

This fiche is part of the wider roadmap for cross-cutting KETs activities

'Cross-cutting KETs' activities bring together and integrate different KETs and reflect the interdisciplinary nature of technological development. They have the potential to lead to unforeseen advances and new markets, and are important contributors to new technological components or products.

The complete roadmap for cross-cutting KETs activities can be downloaded from:

<http://ec.europa.eu/growth/industry/key-enabling-technologies/eu-actions/rocket>

Potential areas of industrial interest relevant for cross-cutting KETs in the Electronics and Communication Systems domain



This innovation field is part of the wider roadmap for cross-cutting KETs activities developed within the framework of the RO-cKETs study. The roadmap for cross-cutting KETs activities identifies the potential innovation fields of industrial interest relevant for cross-cutting KETs in a broad range of industrial sectors relevant for the European economy.

The roadmap has been developed starting from actual market needs and industrial challenges in a broad range of industrial sectors relevant for the European economy. The roadmapping activity has focused on exploring potential innovation areas in terms of products, processes or services with respect to which the cross-fertilization between KETs can provide an added value, taking into account the main market drivers for each of those innovation areas as well as the societal and economic context in which they locate.

Taking the demand side as a starting point, cross-cutting KETs activities will in general include activities closer to market and applications. The study focused on identifying potential innovation areas of industrial interest implying Technology Readiness Levels of between 4 and 8.

E&C.4.6: Embedded broadband communication payload

Scope:

To develop transponder systems enabling embedded communication payloads of satellites, airships or any flying or otherwise moving platforms to provide a broadband communication service at a reasonable cost, with a limited energy consumption (and heat dissipation) and including with all protection systems for preventing unwanted spoofing and jamming of other systems.

Demand-side requirements (stemming from Societal Challenges) addressed:

- Inclusive society is also about closing the digital divide (according to the Digital Agenda for Europe (DAE), 78% of EU citizens use the internet at least once a week, 20% never used the internet, and 62% of the EU has 30Mbps broadband, but only 18% of rural areas). Skills or network deployment are to be supported, but technological developments are required in broadband wireless communications, very high broadband wireline communications, networks interfacing and systems autonomous connectivity, user-friendliness
- With ubiquitous digitalization, cyber-security and protection of the communications is a crucial contributor to a safe EU secure and free society
- Improved transport and energy services, as well as all sorts of system monitoring services (environment monitoring, homeland surveillance, industrial supply chains, etc.) all rely on ever-growing flows of digital information, increasing the need for reliable high throughput communication networks
- Information and communication technologies consume around 2% of global energy consumption, and this is the sector with the fastest growth over past and probably upcoming years. Increasing energy efficiency in Information and Communication Technology (ICT) is crucial

Demand-side requirements (stemming from market needs) addressed:

- Volumes of data exchanges have been continuing growth in the recent years, while European telecommunication operators have been experiencing a drop. These operators expect improved communication networks to provide them with capabilities for new services and constitute important growth and profitability relays
- Normalization is a very important driver or barrier for telecom-related industrial activities. Being at the top-front of innovation in low layer telecoms often provides a direct competitive advantage
- Concern is growing in society about electromagnetic waves. In the meanwhile, the radiofrequency spectrum is a limited resource more and more intensively exploited. Optimizing wireless networks for minimizing resource use and possible health impacts is getting more and more important

Specific technical/industrial challenges (mainly resulting from gaps in technological capacities):

- Increase of transponders data processing rates whilst keeping energy consumption under control
- Development of payload capability for broadband communication (C to Ku and Ka bands), including through increased operational flexibility and reconfigurability
- Enable higher onboard processing power with increasing onboard available energy and improving embedded power and thermal management (including with deployable radiators or cryogenic cooling)
- Power and cost optimized satellite platform
- Development of high performance frequency filters for optimal dimensioning of the transmitter and receiver systems, including supra-conductivity filtering
- Development of building blocks for high performance low cost antennas as large focal length reflectors and their reliable deployment and actuation mechanisms, multi-beam feeds, multi-spot reflect arrays, reconfigurable beam forming antennas or classical Q/V/UHF band antenna manufactured in a repeatable way

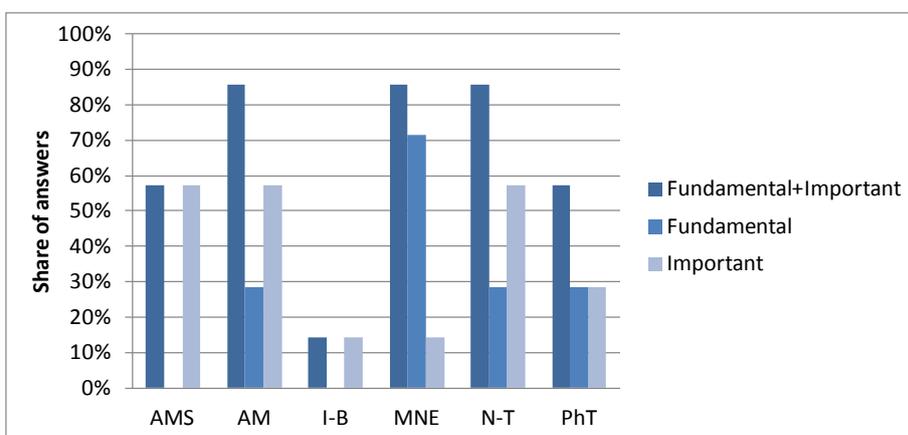
Contribution by cross-cutting Key Enabling Technologies:

In respect to this Innovation Field, the integration of KETs could contribute to the development of solutions such as more advanced transponder systems, including thanks to increasing transponders data processing rates enabling higher on-board processing power whilst increasing on-board available energy and improving

embedded power and thermal management, the development of high performance frequency filters, and the development of payload capability for broadband communication (C to Ku and Ka bands).

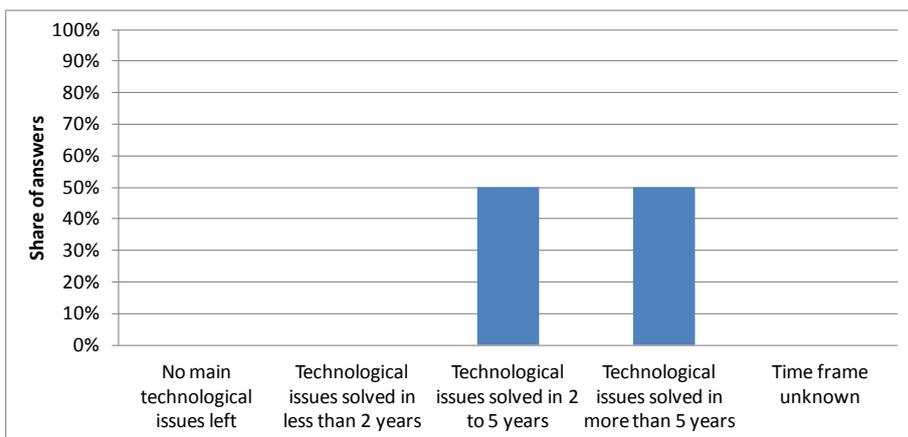
To this aim, the combination of KETs experts' opinions collected through the dedicated survey (whose result is depicted in the below bar chart), the examination of KETs-related patenting activity in respect to this Innovation Field, and desk research activities, have allowed identifying a rather strong interaction of KETs with respect to this Innovation Field, with either fundamental or important contribution mainly by the following KETs:

- Advanced Materials (AM)
- Micro- and Nano-Electronics (MNE)
- Nanotechnologies (N-T)
- Photonics (PhT)
- Advanced Manufacturing Systems (AMS)



Timing for implementation:

According to the majority of KETs experts' opinions (whose result is depicted in the below bar chart), desk research, and in line with the KETs-related patenting activity in this field, it is considered that the main technological issues holding back the achievement of cross-cutting KETs based products related to this Innovation Field could be solved in a time frame of 2 to 5 years or more than 5 years:



Hence, considering that advanced telecom payloads are expected to be particularly requested for the medium term period, but with already opportunities on the short term, the provision of support in the short to medium term should be taken into consideration within this framework.

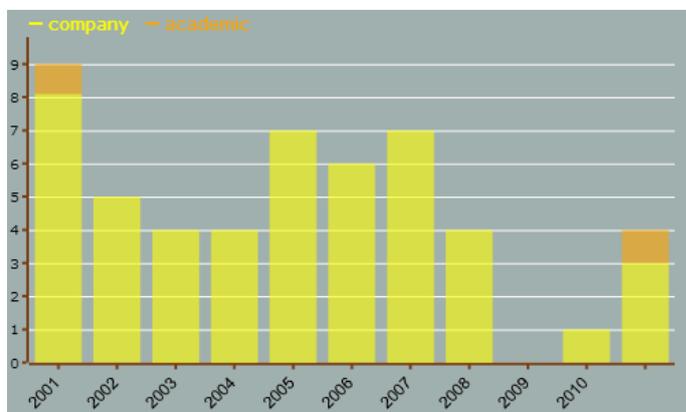
Additional information according to results of assessment:

➤ **Impact assessment:**

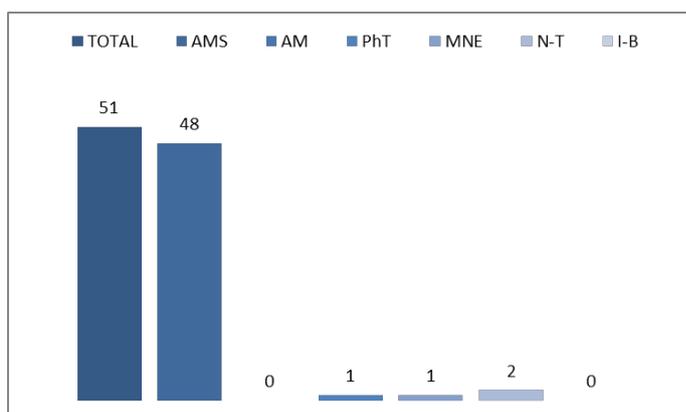
- Satellite-based or airborne wide coverage telecommunication means will support quickly deployable additional communication means, supporting continuity and accessibility of the mobile communication service in specific situations as natural disasters, industrial accidents, exceptional crowd concentration as for sports or cultural events, exceptional use of communication needs (e.g. the typically New Year's Eve SMS flooding) or even warfare contexts. The availability of such additional capability, when and where needed, will allow tailoring normal communication networks without unnecessary margins, saving costs and energy.
- The Digital Agenda for Europe objective of 100% territory covered with 30 Mbps capability needs broadband capability even with very low density and hardly accessible areas, guaranteeing universal access to broadband Internet but also creating opportunities for new services as telemedicine or e-education. Embedded communication systems will be part of the answer.
- Telecom satellites also offer alternatives to intercontinental / long-distance communications. Most of these systems had a specifically defence application. However, in the last few years and in the near future it is expected that more transfers from the defence to the civilian sector can be achieved, building on consolidated know-how.
- As regards industrial impacts, European space industry is suffering on one side the reduction of institutional commands due to public budget restrictions, on the other side growing competition on a stagnant market from industries from America and emerging countries. KET-based innovation supporting more competitive telecom payloads is one of the directions for boosting the market and retrieving market shares and profitability.

➤ **Results of patents scenario analysis:**

- 51 exclusively KETs-related patents identified in the period 2001-2011 for the specific Innovation Field
- Decreasing trend curve (number of patents per year) in recent years, with slight downturn in 2009
- Highest share of industrial applicants:



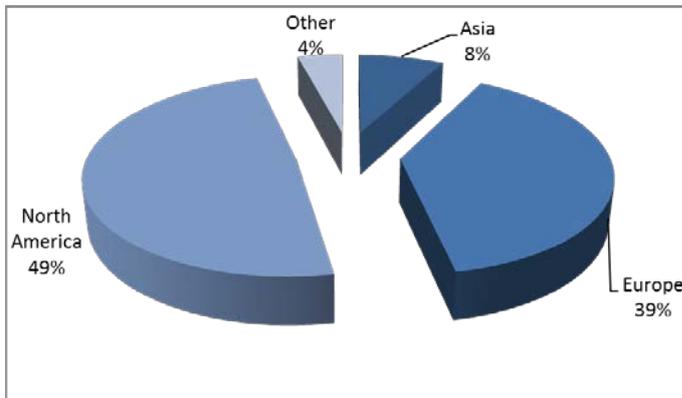
- Patents by KET(s):



- Patents by KET(s) and relevant combinations of KETs:

<i>KET(s)</i>	<i>Number of patents</i>
AMS	48
AMS / MNE	1
MNE	1
N-T	2
PhT	1

- Patent distribution by (Applicant) organization geographical zone:



- Patent distribution by geographical zone of priority protection:

