

Radio frequencies designated for enhanced road safety in Europe - C-ROADS position on the usage of the 5.9 GHz band

The C-ROADS Platform brings together road authorities and operators currently covering 16 Member States (Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Hungary, Ireland, Italy, Portugal, Slovenia, Spain, Sweden, The Netherlands and UK) as well as Norway, Switzerland and Australia.

The objective of these European Member States is to realize the safe travel goal as expressed in the EU transport policy and reduce the amount of accidents via available ITS technology that has been already tested and demonstrated on large scale. The aim of the C-ROADS platform is to realize this road safety goal at a European level by aligning the specifications for cooperative intelligent transport systems (C-ITS) such that a European interoperability is assured. A rapid deployment of C-ITS services is key to the objective. The C-Roads Member States are focused at realizing flawless operation of C-ITS services cross border today and are building the foundations for connected and automated vehicles.

The C-ROADS platform and its contributing Member States follow the European strategy (COM(2016) 766), the European declaration of Amsterdam and the European C-ITS deployment platform recommendations to start the deployment of C-ITS based on the available technologies IEEE802.11p/ETSI ITS-G5 (in short: ITS-G5) and basic 3G and 4G cellular standards. In this combination, the short range communication technology ITS-G5 (as demonstrated in SCOOP and the C-ITS corridor) complements long range 3G/4G cellular communication (as demonstrated in NordicWay). This is depicted in the following figure.

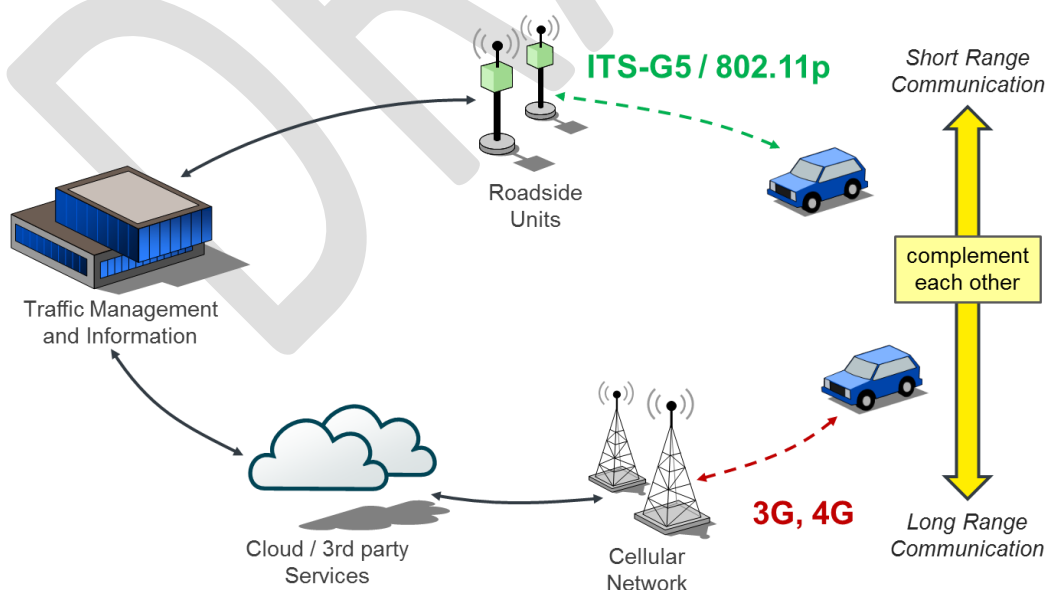


Figure: Short and conventional long range communication should complement each other

ITS Short Range Communication Technologies

In 2008 the European Commission (EC/2008/671) designated a specific frequency band of 30 MHz in the range of 5.875-5.905 MHz (in short 5.9 GHz frequency band) for safety-related ITS applications in Europe. Research on C-ITS started already in the 1980s followed by spectrum allocation in 2004 and the release of a complete set of tested ITS-G5 standards by 2013, resulting in functional products available on the market today for in-vehicle as well as for road side implementations. The C-ROADS partners are investing 350 Mio. EUR into interoperable C-ITS services based on a hybrid communication technology mix – a combination of ITS-G5 short range communication and existing cellular 3G/4G networks for long range communication.

The evolution of cellular communication standards towards 5G is expected to bring further improvements to long range cellular communication (e.g. coverage improvements and signalling efficiency), providing benefits to the hybrid communication approach and complementing short range connectivity.

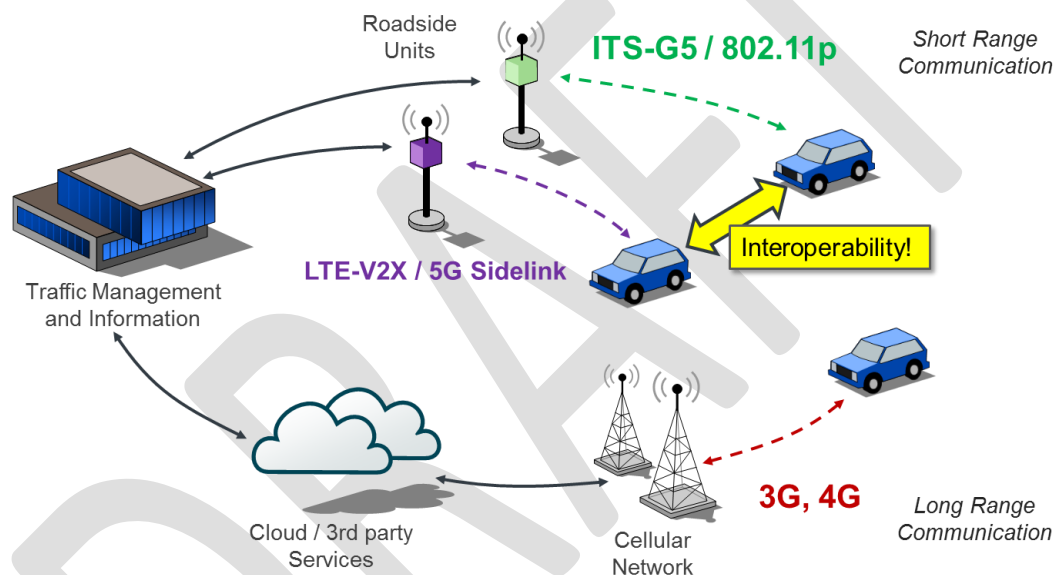


Figure: LTE-V2X / 5G Sidelink needs to be interoperable with ITS-G5 / 802.11p

As part of the 5G standards (LTE Release 14 and beyond), the telecommunications industry in 3GPP has started standardization work on LTE-V2X (also known as 5G Sidelink). LTE-V2X is a technology for short range communication. Interoperability between ITS-G5 and LTE-V2X is currently not possible, i.e. a ITS-G5-only vehicle and an LTE-V2X-only vehicle cannot communicate with each other. Therefore, Member States, road authorities, and road operators contributing to the C-ROADS platform emphasize:

- Interoperability is a must: It is unacceptable that people die on the European roads because two vehicles could not "speak" to each other due to non-interoperable communication systems (ITS-G5 and LTE-V2X).
- The choice of technology for delivering C-ITS services to the road users must not be prescribed to road authorities.

- Road authorities must not be forced to equip the roadside with two or more competing technologies (ITS-G5, LTE-V2X, and potential future technologies) serving the same use cases or providing the same content.
- Furthermore, C-Roads Member States are convinced that backwards compatibility is crucial in the technological evolution: New C-ITS equipment beyond Day-1 needs to be compatible in order to be able to understand already deployed C-ITS services of today.
- In addition to ITS-G5 roadside equipment, road authorities need to have the choice of providing cellular connectivity via cloud services (hybrid approach), including any suitable communication network to vehicles.

Radio Frequencies for ITS and 5G

The European Commission published a communication “A European strategy on Cooperative Intelligent Transport Systems, a milestone towards cooperative, connected and automated mobility” (COM(2016) 766) which clearly states that “The Commission will maintain the designation of spectrum used by ITS-G5 for safety-related ITS services and support measures to protect this frequency band from harmful interference, both at the European and international level (UN International Telecommunications Union and European Conference of Postal and Telecommunications Administrations).”

C-Roads Member States already started the procurement and deployment of ITS-G5 / 802.11p equipment and hence clearly expect that 5.9 GHz frequency bands are available for ITS-G5 / 802.11p equipment without harmful interference. C-Roads Member States cannot delay deployments of safety-related services, while every year 26.000 European citizens lose their lives and 135.000 are injured on European roads.

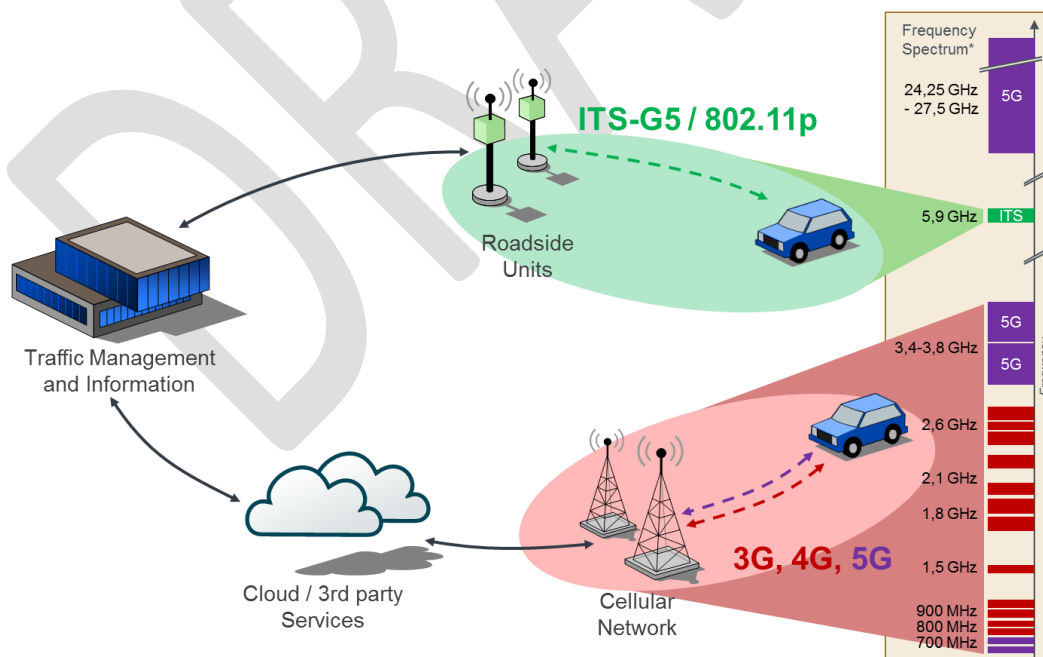


Figure: New frequency bands at 3.4-3.8 GHz will be available for 5G and have been already identified as pioneer frequencies for 5G

While ITS frequency spectrum is allocated at 5.9 GHz, there are several bands available for mobile cellular communication and will become available for the 5th generation of wireless systems (5G). New frequency bands at 3.4-3.8 GHz will be available for 5G and have been already identified as pioneer frequencies for 5G¹. The figure above shows as an example the frequency allocation in Austria, including new designations such as the 5G pioneer bands (allocation may vary in other countries).

Despite the preparation of large harmonized frequency bands for 5G, the 5GAA suggests that LTE-V2X should operate in the ITS band at 5.9 GHz in parallel to the ITS-G5 technology². However, LTE-V2X is currently not compatible with ITS-G5 at 5.9 GHz. The 5GAA states that LTE-V2X and ITS-G5 in the 5.9 GHz band and in the same geographic area without an agreed coexistence solution would result in mutually harmful co-channel interference. But splitting the ITS band and fragmenting the 5.9 GHz spectrum, as proposed by the 5GAA, clearly contradicts spectrum neutrality. Member States see the spectrum neutrality as a principle. It is therefore a clear position of C-ROADS, that any attempt to use LTE-V2X at 5.9 GHz requires prior investigations within CEPT as the forum to deal with such investigations.

C-ROADS Member States expect that any C-ITS deployment needs to respect the current spectrum regulation. This includes the duty of ensuring non-interference with existing technology. Since ITS-G5 equipment is already operational, new technologies need to ensure the proper operation of the existing ITS-G5 equipment.

In the 5G Strategy of Germany, V2X communication is named as one of the central applications for using one of the pioneer 5G frequency bands (3.4-3.8 GHz, not 5.9 GHz)³. LTE-V2X can as well operate in 5G frequency bands, since it is a 5G technology. ACEA highlights that the 3.4-3.8 GHz band is a good compromise between high and low carrier frequencies with regards to propagation characteristics and antenna size. Therefore, ACEA suggests to use ITS-G5 at 5.9 GHz and redundant usage of LTE-V2X at 3.4-3.8 GHz⁴. C-ROADS Member States support this view and therefore suggest that:

- LTE-V2X is a 5G technology and should be used in 5G frequency bands.
- The ITS frequency band is already used for deployment of C-ITS services and shall not serve as a ground for 5G technology trials, while ITS-G5 mass deployment is on its way.
- The evolution of cellular LTE/5G long-range communication is beneficial for connecting vehicles to infrastructures via cloud services and backend interfaces (vehicle-to-network). C-Roads Member States are interested in further developing a hybrid approach, in which services are provided through a mix of complementing technologies.

¹ Radio Spectrum Policy Group; Strategic roadmap towards 5G for Europe, RSPG16-032

² 5GAA Position Paper June 12, 2017. http://5gaa.org/pdfs/5GAA_News_neu.pdf

³ Die Bundesregierung: 5G-Strategie für Deutschland, July 12, 2017, https://www.bmvi.de/SharedDocs/DE/Anlage/Presse/098-dobrindt-5g-strategie.pdf?__blob=publicationFile

⁴ ACEA Position Paper: Frequency bands for V2X, http://www.acea.be/uploads/publications/ACEA_Position_Paper_Frequency_bands_for_V2X.pdf

Cooperations and Ways Forward

The C-Roads Member States envision a growth of C-ITS services in the future and encourage the telecommunications industry as well as the automotive industry to further investigate any communication possibilities together with road authorities to realize future use cases such that these new technologies can be complementary to what is deployed. Such complementary approach shall explore and not replicate possibilities – it shall extend the diversity of spectrum use, not fragment it. This hybrid approach is the basic principle of the C-ROADS community.

The C-Roads platform has already established a cooperation with the Car-to-car Communications Consortium (C2C-CC) since June 2017. This agreement should assure an interoperability of services for the usage of ITS-G5 / 802.11p among road operators / authorities and the automotive industry cross borders and cross vehicle brands.

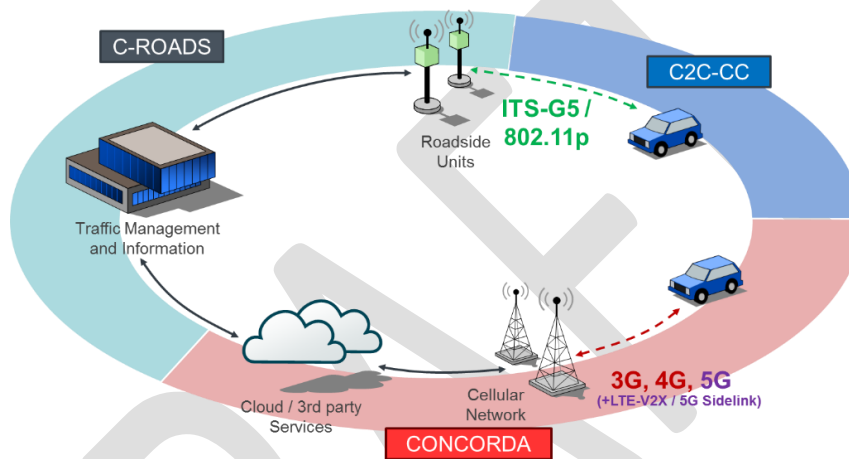


Figure: Cooperation model to cover the full value chain of C-ITS

The C-Roads platform sees a cooperation with the Car-to-car Communications Consortium (C2C-CC) as well as with the CONCORDA project as a natural way forward: All three entities could provide a unique contribution to the deployment and further development of C-ITS, solving the open technological as well as business related questions, following a hybrid technology approach as depicted in this C-ROADS position paper.

Further information about the C-Roads Platform: www.c-roads.eu

Contact information:

Martin Böhm, Secretary General, martin.boehm@austriatech.at