Comments of the

Motor & Equipment Manufacturers Association (MEMA)

to

Federal Communications Commission

RE: Use of the 5.850-5.925 GHz Band

ET Docket No. 19-138

March 9, 2020

The Motor & Equipment Manufacturers Association (MEMA) submits these comments in response to the Federal Communications Commission's Notice of Proposed Rulemaking seeking comment on the Commission's proposal to reallocate a majority of the 5.9 GHZ band to unlicensed use and away from critical connected vehicle safety technologies.

I. Introduction and Summary

The Commission's proposals under consideration in this proceeding would set existing lifesaving Intelligent Transportation Systems (ITS) applications back many years, if not make the ITS Band unusable because of significant and unresolved harmful interference caused by unlicensed use in adjacent bands. The second order effects of the Commission's proposals would be no less detrimental – advanced ITS applications ready for deployment or currently in development would be starved of the spectrum necessary to operate. As a result, the combined effects of the Commission's plans here would be to jeopardize existing safety-of-life applications, while preventing even more impactful technologies designed to protect motorists and pedestrians from being deployed in the United States. And paradoxically, the Commission's proposals are in direct conflict with the concerted international efforts currently taking place to *increase* spectrum availability exclusively for ITS applications in line with the existing 75 MHz of spectrum available on the 5.9 GHz ITS Band in the United States. In a thoroughly global automotive industry, the Commission's plans will singularly harm our nation's leadership in autonomous vehicle and ITS development.

Given these stakes, MEMA respectfully urges the Commission to preserve the full 75 MHz of spectrum currently allocated to ITS, and conduct further testing to ensure that the life-saving technologies and applications currently being developed and deployed by MEMA members will not suffer harmful interference from unlicensed use in adjacent bands.

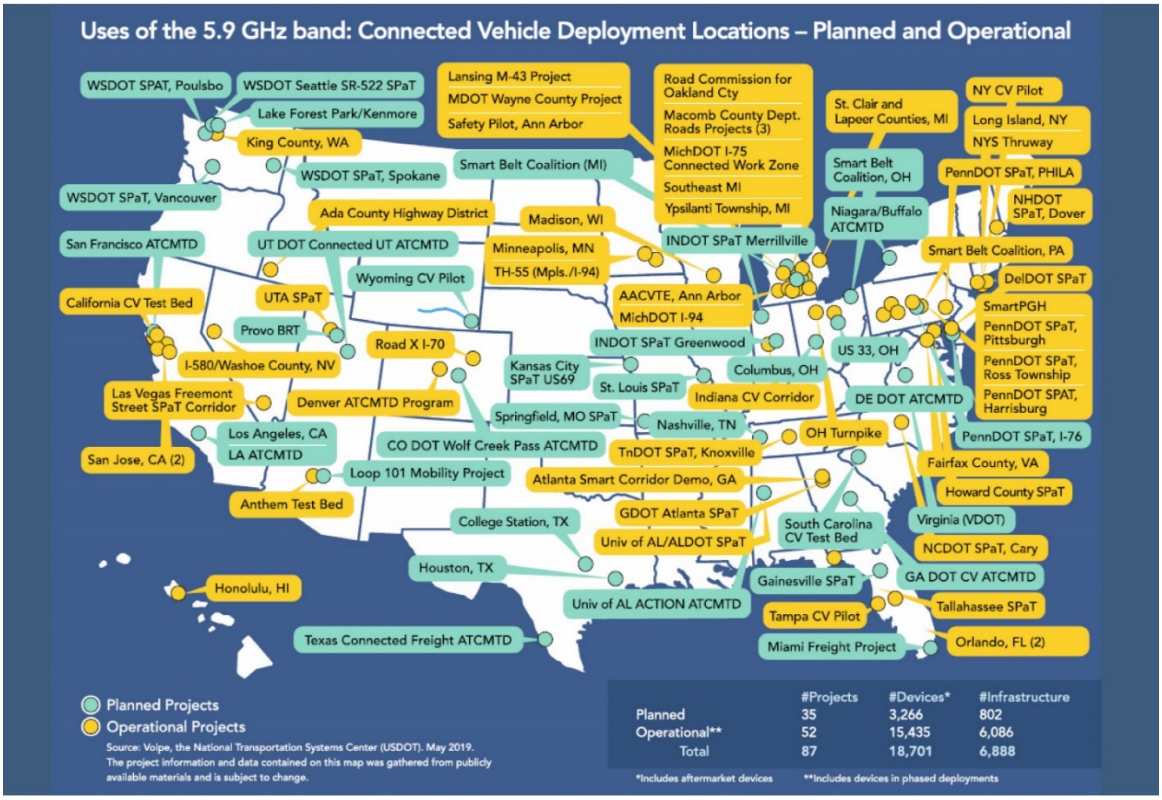
II. Background

A. About MEMA

MEMA represents motor vehicle suppliers that manufacture and remanufacture components and systems for use in passenger cars and heavy trucks. MEMA members provide original equipment (OE) to new vehicles, as well as aftermarket parts to service, maintain and repair vehicles on the road today. MEMA members lead the way in developing advanced, transformative technologies that enable safer, smarter and more efficient vehicles, all within a rapidly growing global marketplace with increased regulatory and customer demands.

Vehicle suppliers play a key role in the motor vehicle industry, particularly in developing and deploying a whole host of advanced driver assistance systems (ADAS) and other advanced vehicle safety technologies. Suppliers are critical in the ongoing development and implementation of vehicle-to-vehicle (V2V), vehicle-to-infrastructure (V2I) and vehicle-to-pedestrian (V2P) technologies (collectively referred to as vehicle-to-everything, or V2X). Moreover, suppliers need to meet the needs of their customers – the vehicle manufacturers – to support the market demands and future standards and regulations related to V2X communications. The motor vehicle supplier industry has spent millions of dollars on research and development in reliance on the Commission's channel plan to meet the requirement for very low latency, stability, and reliability.

In addition, the U.S. Department of Transportation (DOT), several state departments of transportation, and related agencies and stakeholders have all made significant research, infrastructure, and planning investments. Suppliers have been directly engaged on these deployments working with various state departments of transportation and other localities. Public-private partnerships in which suppliers are directly engaged include: Colorado's "RoadX" program; Utah's "Smart Roadways Data Network" project; Georgia's "The Ray" V2X ecosystem; and, Ohio's "Connected Vehicle Environment" project. These are just a few examples of the transformative projects in which MEMA members are currently engaged – there are many more projects noted in the graphic[1] below in various stages of active deployment. All these endeavors are dedicated to a future that envisions a highly connected vehicle environment to enhance transportation safety and efficiency.



[1] Docket No. NHTSA-2019-0083-0004; Excerpt from "USDOT Vehicle-to-Everything (V2X) Research--selected projects and programs" Presented during NHTSA Research Public Meeting, November 2019.

B. The Critical Need for An Improved Intelligent Transportation System

Any reasonable evaluation of the Commission's re-channelization proposals in the NPRM must consider the societal costs of taking resources away from advancing transportation safety. Annually, more than 37,000 people are killed and over 2.7 million people are injured due to motor vehicle crashes.[2] While the pain and suffering experienced by affected families and individuals cannot be quantified, the economic cost of these crashes is estimated at "$250 billion in direct costs and over $800 billion when the loss of life, injuries, and other quality of life factors are put into dollars."[3] On top of this, traffic congestion costs the country $140 billion per year, and this number continues to increase.[4]

V2X applications can decrease all of these costs – significantly. For example, by providing drivers with prompt warnings of likely crash conditions, NHSTA estimates that V2X could reduce the number and severity of motor vehicle crashes by up to 80 percent.[5] That amounts to potentially eliminating over $800 billion in losses to the country each year, not to mention the incalculable benefits of reducing the scourge of lives needlessly lost or ruined on U.S. roads. Further, V2X technology promises to allow smarter vehicles to more efficiently use existing roadways, effectively increasing road capacity by up to 40 percent, and also decreasing emissions and fuel waste by 10 percent.

V2X communications can integrate seamlessly with other ADAS that utilize vehicle sensors and provide additional information for automated vehicles. For new vehicles, fully integrated systems are in development to enhance and augment a vehicle's overall safety system. V2X technology adds non-line-of-sight capability to the existing line-of-sight sensors and enables ADAS to see around corners or detect when a vehicle several vehicles ahead is suddenly braking.

Protecting vulnerable road users (like pedestrians or bicyclists) is the next important goal in V2X development and deployment. Collective perception – also called sensor sharing - through which vehicles share their information gathered by their local perception sensors about objects in their vicinity can protect vulnerable road users. For example, vehicle V2X sensors and smart intersection technology (radar, camera, LIDAR) detect vulnerable road users and communicate their position and movement to all other V2X participants – immediately protecting them with V2X technology.

V2X also plays an essential role in enabling autonomous driving. While V2X is seen as a key technology to support automated driving functions in general, it would augment and complement fully automated driving – especially in urban and suburban traffic that requires the most exacting standards for automated vehicles. For such vehicles, V2X will also allow for cooperative automation with infrastructure and other non-road vehicles (e.g. trains) and emergency vehicles.

III. The Full 5.9 GHz Band Should Be Preserved for Intelligent Transportation Systems

MEMA respectfully submits that the Commission's proposals under consideration would not only arrest the continued development of new vehicle safety applications, but also create a

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[2] *See* Letter from Transportation Secretary Elaine Chao to FCC Chairman Ajit Pai https://www.highways.org/wp-content/uploads/2019/12/sec-chao-letter-5.9-11-20-19.pdf.
[3] *Id.*
[4] *Id.*
[5] Frequency of Target Crashes for IntelliDrive Safety Systems (DOT HS 811 381); NHTSA; October 2010 http://www.nhtsa.gov/DOT/NHTSA/NVS/Crash%20Avoidance/Technical%20Publications/2010/811381.pdf

significant risk that the spectrum for ITS will be unusable for existing applications due to known adjacent channel interference issues. For the reasons detailed below, MEMA therefore urges the Commission to keep the full 75 MHz of spectrum in the 5.9 GHz band allocated to vehicle safety without favoring one particular technology over another. Second, in no event should the Commission proceed with any changes until *real world* testing rigorously establishes that ITS applications will not face harmful interference. Such testing is necessary to ensure that this minimum spectrum receives the best protection from harmful interference.

A. The Commission Should Not Favor C-V2X Over DSRC – Both Technologies Have Their Place in the ITS Safety Arsenal

In order for V2X applications to work safely, they must be able to communicate with minimal latency and interference. Further, the latency requirements and interference tolerances depend on the specific transportation safety application at issue. In other words, vehicle and pedestrian collision warning applications have markedly different requirements than weather warning and congestion mitigation applications, which have more forgiving latency and interference tolerances.

MEMA does not generally favor one available technology over another. But these differing technological constraints are directly relevant to why the Commission's proposal to favor still-maturing Cellular Vehicle to Everything (C-V2X) over existing DSRC technology is, respectfully, misguided. *See* NPRM, ¶¶ 24-31. In the case of V2V and V2X technology, DSRC is the *only* proven, vetted technology currently available. Indeed, DSRC has already been launched by one OEM and many state DOTs, and as a result, it is clearly the lead technology.

Given these facts, the Commission's proposals to dedicate most, if not all, of ITS spectrum to C-V2X and away from DSRC would set back vehicle safety tremendously. C-V2X is a *promising* technology but not yet mature. Indeed, as the DOT Spectrum Team has correctly noted, it is essential to "require proof that a communication technology works in the dynamic and complex of transportation scenarios that are the cause of crashes."[6] DSRC and C-V2X are complementary technologies that *both* need sufficient spectrum to properly function, as discussed below.

B. Limiting Transportation Safety Spectrum to 30 MHz Will Pose Grave and Unexamined Safety Risks and Stifle Innovation

The Commission's proposal to reduce the spectrum available for vehicle safety applications by 60 percent is nearsighted at best because it will effectively limit the number of safety applications that can be transmitted over a much narrower band. More troubling, the safety implications of forcing ITS into this narrow band *and* surrounding ITS applications with unlicensed Wi-Fi usage is alarming. The combined effects of these proposed changes will likely render existing ITS applications useless given known interference issues from adjacent channels. MEMA therefore urges the Commission to preserve the full 75 MHz of spectrum allocated to ITS as it is the proven minimum required amount of safety spectrum (see Table 1 attached), and to better protect the safety band from any harmful interference at the band edges 5850 and 5925 MHz.

[6] *See* https://www.transportation.gov/sites/dot.gov/files/docs/research-and-technology/359811/preliminary-technical-assessment-fcc-59-ghz-nprm-05dec2019-final.pdf.

i. Surrounding the ITS Band with Unlicensed Use Will Likely Make ITS Safety Applications Unusable

As demonstrated by NHTSA testing, the current out-of-band emissions created by UN-II-3 devices do interfere with the ITS band, leading to an unacceptable packet error rate of **up to 70 percent** in V2X communications.[7] Despite this, the Commission appears to erroneously assume that no further testing is needed if it simply adopts its proposed "45/30 megahertz split for unlicensed devices and ITS applications." NPRM, ¶ 11. But as the DOT Spectrum Team rightly noted, a "shift of this nature needs to be based upon independent and objective analysis that includes not only the spectral performance of the technology, but also the safety performance given that it will be applied to safety-of-life applications."[8] Put simply, if there is interference with a Wi-Fi connection, video streaming might be slower to load. Conversely, if there is interference with a collision avoidance system that drivers have come to rely on, lives can be lost. The Commission and DOT recognized this same scenario/threat and commissioned the 3-phase testing.

As a result, MEMA respectfully submits that significant additional testing is required before making any conclusions in this proceeding. Many issues regarding re-channelization were not addressed with the first testing phase conducted strictly under lab conditions – under which devices were placed inside a sealed radio frequency (RF) enclosure and tested. Because of the highly variable, spread out, multi-nodal, and mobile nature of real-world V2V communications, it is unclear how readily any previously performed laboratory test results correlate to actual use cases. Significantly more testing will need to be completed in both laboratory and real-world environments. Since any lost V2V safety messages could result in a collision, prudence demands that significant additional studies be conducted to evaluate the Commission's proposals.

Accordingly, MEMA urges the Commission and DOT to continue and complete the 3-Phase Test Plan, adjusted to encompass any proposals under consideration here. To avoid harmful interference, MEMA recommends that adjacent unlicensed devices should be allowed maximum interference with V2X communication at the same level of self-interference by V2X, which is -40 dBm/MHz out-of-band emissions[9] at the band edges for V2X at 5850 MHz and 5925 MHz. The bottom line, however, is that there is sufficient evidence that V2X technologies cannot safely operate within a narrow 30 MHz of spectrum without harmful interference, and thus there is no reasonable basis to believe that the 75 MHz ITS band can be dismembered without jeopardizing health and safety.

ii. The Commission's Proposals Will Stifle the Development of Life-Saving Applications

It is a simple fact that reduced spectrum availability for ITS will restrict the number and breadth of safety applications that can utilize this dedicated spectrum, safely or not. In fact, all the government-industry developments and planning thus far have been firmly rooted in the Commission's current channel plan and 75 MHz of spectrum capacity. Thus, at a minimum, the continued deployment of accident avoidance and other safety-of-life applications will be further

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[7] *See* "Vehicle-to-Vehicle Communications Research Project (V2V-CR) DSRC and Wi-Fi Baseline Cross-channel Interference Test and Measurement Report" by US DoT, 12/2019, *available at* https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/documents/v2v-cr_dsrc_wifi_baseline_cross-channel_interference_test_report_pre_final_dec_2019-121219-v1-tag.pdf

[8] *See* https://www.transportation.gov/sites/dot.gov/files/docs/research-and-technology/359811/preliminary-technical-assessment-fcc-59-ghz-nprm-05dec2019-final.pdf.

[9] Derived from class c devices in IEEE802.11p current DSRC spectrum mask in Unites States.

delayed simply by virtue of having to be modified and retested to work within the proposed narrower 30 MHz of spectrum capacity.

Indeed, the loss of ITS spectrum should also be expected to result in abandoned or foregone technology developments that will save lives. For example, MEMA members anticipate that 30 MHz of spectrum would be insufficient to deploy a host of life-saving applications currently in development and limit ITS applications to the basic safety messages in use today by removing the necessary spectrum that new safety applications would need as shown in Table 1.

In the future, connected cooperative maneuvers and high-definition sensor data sharing that enables better environmental perception will make further use of the existing 75 MHz of spectrum capacity. Several important innovations are the vulnerable road user (VRU) protection with collective perception as well as the enabling of cooperative automated driving applications, such as:

- Active V2V collision avoidance and maneuver coordination;
- Vulnerable road user (VRU) safety warning;
- Cooperative adaptive cruise control and truck platooning;
- Red light violation warning;
- Curve speed warning;
- Construction zone/Road work warning;
- Emergency vehicle alerts and prioritization;
- Inclement weather warning; and,
- Cooperative merging and lane changing to alleviate congestion.

All of the following applications in development require a minimum of seven 10 MHz channels to safely operate without harmful interference, as demonstrated in Table 1. This Commission's proposal will make deploying these life-saving technologies impossible. Accordingly, there will be very real opportunity costs in foregone life-saving technological advancements if the Commission's proposals are adopted because all of these applications cannot be accommodated within a 30 MHz band of spectrum. MEMA therefore urges the Commission to preserve the full 75 MHz allocated to ITS as it is the proven minimum required amount of safety spectrum (see Table 1) and to better protect the safety band from any harmful interference at the band edges at 5850 MHz and 5925 MHz.

IV. The Commission's Proposals Are Based on False Premises

A. Other Countries Are *Increasing* the Spectrum Allocated to ITS, Not Decreasing It

The Commission appears to base much of its plan on a misconception: that the United States has allocated too much spectrum to ITS applications compared to other countries. NPRM, ¶ 21. In fact, last year, the International Telecommunications Union's World Radio Conference concluded that 75MHz of spectrum at 5850 – 5925 MHz should be allocated to ITS usage in all regions worldwide.[10] This is consistent with the allocations many countries have already made in the 5.9 GHz band for V2X communications, including Canada (75 MHz), Mexico (75 MHz), Australia (70 MHz), Korea (70 MHz), and Singapore (50 MHz), CEPT (70 MHz), Europe (70 MHz), and, Russia (70 MHz). While the Commission correctly notes that Japan currently dedicates 10 MHz of spectrum exclusively for transportation safety communications, Japanese authorities are

[10] *See* WRC recommendation 209 on p. 555, *available at* https://www.itu.int/en/ITU-R/conferences/wrc/2019/Documents/PFA-WRC19-E.pdf

currently testing to explore including additional V2X technologies within 80 MHz of spectrum currently allocated to toll collection. In the EU, 30 MHz of the 5.9 GHz band has been dedicated for transportation safety communications. Importantly, the EU Electronic Communications Committee has recognized that 30 MHz of spectrum is insufficient capacity to safely accommodate the growth of ITS applications, and has thus proposed extending this to 50 MHz, while also providing an additional 20 MHz for non-safety ITS applications – for a total of 70 MHz.

Essentially, the Commission's proposals are swimming against the stream of otherwise consistent recognition that *more* spectrum should be allocated to ITS applications, not less.

B. DSRC and Other ITS Technologies Are Ready to Be Deployed – Only Regulatory Certainty Is Needed

The Commission's conclusion that "DSRC has not lived up to its promise", NPRM ¶ 18, ignores the current ITS technologies ready to be deployed and the governmental policies and inaction that have resulted in widespread delays. As the 5.9 GHz band was allocated in 1999, through this regulatory certainty, the automotive industry was able to build and develop industry-wide service rules, which, in turn, were adopted. Following that, licensing commenced, and a spectrum-sharing agreement negotiated with the incumbent satellite industry. These necessary conditions were achieved in 2008. Furthermore, IEEE 802.11p was completed in 2010.

The automotive industry made significant progress over the next several years developing ITS applications that will function *all the time*, even in challenging environmental and real-world conditions – reliability standards that other technology and software developers never come close to meeting. In other words, ITS applications are in a class of their own in terms of safety and reliability standards, and it is unreasonable to judge their deployment timeline by the standards of mass market consumer products.

Although many ITS applications are ready to be deployed, it was and is essential for final interoperability standards to ensure that the various applications could work together without harmful interference. The DOT/NHTSA NPRM initiated the process to define all the details of a working V2X system, including establishing a Security Certificate Management System (SCMS) and defining exactly which international standards would be used to operate the system. However, this proceeding froze the automotive industry as it waited for the promised governmental standards and directives, which have not been forthcoming. We encourage the associated agencies to work with the industry to move forward with this standard setting process.

C. The Costs of the Commission's Proposal Outweigh the Marginal Benefits

Given the Commission's earlier proposal to allocate the massive amount of 1200 MHz of spectrum in the 5.925 – 7.125 GHz band to expand spectrum availability for Wi-Fi services (i.e. the Wi-Fi 6E), MEMA respectfully submits that the Commission's proposal to potentially give Wi-Fi users an additional 45 MHz of spectrum in the 5.850 – 5.895 GHz will provide limited marginal gains compared to the tragic loss of opportunity for saving tens of thousands lives of our citizens each year. To put this in perspective, the Commission would be increasing total spectrum for Wi-Fi usage by 2.5 percent, while eliminating 60 percent of the spectrum the automotive industry has been using to develop life-saving technologies and applications.

Simply put, the argument that this additional 45 MHz of spectrum will unleash a multitude of innovations is speculative at best, especially given that these "innovations" can be hosted within the additional 1200 MHz of spectrum that will be allocated to Wi-Fi in the near future. In other words,

the Commission's proposals do not account for the law of diminishing returns as the spectrum allocated to Wi-Fi increases. Furthermore, the claim that this additional 45 MHz of spectrum has the potential to add approximately $100 billion to the GDP should be compared to the nearly $1 *trillion* of direct and indirect costs inflicted on the national economy due to road fatalities and injuries.[11] Therefore, MEMA believes that the only prudent course in this proceeding is to preserve the limited spectrum needed for life-saving transportation safety applications over the unproven potential for increased download speeds.

V. Conclusion

For all the foregoing reasons, MEMA respectfully requests that the Commission preserve the full 75 MHz of spectrum currently allocated to ITS, and conduct further testing to ensure that the life-saving technologies and applications currently being developed and deployed by MEMA members will not suffer harmful interference from unlicensed use in adjacent bands. For questions or more information, please contact MEMA's Chief Technology Officer Brian Daugherty at bdaugherty@mema.org or (248) 430-5966, and Vice President of Regulatory Affairs Leigh Merino at lmerino@mema.org or (202) 312-9249.

Table 1 Attached

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[11] *See* https://www.highways.org/wp-content/uploads/2019/12/sec-chao-letter-5.9-11-20-19.pdf

Table 1: Minimum basic spectrum needs for V2X technology in 5.9 GHz band for the current specified V2X applications[12] [13]

Safety spectrum needs for a single short-range V2X communication technology in MHz bandwidth, in 5.9 GHz safety band

	environment			
message type	**urban**	**suburban**	**Rural** (Highway) light traffic, high speed	number of 10 MHz Channels
BSM Basic Safety Message	9	10	9	1
SPAT signal phase and timing, **MAP** road/lane topology and traffic maneuver , **IVI** in-vehicle-information and other **I2V messages**	1	1	1	0,5
PSM personal safety message	4	1	2	0,5
PCM platooning control message	3	6	10	1
CPM collective perception message	23	26	24	2
MCM maneuver coordination message	23	26	24	2
Minimum basic spectrum needs in MHz for safety	**63**	**70**	**70**	
number of 10 MHz channels required				**7**

[12] Source: CAR-2-CAR Communication Consortium position paper "Road Safety and Road Efficiency Spectrum Needs in the 5.9 GHz for C-ITS and Cooperative Automated Driving" https://www.car-2-car.org/fileadmin/documents/General_Documents/C2CCC_TR_2050_Spectrum_Needs.pdf

[13] *See* message type definitions in international standardization bodies SAE, ISO, ETSI: BSM Basic Safety Message, SAE J2945/1, SAE J2735 SPAT, Signal, Phase, and Timing, ISO/TS 19091:2017, SAE J2735, SAE J2945/10 MAP, road/lane topology and traffic maneuver ISO/TS 19091:2017, SAE J2735, SAE J2945/10 PSM Pedestrian protection with Personal Safety Messages according to SAE J2735, SAE J2945/9 PCM, Platooning Control Message draft specification in ETSI TR 103 298, currently being drafted in the European H2020 project ENSEMBLE (multi-brand truck platooning), *available at* https://platooningensemble.eu/https://platooningensemble.eu/news/using-its-g5-for-efficient-truck-platooning5c1a203e7a226 CPM Collective Perception Message, draft ETSI TS 103 324, ETSI TR 103 562, SAE J2945/8 MCM Maneuver Coordination Message, according to ETSI TR 103 578 (draft) "Informative report for the Maneuver Coordination Service"; https://imagine-online.de/en/home/ ,SAE J2945 /6