

Research activities in EEE space components within FP7 and Horizon 2020

ESCCON 2016

European Space Components Conference
ESA/ ESTEC, 1-3 March 2016

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DG GROW - European Commission

Summary



Research activities in EEE space components

1. FP7 (2007-2013)
2. Horizon 2020 (2014-2015)
3. Horizon 2020 (2016-2017)
4. Horizon 2020 (2018-2020)
5. Conclusions



1 - Research activities in EEE space components FP7 (2007-2013)

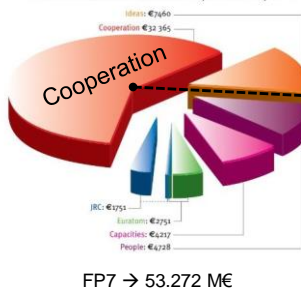
Space

Space in FP7 2007-2013

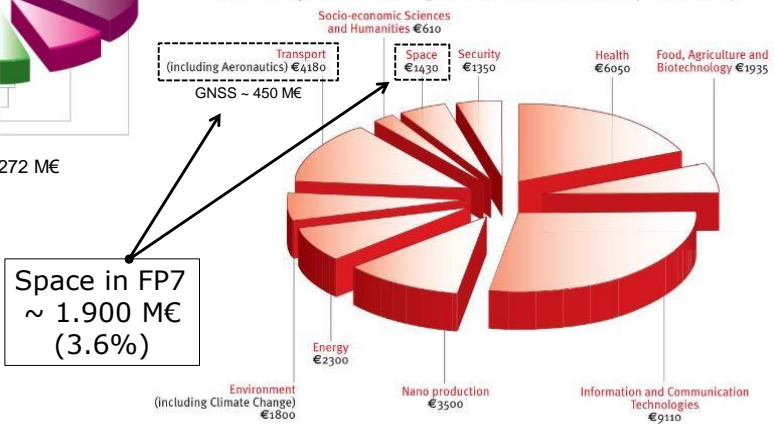


4

The indicative breakdown (€ million) of FP7



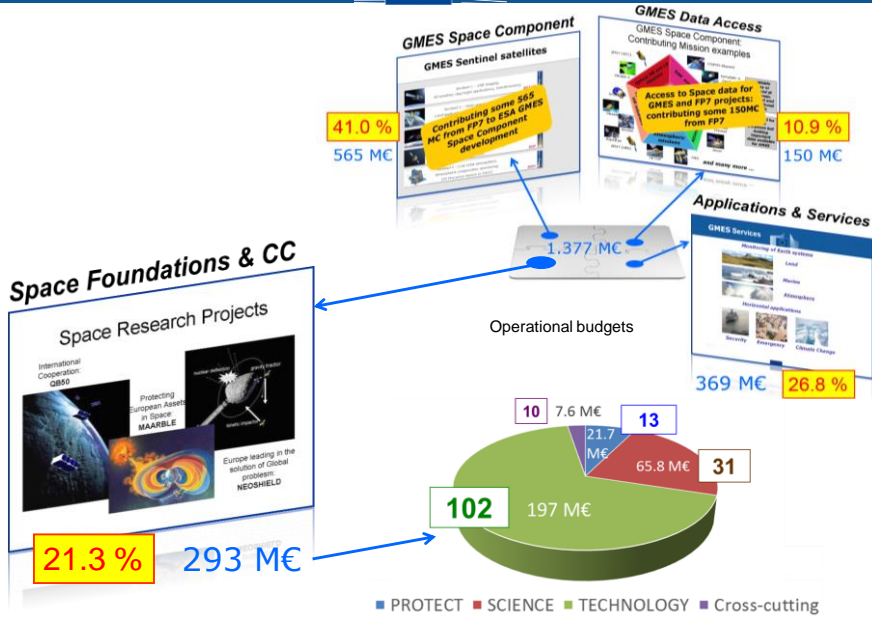
The Cooperation Programme breakdown (€ million)



Space in FP7
~ 1.900 M€
(3.6%)

Space

Activities developed in FP7 / SPACE



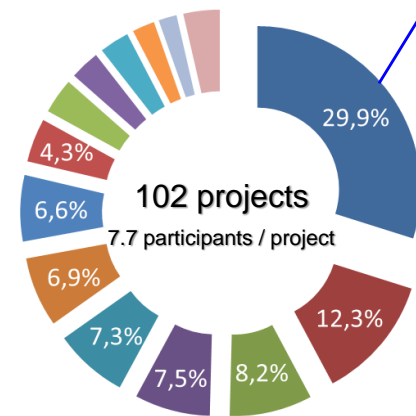
Technology Projects in FP7 / Space



European Commission

Topic on European non-Dependence

EU contribution: 192 M€



- Critical Space Technologies (31)
- In-space propulsion (11)
- Robotics (7)
- Space debris (5)
- Sensors and detectors (8)
- IOD-Satellites (5)
- Re-entry technologies (9)
- Materials and Structures (5)
- RF Systems (4)
- Access to space (4)
- Actuators (3)
- Habitats / Human exploration (3)
- S/C electrical power (2)
- Other topics (5)



What is “non-dependence” ?

Technology “non-dependence” means assured (non-dependent) access to any technology required to implement Europe’s space missions

Non-dependence does not mean producing everything in house

It is not just an ITAR problem, non-export restricted products come with limitations that create undesirable dependence

It is not only an issue for EEE parts, but affects other technologies and products

It is not an issue of end products only but affects all capabilities in the complete supply chain



Space



Joint Task Force (JTF) between the European Commission, ESA and EDA

One of the key objectives of the European Space Policy is to ensure non-dependence on critical space technologies.

The European Commission, the European Space Agency (ESA) and European Defence Agency (EDA) are jointly running the European Non-Dependence process since 2009 that has the objective to map the situation and identify actions for strategic non-dependence in the area of critical space technologies.



Space

Critical Space Technologies in FP7 / Space



Main technologies addressed with FP7 projects on Critical Space Technologies

EEE related 54.6 %	GaN (10.6 M€)	AGAPAC, EUSIC, AL-IN-WON, GANSAT, SLOGAN
	TeraHertz	MIDAS, TERACOMP
	Processors	DSPACE, MacSpace
	ADC	COMETS
	ASIC	VHISSI
	CMOS imagers	EUROCIS
	Memories	SKYFLASH
	SQUID	E-SQUID
	Cryogenics electronics	CESAR
	MMICS + RF MEMS	SATURNE
Photonics related 16.1 %	High power components	HIPPO
	Electro-photonic ADC	PHASER
	Optical inter-connectivity	MERLIN
	Optical clock	SOC2
Remaining Technologies 29.3 %	Flow and Pressure	µFCU, m-PRS
	Materials	SMARTEES, EUCARBON, HYDRA, AERSUS
	Mechanisms	HARMLES, MAGDRIVE
	Structures	DEPLOYTECH

Space

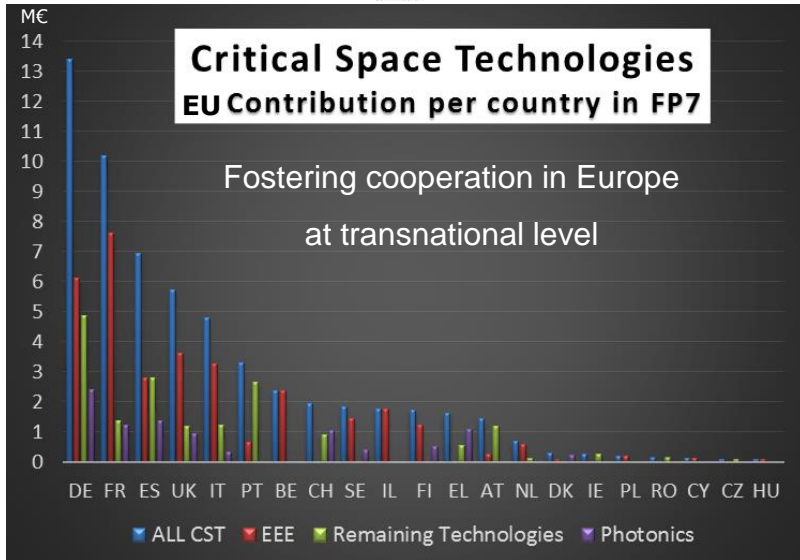
Space RTD projects



- 'Grants'
 - Not overly prescriptive
 - Broad description (not in excess) of call topics
 - Bottom-up
- Policy and Work Programme (DG GROW)
- Evaluation/Implementation (Agencies: REA, GSA, EASME)
- Open competition
 - No geo-return principle
 - Evaluation by independent experts

Space

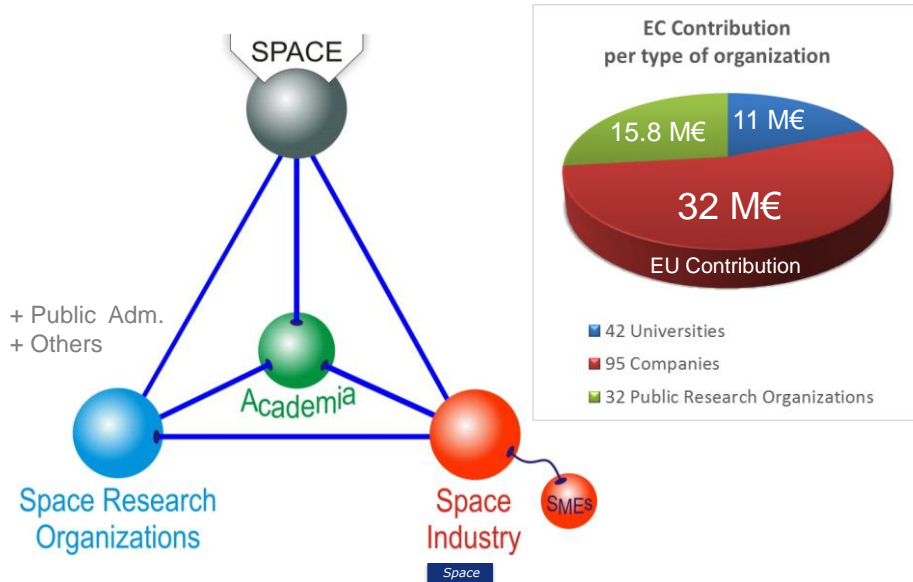
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Space

Type of participants in FP7/Space projects

12



Space

Brochures of the projects in FP7 / Space

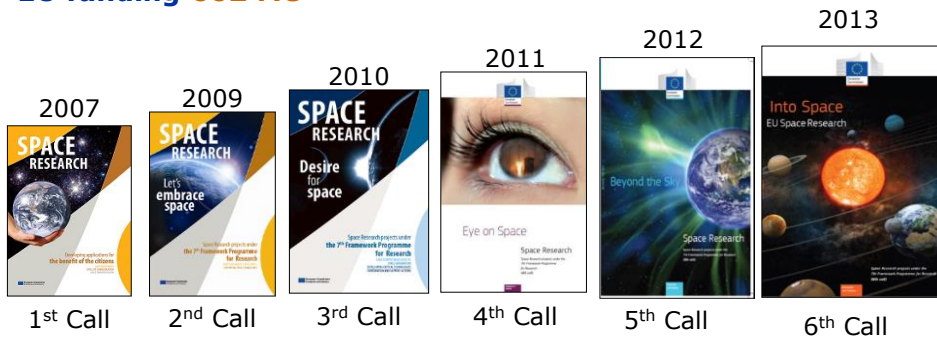


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999 PROPOSALS submitted in **6 CALLS**

262 PROJECTS have been supported by FP7

EU funding 662 M€



Further information available in http://ec.europa.eu/growth/sectors/space/research/fp7/index_en.htm

Space

RTD Projects in FP7 / Space



262 FACT SHEETS



6 BROCHURES



Further information available in http://ec.europa.eu/growth/sectors/space/research/fp7/index_en.htm

Space

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MAARBLE

Monitoring, Analyzing and Assessing Radiation Belt Loss and Energization



ABSTRACT
MAARBLE aims at shedding light on the way the dynamic evolution of the Earth's radiation belt is influenced by ultra low frequency electromagnetic waves in space.

UNDERSTANDING THE DYNAMICS OF Earth's RADIATION BELTS
The Van Allen radiation belts are two torus-shaped regions encircling the Earth, in which high-energy charged particles are trapped by the geomagnetic field. Radiation belt variability is of outstanding scientific interest and is also of relevance to any human endeavor in space, as it has direct impacts on spacecraft as well as on humans in space.

Although the radiation belts were discovered in the early years of the space era by the Explorer satellites, we still have no complete understanding of radiation belt dynamics. The MAARBLE project employs spacecraft monitoring of the geospace environment, complemented by ground-based magnetometer monitoring, in order to analyze and assess the physical mechanisms leading to radiation belt particle energization and loss. Particular attention is paid to the role of ultra low frequency electromagnetic waves, which are known to play a crucial role in the efficient energization of particles.

OBJECTIVES & RESULTS
What is the project designed to deliver?
MAARBLE aims at achieving a deeper understanding of the inter-connection between ULF and VLF waves and radiation belt dynamics, through the development of a statistical model of wave and/or magnetometer data and the incorporation of particle transport models into the assimilation tool.

Why is this project important for Europe?
The European satellite user base is ever-increasing and the need to monitor the state of the radiation belts is becoming more and more acute. Understanding radiation belt dynamics will provide the means to mitigate risk to European satellite users.

How does this project benefit European citizens?
MAARBLE will foster user-based work on the radiation belt variability, which is of direct relevance to the smooth operation of the European satellite navigation and communication systems and the safety of European citizens.

MAARBLE

Monitoring, Analyzing and Assessing Radiation Belt Loss and Energization

LIST OF PARTNERS

- National Observatory of Athens, Greece
- Office National d'Etudes et de Recherches Aéronautiques, France
- Institute for Space and Astronautical Sciences, Japan
- Institute for Space and Astronautical Sciences, Sweden
- Outer Space Agency AV ČR, v.v.i., Czech Republic
- Natural Environment Research Council, United Kingdom
- University of Alberta, Canada
- University of California, Los Angeles, USA

COORDINATOR
National Observatory of Athens, Greece

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PROJECT INFORMATION
Monitoring, Analyzing and Assessing Radiation Belt Loss and Energization (MAARBLE)

Contract N° 284620
Starting Date: 01/01/2012
Duration: 36 months
EU Contribution: € 1,995,042,90
Estimated total cost: € 2,845,504,37

Space



European Commission

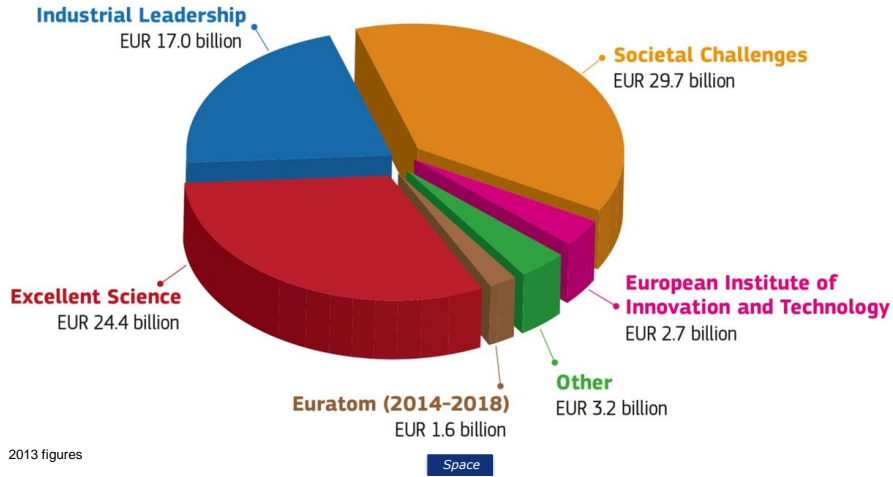
2 - Research activities in EEE space components

Horizon 2020 (2014-2015)

Space



HORIZON 2020 BUDGET (in current prices) € 79 billion from 2014 to 2020



Multiannual Financial Framework 2014-2020

~ 12.000 M€



~ 1.400 M€

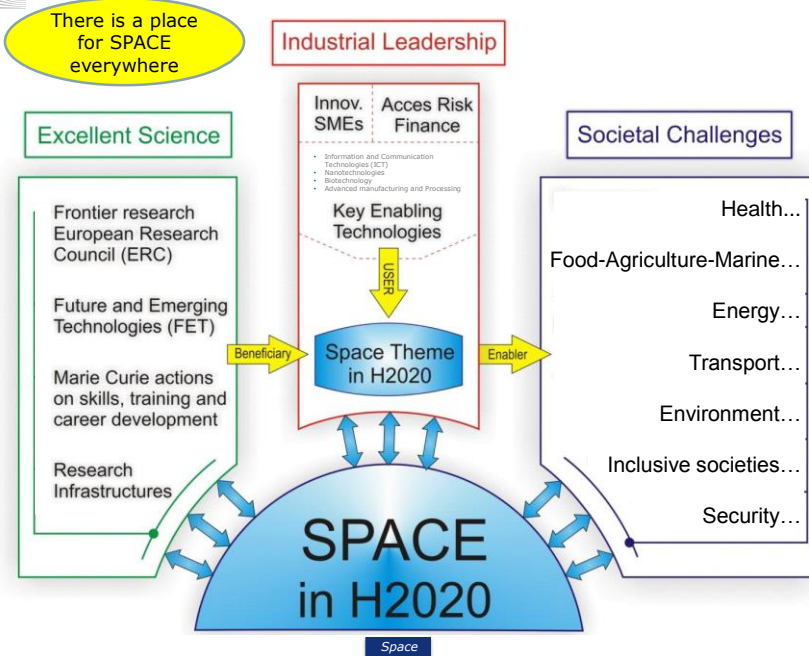
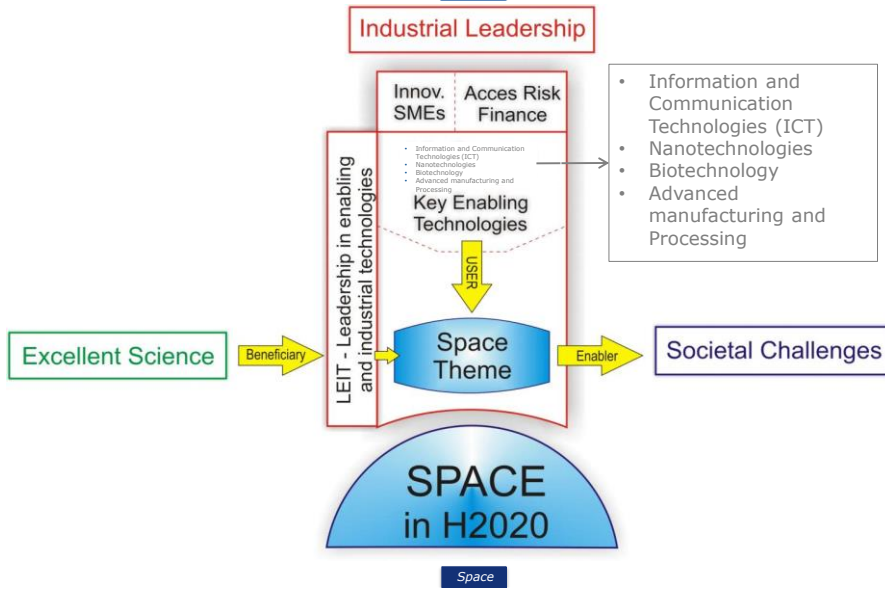


~ 3.800 M€



~ 6.300 M€

Space



The Specific Programme for Space in Horizon 2020



Four objectives Specific Programme proposal

- Enhance **competitiveness, non-dependence, and innovation** of EU space sector

The objective is to maintain a globally leading role in space by safeguarding and developing a competitive space industry and research community and by fostering space-based innovation

- Enable advances in **space technologies**

The objective is to ensure the capability to access space and to operate space systems to the benefit of European society in the next decades

- Increase **exploitation of space data**

The objective is to ensure more extensive utilisation of space data from existing and future European missions in the scientific, public and commercial domain

- Enable participation in **international space partnerships**

The objective is to support the European research and innovation contribution to long term international space partnerships

+ relevant **space applications** under Societal Challenges

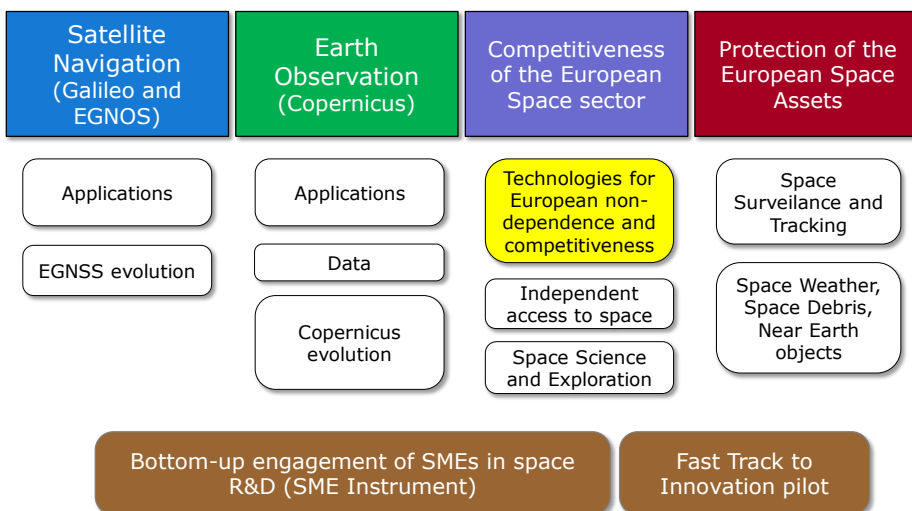
- Transport, Climate, Security,.....

For more information please consult Council Decision of 3 December 2013, [OJ L 347/993](#).

CSTs in the H2020 Space building blocks



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Space

2014-2015 work programme published in 10 December 2013

2014 call: call closed, grants signed, projects launched in January 2015

2015 call: call closed, projects in the phase of 'grant preparation'

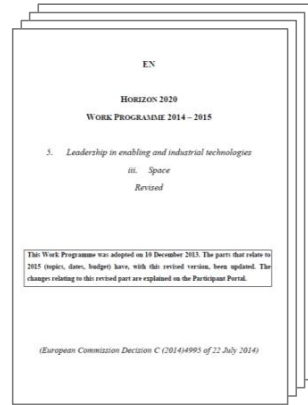
2016-2017

Work programme pre-published (14 October 2015)

Opening date: 10 November 2015

2016 call deadline 3 March 2016

2017 call deadline 1 March 2017



Space

Work Programme 2014-2015

Competitiveness of the European Space Sector

Non-dependence & technology development

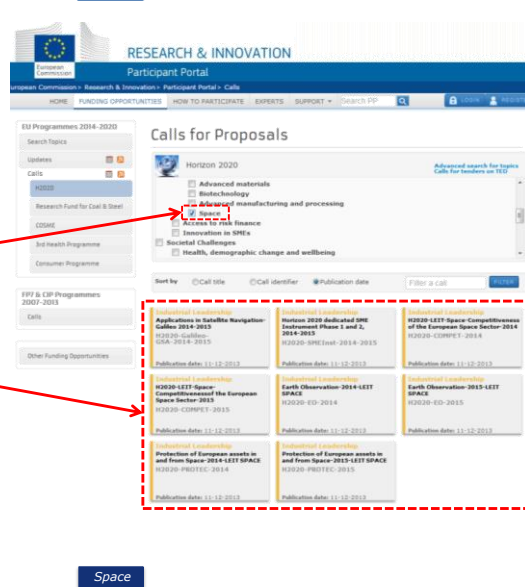


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Horizon 2020 Participants Portal:

<http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/>



H2020 Space Work Programme

Calls for proposals

Space

Types of actions and Funding rates



- **Research and innovation actions (Funding rate: 100%)**: Projects aiming to establish new knowledge, new or improved technology by possibly including basic and applied research, technology development, testing and validation on a small-scale prototype.
- **Innovation actions (Funding rate: 70% - exception: 100% for non-profit legal entities)**: Projects aiming to produce plans, arrangements or designs for a new or improved product, design, process or service by possibly including large-scale product validation and market replication.
- **Coordination and support actions (Funding rate: 100%)**: Projects consisting of accompanying/complementary measures (standardisation, awareness-raising, communication, policy dialogues, networking, studies, etc.)

Space



COMPET-1: Technologies for European non-dependence and competitiveness

2014

U1 - Space qualification of low shock non-explosive actuators

U2 - Advanced thermal control systems

U5 - Alternative to Hydrazine in Europe

U11 - Application Specific Integrated Circuits (ASICs) for Mixed Signal Processing

U17 - High density (up to 1000 pins and beyond) assemblies on PCBs

2015

U4 - Advanced materials and material technology for combustion chambers

U6 - Fibre Optic Gyro (FOG) based Inertial Measurement Unit - IMU

U7 - Power amplification: Travelling Wave Tube (TWT) materials

U12 - High Capacity Field-Programmable Gate Array (FPGA)

Topic	Project	Title	EU contribution
COMPET-01-2014	PEGASUS	Flight Qualification of Deployable Radiator using Two Phase Technology	3.534.174 €
	REACT	REsettable Hold-Down and Release ACTuator	2.731.451 €
	Rheform	Replacement of hydrazine for orbital and launcher propulsion systems	3.787.554 €
	SEPHY	SPACE ETHERNET PHYSICAL LAYER TRANSCEIVER	3.115.223 €
COMPET-01-2015	ERFTM	Export Restriction Free Travelling wave tubes Materials	3.126.720 €
	VEGAS	Validation of European high capacity rad-hard FPGA and software tools	3.976.861 €
			20.271.982 €

Space



There are other topics available for EEE components

COMPET-6-2014: Bottom-up space technologies at low TRL

- "high-resolution optical and radar observation related technologies (including hyperspectral systems)", "radiation-hardened instrument components", "in-situ sensors/instruments of physical parameters", "technologies for flexible/new generation SatCom payloads" and "advanced inter-satellite and/or downlink communications and tracking techniques (RF or Optical)".

COMPET-3-2015: Bottom-up space technologies at low TRL

- "energy storage", "energy production", "materials and structures", "additive layer manufacturing techniques", "mechanisms", "wireless power transmission", "high performance and reliable electronics to boost on-board power", and "thermal control management systems"

COMPET-03-2015	SaSHa	Si on SiC for the Harsh Environment of Space	997.130 €
COMPET-06-2014	PAMPA	Plastic Components for Advanced Microwave Equipment of New Generation SatCom Payloads	1.036.877 €
	PHySIS	Sparse Signal Processing Technologies for HyperSpectral Imaging System	1.028.000 €
	R2RAM	Radiation Hard Resistive Random-Access Memory	1.039.363 €
	TCLS ARM FOR SPACE	Feasibility and Definition of a Triple Core Lockstep ARM System-on-Chip for Space Applications	1.027.338 €
			5.128.707 €

Space

Projects managed by REA in 2014-2015 Calls

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European Commission
RESEARCH EXECUTIVE AGENCY (REA)

European Commission > REA > About REA > Activities > Space

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About us - Activities - H2020 Space projects

2014

Earth observation (EO)	Protection of European assets in and from Space (PROTEC)	Competitiveness of European Space Technology (COMPET)
BACI (149 kB)	NEOShield-2 (96 kB)	COSMOS2020 (101 kB)
EGSIEN (105 kB)	FLARECAST (30 kB)	EDEN ISS (108 kB)
EUSTACE (104 kB)	PROGRESS (30 kB)	EPIC (96 kB)
FIDUCED (108 kB)		EURO-CARES (108 kB)
GALL-CLIB (110 kB)		EUSPACE-AME (97 kB)
URBANFLUDES (40 kB)		GOTOFLY (94 kB)
		GRALL (38 kB)
		HYPROGEO (45 kB)
		INVEST (37 kB)
		IODISPLAY (100 kB)
		ISEM (96 kB)
		Odyssey II (32 kB)
		PAMPA (37 kB)
		PEGASUS (38 kB)
		PERASPERA (94 kB)
		PHYSIS (38 kB)
		PLUGIN (36 kB)
		R2RAM (100 kB)
		REACT (40 kB)
		RheForm (40 kB)
		SCREEN (38 kB)
		TCLS ARM FOR SPACE (18 kB)
		TIME SCALE (94 kB)
		UPWARDS (96 kB)

Other actions:
MACC3 III (127 kB), MyOcean-EO (77 kB), PASS (95 kB)
Space

Horizon 2020 Space projects

- [H2020 Space Projects at REA webpage](#)

European Commission

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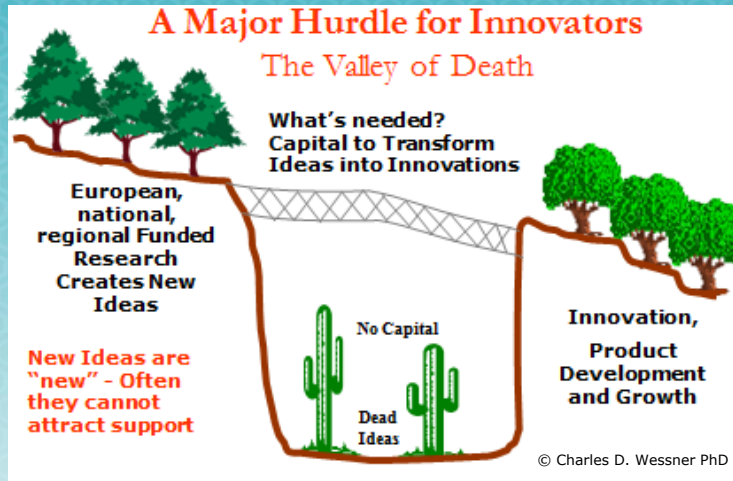
SME Instrument and Fast Track to Innovation

THE FRAMEWORK PROGRAMME FOR RESEARCH AND INNOVATION

HORIZON 2020

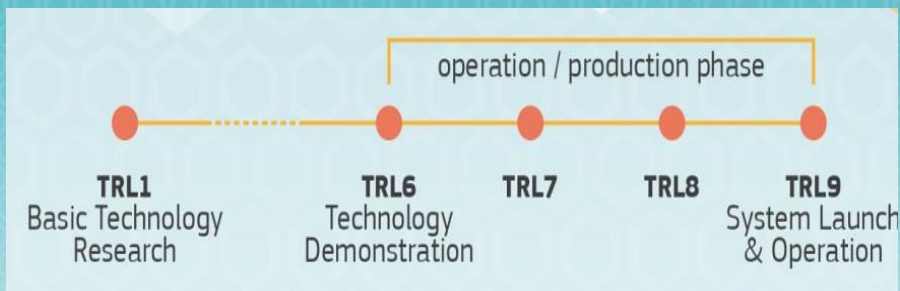


Why the SME Instrument?... ...To get across the Valley of Death...



SME Instrument target

Technology readiness level 6 or above



SME Instrument phases



Space

SME Instrument

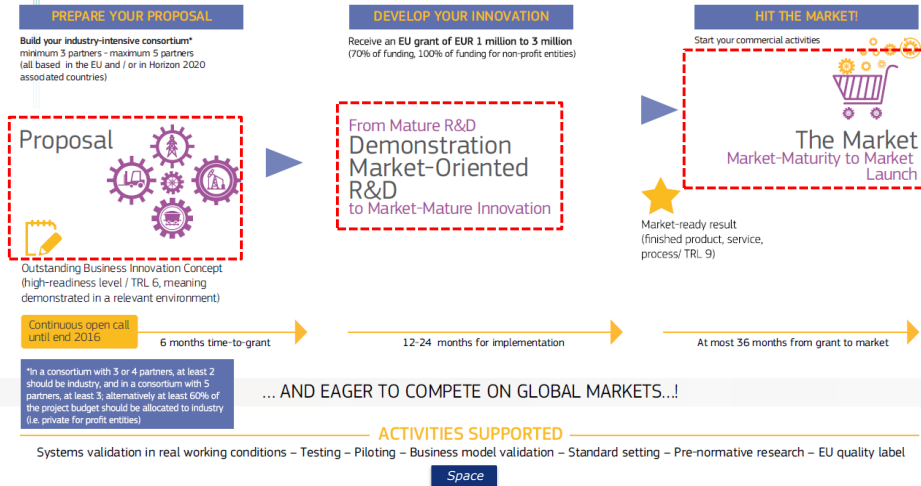
EEE related projects selected in the SME Instrument / Space

Topic	Project	Title	EU contribution
Space-SME-2014-1	ASC	Amorphous Speculative Compression	50.000 €
	SIMPLE	Spacefibre IMPLementation design test Equipment	50.000 €
	Space-COTS	High-tech commercial-off the-self electronics low-cost qualified for space	50.000 €
	SPACE-DSP	REPROGRAMMABLE GENERAL PURPOSE INSTRUMENT FOR DIGITAL SI	50.000 €
	SPACEFIT	SPAcE-Compatible- Filters_in_dielectric waveguide Technology	50.000 €
Space-SME-2015-1	Blink	Software, not Hardware: Revolutionising Satellite Data Acquisition	50.000 €
	EO-SLR	Enhanced Satellite Laser Ranging System	50.000 €
	iSIM	Integrated Standard Imager for Earth Observation Microsatellites	50.000 €

Space

Fast Track to Innovation Pilot

THE ULTIMATE BOOST FOR OUTSTANDING BUSINESS INNOVATORS WITH A NEED FOR SPEED...



FTI Pilot – Useful Information



- **Participant Portal:**
<http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/9096-ftipilot-1-2015.html>
- **Work Programme:**
http://ec.europa.eu/research/participants/data/ref/h2020/wp/2014_2015/main/h2020-wp1415-fast-track_en.pdf
- **Beneficiaries**
https://ec.europa.eu/easme/sites/easme-site/files/FTI-projects-2015_participants%20websites_corrected.pdf



3 - Research activities in EEE space components

Horizon 2020 (2016-2017)

Space

WP 2016-2017
Implementation calendar



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Calls	Opening dates	Deadlines
EO-2016 COMPET-2016	10 November 2015	3 March 2016
GALILEO-2017 EO-2017 COMPET-2017	8 November 2016	1 March 2017

Space



COMPET-1-2016

Technologies for European non-dependence and competitiveness

Activities shall address technologies identified on the Joint EC-ESA-EDA Task Force list of Actions 2015-17

- U14 - Active discrete power components
- U18 - Enhanced performance and space qualified detectors
- U19 - High speed DAC-ADC based on European technology
- U20 - Very high performance microprocessors
- U22 - ASICs: Deep Sub-Micron (DSM)
- N27 - RF components

Recommended project size
Indicative budget
Type of action

2 to 5 M€

14,85 M€

Research and Innovation Actions

The aim of identified actions is to contribute to ensuring European Non-dependence:

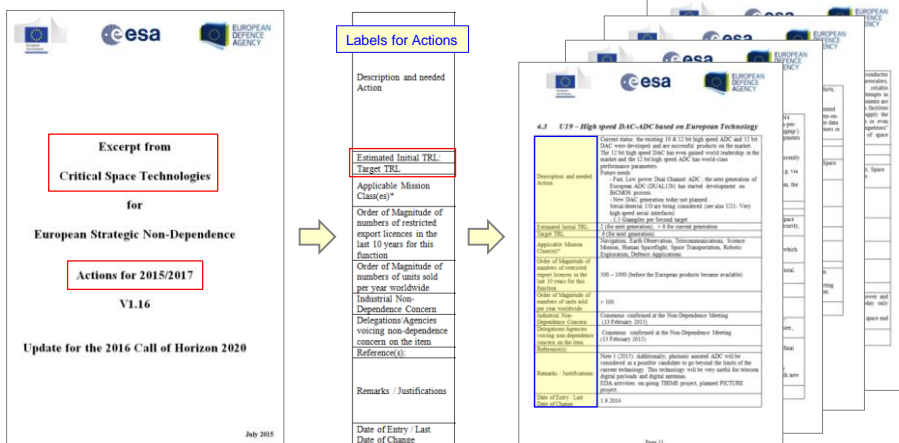
- "Independence" would imply that all needed space technologies are developed in Europe.
- "Non-dependence" refers to the possibility for **Europe to have free, unrestricted access** to any required space technology.

Space



COMPET-1-2016 – Guidance document

Excerpt from Critical Space Technologies (actions 2015/2017)



Space



COMPET-1-2016 – Guidance document

EXAMPLE

Excerpt from Critical Space Technologies (actions 2015/2017)

U14 – Active discrete power components

Description and needed Action	Development and qualification of active components (like diodes) assuring unrestricted availability of space qualified high reliability components in Europe <ul style="list-style-type: none"> – CMOS MOSFET transistors – GaN diodes & transistors – Power functions: POL, PWM, ICL, drivers (MOS) The recommendations from European Space Components Co-ordination (ESCC) via CTB will be taken into account.
Target TRL:	6
Estimated Initial TRL	4 (usually)



COMPET-1-2017

Technologies for European non-dependence and competitiveness

Activities shall address technologies identified on the Joint EC-ESA-EDA Task Force list of Actions 2015-17

U09 - Cost effective multi - junction solar cells for space applications.

U16 - Space qualified GaN components and demonstrators.

U17 - High density (up to 1000 pins and beyond) assemblies on PCB and PCBs.

U21 - Very high speed serial interfaces.

U23 - Development of large deployable structures for antennas.

U26 - Space qualified carbon fibre and pre-impregnated material sources for launchers and satellite subsystems.

N28- Non Dependence of materials and processes (tbc)

*Recommended project size
Indicative budget
Type of action*

2 to 5 M€

15 M€

Research and Innovation Actions





3 - Research activities in EEE space components

Horizon 2020 (2018-2020)

Space

The 2016 revision of the JTF list of actions



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EUROPEAN NON-DEPENDENCE PROCESS IN 2016

The European Non-Dependence Process in 2016 will follow the structure as defined here below:

Your participation is expected!!



INDICATIVE DATES

European Non-Dependence Process in 2016

Space

INDICATIVE

Main opportunities in WP 2018-2020 will be in

- Bottom-up space technologies at low TRL
- Technologies for European non-dependence and competitiveness
- In-Orbit Demonstration and Validation
- SME instrument
- Fast track to innovation (*if continued*)

Your participation is expected!!

Space

4 – Conclusions



> **200 M€** is the **estimated** total cost for the grants related to critical space technologies financed in FP7 and H2020.

The COM-ESA-EDA **Joint Task Force (JTF)** is the main driver in defining the actions on critical space technologies.

H2020 Work Programmes offer a **full spectrum of activities** for EEE components.

We are in an **open consultation** for WP 2018-2020. *Participate!*

Need to set a coherent framework for ensuring a end-to-end supply chain for technological non-dependence and competitiveness for European industry **ranging from development to in-orbit testing and qualification**. This will be achieved by continue working in conjunction **Member States** and **ESA**, aiming at building up complementarity among different actors.

Space



Register as expert!

- For proposal evaluation
- For project reviews



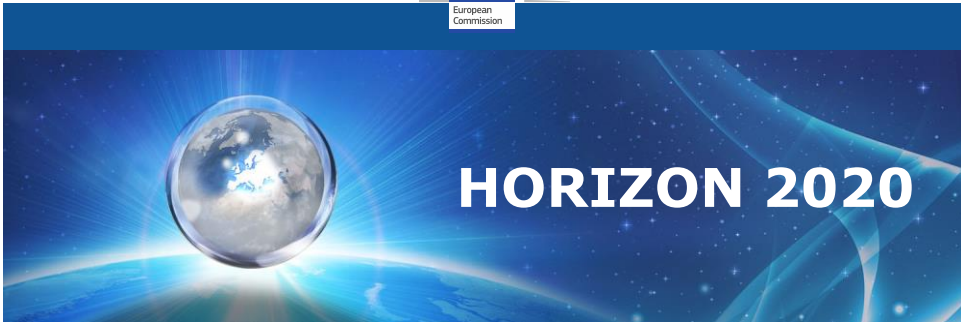
Where?

At the PARTICIPANT PORTAL: <http://ec.europa.eu/research/participants/portal/desktop/en/experts/index.html>

RESEARCH & INNOVATION

The screenshot shows the 'Participant Portal' website. The main navigation bar includes 'OPPORTUNITIES', 'HOW TO PARTICIPATE', 'EXPERTS', and 'SUPPORT'. The 'EXPERTS' section is highlighted. Below the navigation bar, there is a 'New experts' section with a green brain icon. The 'Experts' section contains the text: 'Join the database of independent experts for European research and innovation. The European Commission appoints independent experts to assist with research and innovation assignments including the evaluation of proposals, monitoring of projects, and evaluation of programmes, and design of policy.' There is also a link to the 'H2020 ONLINE MANUAL'.

Space



HORIZON 2020

**Thank you
for your attention**

Find out more:

http://ec.europa.eu/growth/sectors/space/research/horizon-2020/index_en.htm

Space