

# NAVISP Element 1 Innovation

**Giorgio Solari**  
Head of NAVISP Element 1 Office

*Element 1 Session: Innovation*  
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# NAVISP Element 1 Objectives

- 1 • Perform feasibility studies and viability analysis for the emergence of new concepts in the PNT world
- 2 • Contributing to the formulation and implementation of PNT technology innovation
- 3 • Proof of Concept of promising PNT-based solutions

# NAVISP Element 1 Financial Status

- New subscription from Germany (2.63 M€)
- Recent increase of contribution from Finland (+0.60 M€)

 for a **total subscription of 16.03 M€**

- Element 1 activities have been incubated at a very fast pace

 with WP2019 approval: **100% already incubated** of total available funds (13.62 M€) for industrial procurement

# NAVISP Element 1: launched activities



		WP17	WP18	Addendum to WP18
<b>THEME 1</b>	Emerging New Space-based PNT Concepts	<ul style="list-style-type: none"> <li>Complementary PNT Infrastructure in LEO</li> <li>Trusted Radionavigation via Two-Way Ranging</li> </ul>	<ul style="list-style-type: none"> <li>Resilient, Trustworthy, Ubiquitous Time Transfer</li> <li>High-Altitude Pseudo-Satellites for PNT</li> <li>Quantum-based sensing for PNT</li> <li>PNT using Neutrino Particles</li> <li>Design and practical aspects of a space-based relativistic PNT system</li> </ul>	Not applicable
<b>THEME 2</b>	Innovative Use of Space-based Solutions in the PNT Context	<ul style="list-style-type: none"> <li>System Suitability Study for Train Positioning Using GNSS in ERTMS in 2020</li> <li>Multi-System Multi-Sensor Maritime PNT Test Equipment</li> <li>Multipath &amp; Interference Error Mitigation Techniques for Future Maritime e-NAV Services</li> </ul>	<ul style="list-style-type: none"> <li>GNSS/non-GNSS Sensor Fusion for Resilience in High Integrity Aviation Applications</li> <li>Techniques supporting Resilience for High Integrity Train Control Applications</li> </ul>	Not applicable
<b>THEME 3</b>	Proof of Concept of Promising PNT Techniques and Technologies	<ul style="list-style-type: none"> <li>Pulsar Timescale Demonstration</li> <li>Cooperative Navigation and Cloud Processing</li> <li>Weather Monitoring Based on Collaborative Crowdsourcing</li> <li>Space GNSS Receiver for In-Orbit Demonstration of PPP</li> <li>Low-Cost GNSS Antenna Arrays for Improved Performance, Anti-Spoofing, etc.</li> </ul>	<ul style="list-style-type: none"> <li>Low-RF Fast Deployable Systems for Emergencies in Difficult Environments</li> <li>Ultra-Low Power Device Positioning Concepts</li> <li>Artificial Intelligence / Machine Learning Sensor Fusion for Autonomous Vessel Navigation</li> <li>Integrity Monitoring and Prediction Concept for Autonomous Car Resilience and Safety</li> <li>Low cost multi-frequency multi-constellation GNSS antenna for CubeSats</li> </ul>	<ul style="list-style-type: none"> <li>Earth-Moon Navigation / System Study and Development of a Highly-Sensitive Spaceborne Receiver Prototype</li> <li>Precise Relative Positioning in MEO to support Science Missions</li> <li>Multi-Sensor, Multi-System for Space PNT Applications</li> <li>Enabling Ultra-High Accuracy Positioning in Challenging Environment</li> </ul>
<b>Total budget (€M)</b>		<b>4.6</b>	<b>3.9</b>	<b>2.0</b>



# 2019 NAVISP Element 1 Work Plan

## List of Approved Activities



### THEME 1

Alternative Space-based PNT Data Layer

### THEME 2

GNSS science with commercial aircraft

### THEME 3

- Collaborative Processing of Distributed Receivers of Opportunity for Jamming and Spoofing Mitigation
- Advanced Multi-Frequency low-cost high-gain GNSS antennas for next generation of mass-market devices
- Precise Timing for Indoor Small Cells
- Advanced concept for chip-scale atomic clocks
- Antenna and Transponder Unit for Underwater PNT
- AI-enabled baseband algorithms for High Fidelity Measurements
- Machine Learning to model GNSS systems
- Precise positioning for mass-market: optimal data dissemination demonstrator
- PNT Timing & Synchronisation for Aviation Systems and Networks

