

ASECAP position on ITS spectrum: listen-before-talk & no spectrum split

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More than 80.000 km of roads in Europe are toll roads - and more than 70 million on-board units for electronic road usage charging are in circulation on ASECAP roads. Electronic road usage charging creates EUR 32.6 billion annual revenue. This revenue is used to assure Europe's toll roads are the safest in the world. The generation of this income depends on the interference free operation of DSRC which is the predominant technology in tolling on-board units.

Road operators also operate Intelligent Transport Systems (ITS), and ITS radio equipment in the 5.9 GHz band needs to co-exist with road tolling, the smart tachograph and others. Moreover, ITS devices also need to be able to coexist in the 5.9 GHz ITS band, an unlicensed/shared band designated for road safety.

Three pillars of politeness – a future-oriented approach to coexistence:

For the future use of the ITS band, it serves the best interests of spectrum users to respect common "politeness" rules that make sure that technologies in the 5.9 GHz ITS spectrum¹ do not block the spectrum from future usage, not to fragment it along technology lines, and keep it open for future innovations. These rules form 3 pillars of politeness:

Politeness in a Nutshell

...or how polite people share a dining table

1. don't talk when others do ('listen-before-talk')
2. don't talk all the time ('limit the duty cycle')
3. leave room for others, at the table and in the conversation ('limit congestion')

This way everybody can participate and all can enjoy.

- Devices must adhere to a **listen-before-talk** protocol², ensuring that interruptions are prevented. Automotive industry (OEMs) should factor this requirement into their specifications.
- Devices should not consume all the resources (**duty cycle limit**)
- A group of devices (e.g. performing the same use case) should not consume all resources (**congestion limit**)³

¹ The 5.9 GHz ITS spectrum is described in [7] and [8]

² Listen-before-talk is not new, it has been used in RLAN bands since over a decade (see ETSI EN 301 893).

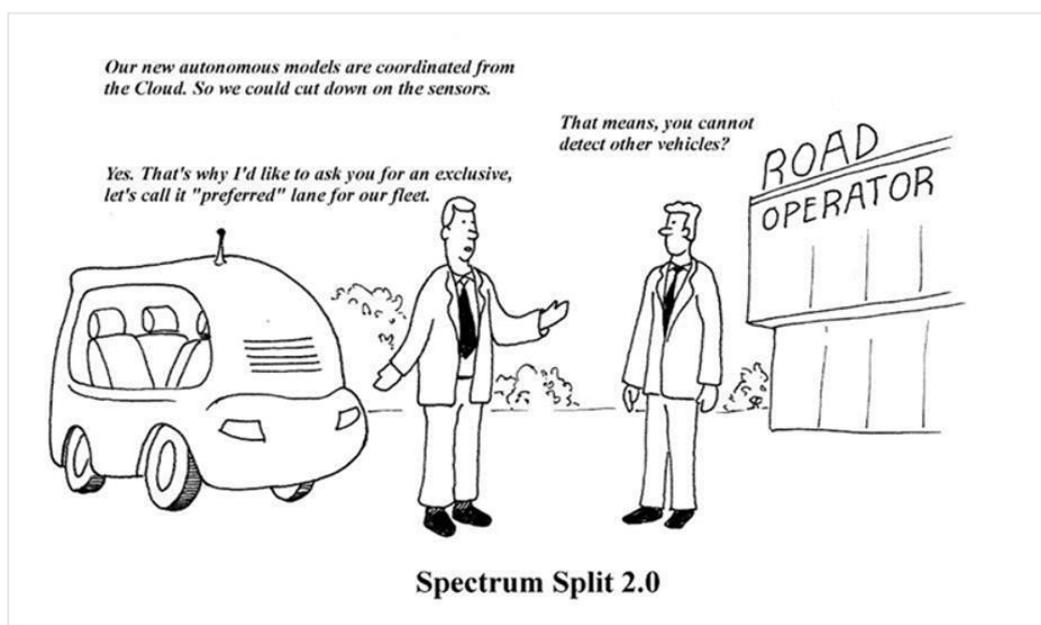
³ Note that vehicular communication takes place in ad-hoc / mesh networks without central control by access points or base stations, thus congestion needs to be controlled by the devices themselves.

ITS deployment and spectrum claims

In the recent years, as cooperative ITS (C-ITS) have been successfully rolled out, we have witnessed day-1 services becoming operational [5]. Essential services such as road works warning and emergency vehicle warnings that bring life-saving functions via direct vehicle-to-everything (V2X) communication into vehicles became a reality. There has been a notable expansion in the provision of infrastructure support for V2X along motorways and in urban areas.

Surprisingly, as the implementation of day-1 services was taking place in the real world, we came across theoretical proposals of assigning different ITS technologies to different parts of the ITS spectrum.

Why should a part of the spectrum be “reserved” for a certain technology? Wouldn’t it be better if the spectrum is open to anyone? Of course, this requires common rules, such as right-of-way rules are used in road traffic instead of assigning exclusive lanes for new vehicle categories.



The state of ITS deployment

Fact is: ITS spectrum doesn’t necessitate the exclusive adoption of a particular technology. What holds significance are common rules that allow all of us to use the spectrum in an open way to accelerate road safety – and we need to adhere to the rules that prevent interference into other radio applications and services.

Furthermore, the rationale behind advocating for multiple non-interoperable technologies remains unclear. We wish to emphasize that road operators have consistently stressed the importance of interoperable solutions from the beginning [1]. In the early years where vehicle penetration is low, it is most often the road infrastructure support that enable customers to experience the day-1 services and see the benefit of Cooperative ITS.

Road operators already support around 30 use cases which are harmonised on European level in the C-ROADS platform [5]. They use 30 MHz of the ITS spectrum already today in full alignment with spectrum regulation [6]. If from now on all new standards request a distinct portion of the remaining ITS spectrum, then the available bandwidth within the 5,9 GHz band will be exhausted, with no room for future innovations.

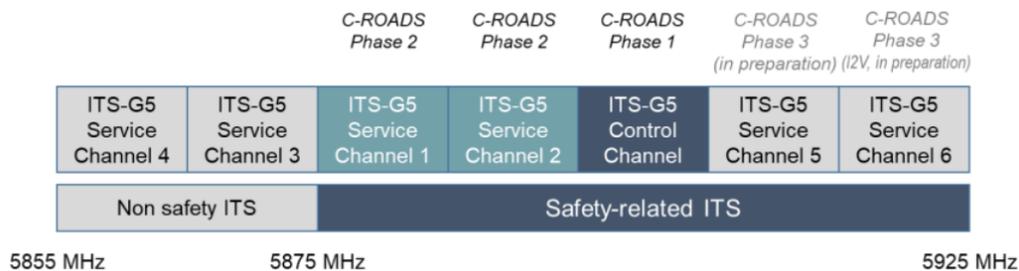


Figure 1 – Current use of the ITS band for infrastructure use cases of C-ROADS [5].
Note that the spectrum is used with listen-before-talk, so that no exclusive allocation is necessary.

The deployment situation in Europe is shown in Figure 2. There is no deployment of LTE-V2X and 5G-V2X, but a deployment of conventional cellular 4G and 5G networks. Note, that there is a significantly larger bandwidth for conventional 4G and 5G than for ITS. A technology mix of short range ITS-G5 and long-range 4G/5G is already possible today and both technology streams complement each other [2].

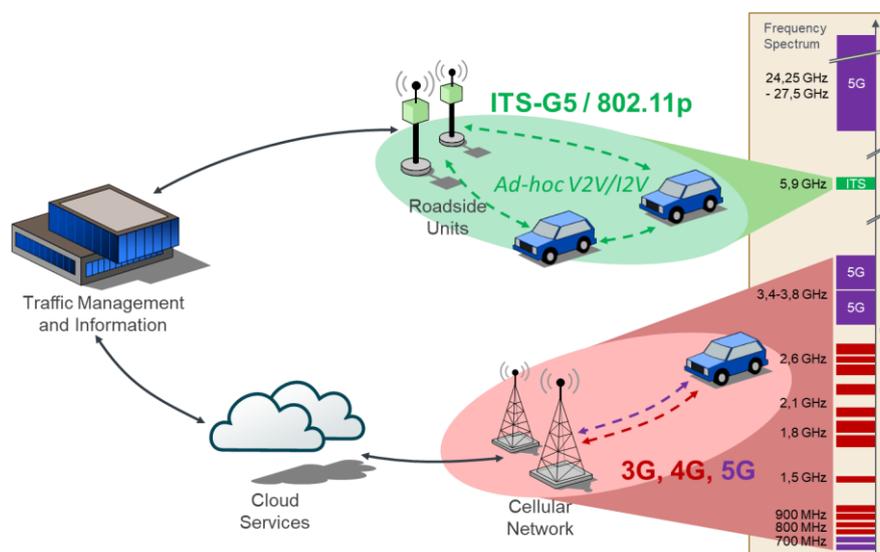


Figure 2 – Spectrum use by ITS hybrid communication in Europe, cf. [2]

Business models versus spectrum sharing

What could be the reason to propose new technologies regardless of coexistence and interoperability? The business model behind licensing communication technology for the automotive domain *bundles* useful technologies and not fully developed ones. Conventional 5G for long-range communication poses no problem and we welcome the services and its potential. The 3GPP automotive short-range technologies LTE-V2X and 5G-V2X may cause radio interference and its technical added value in the field of V2X is disputed.

ASECAP believes that LTE-V2X und 5G-V2X (unlike conventional 4G and 5G) are still not mature, because they do not sufficiently protect electronic road usage charging systems, as well as the smart tachograph. In this respect, the (1.) doubling of transmissions, (2.) non-interoperability with toll protection beacons, (3.) regulatory uncertainty regarding duty cycle limits, which protect incumbent radio applications and services, need further consideration.



The on-going discussions about technology arise from the fact that not all the proposed technologies can coexist with others, though the ITS spectrum is a *shared* spectrum. This scenario can be likened to a conversation where a person talks over and disrupts others, rendering true sharing unattainable. There are standardized solutions for the listen-before-talk principle in short-range communication (both WiFi and cellular-based⁴). If both communities adhere to this listen-before-talk principle, the issue is solved, and there is no necessity to deliberate on the apportionment of technology within specific segments of the spectrum. Any spectrum split and / or exclusive spectrum allocation is considered as bad practice (inefficient spectrum use, contradiction with European spectrum policy etc⁵). There is no evidence that co-existence is technically not feasible – on the contrary: ETSI developed several possibilities for co-channel coexistence [4]: we just need to agree on the technical requirements that will ensure co-existence, on the grounds of existing studies and principles. So, any band split discussion is considered out of context at this point.

These aforementioned politeness principles, which have been followed since early ETSI ITS standards, should be the framework in order ensure future-proof solutions. Adhering to these rules is imperative, as any deviation from them jeopardizes safety or impedes the seamless integration of emerging technologies in the future.

It is crucial to bear in mind that the operational lifespan of a vehicle extends beyond 15 years, with a certain model being produced for approximately 4 to 6 years. Thus, a decision for a technology that comes without listen-before-talk is blocking the spectrum for at least 20 years. If such technology turns out not to be optimal, it will become a road block for the evolution of ITS. Thus, it is not sustainable to give it exclusive priority in ITS spectrum and lose this spectrum for the next 20 years.

ASECAP believes that openness, interoperability, and a rule-based usage of the ITS spectrum will help to develop road safety in coexistence with sustainable road financing.

One road safety – one language – one spectrum

⁴ i.e. based on IEEE standards and 3GPP standards

⁵ When the ITS band was extended, the mandate from the European Commission to CEPT stated that “is not intended to support segmentation and segregation between technologies and applications within the same band and thus to compensate for any cases of inefficient spectrum use. Technology neutrality and efficient spectrum use are important regulatory principles.” [3]

References

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- [6] C-ROADS Statement on ITS spectrum, October 2022
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- [7] ECC Decision (08)01 - ECC Decision of 14 March 2008 on the harmonised use of Safety-Related Intelligent Transport Systems (ITS) in the 5875-5935 MHz frequency band, latest updated on 18 November 2022
- [8] ECC Recommendation (08)01 - ECC Recommendation of 21 February 2008 on use of the Band 5855-5875 MHz for Intelligent Transport Systems (ITS) latest updated on 18 November 2022

About ASECAP

ASECAP is the European Association of Operators of Toll Road Infrastructures across 19 member countries representing 128 companies employing more than 40.000 direct jobs and 200.000 indirect jobs. They operate, maintain, manage a network of more than 80.000 km with a long-term vision that ensures highest quality standards to make the road infrastructure safest, reducing carbon footprint and preserving the environment thank to the user/polluter/pays principle providing sustainable financing.

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