DEDICATED SHORT-RANGE COMMUNICATIONS (DSRC) AND SPECTRUM POLICY

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Dedication of the Spectrum
Basics of DSRC
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Dedication of the 5.9GHz DSRC Band

- FCC Report and Order FCC-03-324 allocated 75 MHz of spectrum in the 5.9 GHz DSRC band

- The FCC noted the benefits of DSRC “…to improve traveler safety, decrease traffic congestion, facilitate the reduction of air pollution, and help to conserve vital fossil fuels.”
What it is

- Low latency, Wi-Fi-like medium adapted for vehicle environment
- Original FCC spectrum allocation in 1999
- FCC revised allocation in 2004 and 2006
- FCC refreshed the record in 2016

How the technology works

- Data can be distributed in a broadcast mode (300m range – line of sight)
- Peer-to-peer data exchanges as well
- Engineered to work well in a moving vehicle environment
- **Packet-based** medium based on IEEE 802 family specifications for lower-layer definition
- Additional **network** layer definitions and a **cryptographic** process for establishing trust and protecting confidentiality given in IEEE 1609 family
- **Payload** definitions and performance requirements for common data units established in SAE standards
- General **IP transport** available with certain **priority** requirements and packet **size** limitations
DSRC Channel Usage

Virtual guard band from UNII-3 below

Time-critical safety-of-life and property applications; e.g., V2V safety, situational awareness, intersection safety

Flexible assignment to promote spectral efficiency, support application priorities and prevent adjacent channel interference; dynamic assignment by control channel

Flexible channel assignment examples per SAE J2945/0

Source: FCC Report and Order FCC 03-324

Public safety or government applications only; e.g., emergency vehicle signal pre-emption, other public safety, public transit
DSRC-ONLY Applications:
Applications that cannot be replicated by any current, known vehicle-resident sensor- or camera-based systems:

- **V2V:**
  - Intersection Movement Assist (IMA)
  - Left Turn Assist (LTA)
  - Emergency Electronic Brake Light

- **V2I:**
  - Red Light Violation Warning
  - Curve Speed Warning
  - Reduced Speed/Work Zone Warning

- **Automation**
  - High-speed Platooning
## DSRC Environment

### Technical Maturity
- Physical Medium (802.11p-wide area LAN) Standards
- Band plan supports a highly mobile environment (*low latency, multi-path resilience, no association times*)
- Appropriate measurements of noise/interference allow applications to account for noise above and below the band

### Technical Efficiency
- Band plan allows for:
  - High density per second per square kilometer
  - Innovative Use of Spectrum: *Broadcast + Peer-to-Peer Modes*

### Policy and Institutional
- User requirements are met:
  - Trust and Authentication
  - No subscription fees
  - Privacy, Security
- Institutional requirements are met:
  - Aligns with regulatory constraints
  - Achieves co-existence with other primary users
DSRC Related Research Reports

- Vehicle-to-Vehicle Communications: Readiness of V2V Technology for Application

- DSRC Technology and Application – Report to Congress

- DSRC Test Plan
  - [https://www.its.dot.gov/research_archives/connected_vehicle/pdf/DSRC_TestPlanv3.5.3.pdf](https://www.its.dot.gov/research_archives/connected_vehicle/pdf/DSRC_TestPlanv3.5.3.pdf)

- DSRC Licensing and Spectrum Management Guide
  - [https://rosap.ntl.bts.gov/view/dot/3577](https://rosap.ntl.bts.gov/view/dot/3577)
FCC Record Refresh for 5.9 GHz

- Federal Register Notice
  - [https://federalregister.gov/a/2016-13510](https://federalregister.gov/a/2016-13510)
  - Published on June 7, 2016
  - Comments provided by July 7, 2016
  - Reply comments provided by July 22, 2016

- The Commission solicits the submittal of prototype unlicensed interference-avoiding devices for testing, and seeks comment on a proposed FCC test plan to evaluate electromagnetic compatibility of unlicensed devices and DSRC.
Two primary mechanisms for sharing the spectrum are being explored:

- **“detect & vacate”:** an approach whereby unlicensed (Wi-Fi) devices operate in the same channel as DSRC but must vacate the channel if DSRC signals are detected.
- **“rechannelization”:** splits the band to giving the lower portion to Wi-Fi and upper portion to DSRC.
FCC 5.9 GHz Testing Status

- FCC Test Plan Published (October 7, 2016)
- FCC Open House (October 21, 2016) – Review Phase I Testing

- FCC Outlined a Three Phased Testing Strategy
  - Phase 1: Laboratory Bench Testing
  - Phase 2: Basic Field Research with Devices
  - Phase 3: “Real-world” Scenario Testing
Phase 1 – Update

- Test Units Submitted to FCC in Response
  - Nine UNII-4 devices provided by five parties in September 2016
  - Six DSRC devices provided by industry in September 2016
  - DOT provide same 10 MHz DSRC devices in October 2016
  - Two 20 MHz DSRC devices provided by industry March 2017

- Current Status
  - FCC has completed the evaluation of operation and performance of the devices submitted for testing
  - FCC is developing the final report which will be public
Phase 2 and 3 – Update

- Phase 2 and 3 Testing are dependent on successful completion of Phase 1
- Planning for Phases 2 and 3 has not started yet
- DOT previously offered to provide resources to support FCC in Phase 2 and 3 testing, such as:
  - Test facilities
  - DSRC devices
  - Technical expertise
I. 5.9 GHz Spectrum Sharing Research:
- Provided technical support for FCC DSRC Phase 1 Laboratory Testing
- Completed initial DSRC & Wi-Fi assessment with automotive industry
- Conducting additional DSRC interference testing with NTIA and US Army
- Potentially supporting FCC Phase 2 and 3 Testing

II. LTE & 5G Technical Developments:
- Analyzing LTE-V2X requirements and related technical developments:
  - AT&T, Ford, Nokia and Qualcomm Launch Cellular-V2X Connected Car Technology Trials
- Monitoring the development of 5G standards that related to V2X technologies

III. International Radio Regulations:
- Actively participating in the International Telecommunication Union – Radiocommunication Sector (ITU-R) to share V2X technical information on relevant ITS agenda items
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