Connected Vehicles

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The Big Picture
The Past

- FCC Allocated 5.9 GHz Spectrum for Connected Vehicles in 1999
- Technical Standards and Security Policies Development
- Safety Applications Developed and Tested
- Consumer Acceptance Clinics Conducted
The Present

• Safety Pilot in Ann Arbor underway
• NHTSA Regulatory Decision for Passenger vehicles by end of 2013
• FCC Rulemaking for Sharing 5GHz Band - NPRM issued April 2013
• NTIA Spectrum Sharing Study Underway (to be completed in 2014)
• Auto Industry and Wi-Fi Industry joint investigation of potential sharing in 5.9 GHz Band
The Future

• NHTSA Regulatory Decision for Heavy Trucks in 2014
• FHWA Infrastructure Implementation Guidance in 2015
• FCC Decision(s) on 5 GHz Band ~ 2013/14
• Implementation of V2V and V2I
Spectrum Sharing Proposal
• The FCC Proposal to expand the use of unlicensed spectrum in the 5 GHz band is a result of the Middle Class Tax Relief and Job Creation Act of 2012.

• However, rulemaking to open 5.9 GHz band was not mandated by Congress.
The Proposal

• Would open 5.35-5.47 GHz and 5.85-5.925 GHz to U-NII (total of 195 MHz)

• Would modify U-NII rules across 5 GHz band “...to ensure that these devices do not cause harmful interference and thus can continue to operate in the 5 GHz band and make broadband technologies available for consumers and businesses.”

• Unlicensed use should be allowed ONLY IF there is no harmful interference to licensed users
Interference Concerns

• Harmful Interference includes any interference which endangers the functioning of DSRC safety services, due to the fact that the opportunity for DSRC to potentially prevent a collision would be impaired.

• Interference should not lead to the delay or omission of a timely safety action (e.g., warning or control actions provided to the driver/vehicle) that could have otherwise been provided in order to prevent a crash.
Interference Concerns Cont.

• The threat of an imminent crash could arise instantaneously during driving conflicts. Therefore, any delay in timely warning or control actions caused by interference must be imperceptible.
Protecting the Spectrum

• Automakers have invested significant time and resources into DSRC

• DSRC important for Safety applications because of low latency and high data transfer rates

• Automakers will not continue to invest in DSRC systems if efficacy is compromised by unlicensed devices in the 5.9 GHz band.
Protecting the Spectrum Cont.

• All current DSRC channels are needed for V2V and V2I safety services and re-channelization and channel use rule changes are not feasible.

• Automakers are working with Wi-Fi industry to investigate potential technical solutions that would allow sharing, however rigorous testing is necessary before the 5.9 GHz spectrum should be opened to unlicensed users.
V2X Safety Applications
Communications Between Vehicle & Infrastructure

- Blind Merge Warning
- Curve Speed Warning
- Emergency Vehicle Signal Preemption
- Highway/Rail Collision Warning
- Intersection Collision Warning
- In Vehicle Amber Alert
- In-Vehicle Signage
- Just-In-Time Repair Notification
- Left Turn Assistant
- Low Bridge Warning
- Low Parking Structure Warning
- Pedestrian Crossing Information at Intersection
- Road Condition Warning
- Safety Recall Notice
- SOS Services
- Stop Sign Movement Assistance
- Stop Sign Violation Warning
- Traffic Signal Violation Warning
- Work Zone Warning
Communications Between Vehicles

- Approaching Emergency Vehicle Warning
- Blind Spot Warning
- Cooperative Adaptive Cruise Control
- Cooperative Collision Warning
- Cooperative Forward Collision Warning
- Cooperative Vehicle-Highway Automation System
- Emergency Electronic Brake Lights
- Highway Merge Assistant
- Lane Change Warning

- Post-Crash Warning
- Pre-Crash Sensing
- Vehicle-Based Road Condition Warning
- Vehicle-to-Vehicle Road Feature Notification
- Visibility Enhancer
- Wrong Way Driver Warning
- Do Not Pass Warning
- Intersection Movement Assist
- Control Loss Warning
Implementation/Deployment Challenges
Vehicles

• Equipping the fleet – V2V and V2I benefits increase with fleet penetration

• Is a government mandate needed (and in what form)?

• Timing of regulations, timing of installation in new vehicles

• Implementation Pathways

• Security Issues – protection from malfunctioning and compromised units
Infrastructure

• What infrastructure is needed to support V2V applications (e.g., for security)?

• What are expectations for a national footprint?

• How will states make decisions on road side unit locations, applications and investment?

• How will infrastructure installation, operation, and maintenance be funded?
Thank You