
Photo Source: USDOT

CONNECTED VEHICLE CHALLENGES: POTENTIAL IMPACT OF SHARING THE 5.9 GHZ WIRELESS SPECTRUM

Connected vehicles use secure and anonymous wireless technology to communicate with other vehicles, road infrastructure, and personal mobile devices. This connected vehicle communication will enable safety, mobility, and environmental advancements that current technologies are unable to provide. Connected vehicle technology could potentially address up to 81 percent of unimpaired vehicle crashes, while also reducing the 4.8 billion hours Americans spend in traffic annually.

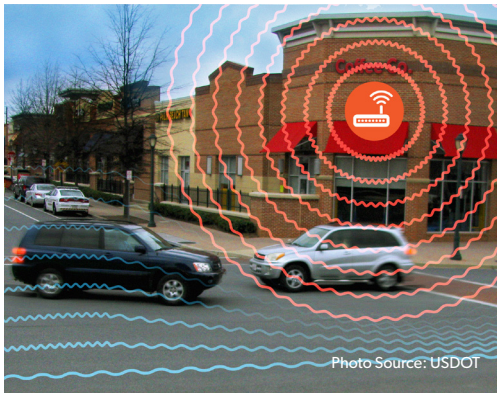
Photo Source: USDOT

For the past decade, the U.S. Department of Transportation (USDOT) has been researching and testing this system of communicating vehicles. The connected vehicle environment that is being researched is based on reliable access to the 5.9 GHz wireless spectrum. The speed, security, and reliability of the dedicated short-range communications (DSRC) are absolutely critical to the safety technology. The 5.9 GHz DSRC wireless spectrum provides this capability—it's proven and it has the potential to save lives and prevent life-changing injuries. However, the technology cannot be effective if the signal is subject to interference.

Overview of DSRC Spectrum

DSRC is a two-way short- to- medium-range wireless communications capability that permits very high data transmission critical in communications-based active safety applications. It is a proactive, next-generation technology in crash prevention.

The 5.9 GHz spectrum is critical to the low latency operation of DSRC. DSRC was designed to operate in this spectrum in a mobile environment to achieve both low latency and high reliability. This means it has very short time delays and assurance of message delivery, so that it works in a fast-moving, mobile environment. The communication paths used for safety applications need to be available continuously so that critical information can get through in the split-seconds needed to avoid collisions, and so that as many vehicles as possible can participate. No other communication protocols have been designed to do that.

With DSRC, vehicles have 360-degree awareness of the roadway conditions and nearby vehicles and of threats and hazards that are emerging at distances of up to 1,000 feet.

DSRC is the only short-range wireless alternative today that provides:

- **Designated Licensed Bandwidth:** For secure, reliable communications to take place.
- **Fast Network Acquisition:** Active safety applications require the immediate establishment of communication.
- **Low Latency:** Active safety applications must be able to transmit messages to each other in milliseconds without delay.
- **High Reliability when Required:** Active safety applications require a high level of link reliability. DSRC works in high vehicle speed mobility conditions and delivers performance immune to extreme weather conditions (e.g., rain, fog, snow).
- **Priority for Safety:** Safet messages on DSRC are given priority over non-safety messages.
- **Interoperability:** DSRC ensures interoperability, which is the key to successful deployment of active safety applications, using widely accepted standards. It supports both vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) communications.
- **Security and Privacy:** DSRC provides safety message authentication and privacy.

U.S. Department of Transportation

Sharing the Spectrum

The Federal Communications Commission (FCC) allocated 75 MHz of spectrum in the 5.9 GHz band for use by intelligent transportation system (ITS) vehicle safety and mobility applications.

This spectrum has been a critical factor in allowing both the government and industry to move forward with making this life-saving connected vehicle technology available to the American public.

The FCC now seeks to open up additional spectrum for unlicensed Wi-Fi devices within the 5.9 GHz band.

Importance of Reliable Access to the 5.9 GHz Wireless Spectrum

In 2013, there were an estimated 5,687,000 police-reported traffic crashes in which 32,719 people were killed and 2,313,000 people were injured.

The National Highway Traffic Safety Administration (NHTSA) estimates that just two of many possible V2V safety applications (i.e., intersection movement assist and left-turn assist) would potentially prevent up to 592,000 crashes; save up to 1,083 lives; avoid up to 270,000 injuries; and reduce up to 728,000 property-damage-only crashes by the time V2V technology has spread through the entire fleet. Of course, the number of lives potentially saved would likely increase significantly with the implementation of additional V2V and V2I safety applications enabled through DSRC.

However, any interference could cause an interruption of DSRC service and restrict the reception of safety-critical communications by blocking access to the channel, interrupting the flow of data between the vehicles, or decreasing the range of the devices. As a result, crash-avoidance applications and critical safety operations would not execute their intended functions, potentially resulting in severe consequences with regard to safety of life.

5.9 GHz dedication ensures that when a vehicle needs access to the spectrum, the spectrum is available without fear of interference that could result in harmful situations.

USDOT Position on Spectrum Sharing with Unlicensed Devices

The USDOT is not opposed to sharing the spectrum provided that it can be proven that unlicensed devices do not interfere with crash-avoidance safety systems. At this time, our connected vehicle safety applications do not work without DSRC. Thus, it is important to first determine that sharing the spectrum would not impact the operation of connected vehicle safety systems.

Currently, there is no credible, demonstrated evidence that unlicensed devices can operate in 5.9 GHz without creating harmful interference. Real-world testing with real devices is needed to definitively answer this question. The USDOT is committed to rapid testing that would ensure life-saving V2V transmissions are not obstructed by radio interference. We stand ready to complete this testing, which many in Congress, the FCC, and industry are eager to complete, within 12 months of receiving production-ready devices to test.


Photo Source: USDOT

Connected Vehicle Resources

The USDOT's Intelligent Transportation Systems Joint Program Office (ITS JPO) fosters the development and future deployment of connected vehicle technologies. However, connected vehicle research involves several agencies within the USDOT, including NHTSA, the Federal Highway Administration, the Federal Motor Carrier Safety Administration, the Federal Transit Administration, and the Federal Railroad Administration.

Visit the ITS JPO web site (http://www.its.dot.gov/) to learn more about connected vehicles:

- Sign up for email alerts
- Read the ITS JPO's ***ITS Strategic Plan 2015-2019***
- View an award-winning animation showing how connected vehicles work
- Download connected vehicle fact sheets, infographics, presentations, and more.

For more information about this initiative, please contact:
Dale Thompson, Program Manager, Connected Vehicle Data and Weather Programs
ITS Joint Program Office | (202) 493-0259 | dale.thomspon@dot.gov | www.its.dot.gov

FHWA-JPO-16-231