Operations Task Force:

FCC Rule Making and Reallocating the Spectrum

March 17, 2021
2:30-3:30 PM (Central)

Agenda

1. **Welcome**
2. **ITS America Update**
   - Presenter: Tim Drake/Carlos Alban, ITS America
3. **CAT Coalition - Strategic Initiatives Working Group Resource related to the FCC Allocation**
   - Presenter: Dean Deeter, Athey Creek Consultants
4. **Utah's Connective Vehicle Project: Dealing with Transition**
   - Presenter: Blaine Leonard, Utah DOT
5. **Upcoming NWP Ops Task Force Webinars**
6. **Wrap Up**

ITS America Update

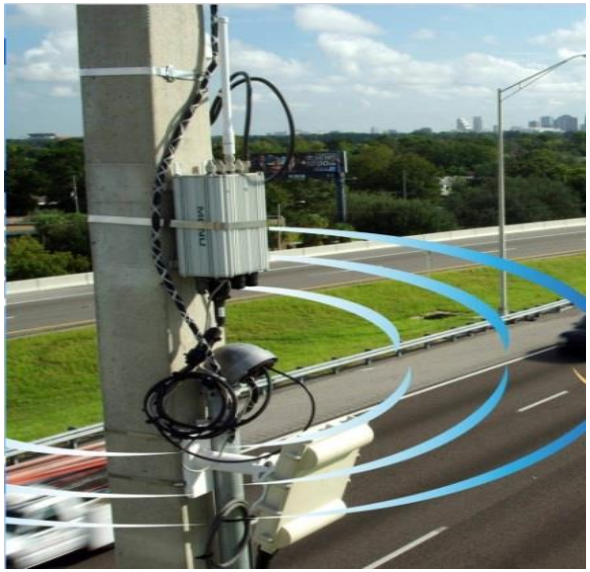
Presenter: Tim Drake/Carlos Alban, ITS America

CAT Coalition – Strategic Initiatives WG Resource related to the FCC Allocation

SPaT Challenge

What is the Challenge?

To challenge state and local public sector transportation agencies to cooperate to achieve deployment of DSRC infrastructure with SPaT broadcasts in at least one corridor or network (approximately **20 signalized intersections) in each state by January 2020**

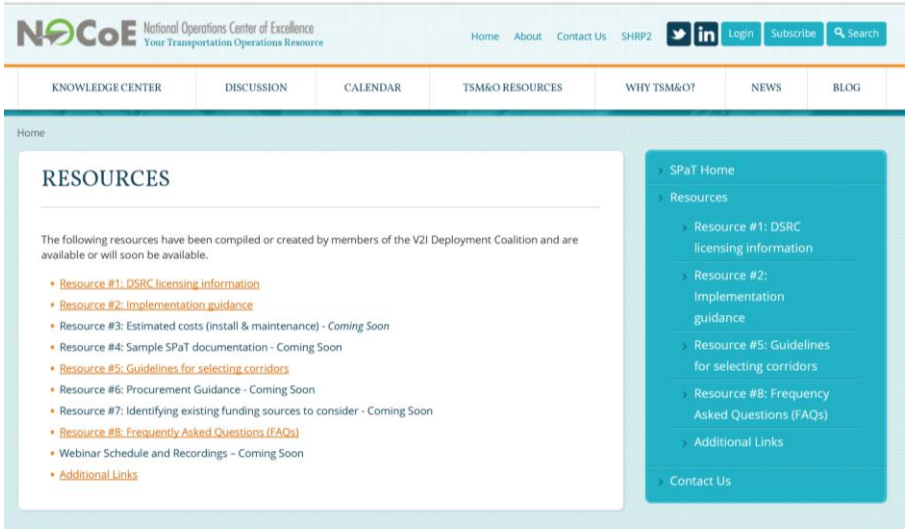


The SPaT Challenge was adopted as an AASHTO Resolution in the **Fall of 2016**

Since the SPaT Challenge Started…..

Developed a set of SPaT Challenge Resources

- Licensing information
- Implementation support
- Corridor-selection
- FAQs
- Many more…



Since the SPaT Challenge Started…..

Conducted 13 SPaT Challenge Webinars

- Introduced key concepts
- Tutorials on all aspects of deploying SPaT systems
- Peer sharing of their experiences
- All webinars recorded and available at http://transportationops.org/spatchallenge

Since the SpaT Challenge Started…..

Observed and supported many deployments

Five years of progress:
47 Corridors
26 States

On the January 2021 Webinar, the CAT Coalition's Strategic Initiatives WG agreed…

- To develop a new resource: *Reacting to the FCC Reallocation of the 5.9 GHz Band: Information to Benefit SPaT Challenge Sites*
- Goal is to support the SPaT Challenge sites (and other sites) given the recent FCC reallocation of the 5.9 GHz band
- Target is a working draft of the resource by the April 2021 webinar
- We found related resources and activities, but nothing exactly as the group decided was needed.
  - NCHRP 23-10 Evaluation and Synthesis of Connected Vehicle Communications Technologies
  - ITS America / AASHTO / ITE efforts and activities

Proposed Resource: Preliminary Outline

1. Introduction

<Recap the FCC reallocation, include links to resources with background information>

2. Technology Impacts of the Reallocation

<Describe the hardware and software changes that are needed. Note the applicability of J2735 and aspects that do not change with C-V2X>

<Description of the potential complementary roles of C-V2X RSUs and cellular network communications.>

<Describe any RSU deployment changes (e.g., can C-V2X RSUs be spaced further apart or is the range similar to that of DSRC? etc.)>

3. Policy Impacts of the Reallocation

<A description of changes to the licensing process for RSUs and if existing licenses transfer. Describe any operational costs that may be incurred, either by the RSU or OBUs.>

4. Timeframe and Key Dates

<Describe the schedule for transition once published by the FCC and other information to help IOOs plan their path for transition.>

5. Next Steps to Consider – Preparing for Connected Intersections

<Identify any available resources for IOOS to use in the transition (e.g., ITE/RSU and ITE/CI standards implementation and interpretation documents)>

<Suggest IOOs use this as an opportunity to ensure their deployments are compliant with standards, that MAP messages are current, that position correction is available. Describe and link to industry resources available (e.g., ITE/CI, ITE/RSU, CV PFS MAP Guidance document)>

6. Resources Available

<Include a summary table of resources with links to the resources>

Proposed Resource: Questions to be Answered

1. When does the DSRC broadcast need to stop and the transition to C-V2X need to occur?
2. Since the FCC hasn't really refined the licensing and operational requirements of C-V2X, shouldn't I wait until those issues are all resolved before I purchase any C-V2X, so that I don't risk buying hardware / firmware that is soon to be outdated or somewhat obsolete?
3. Will C-V2X, which is based on 4G lTE, be forward compatible to 5G? When that transition happens, will today's C-V2X hardware be fully capable of the transition, or will I need to replace this new C-V2X hardware again? If so, shouldn't I wait for the newer C-V2X hardware, so I don't have to replace it twice?
4. If the out-of-band emission issue (from the 45MHz which has been moved to wifi) isn't solved, will C-V2X end up being unworkable because of interference?
5. In the DSRC world, there were issues of incompatibility between the equipment provided by different vendors. Some of that has been resolved. Has there been any field testing identifying or demonstrating
6. What do I need to do to perform the changeover?
7. Are any of the components reusable?
    a. Is the antenna reusable?
    b. Does my MAP message change?
    c. Does my interface to the signal controller change?

Proposed Resource: Questions to be Answered

8. Do I need to transition all my RSUs at once?
    a. If I have two intersecting corridors that have DSRC broadcasting, if I replace the RSUs along one corridor with C-V2X but am not able to replace the other corridor at this time, there will be an intersection that must broadcast both DSRC and C-V2X to support my applications. Is this a problem?
9. Is the licensing process the same?
10. Do any of my DSRC licenses transition over to C-V2X or must we repeat the process?
11. Am I able to get a C-V2X license now?
12. Are there any examples of procurement language that have been used to procure C-V2X RSUs that we could use to begin to procure C-V2X RSUs?
13. Are there any examples of procurement language that have been used to procure C-V2X OBUs (e.g., for use on transit vehicles or snowplows)?
14. Will C-V2X have the same range as DSRC? Is there any opportunity for wider spacing between RSUs with C-V2X?

Proposed Resource: Any input from this group

- Any additional questions you would like answered?

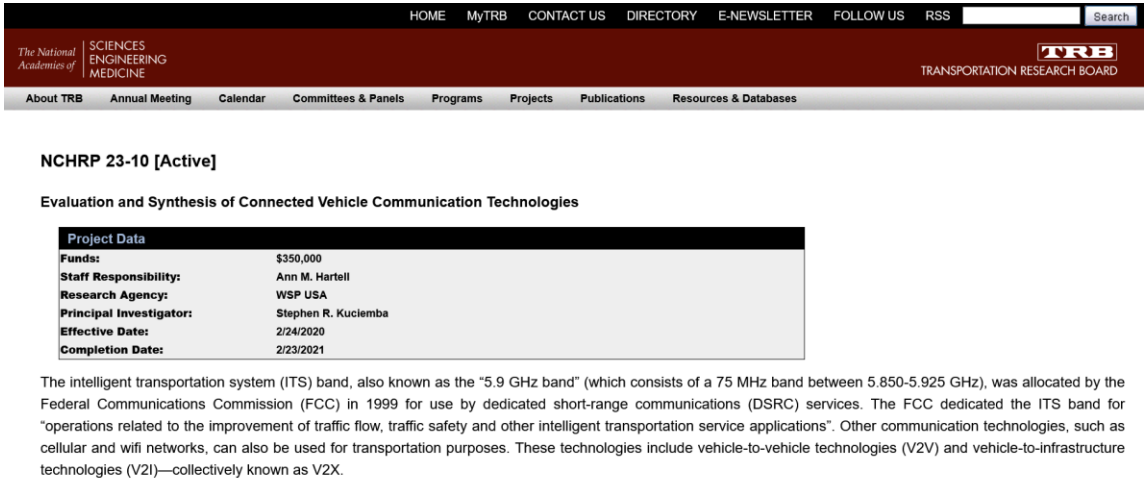
- Any topics you would like to see addressed?

- Any experiences you can share / contribute to the resource document?

NCHRP 23-10 Evaluation and Synthesis of Connected Vehicle Communications Technologies

Two Fact Sheets on-line now

- FCC Realignment of 5.9 GHz
- FCC Realignment of 5.9 GHz (December 2020 Update) – Describing the November 28, 2020 FCC further action



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NCHRP 23-10 [Active]

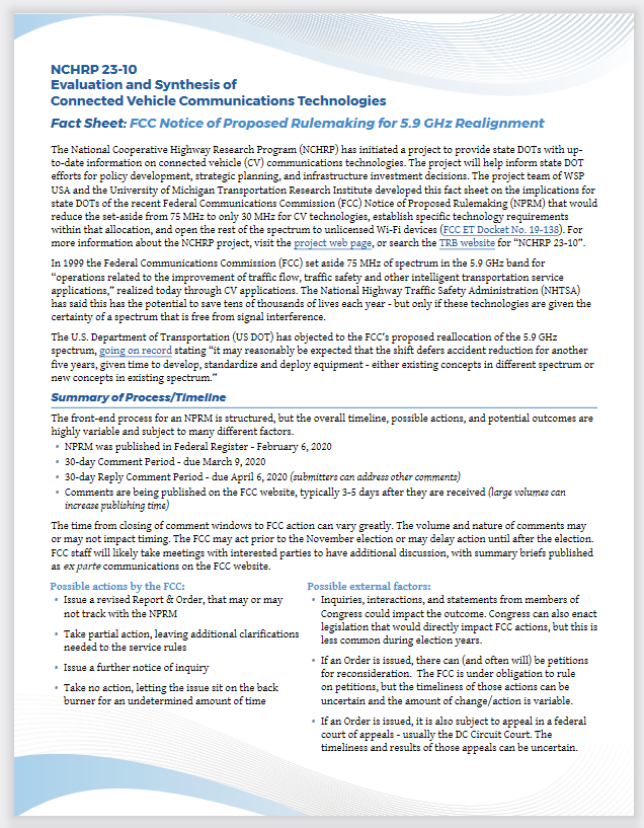
Evaluation and Synthesis of Connected Vehicle Communication Technologies

Project Data	
Funds:	$350,000
Staff Responsibility:	Ann M. Hartell
Research Agency:	WSP USA
Principal Investigator:	Stephen R. Kuciemba
Effective Date:	2/24/2020
Completion Date:	2/23/2021

The intelligent transportation system (ITS) band, also known as the "5.9 GHz band" (which consists of a 75 MHz band between 5.850-5.925 GHz), was allocated by the Federal Communications Commission (FCC) in 1999 for use by dedicated short-range communications (DSRC) services. The FCC dedicated the ITS band for "operations related to the improvement of traffic flow, traffic safety and other intelligent transportation service applications". Other communication technologies, such as cellular and wifi networks, can also be used for transportation purposes. These technologies include vehicle-to-vehicle technologies (V2V) and vehicle-to-infrastructure technologies (V2I)—collectively known as V2X.

Source:
https://apps.trb.org/cmsfeed/TRBNetProjectDisplay.asp?ProjectID=4902

NCHRP 23-10 Evaluation and Synthesis of Connected Vehicle Communications Technologies



NCHRP 23-10
Evaluation and Synthesis of
Connected Vehicle Communications Technologies

***Fact Sheet:* FCC Notice of Proposed Rulemaking for 5.9 GHz Realignment**

The National Cooperative Highway Research Program (NCHRP) has initiated a project to provide state DOTs with up-to-date information on connected vehicle (CV) communications technologies. The project will help inform state DOT efforts for policy development, strategic planning, and infrastructure investment decisions. The project team of WSP USA and the University of Michigan Transportation Research Institute developed this fact sheet on the implications for state DOTs of the recent Federal Communications Commission (FCC) Notice of Proposed Rulemaking (NPRM) that would reduce the set-aside from 75 MHz to only 30 MHz for CV technologies, establish specific technology requirements within that allocation, and open the rest of the spectrum to unlicensed Wi-Fi devices (FCC ET Docket No. 19-138). For more information about the NCHRP project, visit the project web page, or search the TRB website for "NCHRP 23-10".

In 1999 the Federal Communications Commission (FCC) set aside 75 MHz of spectrum in the 5.9 GHz band for "operations related to the improvement of traffic flow, traffic safety and other intelligent transportation service applications," realized today through CV applications. The National Highway Traffic Safety Administration (NHTSA) has said this has the potential to save tens of thousands of lives each year - but only if these technologies are given the certainty of a spectrum that is free from signal interference.

The U.S. Department of Transportation (US DOT) has objected to the FCC's proposed reallocation of the 5.9 GHz spectrum, going on record stating "it may reasonably be expected that the shift defers accident reduction for another five years, given time to develop, standardize and deploy equipment - either existing concepts in different spectrum or new concepts in existing spectrum."

Summary of Process/Timeline

The front-end process for an NPRM is structured, but the overall timeline, possible actions, and potential outcomes are highly variable and subject to many different factors.

- NPRM was published in Federal Register - February 6, 2020
- 30-day Comment Period - due March 9, 2020
- 30-day Reply Comment Period - due April 6, 2020 *(submitters can address other comments)*
- Comments are being published on the FCC website, typically 3-5 days after they are received *(large volumes can increase publishing time)*

The time from closing of comment windows to FCC action can vary greatly. The volume and nature of comments may or may not impact timing. The FCC may act prior to the November election or may delay action until after the election. FCC staff will likely take meetings with interested parties to have additional discussion, with summary briefs published as *ex parte* communications on the FCC website.

Possible actions by the FCC:

- Issue a revised Report & Order, that may or may not track with the NPRM
- Take partial action, leaving additional clarifications needed to the service rules
- Issue a further notice of inquiry
- Take no action, letting the issue sit on the back burner for an undetermined amount of time

Possible external factors:

- Inquiries, interactions, and statements from members of Congress could impact the outcome. Congress can also enact legislation that would directly impact FCC actions, but this is less common during election years.
- If an Order is issued, there can (and often will) be petitions for reconsideration. The FCC is under obligation to rule on petitions, but the timeliness of those actions can be uncertain and the amount of change/action is variable.
- If an Order is issued, it is also subject to appeal in a federal court of appeals - usually the DC Circuit Court. The timeliness and results of those appeals can be uncertain.

https://apps.trb.org/cmsfeed/TRBNetProjectDisplay.asp?ProjectID=4902

Anticipated Impacts of the NPRM to State Departments of Transportation

Safety Oriented V2X Applications May Never Develop - State DOTs who have actively pursued pilot and long-term deployments will be forced to reassess "what is possible" under a new environment. Agencies who may have already delayed plans because of the regulatory uncertainty, or were just getting ready to invest, will need to reexamine whether to move out of the starting blocks. And potential automotive and private sector partners may disappear in a constricted spectrum scenario, which could shift the burden of development costs more onto the state DOTs.

Safety Oriented V2X Applications Might Not Be Reliable - Research published by the US DOT assessing the proposed realignment has indicated signal interference "will occur, raising the question of the reliability of vehicle-to-everything (V2X) communications in this configuration." And given the laws of physics that will limit the amount of traffic within the primary safety channel, a reduced number of use-case scenarios for safety applications will be induced, thus transportation safety will be negatively impacted.

Jeopardizes Planned Funding - Several states have programmed funds within the next five years for CV deployment, and others have been awarded federal money through Congressionally supported grant programs. These allocations may not be able to be deferred, and an opportunity to advance deployment will be lost.

Taxpayer-Funded Projects Will Require Updates - Many state DOTs have engaged in pilot projects and long-term deployment of CV technology based on the current rules governing the 5.9 GHz spectrum. While the lessons learned from these deployments can't be taken away, and a portion of the infrastructure installed will remain useful, there likely would be changes required to hardware, software, and to the overall objectives of deployments - funding for which is not allocated anywhere.

Deployment Momentum Will Be Lost - A decade of effort will need to be evaluated and possibly repeated as state DOTs and the private sector come to grips with channel realignment, new standards development, re-tooled device development, and re-launched proof of concept projects.

Potential Border Limitations - Canada has the full 75 MHz allocated in the 5.9 GHz band for this same purpose; Mexico has stated that CV deployments in the 5.9 GHz band will not face interference. Changing the U.S. rules could render cross-border applications inoperable. Border states may be forced to reconsider CV applications that might have had safety and economic benefits.

Trust and Cybersecurity Could Be Compromised - The CV ecosystem is more than just one channel for safety messages; additional spectrum is needed for certificate management, over-the-air updates, and convenience applications that might financially support even more safety applications. Without this we may be establishing a foundation without sufficient trust, or setting up for a potential failure that could cost lives. Alternatively, we may never see valuable applications develop because we can't satisfy security needs elsewhere on the spectrum (as some have suggested, but no one has researched yet).

Automated Vehicles Without Connectivity - An automated vehicle is limited to what its current sensors, cameras, and on-board systems can manage. Without the benefit of connectivity, a "systems approach" - where vehicles can communicate with each other, the infrastructure, and with mobile devices of all types - may not be realized. The proliferation and roll-out of driver-assist features and automated driving technology will continue - but without the safety benefits of connectivity.

Utah's Connected Vehicle Project: Dealing with Transition

Blaine D Leonard, P.E., F.ASCE
Transportation Technology Engineer
Utah Department of Transportation

March 17, 2021 (Happy St. Patrick's Day!)

Early Connected Vehicle Projects (2014-2019)

- Focus on Transit Signal Priority / Snow Plow Preemption
- RSUs on 131 signalized intersections on 7 corridors
- OBUs on 35 buses and 52 snowplows
- DSRC communication technology (5.9GHz band)
- Demonstrated improvement to bus performance
  - 6% higher reliability at peak times
  - 19% decrease in schedule deviation variability

UDOT Keeping Utah Moving

Connected Vehicle Data Ecosystem (2019 – present)

- Partnership with Panasonic in 2019
  - Expand our system (extent and capability)
- 69 RSUs – Dual DSRC / C-V2X (+138 in 2021)
- 35 OBUs – both DSRC and C-V2X (+150 in 2021)
- Applications for curve speed warning, spot weather impact warning, etc.
  - Incorporating TSP and Plow Preemption in 2021

UDOT Keeping Utah Moving

About C-V2X

- Cellular Vehicle to Everything – C-V2X
- Uses 5.9GHz Spectrum (just like DSRC)
- Based on LTE Standard – like cell phones
  - Is not a “cellular” communication – does not go through cell towers
  - Is based on 4G LTE, not 5G
  - (DSRC uses 802.11p standard, like wifi)
- Uses standardized SPaT, MAP, BSM, TIM messages (SAE J2735)(like DSRC)
- Is NOT compatible with DSRC

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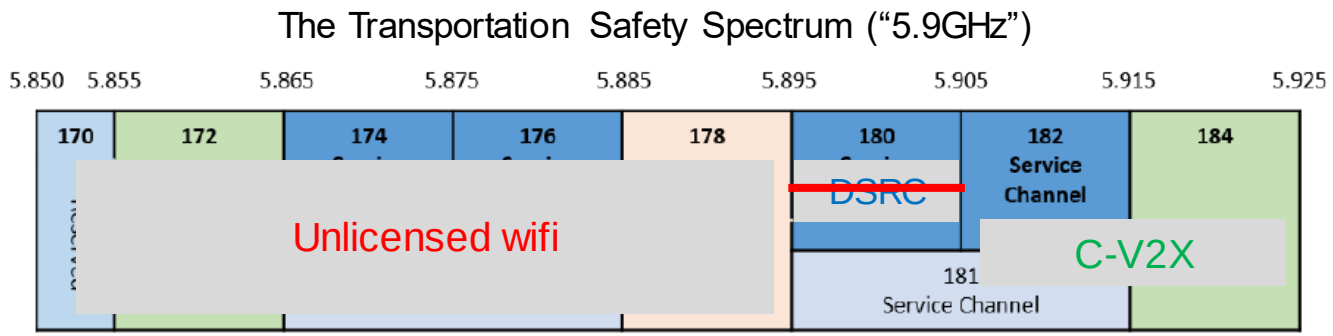
Federal Communication Commission Activities



- Since 1999, the entire spectrum was allocated for DSRC
- The December 2020 FCC action made these changes:
  - Give the lower 45MHz to unlicensed wifi
  - Formally allow C-V2X into the spectrum
  - Confine DSRC (temporarily) to Channel 180 (within 1 year)
  - Phase out DSRC entirely (within 2-3 years)

UDOT Keeping Utah Moving

Transition to C-V2X

- Started to experience C-V2X in 2020 – initial Panasonic deployments
  - No prior unbiased sources of capability & performance
- Initiated procurement process to broaden available options
- Field testing of DSRC / C-V2X side by side
- Drafting a transition plan for eventual conversion

UDOT Keeping Utah Moving

V2X Hardware Procurement

C-V2X is more expensive than DSRC

- Initiated in Sept 2020
  - No prior unbiased sources of capability & performance
- Sought six different types of equipment:

Used earlier in Panasonic deployments

Type 1 DSRC RSU	Type 2 DSRC OBU	Type 3 C-V2X RSU	Type 4 C-V2X OBU	Type 5 Dual Unit RSU	Type 6 Dual Unit OBU

- Received and evaluated responses from nine vendors (there are others)
- Awarded contracts to five vendors:

Cohda	Cohda				
Commsignia	Commsignia	Commsignia	Commsignia	Commsignia	Commsignia
iSmartways	iSmartways	iSmartways	iSmartways		
Kapsch		Kapsch		Kapsch	
Siemens		Siemens		Siemens	

Ficosa

Ficosa - - Used by Panasonic, not procured

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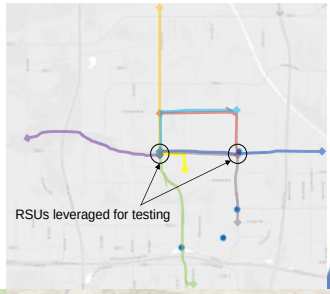
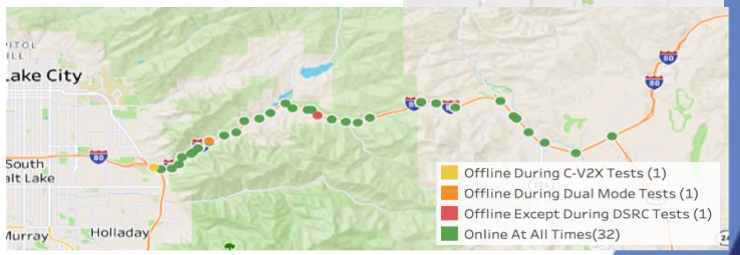
Field Testing

- UDOT's Kapsch RSUs are Dual-Active DSRC / C-V2X
  - Can operate DSRC or C-V2X or both together
- Ran "range of reception" tests
  - Max distance RSU receives BSM message sent by OBU
  - 2 urban intersections / 29 freeway RSUs (curves and slopes)
  - Single mode and dual mode





- Preliminary results:
  - C-V2X had greater range of reception
  - Both DSRC and C-V2X exceeded nominal 300m range
  - No significant negative effect in dual mode operation

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Transition Planning

- DSRC in two counties
- DSRC & C-V2X not compatible
  - Can't add C-V2X buses in DSRC areas
- Broad expansion budgeted / committed
  - No current budget for DSRC replacement
  - Wiring can stay in place
  - Hardware replacement / software modifications
- Scheme for phased replacement / expansion
  - Minimize "obsolete" vehicles & corridors
- CAT Coalition working on transition guidance

UDOT TRANSPORTATION TECHNOLOGY GROUP

https://transportationtechnology.utah.gov/

Upcoming Webinars

Month	Meeting Topic
May 19, 2021 2:30 – 3:30 pm (CT)	**Round robin member highlights and discussion from the 2020-21 winter and flood season**
Jun 16, 2021 2:30 – 3:00 pm (CT)	**Project 15.7: State Weather Messaging Coordination – Project Results**
Jul 21, 2021 2:30 – 3:00 pm (CT)	**Update on NWP WZDx Grant Awards (MnDOT and WSDOT)**
Aug 25, 2021 2:30 – 4:00 pm (CT)	**Technician's Forum**

Wrap Up

Thank You