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15th Edition 2004 – 2018

GALILEO MASTERS

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The leading innovation network
for satellite navigation

The Results, 2018

15th Edition

in cooperation with

E-GNSS Accelerator Partner

special prize partners

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INTROS

Galileo Masters

In 2004, we and our prescient partners established the Galileo Masters with the vision to spur on the commercial use of satellite navigation signals and services in everyday life. This year, we are celebrating the 15th year of the competition – going back to its original name: Galileo Masters. Since day one, our common aim was to help innovative entrepreneurs to create added value for satellite navigation. I am proud to say that this vision became reality: The Galileo Masters has grown into the largest innovation network for satellite navigation by bundling a great variety of knowledge and expertise. Together with its European and global partners, the Galileo Masters acts as a catalyst for economic activities that lead to new companies, new jobs, and new application fields. Since the inception of the Galileo Masters, the majority of the submissions received have been transformed into profitable businesses. I am confident that, with Galileo becoming fully operational in 2020, the Galileo Masters is poised to truly hit its stride and unearth further outstanding innovations and unexpected trends in the downstream satellite market. Mobile location-based services, search and rescue, unmanned aerial vehicles (UAV) and even global financial transactions would not be possible without satellite systems. Multi-GNSS and precise point positioning data as well as time synchronisation now form the backbone of the digital economy, including the Internet of things (IoT), machine-to-machine communication, and smart mobility such as autonomous driving. These key future technologies, in particular, hold great potential for young, innovative companies. Besides, the potential added value of associated innovations offers enormous opportunities for growth and prosperity in Europe. A fact impressively reflected in this year's Galileo Masters submissions. That leads me to this year's anniversary: I would like to especially thank the European GNSS Agency (GSA), which has been supporting the Galileo Masters as one of its main partners and offering its Special Prize Challenge for 10 years now. Special thanks are also due to our other longstanding institutional partners, the European Commission (EC), the German Aerospace Center (DLR), the Federal Ministry of Transport and Digital Infrastructure (BMVI) and the European Space Agency (ESA). All of them have made the competition possible and provided both financial and technical support to help bring the awarded ideas to fruition. Particular thanks also go out to our partner regions, which continue to be truly pivotal in making the Galileo Masters a success every year. Above all, I would like to express my gratitude to all of the participants and congratulate all of the winners in the 2018 competition. I wish you all the best in realising your excellent services, products and applications!
I would be thrilled to see you obtain support from one of the incubators in our Europe-wide network – which, of course, includes the ESA Business Incubation Centres. I am already looking forward to the next iteration of the Galileo Masters, which is scheduled to run from April to June 2019.

Thorsten Rudolph, Managing Director
AZO Anwendungszentrum GmbH
Oberpfaffenhofen

Bringing Business Ideas to Fruition – Where to now?

The EU-supported Galileo Masters and Galileo Incubator programmes have produced very promising results since they were first launched more than 10 years ago. To date, thousands of European entrepreneurs have participated – hundreds of prizes have been awarded to the tune of more than EUR 11 Million, and many applications relying on space technologies were supported in finding their way onto the market. However, we cannot rest on our past glories – we need to do more.

Promoting innovation and entrepreneurship in the wider European economy is a key pillar of the EU's Space Strategy and we are committed to pursuing targeted initiatives that leverage innovation. Consequently, in the proposal for the EU Space Programme for 2021-2027, the European Commission has included the possibility of supporting designated 'Space Hubs' – cooperation undertakings which bring together at regional and national level entities from the space and digital sectors, as well as end-users. This would enable new business ventures – linking space technologies, assets and expertise to other industrial sectors and will facilitate the spill-over of 'space' into the wider European economy.

The successes achieved by the Galileo Masters competition and Incubator programmes will be our guiding star as we strive to create effective 'Space Hubs'.

With the variety of opportunities available, we are calling on European entrepreneurs, businesses, scientists and researchers to put their energies into developing new ideas and pursuing innovative ventures which use services provided by EU space technologies. The European Commission is committed to its space endeavours going forward and to boosting entrepreneurism in the sector as we push to realise the potential and benefits of space for our economy.

European Commission

Elżbieta Bieńkowska
Commissioner for Internal Market, Industry, Entrepreneurship and SMEs
European Commission (EC)

INTROS

10 Years of Cooperation, a Decade of Innovation

This year marks a milestone in cooperation between the European GNSS Agency (GSA) and the Galileo Masters. For ten years now, the GSA and the Galileo Masters have worked together to transform exciting and innovative GNSS-based ideas from concepts into working applications and solutions that bring real benefits to Europeans.

I am proud of what we have accomplished together over the past ten years. The GSA was the first EU organisation to come on board with the Galileo Masters, bringing EU-level added value to the competition. The GSA is the only European Union agency operating' delivering space services and ensuring their update and security. It is our unique mission to serve as the essential link between space technology and user needs, transforming Galileo and EGNOS signals into applications and services that improve the lives of European citizens and ensure that they get a return on Europe's space investment. Galileo Masters has been instrumental in making this happen. Over the past ten years, the Galileo Masters has been a valuable partner in helping us to bridge the gap between ideas and the market. Together, GSA and the Galileo Masters have helped to nurture the innovation needed to support the downstream market for GNSS-based services and applications – a market that is forecast to produce over EUR 70 billion in annual revenue in 2025, with annual growth of over 6%.

Cooperation between the GSA and the Galileo Masters is helping to drive this growth, by annually awarding the best services, products, and business ideas that use satellite navigation in everyday life.

Innovation is of vital importance to the global competitiveness of the EU economy and space technologies are a key driver of innovation in Europe. I am excited to see how this year's competition entries leverage EGNOS and Galileo to boost this drive to innovation, and I wish them every success.

Looking further into the future, I look forward to more fruitful cooperation between the GSA and Galileo Masters, cooperation that will continue to drive economic growth in Europe and deliver the benefits of space to European citizens.

Carlo des Dorides
Executive Director
European GNSS Agency (GSA)

GSA – GROWING THE MARKET FOR SPACE-BASED SERVICES

Space Technology is a Key Driver of Innovation in Europe

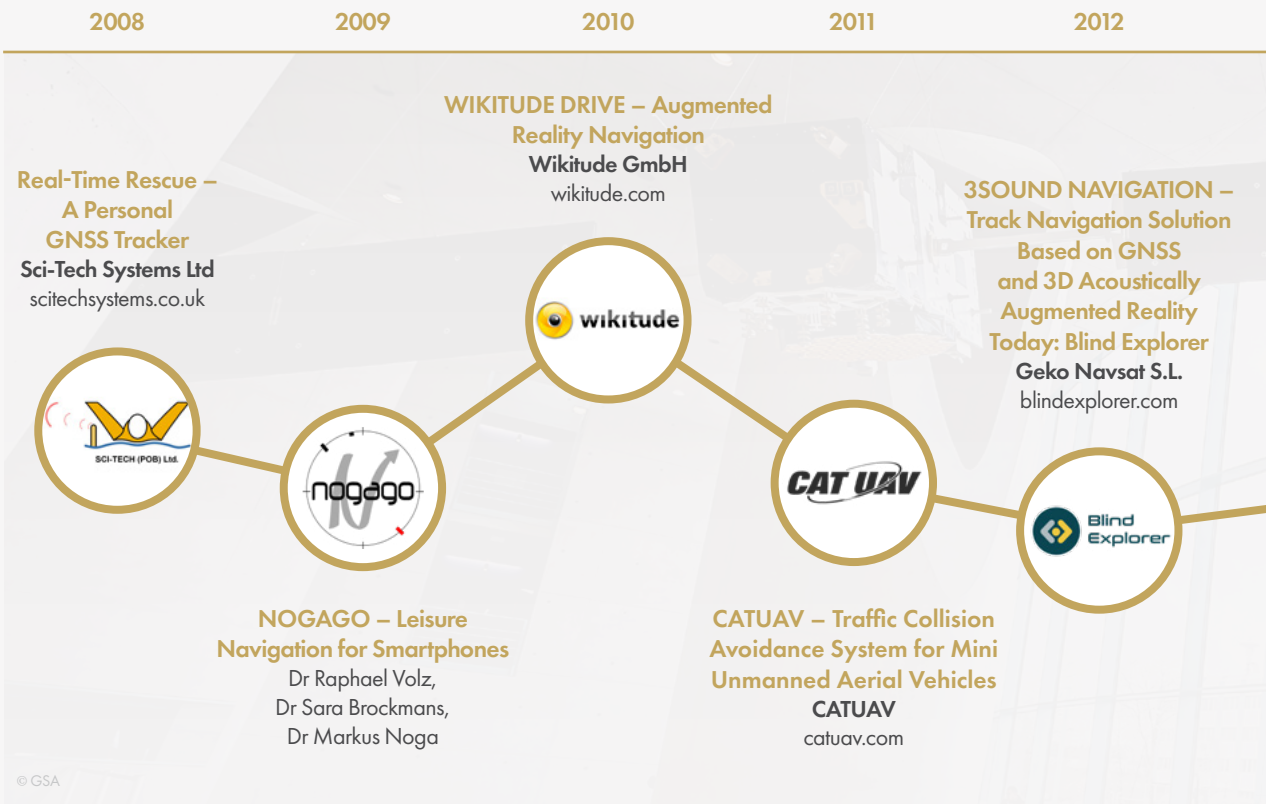
The European GNSS Agency (GSA) links space to user needs by translating Galileo and EGNOS signals into valuable and reliable services for European citizens. Delegated responsibility for Galileo and EGNOS service provision by the European Commission, the GSA has been tasked with growing the market for EGNSS-based services and ensuring that Galileo continues to meet the increasing needs of users. Key tools by which the GSA keeps its finger on the pulse of the latest trends on the GNSS market and in GNSS technology are its twin publications – the GNSS Market Report and the GNSS User Technology Report. The Market Report provides in-depth analysis of global developments in key GNSS market segments – both mass market and professional, while the Technology Report analyses the trends set to shape the global GNSS technology landscape. This comprehensive understanding of both sides of the GNSS ecosystem allows the GSA to help bridge the gap between technology developers and end users, ensuring that technological developments are user-driven and meet user needs. The GSA's market development efforts are already showing some impressive results. In the 18 months since the launch of Galileo Initial Services, millions of people are already using Galileo:

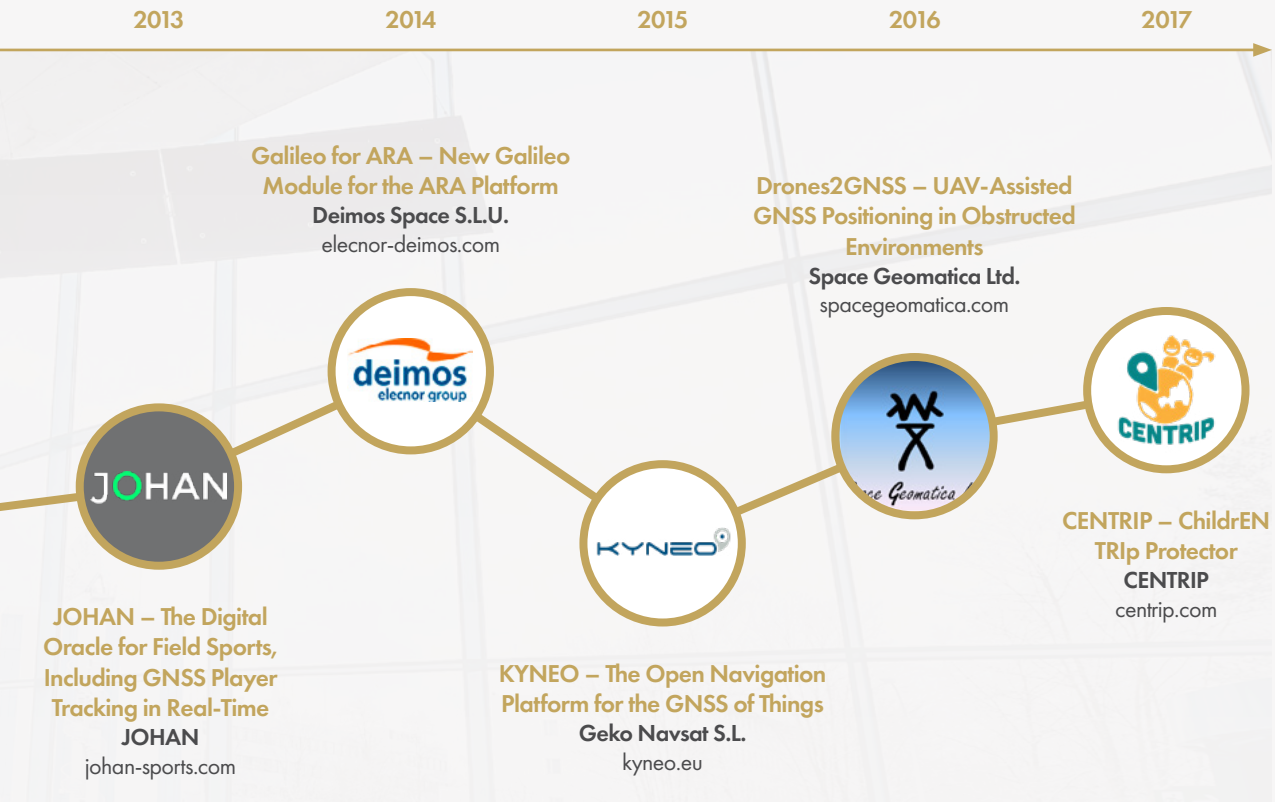
- 69 smartphone models are Galileo-enabled
- 400 million Galileo-enabled phones sold globally, with 1 million new phones sold every day
- 7.5 billion apps will use GNSS by 2019
- 96% of new chipsets support Galileo
- 81% of maritime receivers use EGNSS
- 80% of all tractors with guidance use EGNOS
- 59 drone receiver models use EGNSS
- There will be 400,000 Galileo base units in telecoms, energy and finance in service by 2021, and
- 100% of new car types sold in Europe feature Galileo-enabled eCall

The GSA's market expertise helps identify market needs and supports the development of EGNSS-based services and applications to meet these needs, thereby ensuring that users remain at the heart of EGNSS service provision.

More at: www.gsc-europa.eu

GALILEO MASTERS WINNERS – 10 YEARS GSA INVOLVEMENT




2013
2014
2015
2016
2017
Galileo for ARA – New Galileo Module for the ARA Platform
Deimos Space S.L.U.
elecnor-deimos.com
Drones2GNSS – UAV-Assisted GNSS Positioning in Obstructed Environments
Space Geomatica Ltd.
spacegeomatica.com
JOHAN
deimos
elecnor group
KYNEO
CENTRIP
JOHAN – The Digital Oracle for Field Sports, Including GNSS Player Tracking in Real-Time
JOHAN
johan-sports.com
KYNEO – The Open Navigation Platform for the GNSS of Things
Geko Navsat S.L.
kyneo.eu
CENTRIP – ChildrEN TRIp Protector
CENTRIP
centrip.com

SUCCESS STORIES

GSA Challenge winner 2017

CENTRIP

CENTRIP, the winner of the 2017 GSA Challenge, is making the world a safer place for vulnerable and at-risk people during group activities at any scale. The team behind it is developing state-of-the-art safety systems based on satellite navigation to facilitate discrete, effective monitoring of vulnerable groups at any time and in any environment to prevent disasters from happening. Since its success in the Galileo Masters, the idea has evolved tremendously. " For CENTRIP, winning the GSA Challenge was really the beginning of everything. The GSA believed in us, and that was part of the reason why we participated in the E-GNSS Accelerator, which we also won. We then partnered with an incubator, obtained funding, and got the traction and support we needed to start our company. As we were developing our system for a single application, we realised we were building a technology capable of much more. And there is still a lot to discover," says Ewa Kądziołka, founder of CENTRIP.

GSA Challenge winner 2016

Drone2GNSS

Drones2GNSS, the GSA winner in 2016, is solving the challenge presented by reduced GNSS accuracy in obstructed areas (e.g. under buildings, vegetation, or steep slopes). It features an unmanned aerial vehicle (UAV) that flies over obstacles and can automatically follow a topographic pole to provide precise coordinates. With the extra support of a EUR 500,000 grant from the General Secretariat of Research and Technology in Greece and industry partners, Drones2GNSS is currently working on providing a fully autonomous product. The GSA Challenge supported the development from a technical point of view, whereas the Galileo Masters covered the business aspects. Both provided invaluable input on how to transform the idea into a business case. "The GSA's was the most prestigious challenge because it represented the core of GNSS and featured real expertise related to game-changing products and applications. Drones2GNSS was a perfect fit for this demanding and most promising endeavour," says Dr Panagiotis Partsinevelos, developer of Drones2GNSS.

GSA Challenge winner 2012

3Sound Navigation

In 2012, GSA named 3SounD Navigation its winner for its idea to provide a guidance system for blind people that combines GNSS technologies and 3D sounds (binaural technologies). Today, 3SounD is changing its company name to Blind Explorer. Its solution is the best outdoor digital-guidance system available on the market for visually impaired people. Now that Blind Explorer's technology is patented, the team is currently validating their business model and incorporating the first accessible natural areas. Of the 12 ideas that received prizes as part of Galileo Masters, most were realised, but only went on to generate business and opportunities for a short time. This was different with the GSA Challenge. To this day, the GSA continues to look for projects in niche sectors that can have a real social impact on EU citizens through the use of Galileo. "We thought that the GSA might be interested in exploring new areas where GNSS and Galileo could be applied to add value, promote differentiation, and create new business opportunities. Thanks to its award, we established our company and received further support from the GSA – and later from the ESA BIC with its incubation programme – to produce and patent our solution," says Rafael Olmedo, developer of the Blind Explorer.

GSA Challenge winner 2008

Real-Time Rescue

Real-Time Rescue – a personal GNSS tracker won the GSA Challenge at Galileo Masters 2008. It combines local radio telemetry with EGNOS-corrected GNSS for precise positioning, which enables crews aboard sea vessels to track MOB casualties in the water in real time and retrieve them quickly and efficiently. This "first-responder" assistance addresses the gap in safety systems that rely on satellite communications to trigger remote search-and-rescue operations. The concept has also been expanded to cover all watersports users. The GSA Challenge was especially interesting to the team of investors backing real-time rescue because they had solid technical expertise, but limited business experience. The business incubation included in the GSA's prize was thus a key factor that the team felt would put their idea on the fast track to becoming an established product on the market. "Becoming the first triple winners in the history of the Galileo Masters was and still is a valuable accolade. The prize enabled us to create and study our first prototype in a target environment and get the technology right. The GSA's incubation prize was essential, as it gave us the business support and mentoring we needed to develop a strategy and business plan. This enabled us to develop a tested and functional prototype of our marine tracking system and get it ready for licensing to an interested manufacturer," says Peter Hall, developer of the personal GNSS tracker.

THE GLOBAL INNOVATION NETWORK FOR GALILEO

Developing GNSS applications with EU's Galileo Stakeholders

The most relevant and future-oriented GNSS stakeholders in Europe unite in the Galileo Masters – the world's largest innovation network for satellite navigation applications. Their goal is to systematically support emerging visionaries and achieve the integral promotion of space-based innovation and entrepreneurship for the benefit of the European economy and its citizens.

European GNSS Agency (GSA)

European Space Agency (ESA)

German Aerospace Center (DLR)

Federal Ministry of Transport and Digital Infrastructure (BMVI)

Galileo 5G IoT Challenge

Partner

University Challenge

Partner

GNSS Living Lab Prize

Partner

THE GLOBAL INNOVATION NETWORK FOR GALILEO

Regional Galileo Masters Network

Within the Galileo Master's Network, the focus is placed on the regional dimension to ensure a high level of diversity in the European Community and ultimately to accelerate the job growth potential it holds. Currently supported by 20 partner regions, the cross-regional network comprises about 140 stakeholders at a regional level. As the backbone of the competition's global network, they ensure that participants can access the support they need at any stage to launch their business all across Europe.


Norsk Romsenter
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AVIASPACE
BREMEN
STARTHAUS BREMEN
STARTHAUS BREMERHAVEN
Zuits
Innovative Tec Solutions
NVR
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cesah
esa business incubation centre
digitales.hessen
BLUE DOT
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POLISH SPACE AGENCY
arp
esa business incubation centre
Royal Institute of Navigation
IHK
bwcon
TTR
GeoNet.MRN
Czech Republic Ministry of Transport
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esa business incubation centre
AZO
esa business incubation centre
Bavarian Ministry of Economic Affairs, Energy and Technology
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bmvit
Science Park
The High Tech Incubator
Graz
esa business incubation centre
Montpellier Méditerranée Métropole
Bordeaux Technowest
ESTIA
cnes
GUIDE
aerospace valley
esa business incubation centre
BIC GIPUZKOA
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parque tecnológico

WHEN AND WHERE? – EXACT TIMING AND POSITIONING MATTERS!

SPECIAL PRIZE WINNER

SPORTS

Smart Gate – A Modern Time Measurement System

Smart Gate is a system that will be able to measure time precisely during sport activities. Precise times on ski/snowboard runs are used to improve skills and techniques during every training run. However, today's solutions are very expensive and many sport schools cannot afford professional equipment. Smart Gate is based on satellite signals which, thanks to an atomic clock, can provide timing at a level of precision not available in any consumer electronics. This makes time measurements not only much more accurate, but cheaper, as well. In addition, Smart Gate uses RFID technology to identify athletes using the solution. Combining all this data in one system offers the unique opportunity to create an online service for people passionate about sport.


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Piotr Cieslinski, Pro-Ton
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European GNSS Agency (GSA)

The GSA, a European community agency, works with the European Commission on a range of activities aimed at helping European entrepreneurs and businesses – especially high-tech SMEs, business incubators and related networks – commercially exploit EGNOS and Galileo. These marketing, promotional and R&D activities help to ensure that European industry maintains a competitive edge in the global satellite navigation market. EGNOS is Europe's first venture into satellite navigation and is available free of charge. It augments GPS and makes it suitable for safety-critical applications.It is followed by Galileo, a full-fledged global navigation system.

galileo-masters.eu/gsa

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Lycie – Drive Safely and Save Money

Lycie is the first mobile application that actively prevents traffic accidents and saves lives. The grand prize winner of ActInSpace France uses a CNES (centre national d'études spatiales) patent to detect abnormal behaviour both on the road and inside the car. After the phone is mounted on the dashboard and the car started to drive, real-time notifications are sent to the driver whenever a dangerous situation is identified. Lycie uses a machine-learning algorithm originally designed for satellite data to process smartphone data sources like cameras and accelerometers, as well as information from Galileo. The application learns while driving and warns drivers of potential dangers: Obstacles, cars suddenly changing lanes, or tiredness, for example. Safe driving will be rewarded under users' insurance policies.

Indeed, fewer accidents generate substantial cost reductions for insurance companies, which are then split among these companies, safe drivers, and Lycie. Due to Galileo's accuracy, Lycie brings life-changing safety to everyone. It also wants to contribute to the road safety objectives of the United Nations' goals for sustainable development.

Antoine Bocquier, Jean Galinowski, Jérémy Maisse, Guilhem Vavelin, Lycie
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Lycie

European Space Agency (ESA)

ESA's mission is to shape the development of space capability and ensure that investment in space continues to deliver benefits to the citizens of Europe and the world. ESA designs and implements the European space programme, including the development of technologies and infrastructure for satellite navigation, telecommunications and EO, the promotion of industries, and the endeavour to find out more about the universe. The ESA space solutions® network compiles a variety of expertise from Europe's space programmes to give any business a tailored solution, based on space systems, technologies and know-how. Through ESA's Business Incubation Centres, Technology Transfer Brokers and partners, Europe benefits from its space industry and increased global competitiveness.

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esa space solutions

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German Aerospace Center (DLR)

The German Aerospace Center (DLR) is Germany's national research centre for aeronautics and space. Its extensive research and development work is integrated into national and international cooperative ventures. As German Space Administration, the German federal government has tasked DLR with the forward planning and implementation of the German space programme, as well as with the international representation of Germany's space interests. Furthermore, Germany's largest project-management agency is also part of DLR. DLR is highly guided by industry's demand for innovative products and services. It also invests in promising technologies and offers its R&D capacities to customers. Numerous products have been successfully brought to market in cooperation with innovative enterprises.

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dlr@azo-space.com
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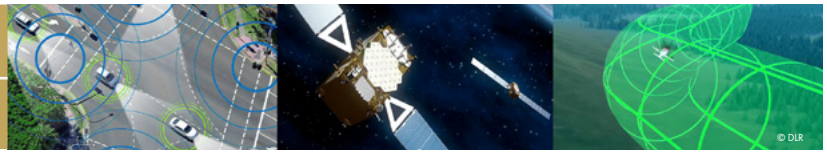
DRIVE AUTOMATION & AUTONOMY TO THE NEXT LEVEL – GALILEO FOR SAFE & SECURE SYSTEMS

DOUBLE WINNER

SPECIAL PRIZE WINNER

GNSS INTERFERENCE



GNSS Spoofing Detection and Signal Quality Checks Within the User Receiver

In the near future autonomous vehicles like UAVs and autonomous ships and cars will become commonplace. They will use GNSS for navigation in addition to "sense-and-avoid" capabilities. However, GNSS is vulnerable to both environmental effects (including multipath reflections and local interference) and malicious attacks. Deliberate jamming from personal privacy devices is a real menace, and spoofing – where GNSS signals are transmitted deliberately to deceive receivers – is now being reported in the real world. This will increase with the availability of low-cost SDR GNSS signal generators.

The innovative solution presented uses algorithms that can easily detect spoofing and other impairments. Its approach processes GNSS signals in the frequency domain with an innovation that significantly reduces the processing load. While most receivers provide three correlation points per satellite, this product provides the equivalent of 250,000 correlation points for every visible satellite in real time. This means the signal quality received can be established before the signals are used, and spoofers are spotted based on the presence of multiple correlation peaks.

Michael Turner, Airbus Defence and Space
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Code Blue – Life-Saving, Affordable, Simple to Use

Code Blue is an automated, affordable, and reliable CPR/AED stretcher equipped with GNSS/GSM/GPRS that saves lives if used within the first five minutes of a medical emergency. Heart disease accounts for one in three deaths in the U.S., and 95% of people in sudden cardiac arrest die before reaching the hospital. While quick bystander action can double the survival rate if CPR is applied and the victim is rushed to the hospital, there is one (twofold) problem: Bystanders typically lack CPR training and an awareness of where they currently are. Code Blue is intuitive enough to be used by a bystander who has never seen it before. It incorporates robotics and life-saving systems

that perform critical functions on their own. Code Blue's combined GNSS/GSM/GPRS system autonomously signals for rapid assistance, offers reliability, and increases the accuracy of the victim's location. The robust features of Galileo PRS will lower the risk of jamming and spoofing, which in turn will increase the victim's chances of surviving.

Jennifer Gammond, Mary Gammond, Javier Choc, Claudia Choc, Code Blue
Jennifer.gammond@yale.edu

German Federal Ministry of Transport and Digital Infrastructure (BMVI)

The German space industry plays a key role in the Galileo system, with OHB and Astrium having constructed all Galileo satellites and one of its two main control centres being operated in Oberpfaffenhofen. The BMVI supports high-quality economic growth by ensuring a sophisticated infrastructure for smart mobility and development. The Galileo Public Regulated Service (PRS) is the first encrypted navigation signal under civilian control. While its use by governments, security authorities, and critical infrastructure is evident, the signal's full potential is yet to be explored. Therefore, the BMVI is strongly committed to driving innovative PRS applications.

galileo-masters.eu/bmvi

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AZO & SpaceStarters

Carried out by AZO Anwendungszentrum GmbH Oberpfaffenhofen and Space Starters, the Galileo 5G IoT Challenge identifies innovative applications, services and business cases for the 5G IoT market based on the Galileo satellite system. SpaceStarters is a crowd-investing platform for space-based innovations that unites expertise in venture capital business with profound market knowledge, and enables investors to participate directly in the success of promising companies, which also come from the Galileo Masters.

galileo-masters.eu/iot

organised by

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GALILEO 5G IOT CHALLENGE

SPECIAL PRIZE WINNER

AR AUGMENTED REALITY

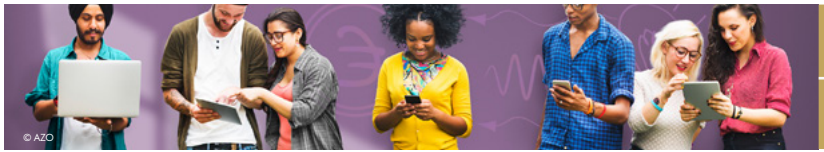
Location-Based AR Reality Platform of the Future

Locatify has built a dynamic cloud platform for delivering location-based content to mobile apps. It has realised an opportunity to create a tourism application and content management system for collecting and delivering professional, crowdsourced, location-based AR (augmented reality) and audio content. The app will harness Galileo NSS positioning data, modern smartphones, and cloud infrastructure to enable accurate,contextual delivery and storage of location-based content. Locatify's tourism app will track users' exact locations and interests, which will allow travellers to explore sites in unprecedented ways while enjoying contextual AR content and rich audio stories relevant to them. It will also enable locals to create and share content to a wider audience for free, resulting in increased tourism, education, and awareness of historical and local stories. In addition to providing geolocation and interest-based advertising, the Locatify app will offer a premium subscription service for accessing content remotely and removing ads.

Sam Liddell, Steinunn-Anna Gunnlaugsdottir, Leifur Bjornsson, Jack Feng, Omar Bechir, Locatify
sam@locatify.com
locatify.com

Locatify
Games & Guides Everywhere!

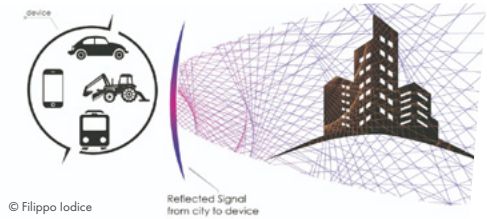
UNIVERSITY CHALLENGE – FROM THE LECTURE HALL TO THE BOARD ROOM



GNSS for Smart Cities

This project applies GNSS signals not only for positioning, but as a passive remote-sensing tool that uses the antennas present in all our cities as hotspots.

Using Copernicus mission data, it will be possible to rebuild a city from different angles. Signal data will be obtained from cellular devices and automatically guided machines. Every single user will be guaranteed information at any time of the day and in any area of the world. Thanks to the use of machine learning, deep learning, and neural networks, the project will do nothing less than create a sort of virtual world that can perceive any change in the real world. GNSS satellites are constantly broadcasting radio



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signals to earth, and part of these signals are reflected back from the earth's surface. The delay in the reflected GNSS reflected signals on the differential paths between direct and reflected signals will provide topographical information.

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AZO & GRACE

Carried out by AZO Anwendungszentrum GmbH Oberpfaffenhofen and the GNSS Research & Applications Centre of Excellence (GRACE), the University Challenge connects innovative thinkers with the business community to pave the way from university to entrepreneurship. GRACE is part of the Geospatial Institute (NGI) at the University of Nottingham, an internationally recognised centre of excellence in surveying, positioning, and navigation technologies. By providing business support, consultancy services, training, and testing for the exploitation of new ideas and the creation of new business opportunities GRACE serves as a hub for the GNSS community and beyond.

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UNIVERSITY CHALLENGE

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AZO

The GNSS Living Lab Prize is being continued by AZO and three living lab partners after having been initiated as part of the FP7 project GAINS (Galileo Advanced INnovation Services). The GNSS Living Lab Prize seeks to facilitate the emergence of user-driven, open innovation demand for services and GNSS applications. Living Labs – Public-Private-People Partnerships (PPPP) of firms, public agencies, universities, institutes, and users – in Bulgaria (Digital Spaces Living Lab) and France (Integrative Usage Lab) are now prepared to conduct a reality check trial with the winning application and up to two finalists.

galileo-masters.eu/livinglabs

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GNSS LIVING LAB PRIZE

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GNSS LIVING LAB PRIZE

SPECIAL PRIZE WINNER

LOCATION BASED SERVICES

GNSS Compare – A Research Lab in the Pocket

GNSS Compare is an open-source Android smartphone application that simplifies the development, implementation, and testing of new algorithms for processing raw GNSS parameters. The application itself, which is available to download for free on the Google Play Store, allows users to calculate their position using a chosen constellation (Galileo, GPS, or both), signal corrections, and an estimator of position, velocity, and time. It is a highly useful tool for helping students gain intuition regarding various steps in the GNSS signal processing chain. However, GNSS Compare is not just a smartphone application. It is a software framework – a formal, step-by-step definition of how raw GNSS parameters should be processed. This takes the effort out of algorithm development, implementation, and testing for GNSS researchers. Through the application's user interface, researchers can assess the quality of their algorithms in real time, including in comparison to implemented solutions. Meanwhile, Android software developers who may not be GNSS experts and want to use raw parameters can now use GNSS Compare's modules as building blocks for their applications.

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GNSS Compare
Research lab in your pocket

REGIONAL WINNER

LOCATION BASED SERVICES

SmartLocater – The Address of the Future

Precise and reliable address information is an essential quality feature of smart delivery services for all kinds of goods around the world. SmartLocater is determined to bring intelligence to any address in the world using the Galileo satellite navigation system. With free mobile and web applications that are already available, users are creating comprehensive addresses that include contact information, photos, and most importantly, Galileo coordinates. When this information is saved, SmartLocator automatically generates a unique QR code that makes it all easy to access, even when the code is printed on an address label. With just three keywords, the same address can easily be uploaded to any

e-commerce site or business that has integrated the SmartLocater widget into its system. SmartLocater adds value at every stage of the process: It addresses the need to increase the flexibility and punctuality of delivery services (as well as the accuracy of address information) in order to reduce last-mile delivery costs, which currently account for 28% of all related expenses.

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SMARTLOCATER

University of Malaga, Promálaga & Parque Tecnológico de Andalucía

The regional partners comprise two organisers: University of Malaga (UMA) is a public institution responsible for higher education with more than 2,300 teachers and 39,000 students. It has a long history of international collaboration with major technological companies.
Promálaga is a development and business promotion agency dedicated to job, wealth and welfare creation in the city of Málaga.
It's guided by the promotion of entrepreneurial spirit, business drive and investment in technology.

galileo-masters.eu/andalucia

organised by

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Austrian Research Promotion Agency (FFG)

The national funding institution for applied research and development in Austria offers a comprehensive range of services for enterprises, research institutions and researchers. Its Aeronautics and Space Agency connects such entities with the international aerospace world, implements Austria's aerospace policy, and represents the country at international aerospace committees – incl. ESA. Austria's ASAP programme, meanwhile, funds research on space science, technology, and applications. Finally, the agency acts as the central interface between Austrian interests and European programmes, FFG's Galileo contact point supports Austria's competencies in the field of satellite navigation and interacts with the GNSS community.

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AUSTRIA

REGIONAL WINNER

SPORTS

Lympik – Motivation and Fun for Sports- and Leisure-Activities

At the moment, the state of the art for most sports and competitions is radio timing, with results on printed paper or notes written by hand – but no analysis. Lympik's vision is to increase motivation and fun in connection with sports and outdoor exercise for everyone from children at playgrounds and in schools to highly professional athletes.

With Lympik, "virtual Olympics", school or company competitions can be organised as location-independent activities – e.g. in different cities at the same time. Lympik will be the platform that connects personal training, leisure sports, and outdoor game performance with the advantages of social media. In the future, Lympik intends to be not just a company, but a community. Users will get precise, real-time performance measurements and analytics with personalised results on their mobile devices. By comparing their performance and sharing great adventures with friends via social media, they will provide free advertising to operators of sports and leisure facilities.

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lympik

REGIONAL WINNER

HEALTH

SafeRoute – Pedestrian Navigation for the Blind

In unfamiliar urban areas, it is often difficult for the blind and visually impaired to find their way around. SafeRoute – Pedestrian Navigation for the Blind guides these people along safer paths through unknown terrain while providing important safety information on crossings and traffic lights. Pedestrian guidance benefits most from sub-metre GNSS positioning. This solution, which is more accurate and more widely applicable than other online routing systems, will exploit the public service availability of the Galileo satellite network. SafeRoute aids one of the most vulnerable groups – people with blindness – by addressing the specific need for accurate guidance on paths and advice on where to cross streets. The ability to get around

safely will improve these people's lives and promote their inclusion in social activities and the workforce. Thanks to worldwide map coverage from OpenStreetMap and a level of routing robustness that meets various standards of map data quality, SafeRoute can be used all over the world. In light of our aging society, people with blindness and impaired vision make up a huge market that will continue to present a strong business case.

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IHK Reutlingen

Baden-Württemberg, the federal state in the South West of Germany and home to 11 million inhabitants, is famous for its tourist highlights, such as the Black Forest and Lake Constance, its universities in Heidelberg, Freiburg, Karlsruhe, Constance, Stuttgart, Ulm, and Tübingen; as well as the companies Daimler, Porsche, SAP and Bosch. The state is known for its great writers like Friedrich Schiller and its people are known as „Tüftler", a term indicating a great enthusiasm for technical problems and their solution. Thanks to its open-minded spirit, Baden-Württemberg is ideally positioned to participate in the Galileo Masters. The twelve Chambers of Commerce and Industry represent the interests of around 607,000 companies and provide services to the region's economy.

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BASQUE COUNTRY / SPAIN

REGIONAL WINNER

DISASTER MANAGEMENT

Galifire – The Efficient Way to Detect and Extinguish Wildfires

The main objective of Galifire is to develop an efficient way to detect and extinguish wildfires. With Galifire, it will be possible to determine the exact coordinates of wildfires and their hotspots. The solution will also enable users to ascertain the area of a fire and assess the corresponding danger level. It will alert nearby fire stations and facilitate efficient fleet management. Furthermore, real-time routing will be developed to provide fire trucks, police cars, and other emergency vehicles with the best and fastest path to the hotspot at hand. Galifire will also make fire extinction more efficient by improving efforts involving firefighting planes. Galifire will enable firefighters to work more effectively by supporting communication and coordination among all the emergency services involved (fire trucks, fire planes, police, etc). The way in which Galifire implements location-based systems for all these services is the best and most efficient way possible to extinguish fires.

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Department of Economic Development and Infrastructures of the Basque Government

The organiser boosts the participation of Basque projects in the Galileo Masters. With the help of the SPRI agency and BIC Gipuzkoa, the Information Society Division manages the competition in Euskadi and sets a regional prize. The Ministry for Economic Development and Competitiveness of the Basque Government coordinates the design and implementation of the Basque R&D&I Policy. That policy is widely known for its strong regional compromise with knowledge and industrial development. Manufacturing plays a major role in the Basque industry and the Government is committed to support its industrial base by promoting higher value added production through R&D&I.

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REGIONAL WINNER

AGRICULTURE

Acrai – Non-Chemical Weed Removal for Agriculture

Acrai's vision is to make agriculture more sustainable and efficient. It builds autonomous robots for the detection, localisation, and automatic removal of plants, the initial aim of which is to replace the use of chemical weed killers. Chemical herbicides are problematic for several reasons. Their unknown long-term consequences for humans and the environment are leading to ever more stringent statutory regulations and prohibitions, and the general public is also growing more and more sceptical of their use. The biggest problem for farmers, meanwhile, is that weeds are becoming increasingly resistant, rendering herbicides useless.
Acrai develops autonomous agricultural robots that solve all the problems mentioned to the benefit of conventional and organic agriculture, as well as of humans and the environment. Its system combines deep-learning-based computer vision for detecting and localising crops with the automation of proven, purely mechanical methods of weed removal. The solution relies heavily on the use of GNSS to navigate and relocate robots on the field.

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ACRAI

AZO

AZO is an international networking and branding company for the European space programs, supporting entrepreneurship with more than 500 companies founded in Europe to date. Over the last 15 years, AZO has established the leading European space cluster innovation network for the satellite downstream market, while providing the necessary marketing and promotion platform, incubation and expert network, as well as regional funding programmes with the objective to increase the uptake of business cases. AZO with its ESA BIC Bavaria, has supported 130 company foundations in Bavaria. AZO organises the most important space-related innovation Masters competitions such as Galileo-Masters, Copernicus Masters, INNOspace Masters and Space Exploration Masters.

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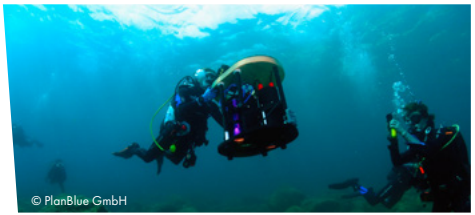
BREMEN / GERMANY

REGIONAL WINNER

MARINE ENVIRONMENT

Intelligent Seafloor Mapping to Improve Conservation and Industrial Activities

While Earth's atmosphere and ground surfaces are wellmonitored by satellites, there are no satellites in its oceans. PlanBlue has developed intelligent software linked to a specific underwater (hyperspectral) camera that facilitates accurate mapping of the seafloor. The high-quality data it produces can be used to explore the unknown 95% of the oceans whilst improving both conservation and industrial activities. In comparison to traditional monitoring, PlanBlue's technology is faster, more accurate, geo-referenced, and up to 75% cheaper. Its seafloor maps feature interactive color-coding and can be interpreted by anyone, from policy-makers to the general public. PlanBlue provides a new monitoring technology that is changing the way we map and assess seafloors and enabling us to tackle present-day challenges such as climate change. These maps will speed up climate legislation and aid underwater construction industries.



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Dr Hannah Brocke, Nils Oehlmann, PlanBlue GmbH
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PLANBLUE

Aviaspace Bremen e.V.

AVIASPACE BREMEN is an association of dedicated companies and application-oriented research institutes in and around the Free Hanseatic City of Bremen.
The association's objective is to improve cooperation and develop innovative projects. AVIASPACE BREMEN connects companies, scientific institutions and authorities. It focuses on topics such as networking, technology transfer, and economic growth by promoting startups and young entrepreneurs. The purpose is to develop a technical and organisational network of producers of end-products, suppliers and service providers, and scientific institutions in the fields of materials science, highlift systems, engineering, manufacturing technology, earth observation, and robotics.

galileo-masters.eu/bremen

organised by

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REGIONAL WINNER

LOCATION BASED SERVICES

MEDEA – Accurate & Affordable Real-Time Positioning

MEDEA is an innovative GNSS receiver concept that provides accurate, real-time, and affordable geolocation to address the navigation requirements of emerging trending technologies such as unmanned vehicles, LBS, and precision farming. Such technologies rely on accurate geolocation solutions as a key element of their applications. In order to be scalable, GNSS solutions have to be not only accurate and reliable, but also affordable. High-end GNSS solutions for geo-location often offer a level of accuracy that exceeds the actual requirements and typically come with a very high price tag, rendering them not scalable at all. MEDEA will thus enable mass-market applications that need access to accurate and affordable geolocation. MEDEA is the cornerstone

of a navigation ecosystem that will provide precise, end-to-end geolocation service to premium, mass-market end users. Its fully configurable GNSS receiver relies on a multi-constellation, multi-frequency architecture that is already being demonstrated with an operational prototype. MEDEA relies on EGNOSS and Galileo's new E5a/b signals, which are an important asset in achieving the desired level of performance.

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MEDEA
ROKUBUN

Government of Catalonia

The Government of Catalonia conducts policy, manages the Government's Administration and holds executive and regulatory powers.
The Government of Catalonia is developing SmartCATalonia, the strategy that is designed to make Catalonia an international smart region benchmark. It aims to take advantage of the digital technology and information, in order to encourage innovation in public services, foster economic growth and promote a more intelligent, sustainable and integrative society. These strategy goals are to improve the services provided to citizens, by means of a more efficient and intelligent use of available information in real-time.

galileo-masters.eu/catalonia

organised by

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Czech Republic

Space exploration and research have a long tradition in the country: Intercosmos 1, launched in 1969, was the first satellite that carried instruments developed in the former Czechoslovakia. Dozens of Czech instruments and systems have been deployed over the past 20 years of space activities, including both terrestrial environment explorations and planetary missions. The Czech Ministry of Transport has a mandate given by the Czech Government to coordinate all national space activities. It is responsible for Czech membership in the European Space Agency, EU space policy, satellite navigation development, space applications and partnership with the European GNSS Agency (GSA).

galileo-masters.eu/cz

organised by

Czech Republic Ministry of Transport

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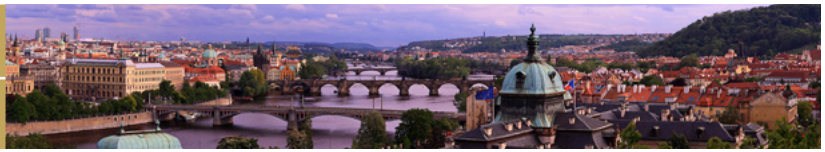
CZECH REPUBLIC

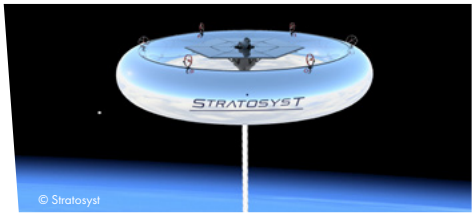
REGIONAL WINNER

SMALL SATS



Stratosyst – A Static Astronomical Observatory In Stratosphere

Since Earth's atmosphere blocks out most infrared wavelengths, humankind currently uses satellites to obtain infrared data and explore the universe. Meanwhile, the number of orbitalinfrared observatories is low, which makes the procedure for obtaining customer-specific data very time-consuming and costly. Stratosyst has thus developed a high-altitude platform for infrared data acquisition in the stratosphere. The advantage of this kind of observation is that the sky/universe can be observed for an extremely long period of time in conditions comparable to orbital satellites at a fraction of the cost. Moreover, the hardware can be recovered after the end of each mission. The first prototype will be a fully functional infrared observatory which will stay in the stratosphere and maintain its position over an extended period of time. The position of the platform will be feedback-controlled by GNSS data.



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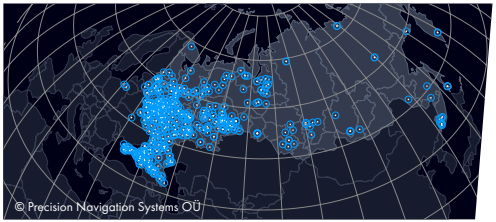
STRATOSYST

REGIONAL WINNER

HIGH PRECISION

HIVE – Solution for Super-Accurate GNSS Navigation

HIVE is a cloud-based solution for highly accurate GNSS positioning and navigation that helps position, navigate, and track drones, robots, and other autonomous GNSS-equipped machines with up to centimetre-level precision. In order to improve their positioning accuracy, autonomous vehicles like these need to be connected to a ground-based, continuously operating reference station (CORS) that uses GNSS. With thousands of CORS facilities operating as local networks or single stations around the world, the challenge lies in obtaining easy access to all the CORS correction data available. HIVE's cloud-based software combines



unlimited numbers of fragmented GNSS CORS facilities in a single solution and provides easy access to all of them. It thus serves as an instrument for creating a united European GNSS CORS infrastructure and enabling next-generation autonomous machines to build a better future for us all.

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HIVE

Tartu Science Park & Tallinn Science Park Tehnopol Foundation

Tartu Science Park (TSP) is the oldest science park in the Baltics. For almost 25 years it has provided the infrastructure, business consulting, technology transfer, and networking services local enterprises need to raise their competitiveness on the global market. TSP also cooperates closely with the University of Tartu and Tartu Observatory.
Founded in 2003, Tehnopol is a science and business campus that aims to advance technology-based entrepreneurship and bring scientists and entrepreneurs together. It is currently home to 200 companies. To foster the growth of businesses capable of generating significant added value, Tehnopol offers startup incubation and business development services tailored to companies in ICT, green technology, and healthcare technology.

galileo-masters.eu/estonia

organised by

Tehnopol

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ESA BIC Sud France

The ESA BIC Sud France promotes entrepreneurship based on technology transfer from space to other domains and the development of services and applications from space technologies. Created in 2013, it is managed by Aerospace Valley in close cooperation with SAFE Cluster and the French Space Agency in Toulouse. It is run by structures that support the creation of innovative companies in Aquitaine, Midi-Pyrénées, Languedoc-Roussillon and Provence-Alpes-Côte d'Azur, including GUIDE, Paca-Est Incubator, ESTIA Entreprendre, CEEI Théogone, Bordeaux Technowest and the BIC Montpellier Mediterranée Métropole. ESA BIC Sud France encourages entrepreneurs to promote and exploit existing space-related patents.

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FRANCE

REGIONAL WINNER

AGRICULTURE

Low Cost Guaranteed Precision Localisation for Safer Robots

Precision agriculture presents a solution for more ecological practices, but the high investment cost is a barrier to adoption for farmers. AgreenCulture has thus developed a low-cost RTK localisation system that offers both integrity and centimetre-level precision. The integrity attribute enables robots to confirm their position, which helps prevent them from leaving a defined perimeter. The system continuously calculates its positioning using GNSS to tell robots when to go and when to stop, which provides for safer autonomy. AgreenCulture can mainly be used in agriculture at present, as precision is crucial in optimising agricultural input and keeping robots from pulling out crops by mistake. Tested in 2018, the solution could be used in airports and on railways, as well. Galileo services have made AgreenCulture a more robust system with faster convergence and improved navigation continuity. The idea is to present a robust, cost-efficient GNSS navigation system for professionals and the premium mass market that supports the joint development of robots.

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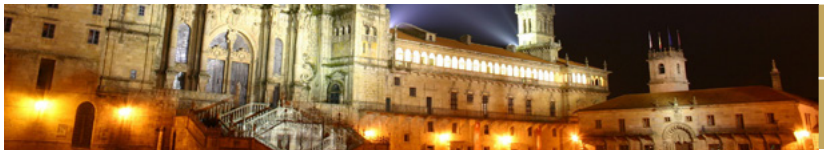

REGIONAL WINNER

UAV

NITROFIREX RPAS – Aerial Forest Firefighting at Night

Wildfires and drugs are causing human and ecological harm, as well as high economic losses. The need to combat these two modern plagues in our society is a maximum priority. Nitrofirex is a project that integrates available RPAS technologies in order to achieve operative capabilities that can be applied at night to battle wildfires and fumigate drug plantations. The application's objective is to spray a significant amount of any type of agent at a pre-determined point in the atmosphere.
In manned/unmanned operations as innovative as those planned by Nitrofirex, the information provided in real- or near-real time by GNSS elements is fundamental to the proper planning, coordination, and execution of RPAS flights.

Meanwhile, forest firefighting aircraft and drug plantation fumigation are also important lines of business that generate billions within the global aviation sector. Strangely enough – especially in comparison with all the other segments of aviation, where innovations are readily apparent – no modern aeronautic technology has been used in this branch until now.

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NF Advanced Engineering
a Nitrofirex company

Vigo Free Trade Zone Consortium

Galicia, one of Spain's 17 autonomous regions, has an area of 29,500 square kilometres and more than 2.5 million inhabitants. The region is a hotbed of education and innovation. It is home to three universities and a large number of nationally acclaimed R&D centres for Forestry, Marine, Automotive, Shipbuilding, Mining, Wind, Hydroelectric Energy, Food and Agriculture. The Vigo Free Trade Consortium is a public institution encouraging international trade and economic development in Galicia since 1947. As an economic development agency, it serves as the main developer of business parks in its area and provides companies with many services. In 2010, the network of parks in Vigo's free trade zone generated >25% each of the total wealth of the Vigo Metropolitan Area and of its employment.

galileo-masters.eu/galicia

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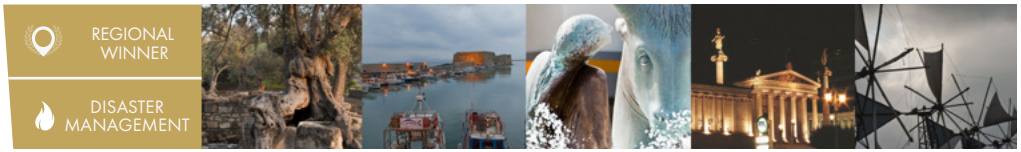
GREECE

Technical University of Crete

The Technical University of Crete is a dynamic engineering university with a clear mission to expand knowledge, pursue excellence and benefit society through high-level research and education. It is one of the two most active universities in the country with the highest index of research publication impact. SenseLab Research Group is a leading interdisciplinary research entity in Space informatics, which develops innovative solutions for Unmanned Aerial Systems, Earth Observation and GIS. SenseLab has been distinguished through several international awards for developing innovative products, including autonomous "smart" drones, visualisation platforms, location-based and geotechnical related services

galileo-masters.eu/greece



ReTiMoS – Real-Time Monitoring of Slopes and Landslides with Low Cost GNSS Receivers

Geosysta's real-time, cloud-based software Minefeed produces reliable storage, evaluation, and alerts for slope stability monitoring based on records captured by topographic and geotechnical instruments. Based on Minefeed users' demand for low-cost, automated, GNSS-derived monitoring of areas prone to such incidents, Geosysta has designed a system for real-time monitoring of slopes and landslides – ReTiMoS. It relies upon low-cost Galileo and Real Time Kinematic (RTK) enabled GNSS boards to serve as system nodes for displacement measurements. The system, which will require little capital for initial installation, can be used by the mining sector, highway operators, and local authorities without significant experience in the field of slope stability to address the safety issue of upcoming or imminent landslides. The system can be easily transferred from one location to another to increase the number of areas monitored. ReTiMoS will address the increasing socio-economic costs of landslide-prone areas.

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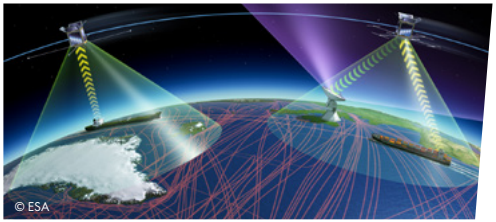
REGIONAL WINNER

HIGH PRECISION

POSEIDON – Maritime AI Navigation Solution

Deep Blue Globe is a startup based in Darmstadt (Germany) that develops artificial intelligence (AI) solutions based on Earth observation data, satellite navigation, and communication services. POSEIDON is a solution that optimises ship routing to save time, fuel, and money on any kind of journey (from regional to international) while factoring in real-time maritime traffic and weather conditions. POSEIDON can be used by all kinds of fleet operators – including shipping companies, fisheries, ferries, and cruise liners – as well as by small maritime operators and sailors. It makes it possible to follow optimal routes using only the infrastructure that ships already have on board.



Benefits:

- Reduced costs thanks to lower fuel consumption
- Shorter maritime journeys
- Automatic route optimisation and re-planning
- Increased safety during maritime navigation
- Reduced CO2 and SOx emissions
- Support for unmanned maritime navigation systems

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Deep Blue Globe

Centre for Satellite Navigation Hesse (cesah)

The ESA Business Incubation Centre (BIC) in Darmstadt is managed by cesah, a competence, information and incubation centre for satellite navigation. It is supported by its shareholders, the Region of Hesse, the City of Darmstadt, and renowned scientific and industrial partners. Located in the vicinity of the EuropeanSpace Operations Centre (ESOC), cesah supports the development and marketing of business ideas and startups in the satellite navigation domain. cesah is supported by digitales.hessen, a programme of the Hessian Ministry of Economic Affairs that supports the Hessian ICT sector in its market development, as well as SMEs in their efficient and creative use of ICT.

galileo-masters.eu/hesse

organised by

cesah Centrum für Satellitennavigation Hessen

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National Space Centre

Supported by a highly skilled workforce, Ireland's knowledge-based economy and strong technology sector have given the country the highest concentration of ICT activity and employment in the OECD. Ireland's ICT sector also attracts global investment, with 7 of the world's top 10 companies now operating from the country. ICT also accounts for EUR 50 billion in Irish exports. The National Space Centre, located in the South of Ireland, is Ireland's only teleport. It is involved in a number of emerging satellite technology projects, including the development of Satellite Automated Information Systems (SAIS) and marine mapping feeds with ESA and has provided technical support services for the European Galileo satellite navigation programme.

galileo-masters.eu/ireland

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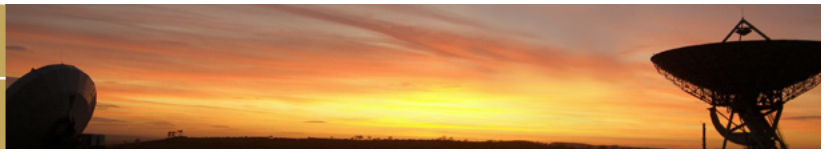
IRELAND

REGIONAL WINNER

UAV



Jack in the Box – UAV Persistent Surveillance

Self-contained, tethered, and aircraft-deployable, the Jack in the Box drone system provides real-time visual data and pinpoints locations to assist emergency services and disaster relief in remote or inaccessible areas. It monitors up to 300 square kilometres from a fixed position and supports flight times of up to 500 hours. It can also operate in adverse environments without risking lives. Jack in the Box can provide reliable positioning data to support emergency services, environmental protection, government bodies, civil defence, and border control on land, at sea, and in remote locations. To do so while supplying live, high-quality streaming video, it deploys a self-contained drone "package" that is affixed to a tether and fuel supply.

The customer benefits include reliable real-time data, extended flight times, re-usable hardware, the ability to network multiple devices, variable payload options, and cost-efficiency compared to standard aircraft. Jack in the Box also presents no threat to other aircraft. The system uses GNSS data to compute the precise location of individuals and assets at risk while real-time video footage of events is relayed to a command centre via communications satellite.

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REGIONAL WINNER

LOGISTICS

SigmaQ – Upgrading Railways from the Air

Rail companies' lack of geographic data has becomea crucial issue in train development, train infrastructure, and the placement of signals and switches along rail corridors. To address related challenges in terms of safety and efficiency, SigmaRail has developed SigmaQ, a drone-based solution designed to enhance geolocation, cut costs, and increase safety. The system is already being used to geo-localise assets and test maintenance efforts on high-speed lines. Galileo plays a critical role in the performance of SigmaQ by providing geographic information for digitalised data. The integrity, high accuracy, and availability

of Galileo services will improve the current implementation of the solution. Meanwhile, the accurate geolocation of assets will also be key in automating drone operations and deploying new systems.

Mario Fernández Marín, Jorge López Sánchez, Angel Marivela Pedraza, Alba Coello Romero, SigmaRail
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SigmaRail

SIGMAQ

madri+d Foundation

The Madrid region represents the primary hub of Spanish industry, research, and education in the aerospace sector. It accounts for around 92% of the country's aerospace activity, both in terms of direct employment and turnover. The Madrid region is also home to a large number of public and private universities and boosts Spain's highest level of investment in R&D. The madri+d Foundation supports the creation and early consolidation of new technology based firms. Since 2002, it has supported 600 startups generating > EUR 250 million in total turnover and > 3,500 jobs. madri+d works closely with its network of universities, incubation centres, research and entrepreneurial institutions.

galileo-masters.eu/madrid

organised by

fundación para el conocimiento madri+d
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The Netherlands Space Office (NSO)

The Netherlands Space Office (NSO) was established by the Dutch government to develop and implement its country's long-term space programme. In addition to serving as the Dutch space industry's representative in international space organisations like ESA and NASA, NSO forms the central point of contact for the space community within the Netherlands. Moreover, NSO also seeks to educate the general public – and specifically students and teachers – about space (science, applications, and exploration) in an open and innovative manner. Finally, NSO invests in programmes that foster the commercial market for applications based on the utilisation of space data.

galileo-masters.eu/nl

organised by

Netherlands Space Office

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THE NETHERLANDS

REGIONAL WINNER

AUGMENTED REALITY

Arworld – Creating and Sharing 3D Content in the Real World through AR

Arworld is a platform for creating and sharing 3D content in the real world through augmented reality (AR). It will allow users to create 3D content and permanently place it in the real world for others to interact with using mobile devices.

Arworld aims to connect its AR Cloud infrastructure to a web-based 3D editor to enable people to express their creativity on a scale never seen before. The platform is designed to appeal to a wide audience of both content creators and consumers with its simple interface and sandbox nature. It will allow creative spirits to unleash their imagination, history enthusiasts to rebuild ancient temples, and architects to show their clients the homes of their dreams. AR Cloud technology addresses the shortcomings of GNSS in displaying geolocated AR content to multiple users. In turn, GNSS provides continuous positioning when the visual positioning system is not being used. It reactivates AR Cloud's positioning more quickly and can provide incentives for users to map new environments and contribute to AR Cloud.

Peter Vaník, Matej Poliaček, Benjamin Thomas Ringrose Torn, Cedric Ia, Moritz Link, ESA
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REGIONAL WINNER

SAFETY & SECURITY

Norgeskart – Location Tracking for Search and Rescue Missions

The winning solution equips volunteers from the Norwegian Red Cross Search and Rescue Corps not only with information on their rescue mission but also with a personalised link, which activates the Norgeskart app on the volunteer's phone and sends the GPS location in the background. This allows the Mission Leader to see on a map where the available volunteers are located and therefore save lifes.

The Norwegian Red Cross Search and Rescue Corps is the country's largest voluntary rescue organisation and a part of the Norwegian Red Cross. It has more than 5000 active and trained

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missions in the mountains, at sea and in urban areas. The Search and Rescue Corps has procedures in place to coordinate volunteers when a mission starts, however the handling of location-based information and GPS tracks often relies on manual steps, leading to loss of time in critical situations.

Robert Sasak, Norgeskart
Lars Pesch, Anders Sagevik, SAR Mission Leader
Peter Morihladko, Elin Manger Rørosgaard, Freelancer
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Norwegian Space Centre

The Norwegian Space Centre (NSC) is a government agency under the Ministry of Trade and Industry. Its mission is to ensure that Norway benefits as much as possible from its space activities. NSC's areas of focus include activities in which Norway can compete in the global market for space-related goods and services, and which to a great degree are based on national qualifications and needs. In addition to promoting the development, coordination, and evaluation of the country's space activities, NSC supports Norwegian interests through the European Space Agency (ESA). Norway's participation in the EGNOS and Galileo programmes is also actively managed by NSC.

galileo-masters.eu/norway

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POLAND

Blue Dot Solutions

Poland is one of the biggest and fastest-growing markets for IT, mobile, transport, and entertainment products and services in the EU. It also has a growing investment scene interested in funding new applications and technological solutions. After joining the EU (2004) and ESA (2012), Poland hassignificantly increased funding in R&D, especially in the space sector. At the same time, there is a substantial large industrial base interested in digitising its operations. Blue Dot Solutions (BDS) is a Polish SME active in the GNSS and EO domains.
In addition, BDS supports other entities aspiring to the space sector by offering acceleration and incubation programmes, access to finance and contacts with potential users. BDS maintains the biggest Polish website dedicated to the space sector – Kosmonauta.net.

galileo-masters.eu/poland

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BLUE DOT SOLUTIONS

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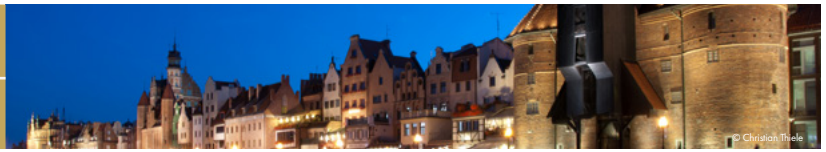
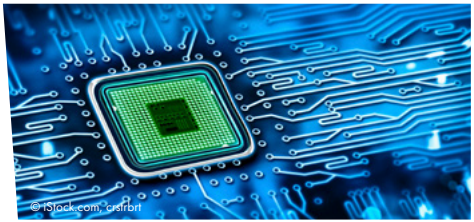
REGIONAL WINNER

HIGH PRECISION



NaviSoC™ – A Precise, Low-Power GNSS Receiver with MPU

NaviSoC is an all-in-one, single-chip solution capable of bringing reliable, high-precision positioning to mass-market users and applications. It contains a miniature GNSS receiver equipped with an application microcontroller (MPU) and comes with an SDK that simplifies user application development. This feature sets NaviSoC apart from other GNSS receivers and can be especially important for IoT applications and autonomous systems. No product of this kind has been brought to market, which is why NaviSoC could galvanise future segments of GNSS users and take automation to the next level. It can also drive the market for reliable, low-cost, high-precision GNSS systems as an open-platform solution. NaviSoC's navigation component is a multi-frequency GNSS receiver that can receive Galileo, EGNOS, GPS, GLONASS, BeiDou, and QZSS signals simultaneously. Despite being full integrated on silicon, it offers unlimited access to raw GNSS data on any level and could be used in tandem with an external IMU to complement its PNT functions with non-GNSS sensors. NaviSoC could help promote the market for high-precision applications at a low cost and serve as the basis for many other innovative products.



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Dr Tomasz Radomski, INOWATRONIKA
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NAVISOC

ChipCraft

DOUBLE WINNER UNITED KINGDOM

REGIONAL WINNER

GNSS INTERFERENCE

GNSS Spoofing Detection and Signal Quality Checks Within the User Receiver

In the near future autonomous vehicles like UAVs and autonomous ships and cars will become commonplace. They will use GNSS for navigation in addition to "sense-and-avoid" capabilities. However, GNSS is vulnerable to both environmental effects (including multipath reflections and local interference) and malicious attacks. Deliberate jamming from personal privacy devices is a real menace, and spoofing – where GNSS signals are transmitted deliberately to deceive receivers – is now being reported in the real world. This will increase with the availability of low-cost SDR GNSS signal generators. The innovative solution presented uses algorithms that can easily detect spoofing and other impairments.
Its approach processes GNSS signals in

the frequency domain with an innovation that significantly reduces the processing load. While most receivers provide three correlation points per satellite, this product provides the equivalent of 250,000 correlation points for every visible satellite in real time. This means the signal quality received can be established before the signals are used, and spoofers are spotted based on the presence of multiple correlation peaks.

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AIRBUS

The Satellite Applications Catapult

The Satellite Applications Catapult is an independent innovation and technology company, created to foster growth across the economy through the exploitation of space.The Catapult helps organisations to exploit satellite technologies and brings together multi-disciplinary teams to generate ideas and solutions in an open innovation environment. Their world-class facilities and expertise enable the best businesses, researchers and end-users to work together to develop new satellite-based products, services and applications, translating ideas from concept to market. The Catapult allows the UK to boost the business support provided to all entrants, and vastly expand on the range of available programmes such as for investor readiness and ideas accelerators

galileo-masters.eu/uk

organised by

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VALENCIAN COMMUNITY / SPAIN

REGIONAL WINNER

SAFETY & SECURITY

Val Space Consortium

Boasting an excellent communications network, modern infrastructure, quality industrial land, and skilled entrepreneurs, the 3 provinces of Valencia, Castellon, and Alicante offer an ideal place for companies to settle and grow. Val Space Consortium was created in 2010 to combine Valencia's efforts in the space sector and increase their impact and international competitiveness. Composed of Generalitat Valenciana, the city administration of Valencia, Universitat Politècnica de València, and Universitat de València Estudi General, it performs scientific research and renders technological development services in space-related fields. Through collaborations with ESA and other institutions, the consortium facilitates European space development.

galileo-masters.eu/valencia

organised by

VSC VAL SPACE CONSORTIUM

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SAFEman – Real-time Positioning and Health Status Monitoring of Firefighters

SAFEman is an individual low-cost solution designed to monitor in real-time the position and health status of our firefighters and other emergency corps in order to rescue them faster in case of extreme emergency. It consists of a wristband equipped with multiple monitoring systems and an emergency button working in conjunction with a transmitter located on the firefighter's helmet.

The system sends the accurate location of each firefighter to the control center every 30 seconds, thanks to the Galileo GNSS Search & Rescue Service, avoiding the loss of human lives because without SAFEman, they could not be located and therefore evacuated on time before the fire reach them. Also, it is always connected to the wristband via Bluetooth connection, so if the wristband detects any anomaly like a high rate pulse alert or that the firefighter is laying for more than 3 minutes without moving, an emergency signal is sent to the control centre. This fast, precise and secure location system will allow locating them faster and receive in real-time alerts sent by the own firefighters with their wristband. SAFEman is focused on professional emergency corps but in future this technology could be applied to other people like risky outdoor athletes.

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SAFEman by Stratolloon

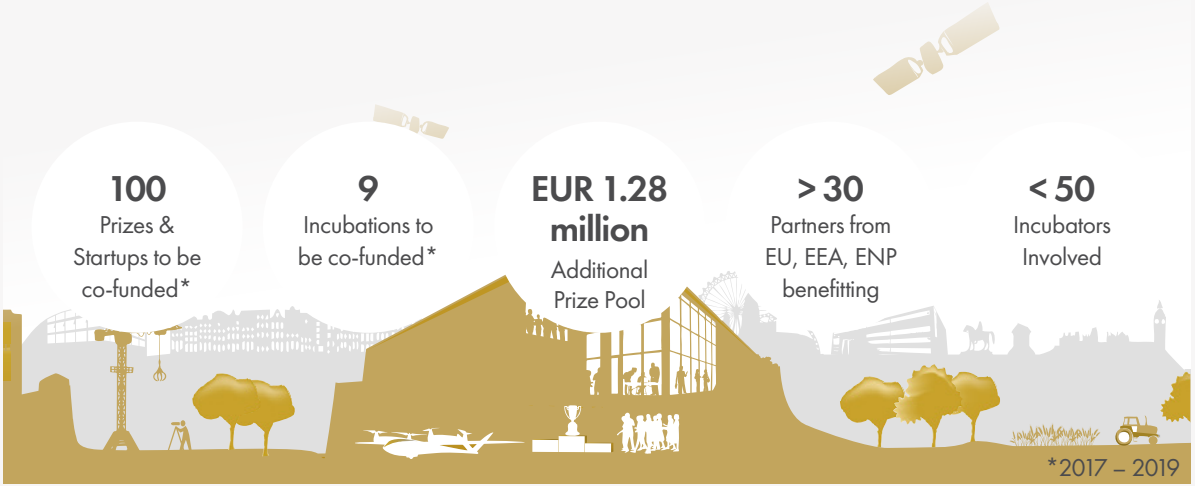

GALILEO MASTERS
10 YEARS ESA Cooperation
(SPACE + INNOVATION)
x ENTREPRENEURSHIP
= GROWTH!

E-GNSS ACCELERATOR

Boost Your Region with High-Tech Innovation

Since 2004, the Galileo Masters serves as accelerating instrument for startups and entrepreneurs with the most forward-thinking applications based on satellite navigation. Until today, the competition remains to set benchmark levels of space-related innovations for Europe.

From 2017 until 2019, this success story is further strengthened thanks to the new E-GNSS Accelerator. Funded by the European Commission, it is the first Accelerator for the European Galileo programme enabling partners and participants to foster the Galileo/EGNOS market uptake on a broad scale.



Benefit as Galileo Masters Partner Region

- Co-financing of EUR 10,000 for your regional prize
- Additional EUR 43,000 for further services if your winner is among the top 3 Galileo Masters startups
- More attractive prizes to be offered within your challenge
- Retrieval of innovative satellite navigation data business ideas for daily use & corresponding development into real commercial ventures
- Key position for your country in the implementation of Europe's new Space Strategy
- Access to 140 GNSS stakeholders such as EC, GSA, ESA, DLR, BMVI and many more
- Driver of innovation of Europe's first E-GNSS Accelerator

Who's Eligible?

The E-GNSS Accelerator creates multiple benefits for the Galileo Masters Regional Prize partners from EU28, the European Economic Area (EEA) and European Neighbourhood Policy (ENP) countries.

Get Involved

Find out more about the largest E-GNSS Accelerator for satellite navigation at www.galileo-masters.eu/accelerator

Do you want to boost your region with high-tech innovation? Then please contact us!

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Project Manager
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Ulrike Daniels
Business Development
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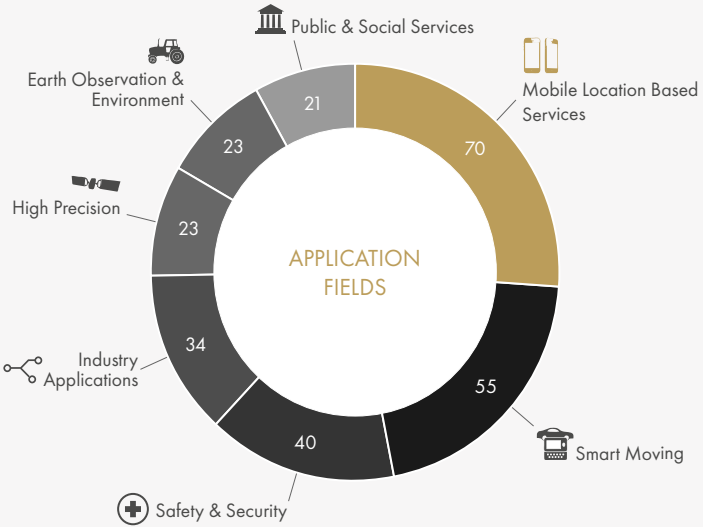
STATISTICS

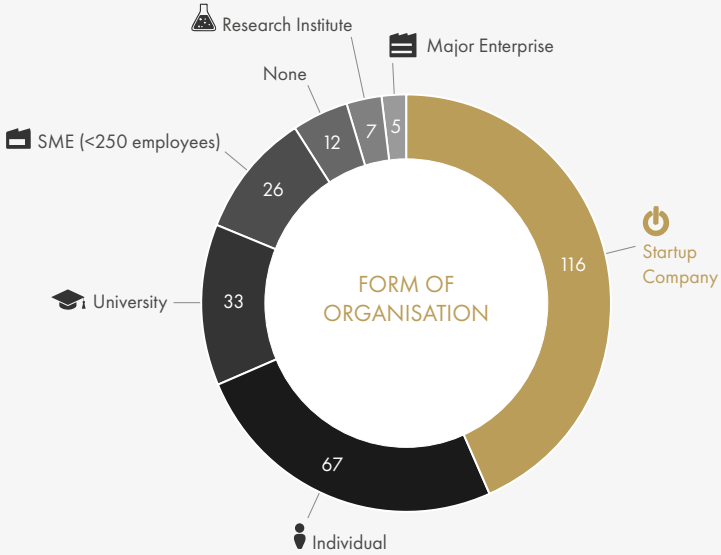
Scouting the latest GNSS trends around the globe

This year's edition of the Galileo Masters recorded another great result with 266 entries and reached entrepreneurs from over 40 different countries. More than 11,500 participants have submitted 4,118 business cases since 2004. This contribution has helped to foster the growing market, which is expected to produce over EUR 70 billion in revenue annually in 2025.* When the revenue created by added-value services is included, this number could more than double.

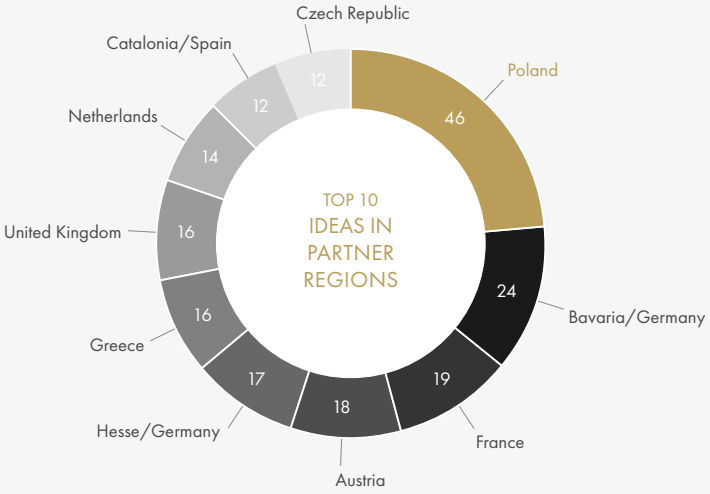
*(European GNSS Agency 2017 – GNSS Market Report)

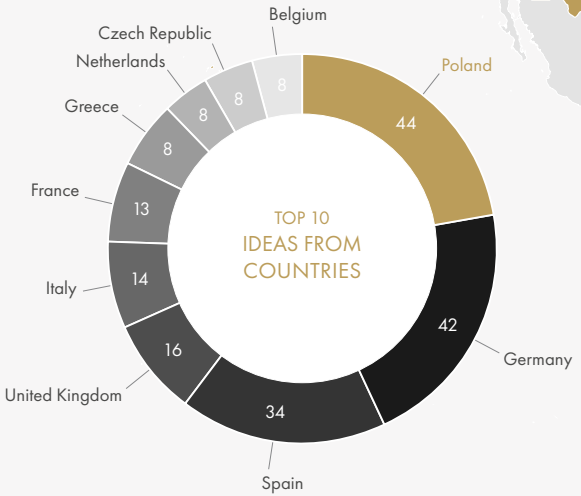


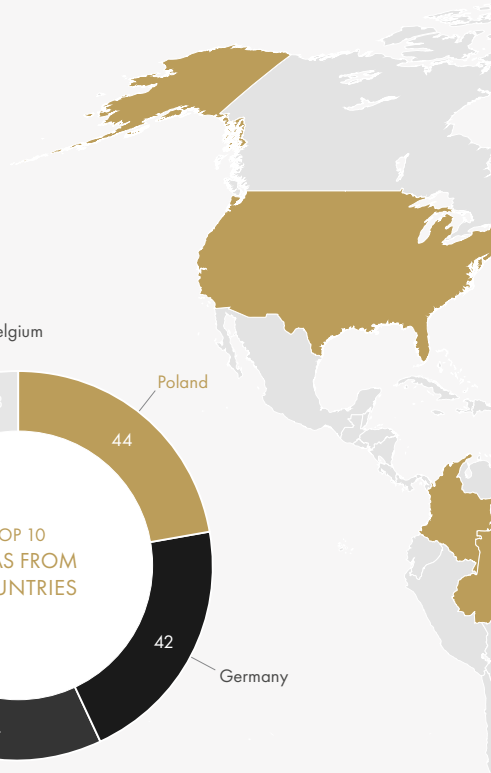

PARTICIPATION IN SPECIAL PRIZES
94% OF ALL SUBMISSIONS
51
51
50
40
31
17
16
10
None
GNSS LIVING LAB PRIZE
UNIVERSITY CHALLENGE
DLR
esa space solutions
Space Starters

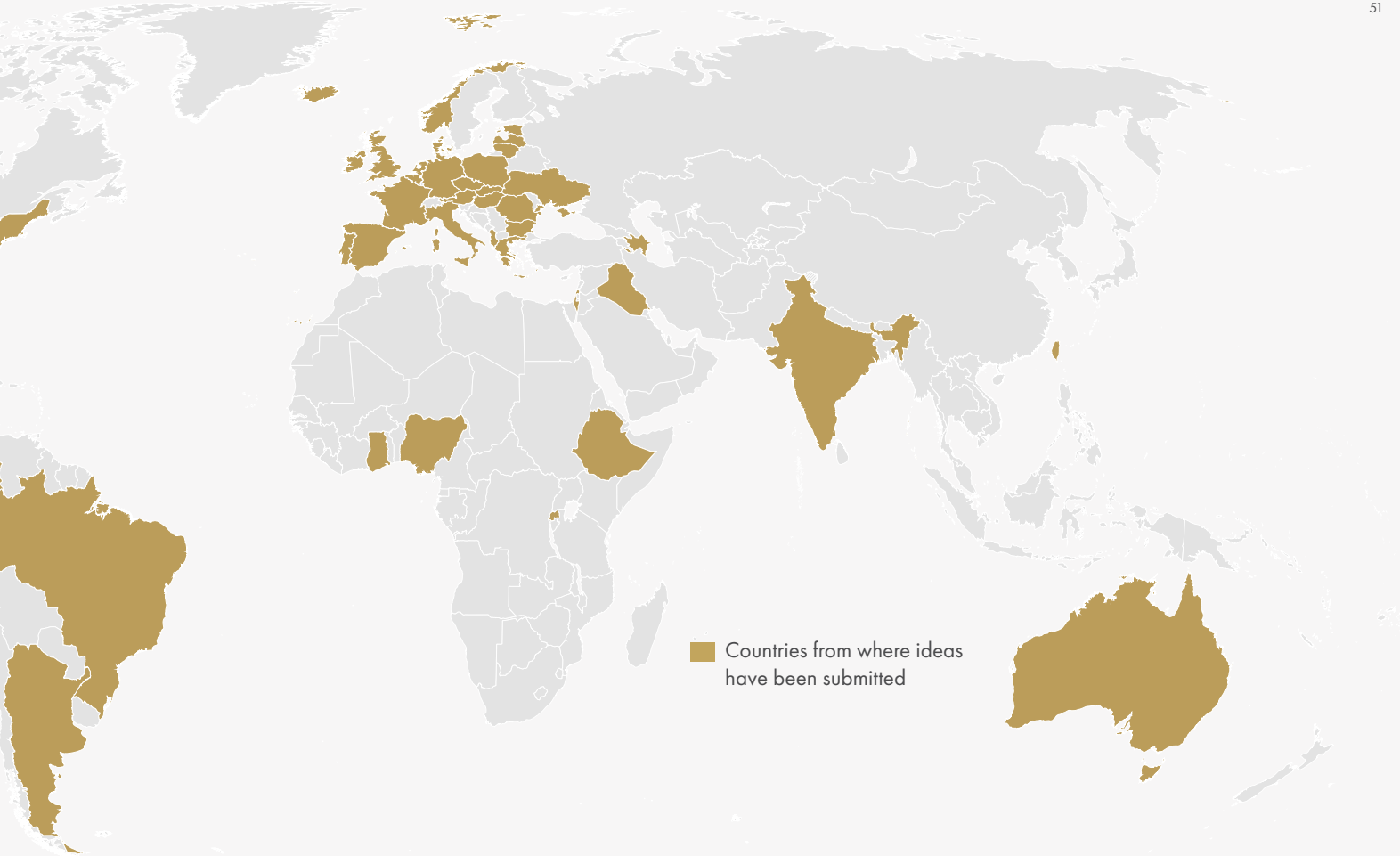

FORM OF ORGANISATION
116
67
33
26
12
7
5
Startup Company
Individual
University
SME (<250 employees)
None
Research Institute
Major Enterprise

CROSS-REGIONAL IMPACT








Countries from where ideas
have been submitted

EXPERTS

United expert knowledge for future-oriented entrepreneurs

Within the past 15 years, the Galileo Masters has grown into a unique network of space innovation and expertise. 200 international experts from the realms of industry, research and politics contribute to this huge knowledge pool. Their most important task is to evaluate the ideas submitted and detect new key future technology trends.

European GNSS Agency (GSA)

Ms Dafni Dimoudi	European GNSS Agency (GSA)
Mr Tim Dufourmont	European GNSS Agency (GSA)
Mr Vojtech Fort	European GNSS Agency (GSA)
Ms Marta Krywanis-Brzostowska	European GNSS Agency (GSA)

European Space Agency (ESA)

Mr Marek Aldorf	ESA BIC Prague – CzechInvest
Dr Thomas Bouvet	European Space Agency (ESA)
Mr Andrea Cosentino	Lazio Innova Space Agency
Mr Armen Derderian	European Space Agency (ESA)
Mr Matthew Edwards	European Space Agency (ESA)
Mr Niels Eldering	European Space Agency (ESA)
Ms Cornelia Gebath	ESA BIC Bavaria – AZO
Mr Jeremija Hranjec	Science Park Graz
Ms Dijana Janevska	ESA BIC Austria
Mr Herve Joumier	European Space Agency (ESA)
Mr Michal Kunes	CzechInvest
Mr Andrus Kurvits	Tartu Science Park
Mr Bruno Naulais	European Space Agency (ESA)
Ms Aude Nzeh Ndong	ESA BIC Sud France
Ms Sue O'Hare	ESA BIC Harwell
Mr Guillermo Ortega	European Space Agency (ESA)
Ms Donata Pedrazzani	cesah GmbH Centrum für Satellitennavigation Hessen
Mr Carlos Romero Moreno	ESA BIC Madrid
Mr Martijn Seijger	SBK Noordwijk BV

German Aerospace Center (DLR)

Dr Rolf-Dieter Fischer	German Aerospace Center (DLR)
Mr Harald Hofmann	German Aerospace Center (DLR)
Mr Robert Klarner	German Aerospace Center (DLR)
Prof Dr Michael Meurer	German Aerospace Center (DLR)
Mr Hendrik Osenberg	German Aerospace Center (DLR)
Mr Walter Päffgen	Gesellschaft für Raumfahrtanwendungen (GfR) mbH

German Federal Ministry of Transport and Digital Infrastructure (BMVI)

Mr Frank Christophori	Federal Office for Information Security (BSI)
Mr Kai Herrmann	Federal Ministry of Transport and Digital Infrastructure (BMVI)
Mr Sascha Heupel	German Aerospace Center (DLR)
Mr Robert Klarner	German Aerospace Center (DLR)
Mr Hendrik Osenberg	German Aerospace Center (DLR)
Mr Alexander Rügamer	Fraunhofer IIS
Mr Lukas Schmid	Federal Ministry of Transport and Digital Infrastructure (BMVI)
Mr Mathias Thelker	BMVg

University Challenge

Mr Paul Bhatia	University of Nottingham
Dr Fabio Dovis	Politecnico di Torino
Mrs Kathrin Frankl	Universität der Bundeswehr München
Ms Kristina Kudlich	Universität der Bundeswehr München
Dr Carl Milner	Ecole Nationale de l'Aviation Civile (ENAC)
Ms Gabriella Povero	ISMB
Mr Himanshu Sharma	Universität der Bundeswehr München

EXPERTS

GNSS Living Lab Prize

Dr Stavri Nikolov	Digital Spaces Living Lab (DSLL)
Prof Charles Tijus	IUL LUTIN

Galileo 5G IoT Challenge

Mrs Ulrike Fricke	Triangle Venture Capital Group
Mr Sascha Jakubek	Deutsche Telekom AG
Dr Edgar Jochheim	JOINCO/Deutsche Telekom AG
Mr Axel Preusse	Global Foundries
Mr Thorsten Rudolph	AZO

Andalucia / Spain

Mr Sergio Fortes	University of Málaga
Dr Rafael Godoy Rubio	University of Málaga
Mr Pedro Lázaro Legaz	University of Málaga
Mr Mariano Morán Prados	Promálaga
Mr Pedro Pablo Sanchez	AERTEC SOLUTIONS
Mr José Antonio Santoyo Ramón	University of Málaga
Mr Rafael Ventura Fernández	University of Málaga
Prof Dr Gonzalo W. Pérez	University of Málaga

Austria

Mr Christian Fuchs	Austrian Research Promotion Agency (FFG)
Mr Martin Mössler	ESA BIC Austria / Science Park Graz GmbH
Dr Thomas Nennadal	Accent Gründerservice
Dr Matthias Schreitl	Austrian Research Promotion Agency (FFG)
Prof Dr Robert Weber	Vienna University of Technology
Prof Dr Manfred Wieser	Graz University of Technology

Baden-Württemberg / Germany

Ms Eva Beckershoff	IHK Reutlingen
Prof Dr Volker Coors	Hochschule für Technik Stuttgart
Dr Stefan Engelhard	IHK Reutlingen
Mr Dieter Geiger	ITS Baden-Württemberg e.V.
Mr Hartmut Gündra	IHK Reutlingen
Dr Carsten Günther	Heidelberg Mobil International GmbH
Prof Dr Reiner Jäger	Hochschule Karlsruhe (HSKA) – University of Applied Sciences
Dr Michael Klein	Ministerium für Wirtschaft, Arbeit und Wohnungsbau Baden-Württemberg
Ms Barbara Koch	Universität Freiburg
Mr Anton Pfauth	Ministerium für Wirtschaft, Arbeit und Wohnungsbau Baden-Württemberg Referat IKT und Kreativwirtschaft
Mr Friedhelm Schaal	Wirtschaftsförderung Stadt Konstanz
Dr J. Marius Zöllner	Forschungszentrum Informatik FZI

Basque Country / Spain

Mr Pablo Martinez Muñoz	BIC Gipuzkoa
Dr Oihana Otaegui	VicomTech-IK4

Bavaria / Germany

Prof Dr Werner Enderle	European Space Agency (ESA)
Mr Lars Holstein	WFG BGL
Mr Josef Kolbinger	Kolbinger Consulting
Dr Günter Rohmer	Fraunhofer IIS
Mr Peter Seige	Seige Consult
Dr Daniel Westenberger	LKGLOBAL

Bremen / Germany

Ms Anke Felbor	Starthaus Bremen (BAB)
Mr Heinz-Hermann Müller	Ariane Group
Mr Holger W. Oelze	Aviaspace Bremen e.V./ZARM Technik AG

Catalonia / Spain

Mr Marc Beltran	Barcelona Drone Center
Ms Meritxell Codina	Eurania Services
Mr Carles Comes	ZBM Patents
Ms Elisabeth Jordà	BarcelonaTech (UPC)
Mr Pedro Linares	Telecos.cat
Mr Toni Paz	Knowledge Innovation Market (KIM)
Mr Lluis Pina	Indra
Mr Albert Sitjá	CTTC
Mr Armengol Torres	Intelligent Consulting

Czech Republic

Mr Michal Kunes	CzechInvest
Mr Josef Šobra	Ministry of Transport of the Czech Republic
Prof Dr František Vejražka	Czech Technical University in Prague

Estonia

Mr Tõnis Eerme	Invent Baltics
Mr Andrus Kurvits	Tartu Science Park & ESA BIC Estonia
Mr Martin Goroško	Tallinn Science Park Tehnopol & ESA BIC Estonia
Ms Heleri Holm	Tallinn Science Park Tehnopol
Mr Erik Saluveer	Positium

France

Mr Marc Barret	Inria Research Centre Sophia Antipolis
Ms Camille Bertin	ESA BIC Sud France – Bordeaux Technowest
Mr Loïc Chanvillard	Pôle Pegase
Mr Thierry Chapuis	National Centre for Space Studies (CNES)
Mr Michel Courtois	ESA BIC Sud France – Aerospace Valley
Mr Frédéric Daumas	ESA BIC Sud France – CEEI Theogone – CG31
Mr Eric Descheres	Société Kapsys
Mr Patxi Elissalde	ESA BIC Sud France – ESTIA Entreprendre
Mr Laurent Francillout	ESA BIC Sud France – Aerospace Valley
Mr Nicolas Laruelle	ESA BIC Sud France – Incabateur Paca-Est
Ms Juliette Marais	French Institute of Science and Technology for Transport, Development and Networks (IFSTTAR)
Ms Hélène Marty	ESA BIC Sud France – ESTIA Entreprendre
Mr Laurent Masson	ESA BIC Sud France – Incabateur Paca-Est
Dr Aude Nzeh Ndong	ESA BIC Sud France – Aerospace Valley

Galicia / Spain

Mr Francisco Diaz-Otero	University of Vigo
Ms Rosa Eguizábal	Vigo Free Trade Zone Consortium
Mr Alfonso Fernandez	ATLANTTic Research Center
Mr Carlos Groba-Presa	Marine Instruments
Dr Roberto Prieto-Cerdeira	European Space Agency (ESA)

EXPERTS

Greece

Mr Nikolaos Kalogeris	Regional Government of Crete, Environment and Energy
Mr Constantine Karamanis	PRAXI Network
Mr Yiannis Kostis Giannarakis	Hellenic Association of Mobile Application Companies
Dr Panos Lolonis	National Cadastre & Mapping Agency
Prof Stylianos Mertikas	Technical University of Crete
Dr Panagiotis Partsinevelos	Technical University of Crete

Hesse / Germany

Prof Dr Matthias Becker	Technical University Darmstadt
Prof Dr Carolin Bock	Technical University Darmstadt
Mr Arne Jungstand	Steinbeis Transfer Centre Navigation
Dr Wolfgang Kniejski	EIT Digital Accelerator
Mr Holger Kurz	Sparkasse Darmstadt
Mr John Lewis	Telespazio VEGA Deutschland GmbH
Ms Donata Pedrazzani	cesah GmbH Centrum für Satellitennavigation Hessen
Mr Hendrik Terstiege	HA Hessen Agentur GmbH
Dr Frank Zimmermann	cesah GmbH Centrum für Satellitennavigation Hessen

Ireland

Mr Bruce Hannah	National Space Centre
Mr Paul Kiernan	Skytek
Dr Donagh O'Mahony	Tyndall National Institute
Dr Niall Smith	Cork Institute of Technology

Madrid / Spain

Ms Marta Balenciaga	Colegio Oficial de Ingenieros de Telecomunicación (COIT)
Dr Félix Bellido	Comunidad de Madrid
Dr José Caro	GMV
Mr José de la Sota	Fundación para el Conocimiento madrimasd
Mr Eduardo Díaz Sánchez	Fundación para el Conocimiento madrimasd
Mr Eugenio Fontán	Official College of Telecom Engineers (COIT)
Mr Carlos Montesano	Airbus DS Space Systems
Mr Miguel Ángel Muñoz	Comunidad de Madrid
Ms Andrea Pérez-Carro	CDTI
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Mr Peter Dieleman	NLR
Mr Matthew Edwards	ESA
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Mr Bert Meijvogel	Netherlands Space Office (NSO)
Mr Wim Ploeg	Ministery of Infrastructure & Environment
Mr Axel van den Berg	CGI

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Mr Jon Glenn Gjevestad	Norwegian University of Life Sciences
Ms Kjersti Moldeklev	Norwegian Space Centre (NSC)
Mr Christian Rost	Norwegian Space Center
Ms Kremena Tosheva	Oslotech / Forskningsparken

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Mr Jaroslaw Chojnacki	Krakow Technology Park
Mr Wojciech Drewczyński	Space3ac accelerator
Dr Krzysztof Kanawka	Blue Dot Solutions
Mr Adam Korybut-Kotulewski	Blue Dot Solutions
Mr Wojciech Leonowicz	Blue Dot Solutions
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Mr Ruairidh Henderson	Science and Technologies Facilities Council
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Mr Andy Proctor	Innovate UK and UK Space Agency
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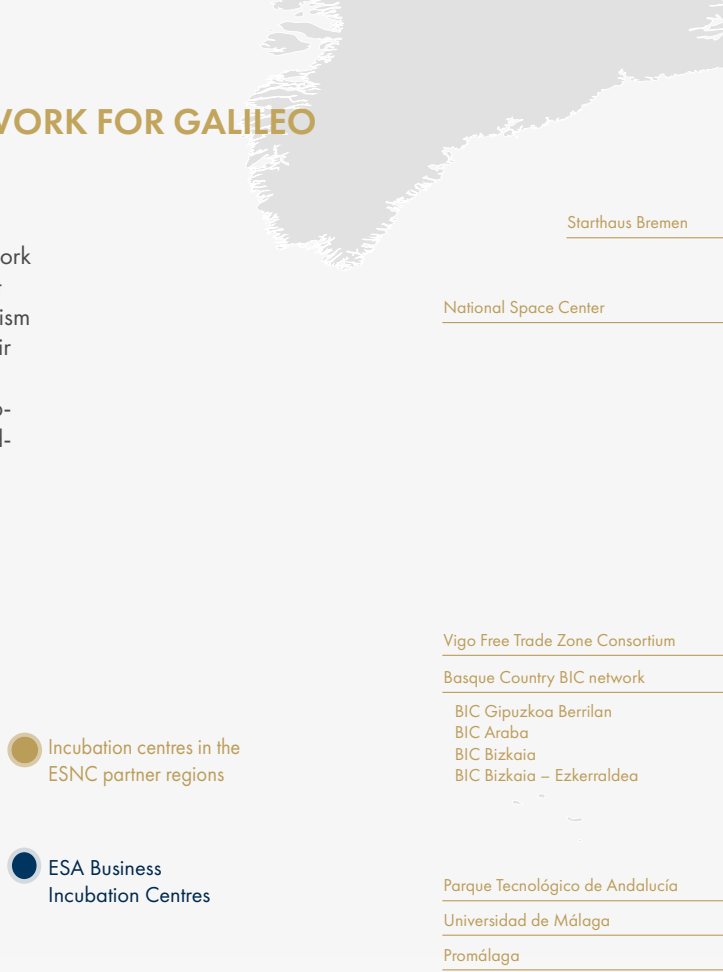
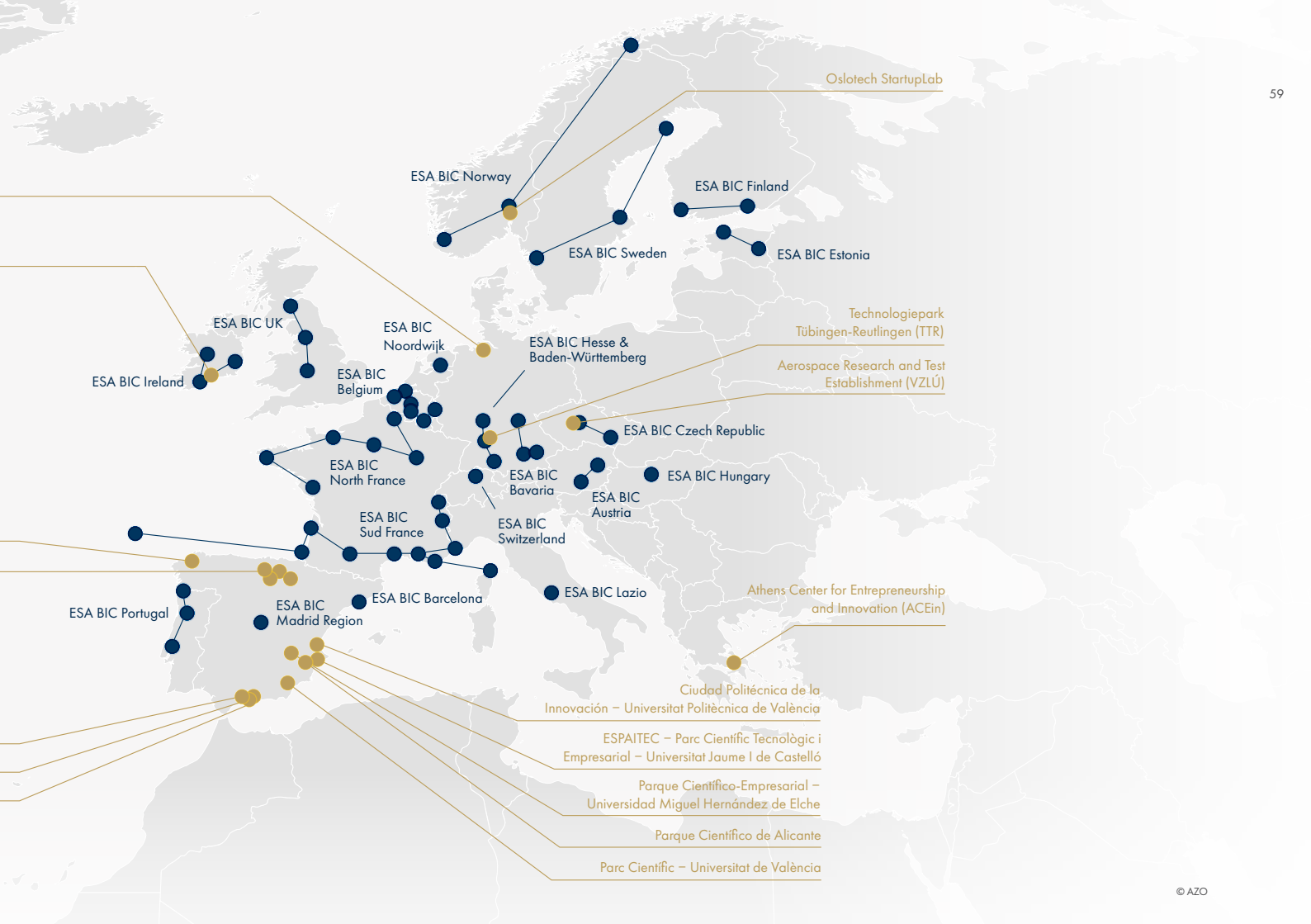
THE GLOBAL INNOVATION NETWORK FOR GALILEO

Incubation Network

Create new businesses in our BIC Network

The Galileo Masters encompasses a Europe-wide network of more than 50 incubators that form the world's largest space-related incubation network. The support mechanism for entrepreneurs and startups allows winners to get their space-based business off the ground and support them along the entire value chain. Through this additional support this network ensures to provide society with groundbreaking technological novelties.

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ESA BIC Ireland
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Aerospace Research and Test Establishment (VZLÚ)
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The Galileo Masters in the limelight
We want to express our appreciation to the GNSS magazines and stakeholders active in space-fields who support the Galileo Masters as media partners. They are an essential part of spreading the news about the unique opportunities available to entrepreneurs and startups all across the world.

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- Be the first to receive our latest news
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- Profit from our outreach:
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  - Geographical outreach to 98 countries
  - 140 space-related stakeholders

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Airbus: Communication, electronics, space systems, security, manufacturing

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Contact us!

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Space of Innovation

AZO – Your Partner in Competition & Innovation

AZO is the international networking and branding company for European space programmes. AZO organises its "Innovation Masters Series", the most important space-related innovation competitions with the Galileo Masters, the Copernicus Masters, the INNOspace Masters, the Space Exploration Masters as well as the Copernicus Hackathons. From 2004 – 2018, there have been 13,160 participants from 98 countries, 466 prizes awarded, EUR 20.8 million prize pool available, with 300 top experts.

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Copernicus masters

Annually from 1 April – 30 June
www.copernicus-masters.com

Copernicus hackathons

Until end of 2019
hackathons.copernicus.eu

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www.innospace-masters.com

SPACE EXPLORATION MASTERS

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