CAMP LLC

Crash Avoidance Metrics Partners LLC

July 2, 2015

<u>EX PARTE VIA ECFS</u>

Ms. Marlene H. Dortch
Secretary
Federal Communications Commission
445 12th Street, S.W.
Room TW-A325
Washington, D.C. 20554

Re: ***Revision of Part 15 of the Commission's Rules to Permit Unlicensed National Information Infrastructure (U-NII) Devices in the 5 GHz Band,*** **ET Docket No. 13-49**

Dear Ms. Dortch:

On June 30, 2015, John Capp, Scott Geisler, Harry Lightsey, Cherie Wilson, and Don Grimm of General Motors; Dr. Mike Shulman and Jeff Donofrio of Ford; Roy Goudy, Jeremy Chambers, and Neal Probert of Nissan; Andrew Cunningham and Tigran Khatchatrian of Volkswagen; Sue Bai of Honda; and Steve Van Sickle of the Crash Avoidance Metrics Partnership ("CAMP"), met at a CAMP-sponsored demonstration with Commissioners Jessica Rosenworcel and Michael O'Reilly, as well as Jennifer Thompson, Legal Advisor to Commissioner Rosenworcel, and Erin McGrath, Legal Advisor to Commissioner O'Reilly.

During the demonstration, the CAMP and automobile industry representatives took the Commissioners through the attached power point presentation, described Vehicle-to-Vehicle ("V2V") and Vehicle-to-Infrastructure ("V2I") communications, and discussed the functioning of the 5850-5925 MHz ("5.9 GHz") Dedicated Short-Range Communication Service ("DSRC") systems that enable V2V and V2I communications. The CAMP and automobile industry representatives also discussed the myriad safety benefits of V2V and V2I, including emergency electronic brake lights, do not pass warnings, intersection movement assist, enhanced forward collision warnings, red light violation warnings, spot weather impact warnings, and others. Other vehicle applications enabled uniquely by DSRC communications, such as connected automation of vehicles, were also discussed and included in the presentation.

The CAMP and automobile industry representatives also discussed the dangers to vehicle and passenger safety that could result from interference to 5.9 GHz DSRC operations. They emphasized that the threat of a traffic accident can arise quickly, so delays or interruptions in the delivery of V2V and V2I warnings and messages must be imperceptible. In light of this concern, they reiterated their general support for the Cisco spectrum-sharing proposal in this proceeding, which holds promise for allowing Wi-Fi use of the 5.9 GHz band without causing harmful interference to DSRC operations, and their grave concerns about the Qualcomm proposal, which could cause harmful interference to DSRC operations and delay significantly the deployment of DSRC technology.

The CAMP and automobile industry representatives also indicated that all of the work and development by the automotive industry pertaining to V2V thus far has been based on the assumption that V2V communications will occur on DSRC Channel 172, located at 5855-5865 MHz, consistent with the FCC's DSRC rules.[1] Accordingly, they noted that any changes to the FCC's DSRC rules, as would be required under the Qualcomm proposal, would cause significant delay in the development and deployment of V2V. They also observed that the Cisco proposal, by comparison, would not require any FCC DSRC rule changes, and poses less of a threat of interference to DSRC operations.[2]

CAMP-member General Motors has already announced the deployment of V2V, based on the Commission's existing DSRC rules,[3] and in May 2015 the US Secretary of Transportation indicated that the Department of Transportation ("DoT") would be accelerating its rulemaking process for considering a proposal to require V2V equipment on all new automobiles and developing an expedited testing capability for V2V technologies,[4] again based on the FCC's existing DSRC rules. Finally, US automobile manufacturers have decided to move forward with Cisco to test the viability of Cisco's spectrum-sharing proposal, and will submit relevant data from that testing into the record in this proceeding. They expect the testing data to contribute greatly to the FCC's and DoT's efforts to resolve the 5.9 GHz compatibility issues raised in this proceeding, and to the ultimate, successful deployment of V2V and V2I communications throughout the nation.

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[1] *See* 47 C.F.R. § 95.1511(a) (designating DSRC Channel 172 for "public safety applications involving safety of life and property").

[2] Ex Parte Letter of the Alliance of Automobile Manufacturers and the Association of Global Automakers, ET Docket No. 13-49 (Mar. 25, 2015).

[3] Press Release, General Motors, Cadillac to Introduce Advanced 'Intelligent and Connected' Vehicle Technologies on Select 2017 Models (Sept. 7, 2014), *available at* http://media.gm.com/media/us/en/gm/news.detail.html/content/Pages/news/us/en/2014/Sep/0907-its-overview.html.

[4] Press Release, National Highway Traffic Safety Administration, Transportation Sec. Foxx announces steps to accelerate road safety innovation (May 13, 2015), *available at* http://www.nhtsa.gov/About+NHTSA/Press+Releases/2015/nhtsa-will-accelerate-v2v-efforts.

Pursuant to Section 1.1206(b)(2) of the Commission's rules, an electronic copy of this letter is being filed in the above-referenced docket. Please direct any questions regarding this filing to us.

Very truly yours,

Dr. Michael A. Shulman

Very truly yours,

Scott R. Geisler

c.c.: Commissioner Jessica Rosenworcel
Commissioner Michael O'Reilly
Jennifer Thompson
Erin McGrath

Crash Avoidance Metrics Partners LLC

- Founded in 1995
- Scope: Active Safety Research with the US Dept. of Transportation and other OEMs
- Major focus is Vehicle-to-Vehicle (V2V) research with NHTSA
- Expanding Vehicle-to-Infrastructure (V2I) research with FHWA

Government - Industry Collaboration on V2V and V2I

FCA
FIAT CHRYSLER AUTOMOBILES

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HYUNDAI·KIA MOTORS
Hyundai·Kia America Technical Center, Inc.

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GM

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VOLVO

U.S. Department of Transportation

NHTSA
www.nhtsa.gov

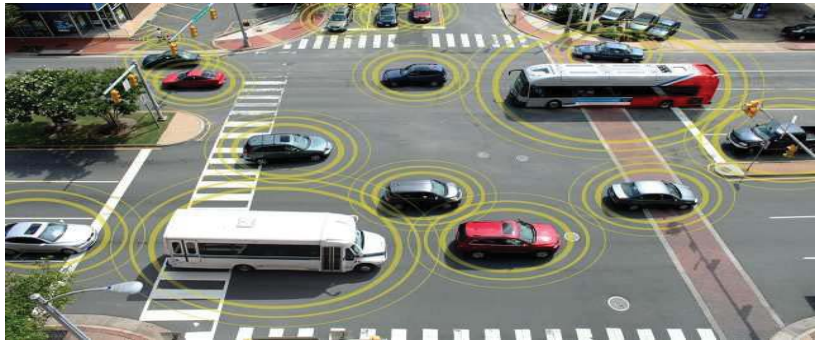
U.S. Department of Transportation
Federal Highway Administration

How Does V2V Work?

- Each vehicle acts as a beacon sending a signal to other vehicles. Equipped vehicles can detect each others' position and predicted path.

- Vehicle-to-Vehicle communication is done via DSRC (Dedicated Short-Range Communication), modified Wi-Fi on the 5.9 GHz frequency band, which has been allocated for V2x communication. A dedicated frequency is needed for high availability.

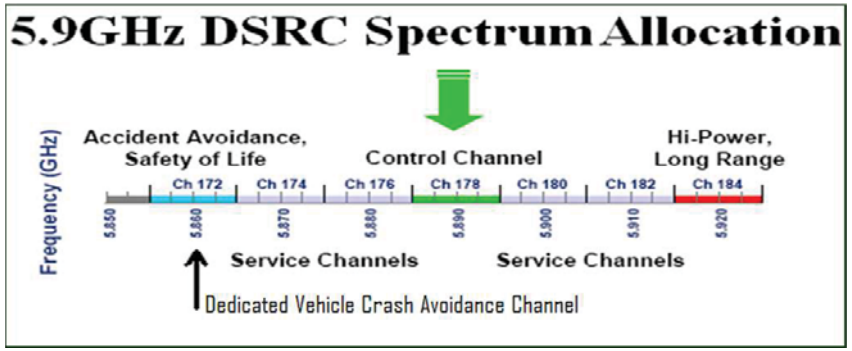
- DSRC also provides the low latency needed for crash imminent safety-based functions.



V2V Uses Modified Wi-Fi And GPS On A Dedicated Frequency To Reduce Or Mitigate Potential Collisions.

Dedicated Short Range Communications (DSRC)

- 75 MHz of spectrum @ 5.9 GHz for ITS
- Key Benefits
  - 802.11p technology similar to 802.11a
  - Low latency communication (<< 50 ms)
  - High data transfer rates (3 – 27 Mbps)
  - Line-of-sight, up to 1000 m and 360º
  - Low power message reception (< -90 dBm)



- Standards
  - IEEE: 802.11p, 1609.2 – 1609.4, 1609.12
  - SAE: J2735, J2945
- V2V Basic Safety Message (BSM)
  - Average message size: 320 bytes
    - PHY + MAC + WSMP: 80 bytes
    - Security including Certificate: 160 bytes
    - SAE J2735 BSM payload: 80 bytes
  - Default transmit rate: 10 Hz
    - More sophisticated protocols in development
  - Enables multiple V2V Safety Applications

Vehicle-to-Vehicle (V2V) Overview

J2735 Basic Safety Message:

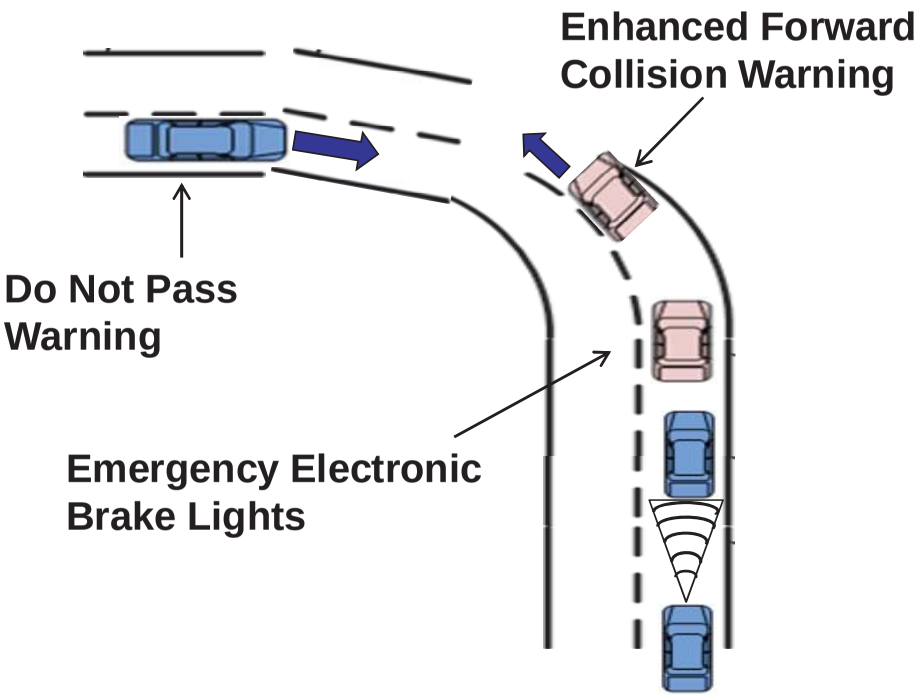
Information Transmitted
Random Vehicle ID, Sequence #, Time Stamp,
Position (latitude, longitude, elevation, accuracy),
Motion (speed, transmission state, heading angle, brake, accel /decel),
Control (yaw rate), &
Vehicle Size (length, width)

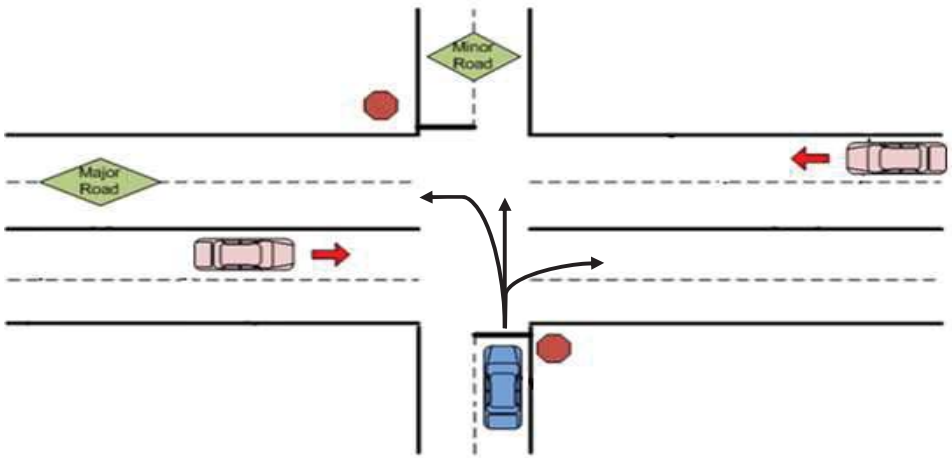
Security Credentials

DSRC = Dedicated Short Range Communication

V2V technology could enhance existing driver assistance systems.

Example V2V Safety Applications





- Intersection Movement Assist
- Left Turn Assist
- Right Turn Into Path

With greater field of view and greater data content, V2V will outperform current “forward collision” technologies and reduce “cross-path” collision risk

Connected Vehicle Applications

U.S. Department of Transportation

V2I Safety

Red Light Violation Warning
Curve Speed Warning
Stop Sign Gap Assist
Spot Weather Impact Warning
Reduced Speed/Work Zone Warning
Pedestrian in Signalized Crosswalk Warning (Transit)

V2V Safety

Emergency Electronic Brake Lights (EEBL)
Forward Collision Warning (FCW)
Intersection Movement Assist (IMA)
Left Turn Assist (LTA)
Blind Spot/Lane Change Warning (BSW/LCW)
Do Not Pass Warning (DNPW)
Vehicle Turning Right in Front of Bus Warning (Transit)

Road Weather

Motorist Advisories and Warnings (MAW)
Enhanced MDSS
Vehicle Data Translator (VDT)
Weather Response Traffic Information (WxTINFO)

Environment

Eco-Approach and Departure at Signalized Intersections
Eco-Traffic Signal Timing
Eco-Traffic Signal Priority
Connected Eco-Driving
Wireless Inductive/Resonance Charging
Eco-Lanes Management
Eco-Speed Harmonization
Eco-Cooperative Adaptive Cruise Control
Eco-Traveler Information
Eco-Ramp Metering
Low Emissions Zone Management
AFV Charging / Fueling Information
Eco-Smart Parking
Dynamic Eco-Routing (light vehicle, transit, freight)
Eco-ICM Decision Support System

Agency Data

Probe-based Pavement Maintenance
Probe-enabled Traffic Monitoring
Vehicle Classification-based Traffic Studies
CV-enabled Turning Movement & Intersection Analysis
CV-enabled Origin-Destination Studies
Work Zone Traveler Information

Mobility

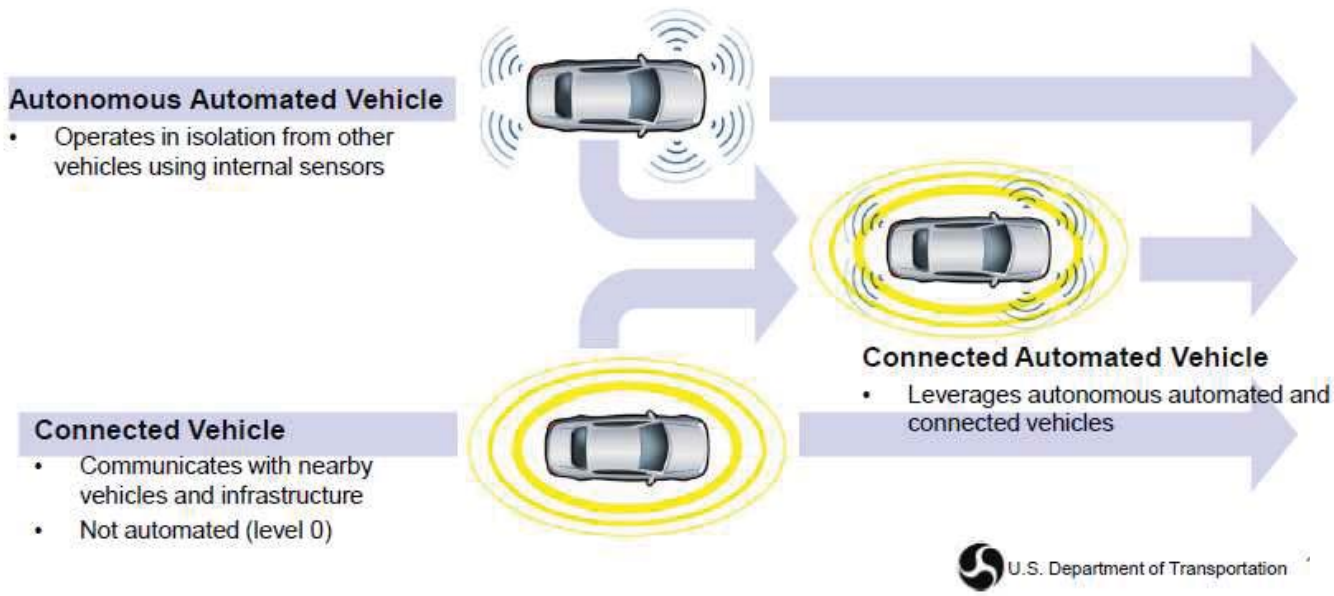
Advanced Traveler Information System
Intelligent Traffic Signal System (I-SIG)
Signal Priority (transit, freight)
Mobile Accessible Pedestrian Signal System (PED-SIG)
Emergency Vehicle Preemption (PREEMPT)
Dynamic Speed Harmonization (SPD-HARM)
Queue Warning (Q-WARN)
Cooperative Adaptive Cruise Control (CACC)
Incident Scene Pre-Arrival Staging Guidance for Emergency Responders (RESP-STG)
Incident Scene Work Zone Alerts for Drivers and Workers (INC-ZONE)
Emergency Communications and Evacuation (EVAC)
Connection Protection (T-CONNECT)
Dynamic Transit Operations (T-DISP)
Dynamic Ridesharing (D-RIDE)
Freight-Specific Dynamic Travel Planning and Performance
Drayage Optimization

Smart Roadside

Wireless Inspection
Smart Truck Parking

Safe and Connected Automation

- Safe
  - Meets requirements for functional safety, cybersecurity, and system performance
- Connectivity
  - Includes all types of communication with vehicles and infrastructure (Wi-Fi, DSRC, Cellular, etc.)



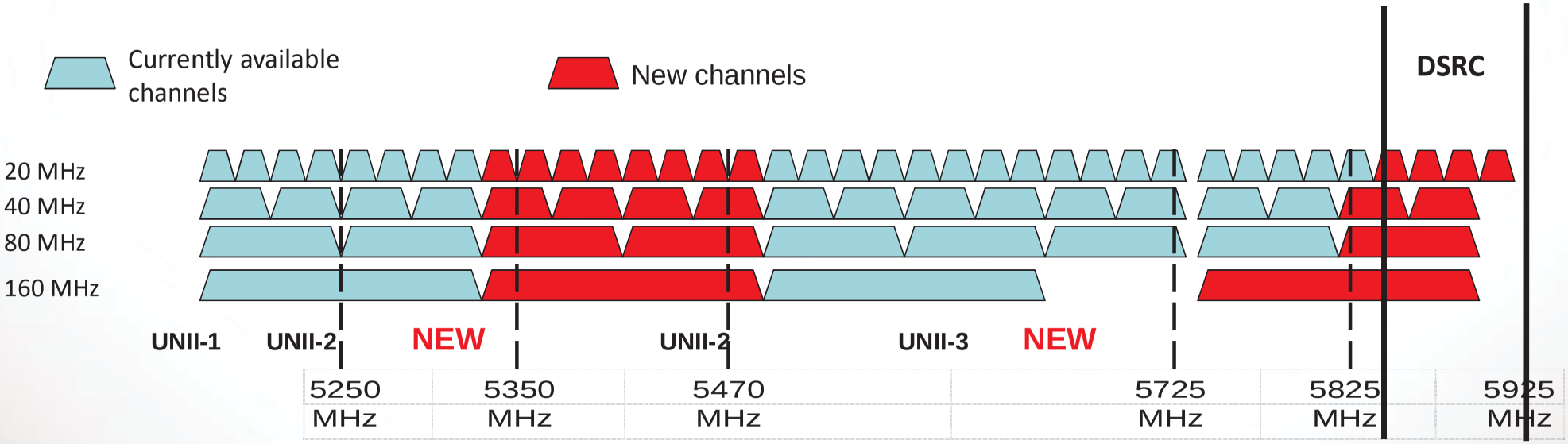
Harmful Interference to 5.9 GHz DSRC Connected Vehicle Safety

- *“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. 47 C.F.R § 2.1*

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

- 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.

Potential Sharing of the DSRC band with Wi-Fi



Sharing Concept "A": Channel reallocation (Qualcomm)

- Realign 'protected" DSRC channels to upper three channels (180-184).
- Create 2 - 20 MHz channels (172-178) for WiFi use (sharing).
- Packet-by-packet WiFi-DSRC sharing.

Sharing Concept "B": Listen, Detect & Vacate (Cisco)

- No DSRC channel reallocation
- No merging of DSRC channels.
- If WiFi detects no DSRC activity (~10 seconds), WiFi use allowable.

Channel Sharing: Safety Concerns

- All of our development to date is based upon transmission of BSMs on Channel 172.

  Any channel changes would delay V2V deployments, including FMVSS 150.

- DSRC operates at extremely low power levels, such as -92 dBm.

  Out-of-band interference is unclear, channel changes would require full test regimens.

- Channel 172 allocated for high-availability, low-latency and Channel 184 for high-power, public safety applications.

  Separated at the ends of the allocated band to avoid out-of-band interference, reduced separation could lead to interference of BSM reception.

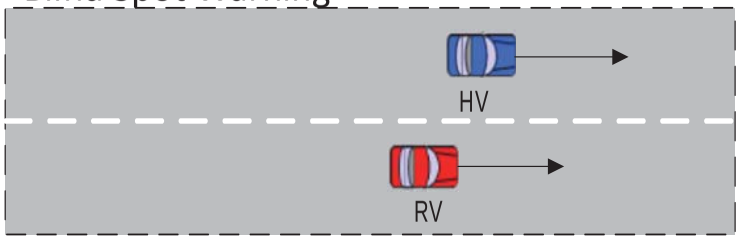
- Non-shared channels will support many other applications extending to other road users such as motorcycles, pedestrians and bicyclists.

  This includes several Vehicle-to-Infrastructure applications for safety, mobility, sustainability and automation that are under development.

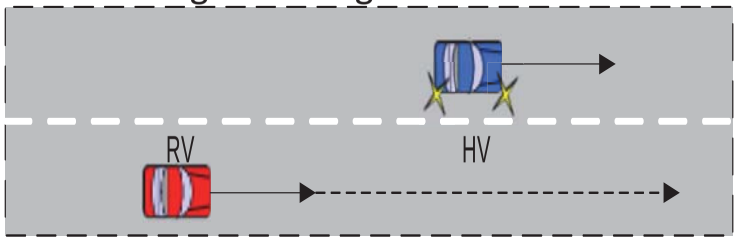
The fact that DSRC already operates in challenging environment only heightens need for U-NII to avoid contributing interference

TODAY's V2V DEMOS

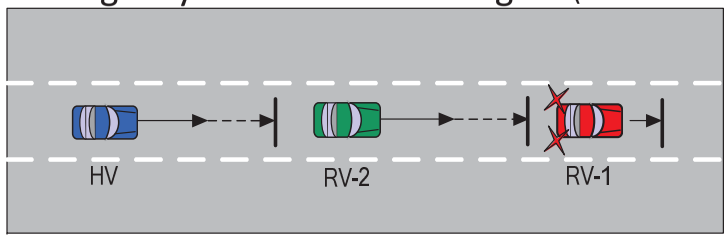
Blind Spot Warning



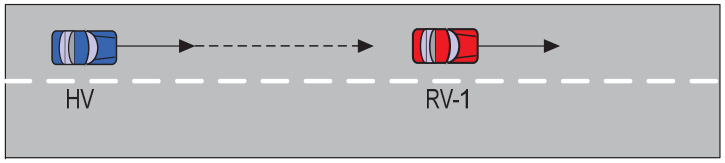
Lane Change Warning



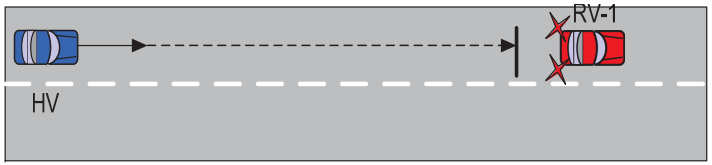
Emergency Electronic Brake Lights (non line of sight)



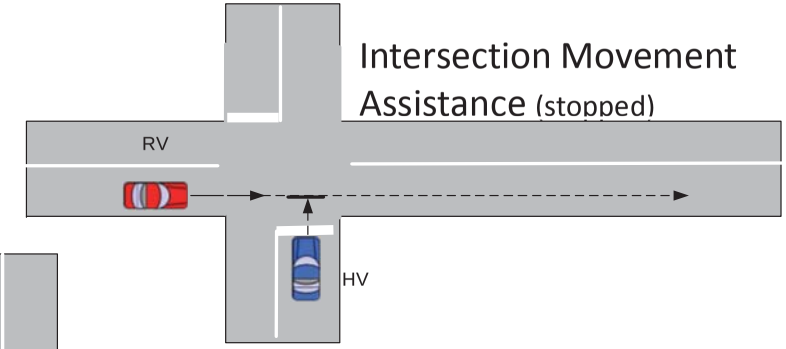
Forward collision warning (slow vehicle)

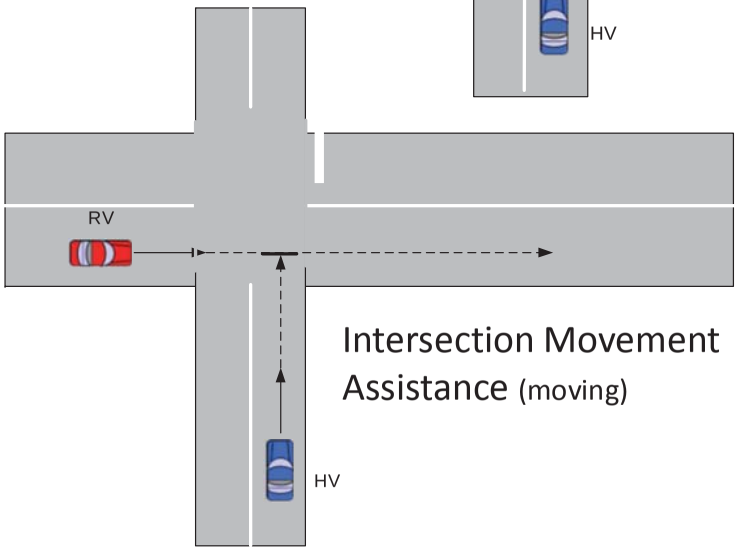


Forward collision warning (Stopped /Hazard vehicle)



Intersection Movement Assistance (stopped)





Intersection Movement Assistance (moving)