

Earth observation technologies

The aim of this topic is to demonstrate, in a relevant environment, technologies, systems and sub-systems for Earth observation from satellites as well as from high altitude platforms. Proposals should demonstrate significant improvements in such areas as miniaturisation, power reduction, efficiency, versatility, and/or increased functionality, and should demonstrate at the viable extent complementarity to activities already funded by Member States and the European Space Agency. Proposals should also ensure system readiness for operational services and provide leverage on industry competitiveness, particularly on export markets.

Each proposal shall address only one of the following subtopics:

a) Very high resolution optical EO for LEO and/or high resolution optical EO for GEO/HEO instrument technologies, with focus on improving payload (e.g. radiometric and spectral parameters, spatial resolution, swath), including detectors, materials and solutions for stable and large optomechanical elements and systems (e.g. lightweight telescope mirrors with metre-level diameter) focal planes, wave front error and line of sight control, high performance actuators, multispectral filters for large focal plane;

b) Competitive remote sensing instruments and space systems: innovations supporting readiness advancements for next generation systems in the optical and radio frequency domains (active/passive), technologies enabling advanced system solutions (including small satellites possibly in convoy with existing space assets), on-board image processing and detectors for video imaging with increased swath and resolution, technologies for super- and hyperspectral imaging instruments with high performance, radio occultation sensors, low cost high resolution telescopes and radar imaging systems;

c) Disruptive technologies for remote sensing, as technology building blocks for innovative LiDAR (Light Detection And Ranging) and radar instruments (including cost-effective wide-swath altimetry and imaging systems), super-spectral and hyperspectral payloads with wide spectral and/or coverage, limb sounders and

gravimetry payloads; high quantum efficiency photo detectors and high-precision optical beam scanning and pointing; advanced infrared (IR) technologies (optical filters, detectors and electronics);

d) On-board data processing: integrated multi-instrument on-board payload data processing for resource-constrained missions; solutions for high observation reactivity and real-time applications such as very high performance payload processing; on board data/image optimisation and compression for advanced video and image pre-processing as well as smart on-board data/image analysis; data flow optimisation for new missions, including impacts on the evolution of associated ground segment, for enhancement of overall processing power and speed over the full chain and for supporting massive data processing and machine learning in EO applications;

e) Advanced SAR/Radar technologies: step up maturity in new sensing concepts and technologies such as large and active antennas and reflectors, including multi-frequency concepts; enablers for digital beam-forming and beam-hopping interferometric systems, and for other concepts, such as large swath maritime surveillance radar, active sensing/processing of SAR ships, data fusion integration with new generation Automatic Identification Systems (AIS);

Low cost solutions based on components off the shelf (COTS) are encouraged.

Participation of industry, in particular SMEs, is encouraged.

Activities shall be complementary and create synergy with other European activities in the same domain.

To this end, proposals shall include the following tasks:

- Analysis of relevant roadmaps, including roadmaps developed in the context of actions for the development of Key Enabling Technologies supported by the Union, and where available, roadmaps developed by the European Space Agency and European national space programmes;
- Commercial assessment of the supply chain technology in the space or non-space domains and, if applicable, a business plan for commercialisation with a full range (preload) of recurring products.

The involvement of post-graduate scientists, engineers and researchers is encouraged, for example through professional work experience or through fellowships/scholarships as applicable.

The Commission considers that proposals requesting a contribution from the EU of between EUR 2 and 3 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

The challenge is to mature application-oriented technologies in the domains of Earth Observation (EO) which are expected to underpin competitiveness and contribute to the integration of space in society and economy.

The overarching objective is to improve the performance of EO systems, building on previous activities supported by the Union, Member States and ESA.

Activities in EO will focus on improving timeliness and reactivity of observations, their resolution and swath, the performance of sensors and the underlying technologies, while addressing the new challenges associated to larger data collection in remote sensing missions, including at ground segment level (e.g. massive data processing, machine learning, knowledge-based systems).

Moreover, some technologies and building blocks such as deployable antennas and/or (electrically) steerable antennas and mechanisms/structures, high mechanical/thermal stability aperture solutions, high efficiency power components, data processing and networks, or data links can provide synergies with SATCOM application domains.

- Improvement in the capability, including through miniaturisation and power reduction, precision, efficiency or other characteristics with respect to existing Earth observation missions, opening new avenues for future space systems;
- Substantial improvement in state-of-the-art technologies in key areas such as optical and radar systems, radio occultation sensors, sounders, LiDARs for Earth observation, and related key technologies, as for instance detectors and antennas;
- Enabling synergic use of heterogeneous Earth Observation constellations;
- Strengthening Europe's position in industrial competitiveness in technologies for Earth observation payloads and missions;
- Greater industrial relevance of research actions and output as demonstrated by deeper involvement of industry, including SMEs, and stronger take-up of research results.
- Fostering links between academia and industry, accelerating and broadening technology transfer.

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