

# Emerging Technologies Update

May 24, 2017

**National Security Emergency Preparedness Executive Committee  
Task Group on Emerging Technologies**

**Conference Line: 1-866-767-6381 Passcode: 1120667**

**Webinar Access Information : <https://join.me/NPSTCsupport1>**

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# Welcome and Opening

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- Marilyn Ward, NPSTC Executive Director
- Barry Luke, NPSTC Deputy Executive Director
- Kim Coleman Madsen, Chair, NPSTC Technology and Broadband Committee; State of Colorado, Broadband Program Implementation Manager.

# NPSTC Mission Statement

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NPSTC is a federation of organizations whose mission is to improve public safety communications and interoperability through collaborative leadership.



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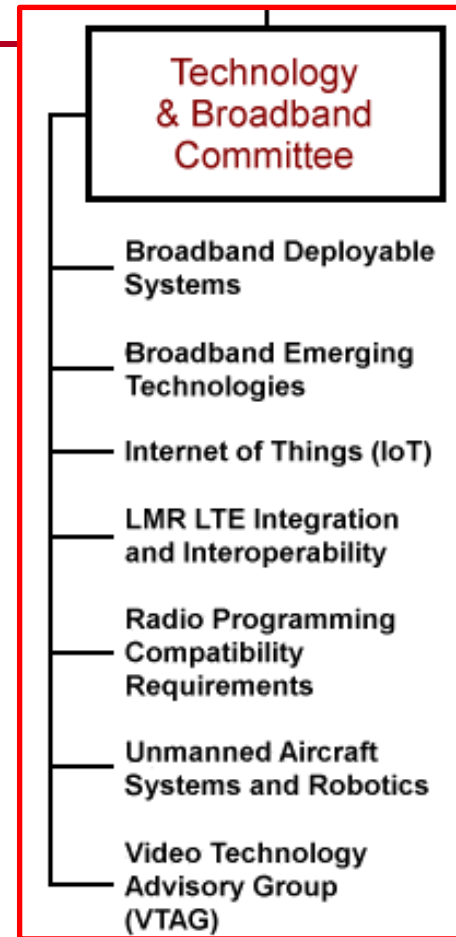
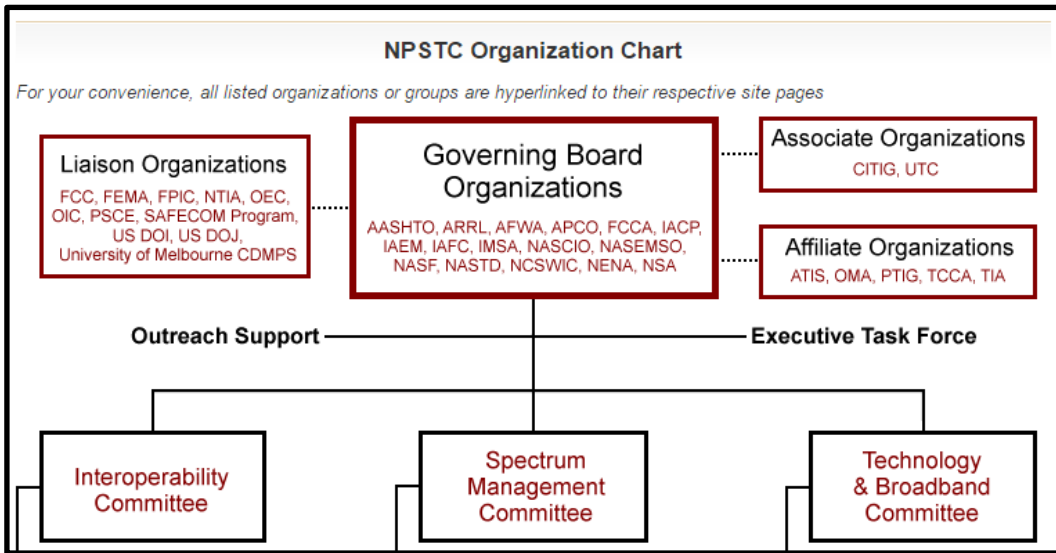
# NPSTC Governing Board (Voting Member Organizations)



NATIONAL SHERIFFS' ASSOCIATION



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# Outline for Today

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- **Emerging Technology Issues in Public Safety Communications**
  - Overview of the rapidly changing landscape
- **Overview of NPSTC Activity:**
  - 3<sup>rd</sup> Generation Partnership Project (3GPP)
  - Public Safety Internet of Things (PS IOT) Working Group
  - Unmanned Aircraft Systems and Robotics (UAS-R) Working Group
  - Broadband Deployable Systems (BBDS) Working Group
  - Broadband Emerging Technologies (BET) Working Group
  - LMR LTE Integration and Interoperability (LMR/LTE) Working Group
  - Video Technology Advisory Group (VTAG)
  - Supplemental Material
- **Questions and Answers**



# Emerging Technology Issues In Public Safety Communications



# Emerging Technology Issues in Public Safety Communications

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- **Big Themes Impacting First Responder Communications**
  - Uncertain Success with Emerging Technologies:
    - IOT and sensors (community based and first responder based)
    - Body worn video for real time tactical use (vs. evidentiary use)
    - Policy and Privacy Implications impact Technology potential
  - Adoption by Public Safety is uneven
    - Timeline to implement (lifespan of legacy systems)
    - Cost to implement (where do new dollars come from?)
    - Some public safety agencies lack knowledge on how applications and solutions could improve or enhance response.
  - Path to Interoperability is not clear
    - Adoption of LTE voice solutions (FirstNet, Commercial Network, OTT)
    - Adoption of non P25 digital solutions (TETRA, DMR)
    - Disparate encryption solutions and implementations
    - Challenges with Data Interoperability
    - 3GPP Standards work is delayed, creating “industry opportunity”





# 3<sup>rd</sup> Generation Partnership Project (3GPP) Standards

# 3<sup>rd</sup> Generation Partnership Project (3GPP) Standards

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- Release 14
  - Coming to a rapid close.
  - Focused on common use of mission critical components (PTT, data, and video).
- Release 15
  - Phase 1 of the 3GPP initiative to create 5G standards
  - Some LMR LTE interoperability work is proposed
    - How are MC-PTT systems interconnected with LMR systems
    - SA6 meeting in China on April 3<sup>rd</sup> to finalize study items
  - LTE Direct Mode work will not occur in Release 15.
  - This release was designed to have a small set of features in order to speed the deployment timeline.

# 3<sup>rd</sup> Generation Partnership Project (3GPP) Standards, *continued*

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- Release 16
  - Phase 2 of the 3GPP initiative to create 5G standards
  - Additional study of Direct Mode architecture options
    - 3GPP is looking at Vehicle to “everything” (V2x)
    - FirstNet will examine if V2x may work for public safety direct mode by studying gaps between V2x proposals and what first responders need.

# 3<sup>rd</sup> Generation Partnership Project (3GPP) Standards, *continued*

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- SA6 Working Group Migration
  - SA6 Working Group was established by 3GPP to work on mission critical services and was initially dedicated to public safety.
  - SA6 will either transition to include non mission critical work or it will be phased out (unlikely).
  - Expansion of SA6 work would allow more visibility to commercial operators and may result in them commercializing some public safety services. The U.S. supports this change.
    - There is some resistance to this approach.

# 3<sup>rd</sup> Generation Partnership Project (3GPP) Standards, *continued*

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- Why is this important?
  - FirstNet will build according to 3GPP standards
  - Advocacy for U.S. requirements is critical during development of international standards involving multiple entities with competing agendas.
  - Delayed adoption of a standard creates an opportunity for industry to provide proprietary solutions for individual agencies.



# Internet of Things (IoT) Working Group

# Public Safety Internet of Things (IoT)



- This new Working Group was approved by Governing Board on January 24, 2017.
  - PS IoT has 80 members from public safety, industry and academia.
- The following work items are in the charter:
  - Examine current state of IoT.
  - Examine specific issues that impact public safety.
  - Identify issues and concerns for action by the NPSTC Governing Board.



# Public Safety Internet of Things (IoT)

*continued*



- Additionally, the Working Group may:
  - Create outreach materials to educate public safety on IoT.
  - Schedule presentations to discuss IoT usage by public safety agencies.
  - Examine the role of standardization of the IoT ecosystem.

# Public Safety Internet of Things (IoT)

*continued*



- Working Group Approach
  - Examine current state of IoT.
    - Presentation by NIST on the IoT Green Paper (general IoT focus).
    - Presentation by NIST on the Global City Team Challenge (local government focus).
    - Presentation by DHS S&T on First Responder of the Future (public safety focus).
  - Examine specific issues that impact public safety.
    - IoT and sensor support for various public safety responses.
    - IoT and sensor networks.
    - The role of edge and analytic processing.
  - Identify issues and concerns for action by the NPSTC Governing Board.
    - Advocate for best practices and technical requirements as appropriate.

# Public Safety Internet of Things (IoT)

*continued*



- Why is this important?
  - IoT is poised to significantly impact public safety
  - NG911 will allow IoT sensors to be directly connected to PSAPs (incoming data from the public, and M2M interfaces)
  - FirstNet will enable IoT sensors to be connected to public safety/critical infrastructure buildings, vehicles and personnel.
  - Use of analytics will be essential to convert raw sensor data into actionable intelligence.
  - Routing models for data flow must be studied (what comes directly to the PSAP, what is routed to a third party for verification?)



# Unmanned Aircraft Systems (UAS)/Robotics Working Group

# UAS and Robotics Working Group



- Progress Report
  - First report from the Working Group has been completed
    - Unmanned Air Systems and Robotics – Guidelines for Creating a UAS Program.
    - Identifies specific components that must be evaluated by public safety agencies.

# UAS and Robotics Working Group

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- Next report will focus on UAS and Aerial Communications.
  - How UAS can provide voice and data communications to support an incident.
  - Will examine both LMR and LTE implementations.
- Future Work
  - Continue to examine public safety use.
  - Schedule additional education presentations on UAS/R use by public safety and new technologies offered by industry.
  - NPSTC will be monitoring the National Council on Public Safety UAS, which is engaging on all UAS issues beyond communications.

# UAS and Robotics Working Group

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- Why is this important to public safety?
  - UAS is currently performing a significant public safety role.
    - Situational Awareness
    - Immediate delivery of medication, supplies
    - Airborne communications platforms.
  - LMR (voice) and LTE (data) coverage in rural and frontier areas may require UAS solutions.
  - Public Safety agencies need guidance and education to realize the full potential of these systems.





# Broadband Deployable Systems Working Group

# Broadband Deployable Systems



- The Working Group has completed its mission to research and produce a comprehensive report on the use of Broadband Deployable Systems.
  - The Working Group started this effort in August of 2014
  - More than 150 participants have engaged with the Working Group.
  - The final report is 254 pages and includes significant technical detail and discussion.
  - Technical assistance was provided by Defense Research and Development Canada's Centre for Security Science, PSCR, Simon Fraser University as well as robust industry interaction.

# Broadband Deployable Systems

*continued*



- The report includes five main components:
  - 1. Operational, technical, and background information.**
    - This information is contained throughout the report in the various chapters relating to specific BBDS components and issues.
  - 2. Public Safety Technical Requirements**
    - Fifty four technical requirements have been identified which articulate necessary capabilities of BBDS technology.
  - 3. Deployment Considerations**
    - Assume that BBDS can be owned, dispatched, and operated by local/state/provincial/federal agencies and by NPSBN contractor;
    - Operator training issues for first responders, public safety technicians and FirstNet contractor teams.

# Broadband Deployable Systems

*continued*



- The report includes five main components:
  4. **Technical Challenges**
    - A series of technical challenges have been identified that may inhibit the capabilities that are expected from the utilization of BBDS by public safety agencies.
  5. **Conclusions and Recommendations**
    - 18 conclusions have been identified which illustrate public safety's expectations of BBDS technology; and
    - 16 action items articulate a “path forward” for the implementation and use of BBDS.

# Broadband Deployable Systems

*continued*



- Broadband Deployable Systems Final Report
  - This report has been transmitted to the FirstNet PSAC and is publicly available on the NSPTC web site
  - Additional work in this area will be managed by the Broadband Emerging Technologies Working Group and/or the Technology and Broadband Committee.

# Broadband Deployable Systems

*continued*



- Why is this important to public safety?
  - FirstNet will need network extension services, to provide in building and outdoor coverage in certain areas.
  - Public Safety needs to articulate operational requirements for the use of these technologies.
  - Public Safety needs to advocate for the use of a range of these technologies.



# Broadband Emerging Technologies Working Group

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# Broadband Emerging Technologies Working Group

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- Working Group Update
  - February session was a panel presentation on LTE Small Cells and the impact to public safety.
    - Gary Monetti moderated the panel which involved four industry participants.
  - March session was a presentation by the Broadband Deployable Systems Working Group on the key findings in their report.
  - April session included a presentation by the City of Houston and Harris County on broadband utilization at the Super Bowl.

# Broadband Emerging Technologies Working Group

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- Working Group Update
  - The Working Group will be reviewing two reports coming from the NPSTC EMS Working Group later in the year:
    - Rural Implications for EMS Usage of Public Safety Broadband.
    - Broadband EMS Applications Update.
  - May 24<sup>th</sup> presentation will be from the National 911 Program Office on NG911 implementation and interoperability.

# Broadband Emerging Technologies Working Group

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- Why is this important to Public Safety?
  - First responders need a mechanism to stay abreast of changing technology issues.
  - NPSTC needs a group of “ready” public safety practitioners who can provide input on issues.



# LMR LTE Integration and Interoperability Working Group

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# LMR LTE Integration and Interoperability Working Group

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- Three focus areas are being completed:
  - Validate existing 2012 NPSTC Mission Critical Voice requirements
  - Examine additional features and capabilities needed for LMR/LTE interoperability
  - Monitor 3GPP Standards Process regarding LMR/LTE Interworking

# LMR LTE Integration and Interoperability Working Group *continued*



- Eight use cases have been completed which assess how public safety agencies will communicate during LMR and LTE joint operations.
  - Use Case 1: Single Talkgroup PTT Voice Interworking
  - Use Case 2: Multiple interconnected LMR/LTE talkgroups
  - Use Case 3: Off Network Communications
  - Use Case 4: Consultation/Full Duplex Voice
  - Use Case 5: Incident Command Monitor/SCAN
  - Use Case 6: Emergency and Unit/Talker ID
  - Use Case 7: Cellular Push to Talk/Over the Top Push to Talk
  - Use Case 8: Encryption

# LMR LTE Integration and Interoperability Working Group *continued*



- An additional 12 items are under discussion by the Working Group.
  - These include Individual/Private Call, Radio Monitor, Radio Check
    - Of these features:
      - a) Which ones are essential to LMR LTE integration?
        - Which ones are optional?
      - b) Which features can be managed through other means?
        - Can a dispatcher walk to another terminal to inhibit a radio?
      - c) Which features are needed on consoles but not on subscriber radios?
        - Some requirements may be satisfied through the console which can integrate a variety of technologies, vs. having the feature supported through the interface.

# LMR LTE Integration and Interoperability Working Group *continued*

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- Why is this important to Public Safety?
  - LMR systems will be used into the foreseeable future
    - Some public safety agencies will never migrate to LTE
    - Some public safety agencies are completing major LMR infrastructure projects (e.g. Seattle and Houston) with 20 year life expectancies.
  - Voice interoperability is critical between first responders operating on both LMR and LTE networks at the scene of the same incident.
  - There is not yet a consensus on how feature rich the LMR LTE interface should be.





# Video Technology Advisory Group (VTAG) Working Group

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# Video Technology Advisory Group (VTAG) Working Group

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- Working Group Update:
  - Reviewed Video Handbook Update.
  - Handbook to be published as addendum to Volume 1 – presently under review at DHS First Responders Group.
  - Examining the role of edge analytics to better support public safety video.
  - Reviewing new features and capabilities of video from industry panelists.

# Video Technology Advisory Group (VTAG) Working Group *continued*

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- Why is this important to Public Safety?
  - Video continues to play a large and evolving role in public safety operations.
  - Video analytics are needed to manage large volumes of “raw video”.
  - Video technology is expanding rapidly and public safety agencies need guidance and best practices on acquisition, deployment and management.



# SUPPLEMENTAL INFORMATION

**The following slides provide an overview of NPSTC activity in the areas of Spectrum Management and Voice Interoperability.**



# Radio Programming Compatibility Requirements (Radio PCR)

# Radio PCR Working Group

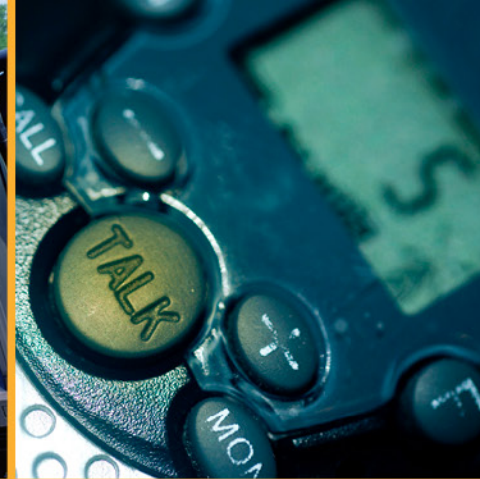


- PAM Tool Update
  - Version 6 is being finalized (freeze date 1/27/2017)
  - Compliant with DHS NIFOG Version 1.6.1 (April 2016)
  - Clean up of spreadsheet functionality
  - New manufacturer added: Relm
  - Restructuring administrative control, standardizing passwords

# Radio PCR Working Group *continued*



- TIA Update
  - Request for Technical Bulletin submitted during presentation to TIA on February 1, 2017.
  - Technical Bulletin will create a standardized data exchange format for basic radio programming.
  - TR-8 Private and Personal Radio Standards Committee is now evaluating the request and comments received from TIA members.
- Outreach Update
  - Working with DHS S&T to have PAM Tool checked for compliance with applicable federal standards (e.g. 508 compliance).
  - DHS OEC will post the PAM Tool to the SAFECOM website.



# Spectrum Management Committee

Don Root, Chair

Charlie Sasser, Vice Chair

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# Committee Issue Update

## 700 MHz Public Safety Air-to-Ground (ATG)

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- FCC Public Notice March 15; Comments due May 1, 2017.
- Eight Channels previously designated for U.S.
- Current U.S./ Canada Agreement does not cover ATG
- FCC-U.S./ISED-Canada in discussions
- Options:
  - Same ATG channels in U.S. and Canada – Each country restricted in ATG use
  - Different ATG channels in U.S. and Canada – Choice of channels and maximum height in Canada determines impact to U.S.
  - Mix- some channels the same for interoperability; others distinct
- Spectrum Committee studying options to draft substantive recommendations.

# Committee Issue Update

## 800 MHz Cellular Service Reform



- Benefit to 800 MHz Cellular Carriers:

- FCC Decision March 23.
- Rule changes enable broadband
- Permits Power Flux Density (PFD) to use same power across band, whether broadband or narrowband
- Conforms 800 MHz cellular technical rules to those in other CMRS bands
- Keeps existing interference resolution rules/procedures

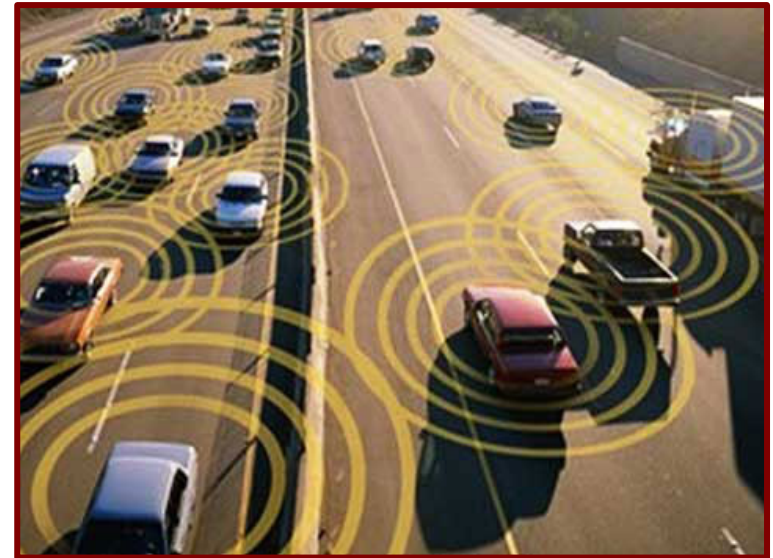
- Impact to Public Safety:

- May increase interference
- FCC calls for a Public Forum among PS, PS equipment manufacturers and commercial carriers to address band coexistence
- FCC raises possibility of public safety receiver requirements

# Committee Issue Update

## NHTSA Vehicle-to-Vehicle (V2V) Proposal

- NHTSA NPRM-Docket 2016-0126 ---- 392 pages
- Comments due April 12, 2017.
- NPRM proposes to mandate for V2V communications for new light vehicles for crash avoidance.
- Also proposes to standardize the message and format of V2V transmissions.
- Would phase in over four years following final rule.
- Committee plans to draft supporting comments for the Governing Board review and approval.
- NPRM includes discussion on 5.9 GHz DSRC.



# Committee Issue Update

## 700 MHz Deployable Trunked Channels

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- NPSTC and the NRPC jointly issued a report October 2015 entitled “700 MHz Nationwide Deployable Trunked Solutions.”
- Since that time, NRPC has implemented its administration of system IDs, etc.

# Committee Issue Update

## 700 MHz Deployable Trunked Channels *continued*



- We now need to take steps toward an updated report:
  - Educate agencies on how to obtain a deployable trunked system ID.
  - Determine whether P25 Phase II mode can be used in addition to the P25 Phase I mode.
  - Address some concerns in the U.S. / Mexico border area regarding potential conflicts on deployable trunked system control channels.
  - Promote adoption of 700 MHz deployable trunked channels in Canada.
  - Determine whether to develop a sample programming template to use in updating the PAM tool, working with the Technology and Broadband Committee.
- The Committee requests Governing Board approval for this activity.

# Committee Issue Update

## 4.9 GHz

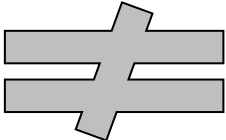
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- NPRM previously on FCC 8<sup>th</sup> floor circulation.
- Pulled from circulation in January 2017.
- We hear that some degree of edits/modifications are being made.
- Awaiting FCC adoption/release.
- Expect NPRM to include some discussion on spectrum sharing.

# Committee Issue Update

## 4.9 GHz *continued*

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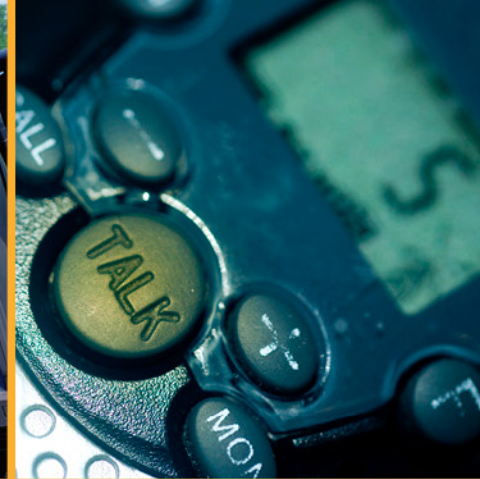
- Committee has held two educational sessions to learn how dynamic spectrum management through a spectrum access system (SAS) is designed and is being tested at 3.5 GHz.
- Spectrum environment a key factor in sharing mechanisms.
- Spectrum environment: 4.9 GHz  3.5 GHz.

# NPSTC Filings in 2017



Date Filed	Topic	Type of Filing
<b><u>Anticipated:</u></b>		
TBD	4.9 GHz NPRM (TBR)	Comments, FCC
5/01/17	700 MHz A-G Border	Comments, FCC
4/12/17	V2V Mandate & Standardization	Comments, DOT/NHTSA
<b><u>Completed:</u></b>		
3/24/17	Wilson/Cellular Boosters	Comments, FCC
3/06/17	Higher Ground	Comments, FCC
1/27/17	North Dakota n-VLAW 31	Comments, FCC
1/22/17	P25 Encryption Capabilities	Letter, DHS





# Interoperability Committee

John Lenihan, Chair  
Jason Matthews, Vice Chair

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# Interoperability Committee



- Monitoring non P25 system implementations for public safety.
  - Digital Mobile Radio (DMR) and TETRA are replacing legacy analog systems.
- Monitoring encryption issues.
  - Vendors are creating compatible, industry encryption schemes, that work across manufacturer and radio platforms.
  - Harris is releasing an encryption that is compatible with Motorola’s proprietary Advance Digital Privacy (ADP) offering.
- Monitoring state laws on use of “hand-held” devices.
  - Many states are enhancing their laws to prevent mobile device use while driving.
  - Reviewing impact to public safety operations.



# Emergency Medical Services

**Paul Patrick, Chair**

# EMS Working Group



- Completed report on “Public Safety Broadband Data: Implications for Rural EMS.”
  - Highlights unique issues facing rural EMS providers.
  - Addresses three components: Time, Resources, and Incidents.
  - Examines solutions to improve patient care.
  - Report is in final editing and will reach the Governing Board soon.
- Starting review of EMS Broadband Public Safety Applications list that was created in 2012.
  - Determine current status of applications.
  - Identify new applications that may be needed by EMS.



# Radio IO Best Practices Working Group

**Mark Schroeder, Chair**

# Radio Interoperability Best Practices



- Best Practice Master Report and three Best Practice Statements were approved by the Governing Board on January 24, 2017.
  - These documents have been published and distributed broadly.
  - Best Practice 1,2,3 were also approved:
    - BP #1: Nationwide IO Channel Naming and Usage
    - BP #2: IO Systems Change Management Practices
    - BP #3: Training and Proficiency in the Management and Usage of IO Equipment and Systems.

# Radio Interoperability Best Practices

*continued*



- Best Practice # 4 on Governance and Interoperability Relationships has been completed and distributed to the Governing Board.
  - ACTION NEEDED: *Governing Board consideration for approval of report.*
- Work continues to finalize the next Best Practice document covering Infrastructure Management.



# Cross Border Working Group

**Steve Mallory, Chair**



# Cross Border Working Group



- Finalizing input on the Cross Border 911 Data Sharing Report
  - Provides guidance to PSAPs along the U.S. Canadian border on how to access customer account and location data that resides with a commercial carrier in the other country.
  - Also provides guidance for the management of calls which did not trigger a 911 call.
- Reviewing the FCC Public Notice on 700 MHz Air to Ground channels.
  - Presentation received from Brian Marengo from the FCC.
  - Monitoring efforts in the Spectrum Management Committee.

## Cross Border Working Group *continued*

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- Participating with CITIG at the upcoming CANUS Communications Interoperability Working Group meeting in Buffalo, NY, with DHS OEC and Public Safety Canada.