5GAA Response to the Draft RSPG Opinion on Spectrum Aspects of Intelligent Transportation Systems

The 5G Automotive Association (5GAA)[1] is pleased with the opportunity to provide an industry consortium view on the RSPG's draft opinion on spectrum aspects of ITS. Spectrum for ITS is important to 5GAA, as our association was founded on the prospect that direct communications between vehicles and the roadside units and pedestrians is critical to road safety and automated driving. We are committed to the realisation that direct 4G and eventually 5G communications will supplement the ever-increasing coverage and capabilities of wide area cellular coverage. Consequently, with the proviso that Cellular V2X (C-V2X) technologies gain fair access to spectrum harmonised for ITS, the 5GAA is working diligently on technology, standards and deployment models to considerably – even transformational – to enhance safety and mobility on roads and railways in Europe. We see a great promise by integrating cellular systems in addressing the totality of transport communication requirements, fulfilling not only the important short range ad hoc need but at the same time addressing the manifold communication links necessary for seamless multi-modal connectivity.

The 5GAA is keenly aware that the first version of C-V2X is already standardised (www.3gpp.org/news-events/3gpp-news/1798-v2x_r1) and that further C-V2X enhancements within 3GPP Release 14 will be standardised by early 2017. The specified C-V2X technology allows vehicles and roadside infrastructure to communicate directly with each other using the ITS-designated band in 5875-5905 MHz (5.9 GHz band). Additionally, C-V2X allows for enabling ITS communication over licensed spectrum, for direct communication between vehicles and between vehicles and roadside infrastructure, but also for efficient ITS support using cellular mobile networks. In a recent white paper on the matter, (http://5gaa.org/pdfs/5GAA-whitepaper-23-Nov-2016.pdf), 5GAA has stated that "depending on market demand C-V2X can be commercially ready by 2018."

With regard to the subject of this consultation, 5GAA fully agrees with the RSPG draft recommendation 1 on ITS for roads. The spectrum designation in 5875-5905 MHz should be technology-neutral as outlined in recommendation 2 for ITS for roads; moreover, it is important that in-band coexistence and cross border operation of ITS is ensured. 5GAA fully agrees to the recommendation 3 and 4 on ITS for roads and emphasises for recommendation 5 on ITS for roads that mobile networks operated in licensed MBB bands can provide opportunities for further valuable services and use cases to complement ITS, in particular using 5G features. With respect to recommendation 6, 5GAA observes that while spectrum at 63-64 GHz may be considered for short range communications the propagation characteristics at such high

[1] 5GAA (http://5gaa.org/) is a consortium of automakers, information and communication companies and telecommunications operators to develop, test and promote communications solutions, initiate their standardisation and accelerate their penetration to address society's connected mobility and road safety needs with applications such as autonomous driving, ubiquitous access to services and integration into smart city and intelligent transportation

frequency, and especially close to the oxygen absorption peak, are not ideal for communications between vehicles and infrastructure or for longer range communications between vehicles, especially considering the high mobility of ITS scenarios. From this perspective it becomes even more crucial to protect the spectrum at the 5.9 GHz band, taking into account both today and future ITS safety applications and their need to interact with roadside infrastructure and to communicate over relatively long range.

There can be various models of C-V2X deployment in Europe. We recognise that unlike IEEE-802.11p, C-V2X can provide all ITS Day One Services and future end-to-end communication needs, be they device-to-device[2], device-to-roadside, device-to-network, device-to-pedestrians or for communications to facilitate railway operations. Indeed, C-V2X encompasses two interfaces: (a) the wide area network LTE interface that connects end-user devices and vehicles to eNBs and the core network to provide existing WWAN/Internet, and Vehicle to Network (V2N) Services; and (b) the direct communications interface that connects vehicles (V2V), roadside infrastructure (V2I) and pedestrians and other vulnerable road users (V2P) directly with each other providing low-latency, high-reliability vehicular (aka V2V/I/P) services.

In this model, V2N services can be supported by spectrum already licensed to Mobile Network Operators. These networks will continue to evolve from LTE to 5G and with that they will use additional licensed spectrum as that becomes available.

The V2V/I/P services, on the other hand, benefit immensely from common spectrum which allows vehicles, road side infrastructure, and vulnerable road user to share it and directly communicate with each other independently of any MNO relationship and cellular network availability. The 5875-5905 MHz spectrum is harmonised for safety-related ITS across Europe, and thus the spectrum is ideal for V2V/I/P services delivered by C-V2X direct communications.

However, this spectrum is available on a license exempt basis. That is to say, the spectrum is available to all technologies which comply with the relevant regulatory technical conditions. As such, the matter of co-channel coexistence between C-V2X and 802.11p is of particular importance. The 5GAA is encouraged by the initial coexistence studies by 3GPP and strongly supports the development of technical measures to ensure that C-V2X and IEEE-802.11p can fairly co-exist in the ITS 5.9 GHz band. Examples of these include "mutual detect and avoid" mechanism whereby C-V2X and IEEE-802.11p detect each other and switch channels accordingly thereby avoiding co-channel operation. It is expected that such mechanisms will be specified in the next revision of ETSI EN 302 571.

Nevertheless, the 5GAA wishes to highlight that licence exemption (i.e., operation on a non-protected basis in a spectrum *public commons*) is not the only possible authorisation model, especially in the context of safety-related ITS. This is because while mechanisms such as "detect and avoid" can mitigate the risk of mutual harmful interference between C-V2X and 802.11p, there are still likely to be scenarios where system performance and level of reliability of each technology is degraded. *We encourage RSPG to consider alternative authorisation regimes in spectrum harmonised for ITS. Such regimes would allow the licensees to control the access to the spectrum by the ITS technologies and to better manage scenarios potentially resulting in harmful interference for safety-related ITS."*

[2] This mode enables out-of-coverage operations.

With respect to recommendation 3, 5GAA also recommends additional studies to assess the spectrum needs for future road safety ITS services. Should such requirements exceed the currently available 30 MHz at 5875-5905 MHZ, we would encourage RSPG to consider harmonization of the 2x20MHz above and below the existing designation (i.e., 5855-5875 and 5905-5925 MHz) for safety-related ITS.

Given that there is limited spectrum and a plethora of use cases and applications for roads, railways and next generation ITS operations, the 5GAA recommends that the RSPG and European Commission ensure that spectrum for ITS remains technology-neutral and that there are no regulatory barriers for existing and future technologies to evolve and operate in the ITS 5.9GHz band. We note that such an approach is consistent with the European Commission's recent ITS Masterplan, which states amongst other things that "*Initial deployment for short range vehicle-to-vehicle and vehicle-to-infrastructure communication will be based on technologies already available using this band and where appropriate will operate in seamless co-existence with 5G, under a complementarity principle*" and that the Commission will "*consider, where appropriate, making use of its mandate under the ITS Directive to adopt delegated act(s) by 2018… on ensuring a forward looking hybrid communication approach*".[3]

Based on the above coexistence considerations, and in order to enable ITS growth in a smooth manner within Europe, it is proposed for the following steps to be taken:

- Until a certain date, IEEE-802.11p and C-V2X would be restricted to operate on mutually different specific channels within the ITS 5.9 GHz band. The RSPG should consider publishing guidance to support the adoption of this proposal by the relevant industries, stakeholders, and Member States.
- RSPG to consider additional spectrum authorisation arrangements for ITS (V2V, V2P, V2I) applications in spectrum harmonised for ITS to ensure future support of ITS services uptake and service scalability.
- RSPG, in conjunction with industry, other stakeholders, and Member States, develop a plan that would enable all available ITS technologies, including future C-V2X enhancements e.g. 5G, to co-exist in applicable bands.

This approach should ultimately lead to the delegated act envisaged by the European Commission to support a technology-neutral communications approach, any revised ETSI EN for applications of communications technology for ITS at 5.9 GHz, an update to CEPT ECC Decision (08)01[4] as required and ultimately to facilitate the deployment of all available technologies and their future innovations to support 5G requirements for roads.

We therefore suggest that the following additional text (in italics) to recommendation 5 on ITS for roads of the RSPG Draft Opinion be inserted: "RSPG notes that mobile networks *will* provide opportunities for services to complement ITS, in particular using 5G features. *The RSPG fully supports the identification of*

[3] European Commission Communication 'A European strategy on Cooperative Intelligent Transport Systems, a milestone towards cooperative, connected and automated mobility' of 30 November 2016

[4] CEPT/ECC Decision (08)01 on the harmonised use of the 5875-5925 MHz frequency band for Intelligent Transport Systems.

suitable methods to facilitate the deployment of ITS technologies using both C-V2X and 802.11p in the 5.9 GHz band."