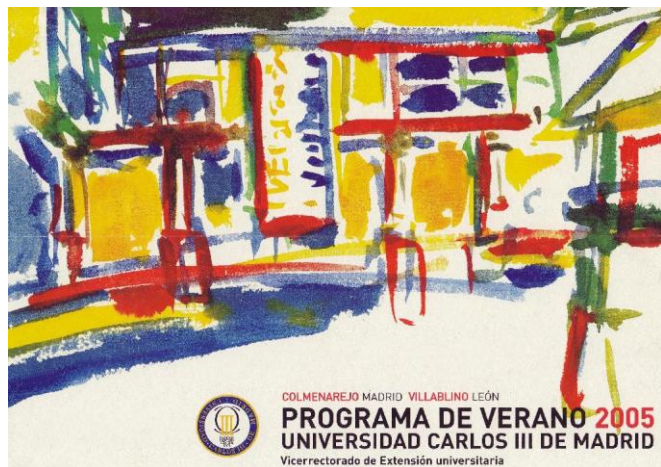
Photonic local oscillators

Quasi optical systems



6 dB improvement





Cursos de verano Universidad Carlos III de Madrid



IV Feria Madrid por la ciencia

≡ EL PAÍS

Materia

Un detector del tamaño de una mano para saber qué pasó tras el Big Bang

Un proyecto internacional facilitará la búsqueda de ondas gravitacionales primigenias, claves en las teorías cosmológicas sobre el origen del universo



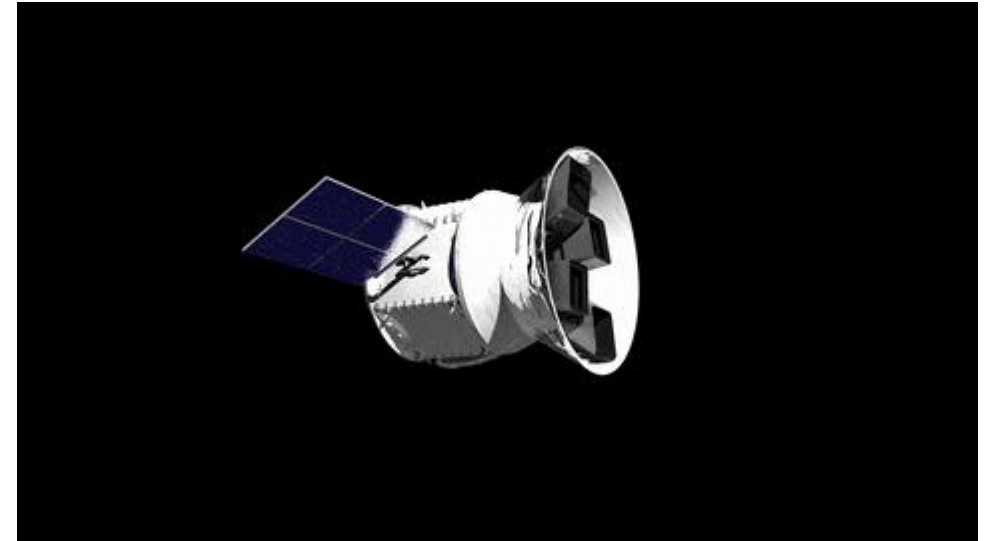
DANIEL MEDIAVILLA

25 ABR 2017 - 01:06 CEST



Objetivos

Millimeter wave **A**ray at **R**oom **T**emperature for **I**Nstruments in **L**EO **A**ltitude **R**adio **A**stronomy (MARTINLARA) desarrolla una misión espacial de demostración en órbita integrando en un nanosatélite tecnologías de uso espacial en radioastronomía, observación de la Tierra, fotónica espacial, y propulsión espacial eléctrica.



**Teconología espacial debe superar
validacion en misión de demostración**

**Objetivos científico-
tecnológicos**

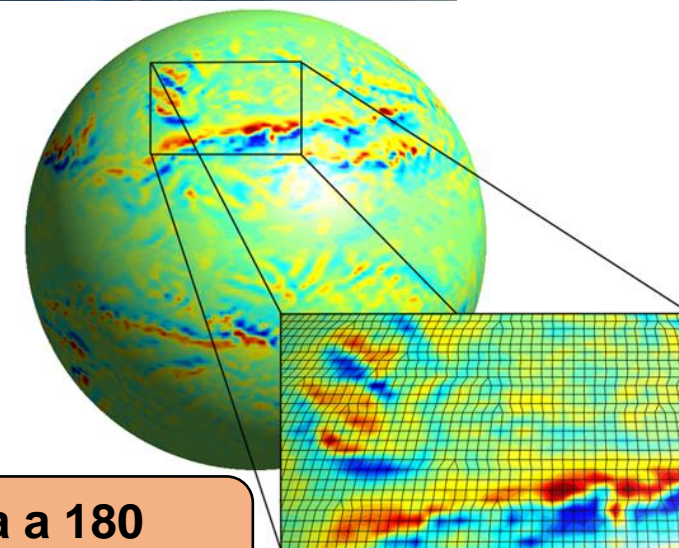
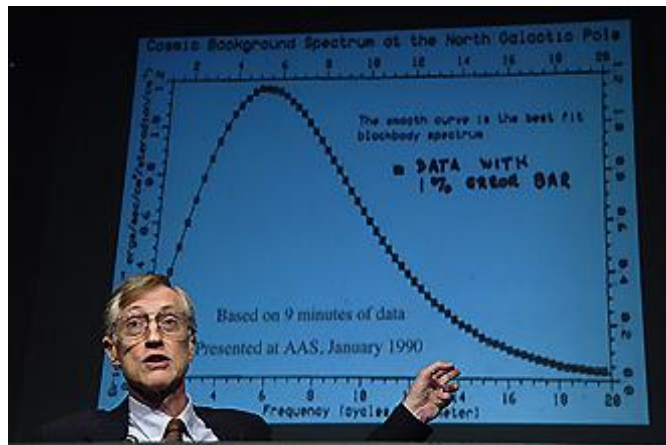
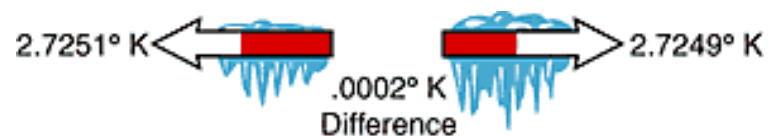
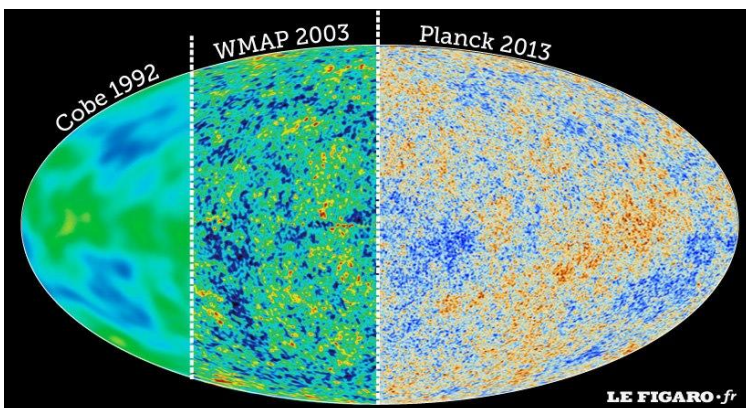
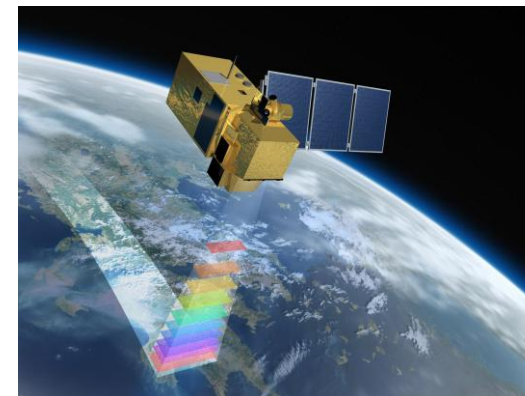
Objetivos aeronáuticos

Motivación: objetivos científico-tecnológicos

CMB anisotropies

CMB a 180, 200 y 250 GHz

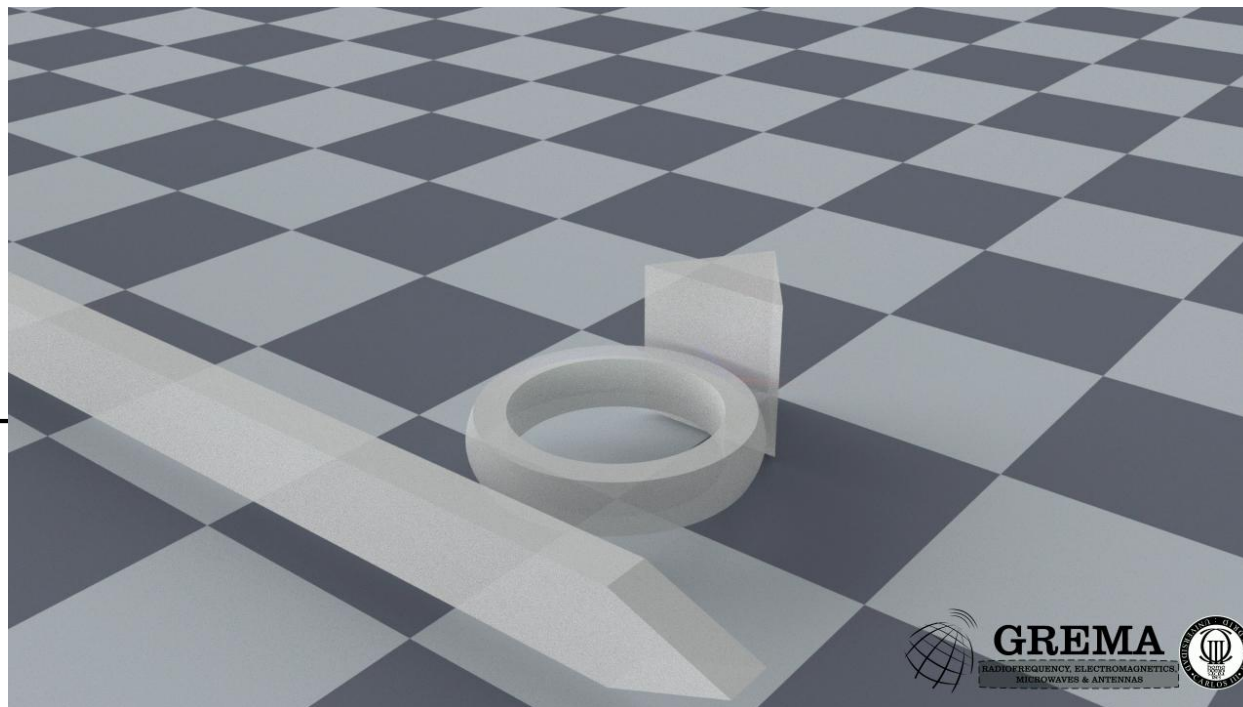
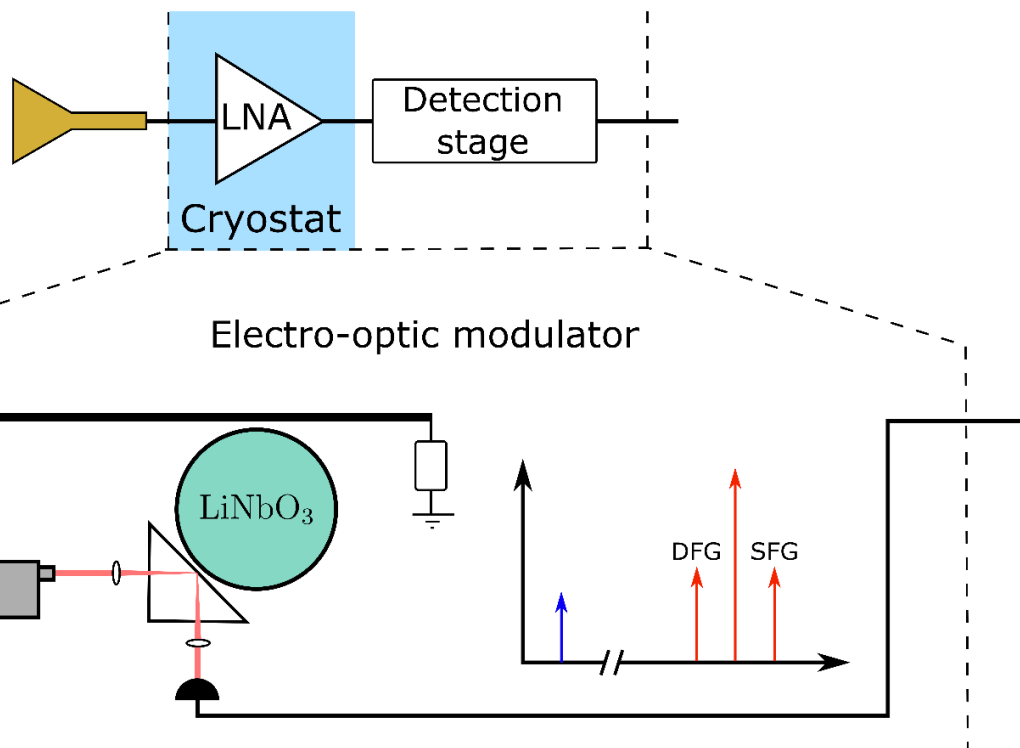
Numerical Weather Prediction



Vapor de agua a 180 GHz

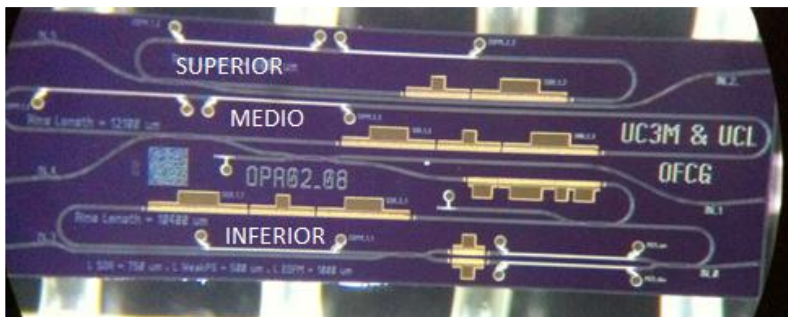
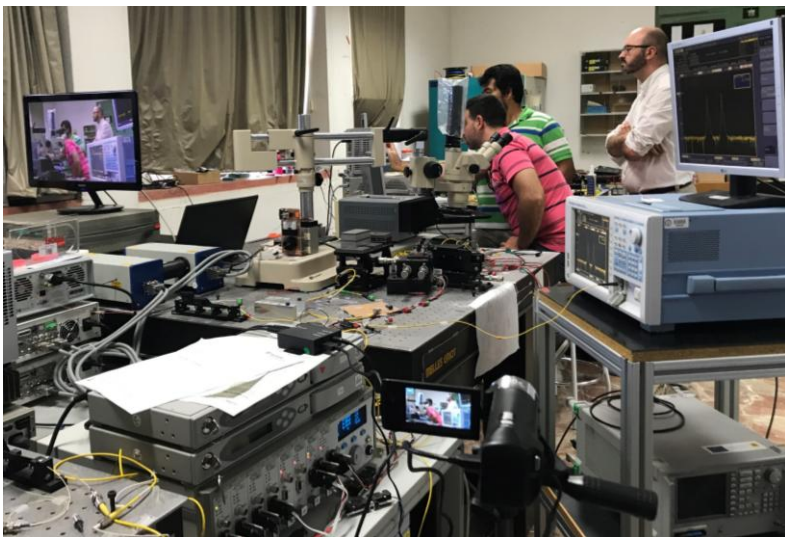
Motivación: objetivos científico-tecnológicos

Electro-optic up converter working at room temperature

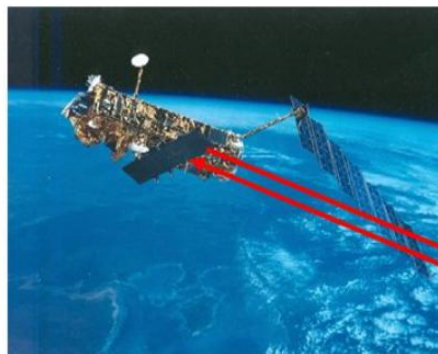


Motivación: objetivos científico-tecnológicos

Tecnologías fotónicas en espacio



Retroreflectores para SLR



- SLR significa Satellite Laser Ranging (Mediciones Láser a Satélites)
- Con esta técnica se mide distancias a satélites a través de pulsos de luz láser
- Una red de 35 estaciones SLR distribuidos por todo el mundo mide las órbitas de 25 satélites diferentes
- La alta precisión de estos datos (milímetros) sirve para un un gran espectro de aplicaciones científicas



**Teconología espacial debe superar
validacion en misión de demostración**

**Objetivos científico-
tecnológicos**

Objetivos aeronáuticos

Motivación: objetivos aeronáuticos

Un sistema eléctrico de retropropulsión espacial usa energía eléctrica para cambiar la velocidad de una nave espacial. La mayoría de estos sistemas de retropropulsión espacial utilizan campos electromagnéticos para expulsar propelente (masa de reacción) a alta rapidez.

