V2X SHORT RANGE RADIO TECHNOLOGY CHOICE

This document presents the position of the French Automotive Industry on the choice of 5G-V2X for V2X short range radio technology.

Context:

The European Commission framework has harmonized the use of the band 5.875-5.935 GHz for ITS[1] road safety related applications (Implementing Decision (EU) 2020/1426). The frequency band 5.875-5.925 GHz has been identified as the most suitable frequency band for development and deployment of ITS providing road safety and traffic efficiency applications all over Europe (see Figure 1).

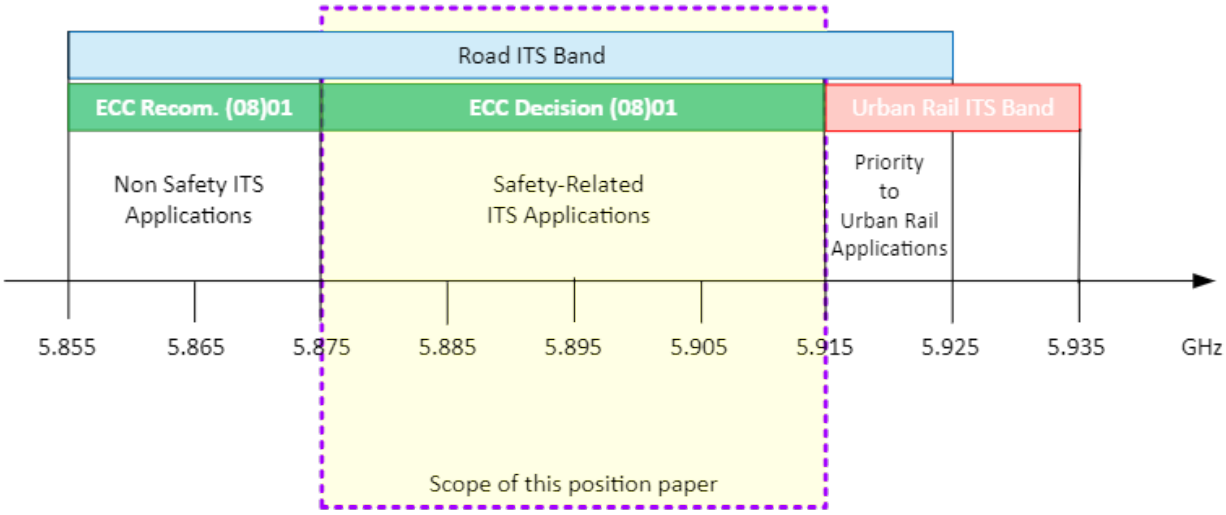

Figure 1 : Radio Channels for European Road ITS in the 5.9 GHz Band

The PFA, the French Automotive Industry and Mobilities, is strongly committed to improving the safety for all road user and the efficiency of road traffic and works actively towards the emergence of the Connected Automated Vehicle. V2X[2] services using radio short range communications are part of the technical enablers that will allow us to achieve these major goals.

During the last years, the issue of the coexistence of two competing families of radio technologies designed for V2X has hampered the massive deployment of V2X services. Indeed, radio technologies based on IEEE 802.11[3] series specifications (802.11p or 802.11bd) cannot interoperate on the same radio channel with radio technologies based 3GPP sidelink (LTE-V2X or 5G-V2X, sometimes referred as C-V2X)[4].

The PFA thanks the ETSI[5] for the intensive work that was conducted within the Technical Committee ITS to propose several solutions to resolve this coexistence issue. However, it shall be noted that ultimately a consensus among experts could not be reached to agree on the solution that would have allowed a massive adoption of V2X services by the automotive industry.

The PFA acknowledges that a deployment of V2X services using 802.11p radio technology has started in Europe, including within a few cities and some major road axis. To date, this deployment has not reached a point it could have been considered as the de-facto or must-have technical solution for V2X basic safety services.

The PFA notes that the USA has abandoned 802.11p in favor of C-V2X[6], joining China in this technological choice.

And finally, the PFA welcomes the decision of European Authorities to include the technology neutrality in the revision of the ITS Directive 2010/40/EU as one of the principles for specifications and deployment of ITS.

Position:

Considering all these facts, and following the consensus within the PFA's ITS expert group, the PFA is:

- in favor of deploying directly 5G-V2X (3GPP Release 16 NR-V2X sidelink or next releases) and of skipping prior V2X short range radio technologies. The PFA's French Automotive OEMs are committed to working on the deployment of 5G-V2X in their future vehicles.
- confident that 5G-V2X provides a future-proof technical solution that fulfills today's V2X services requirements, and that 5G-V2X will evolve as appropriate to fulfill those of future cooperative driving services.
- also confident that the 3GPP will maintain 5G-V2X specifications and include new features, evolutions, and corrections as appropriate, just as 3GPP did with GSM, GPRS and EDGE specifications over the past 20 years.
- in favor of an industry agreement on the ITS band split which respects and protects past and future investments in C-ITS. Therefore, the PFA rejects the idea of binding the usage of any channels of the ITS band to a service or to an ETSI release if it mandates the usage of a specific radio technology.

The PFA proposes to split the Safety-Related part of the ITS as follows (see Figure 2):

- Assign the frequency band from 5.875 to 5.895 GHz to 5G-V2X. For spectral efficiency, a single 20 MHz channel should be used instead of two 10 MHz channels.
    - The usage of this 20 MHz channel shall not be restricted to any ETSI V2X services. ETSI V2X release 1, 2 and beyond services shall be allowed on this channel.
- Assign the frequency band from 5.895 to 5.905 GHz to 802.11p.

  - The usage of this channel shall not be restricted to ETSI V2X Release 1 services only.
- Keep as spare the frequency band from 5.905 to 5.915 GHz until effective V2X deployments or emerging safety applications allow the industry to determine the best possible use of these 10 MHz.

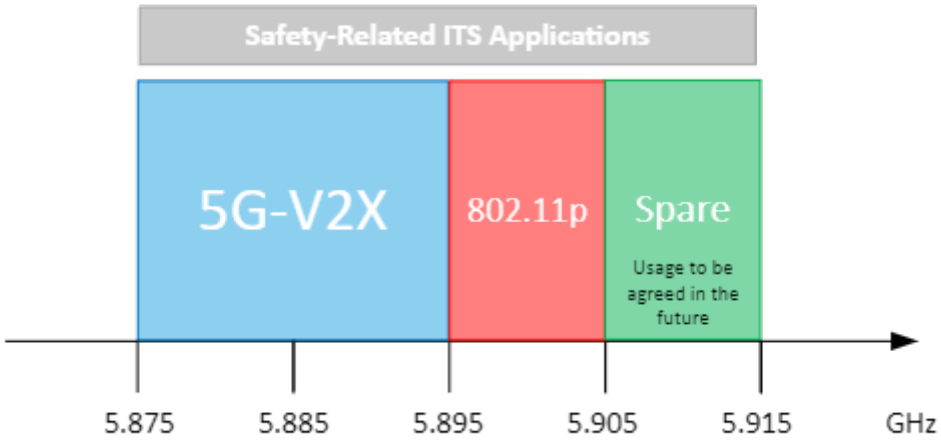

Figure 2 : Proposal for Safety-Related part of ITS Band channel attribution per radio technology

[1] ITS: Intelligent Transports Systems

[2] V2X: Vehicle to everything. Refers to communications of vehicles with other vehicles (V2V), road infrastructure (I2V), pedestrian (V2P), servers in distant networks (V2N), etc. V2G (Vehicle to Grid) is usually not considered as V2X by the ITS community.

[3] IEEE 802.11: IEEE 802.11p (https://standards.ieee.org/ieee/802.11p/3953/) and its enhanced version IEEE 802.11bd (https://standards.ieee.org/ieee/802.11bd/7451/) are derivative of WLAN standards for the vehicular environment. Being the oldest (2010), 802.11p was the first radio access technology to be specified for ITS G5, the European V2X standard, and for WAVE, the USA V2X standard. 802.11p is sometimes referred to as DSRC (Direct Short-Range Communications).

[4] 3GPP sidelink: device to device communication technology based on 3GPP standards. The adaptations of sidelink for the vehicular environment are called LTE-V2X (if based on 4G/LTE standards) or 5G-V2X. 5G-V2X is also called NR-V2X (NR for New Radio). Both can also be referred to as PC5 (LTE PC5 or NR PC5) which designate unambiguously the corresponding radio interface in the 3GPP architecture by opposition to the usual Uu radio interface between a terminal and the radio access network (RAN). C-V2X (cellular V2X) encompasses to all V2X radio technologies based on 3GPP standards.

[5] ETSI: The European Telecommunications Standardization Institute specifies the European V2X standard which is named ITS G5. The ITS G5 includes the radio access, protocols, security, system architecture and services. The ITS G5 radio access was originally based on IEEE 802.11p, but the ETSI ITS technical committee (TC ITS) introduced the LTE-V2X in this standard and is currently working to enable 5G-V2X and 802.11bd as possible radio access technologies for ITS-G5. The ETSI TC ERM (EMC and Radio spectrum Matters) has explored in TR 103 667 spectrum sharing between 802.11p and LTE-V2X (TR 103 667) and in TR 103 766 co-channel co-existence between IEEE- and 3GPP- based ITS technologies (TR 103 766):

TR 103 667: https://www.etsi.org/deliver/etsi_tr/103600_103699/103667/01.01.01_60/tr_103667v010101p.pdf
TR 103 766: https://www.etsi.org/deliver/etsi_tr/103700_103799/103766/01.01.01_60/tr_103766v010101p.pdf

[6] FCC Waiver: In November 2020, the USA Federal Communications Commission decided to reallocate the lower 45 MHz of the Road ITS band to unlicensed services (e.g. WiFi) and mandate the use of C-V2X instead DSRC for the remaining 30 MHz. (https://docs.fcc.gov/public/attachments/DOC-368228A1.pdf)