



## Public Safety Communications Research Gulf States 700 MHz Broadband Overview

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# PSCR Partnership

NIST



**ITS** Institute for Telecommunication Sciences  
Boulder, Colorado

# PSCR Sponsors



**Homeland  
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# PSCR Program Plan Snapshot

**Vision** The response community nationwide can exchange voice and data seamlessly to effectively respond to any incident or emergency.

**Mission** To fulfill this vision, PSCR will act as an objective technical advisor and laboratory to OIC and public safety to accelerate the adoption and implementation of only the most critical public safety communication standards and technologies.

## PSCR Projects

LMR Standards and Technologies	Broadband Standards and Technologies	Interoperability Device Standards and Technologies	Emerging Standards and Technologies	Cross-cutting or Supporting Activities
P25 CAP	ROW-B	Multi-Band Radio	Public Safety Security	Program Management & Reporting
Project 25 (P25) Standards Development	Public Safety VoIP	Interim Interoperability Device Testing	Technical Services Projects (MANET, Security)	Statement of Requirements (SOR)
ISSI Test Tools	4.9 GHz Broadband Task Group		Video Quality	Public Safety Architecture Framework
Audio Quality	700 MHz Broadband Working Group			RF Propagation Studies
	Modeling and Simulation			

## PSCR Approach



# 700 MHz History

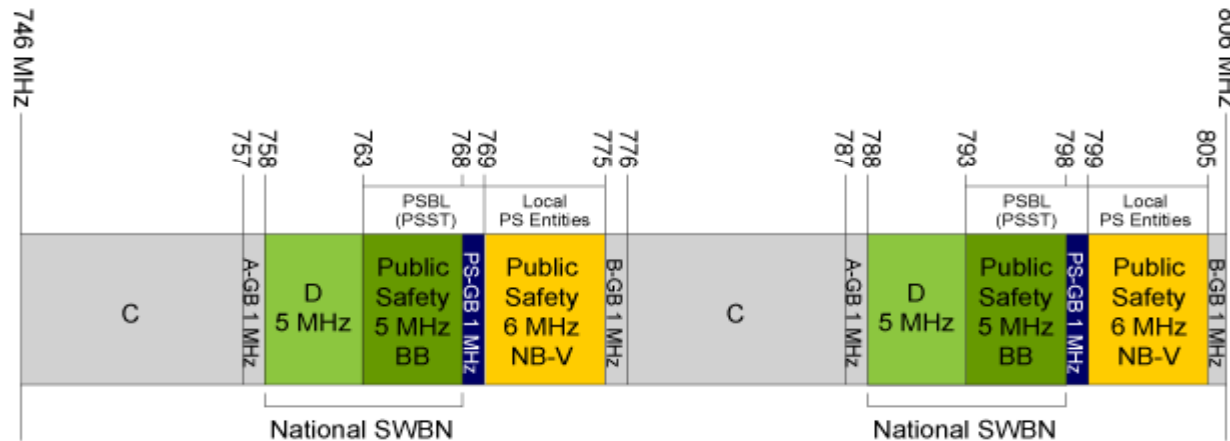
- The 700 MHz broadband spectrum allocations were created over several years and rulings by the Federal Communications Commission (FCC).
- The public safety 700MHz broadband spectrum and the D-Block are based on clearing of UHF TV stations 60 – 69 (746 – 806 MHz), in addition to the FCC 2nd, 8th & 9th Notice of Proposed Rule Making (NPRM).
  - 2nd NPRM moved narrowband and wideband operations to allow for more high speed data spectrum
  - 8th NPRM allowed for broadband operations in the 700 MHz Band
  - 9th NPRM calls for a national broadband network

# 2<sup>nd</sup> Report & Order

- On July 31, 2007 the 2nd Report and Order was created by the FCC to “to promote the creation of a nationwide interoperable broadband network for public safety and to facilitate the availability of new and innovative wireless broadband services for consumers”.
- The Order established a framework for a nationwide 700 MHz single licensee, nationwide license for the public safety broadband spectrum, assigned to a Public Safety Broadband Licensee, which will work with the adjacent commercial 10-megahertz Upper D Block licensee as part of the 700 MHz Public Safety/Private Partnership.

# Spectrum Allocation

## Public Safety Spectrum Allocation in the 700 MHz Band



### Public Safety 700 MHz Allocations

Total Allocation	( 12 x 12 )	24 MHz
Broadband Portion	( 5 x 5 )	10 MHz
Narrowband Portion	( 6 x 6 )	12 MHz
Guardband Portion	( 1 x 1 )	2 MHz

### Legend

PSBL = Public Safety Broadband Licensee
PSST = Public Safety Spectrum Trust
PS Entities = Public Safety Narrowband Licensees
SWBN = Shared Wireless Broadband Network
BB = Broadband
NB-V = Narrowband Voice (e.g., P25 systems)
PS-GB = Public Safety Guardband

- FCC allocated spectrum to public safety for broadband data services
- Commercial D block, to be combined with public safety broadband allocation
  - These combined blocks will be called the Shared Wireless Broadband Network (SWBN)
  - Public Safety will have highest priority use of and the only pre-emption authorities on the SWBN
  - The combined 10 x 10 MHz block will allow public safety to use advanced broadband data services

# SoR & PSST

- The National Public Safety Telecommunications Council (NPSTC – [www.npstc.org](http://www.npstc.org) ) created a Broadband Working Group (BBWG) to develop a 700 MHz Broadband Statement of Requirements (SOR).
  - On November 8, 2007 the Public Safety 700MHz Broadband Statement of Requirements Version 0.6 was published.
- The Public Safety Spectrum Trust (PSST) was then established and on November 19, 2007 the FCC named the PSST as the nationwide Public Safety Broadband Licensee (PSBL).

# 700 MHz Auction

- As part of the 2nd Report and Order the FCC established rules for the 700 MHz spectrum and how it would be auctioned off.
- Auction time - 01/24/08 - 03/18/08 – 700 MHz Auction #73.
  - Auction raised almost \$20 billion.
  - Only one bid for the D Block spectrum which did not meet the minimum bidding requirement of \$1.33 billion.
- 03/20/08 – FCC Order Delaying Further D Block Action until further notice
- 09/25/08 – FCC voted unanimously to issue the Third Further Notice of Proposed Rulemaking (Third FNPRM).
- 11/26/08 – FCC Chairman Martin did not circulate a draft Third Report & Order after Congressional leaders requested all matters be deferred to the next Administration.

# Waiting Period

- The current status of 700 MHz *had* not changed much until June 2009 – this is now changing rapidly.
  - HDTV transfer is done
  - FCC commissioner sworn in
  - Within the past few months 12 cities and states have filed waiver requests to deploy their own 700 MHz broadband networks.

# Waiver Requesters

- City of Boston
- City and County of San Francisco, City of Oakland and City of San Jose
- State of New Jersey
- City of New York
- District of Columbia
- State of New York
- City of Chesapeake, Virginia
- City of San Antonio, Bexar County and Comal County, Texas;
- State of New Mexico
- State of North Dakota
- City of Charlotte, North Carolina
- Counties of Blackhawk, Buchanan, Dubuque, Grundy, Johnson, Marshall and Scott, and the City of Cedar Rapids, Iowa

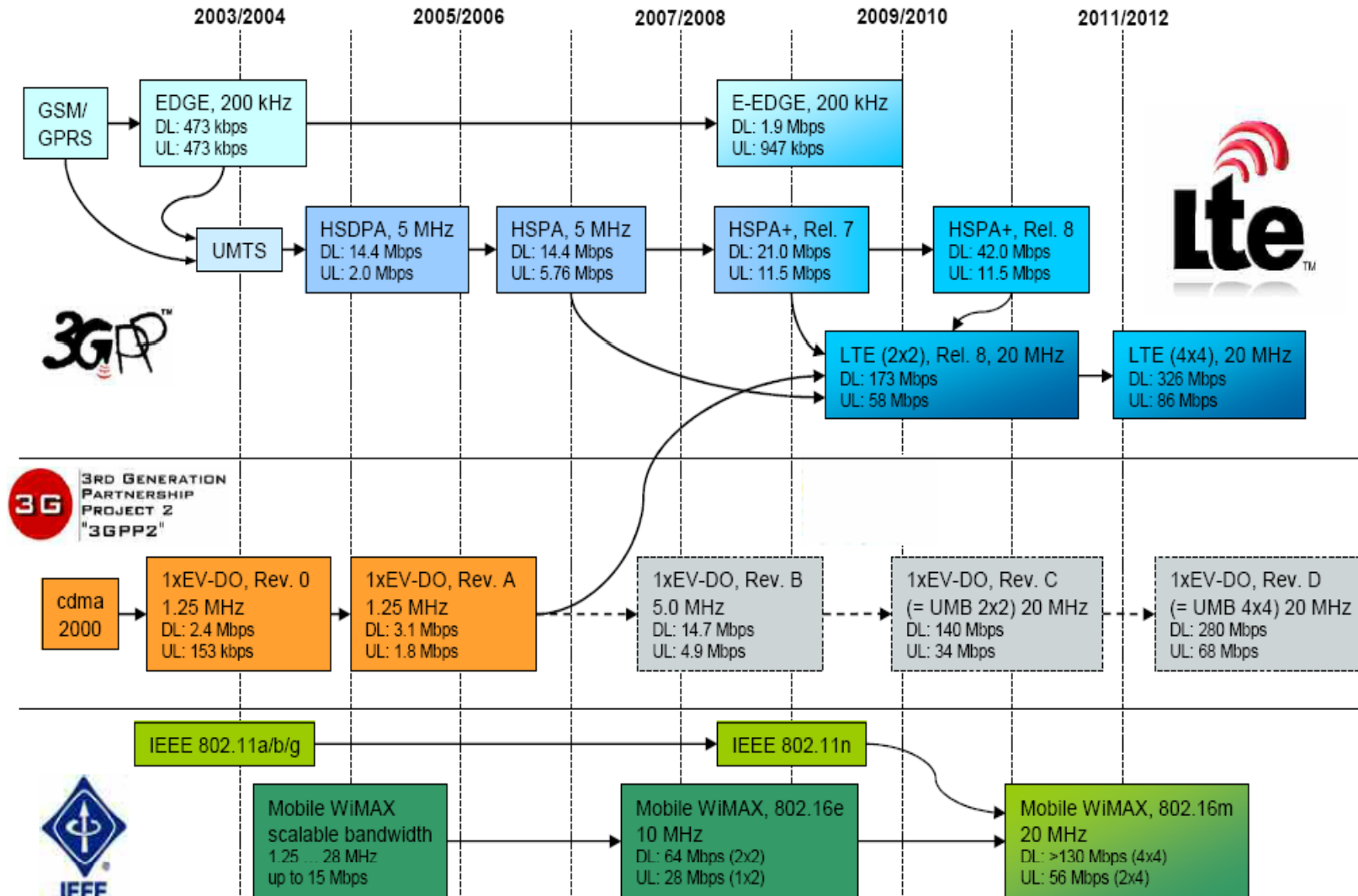
# Technology Choice

- NPSTC, NENA, MCC, PSST and APCO have chosen LTE as their broadband technology of choice
- LTE – Long Term Evolution a.k.a 3rd Generation Partnership Project (3GPP) Release 8
  - Current goal is to provide support for technical specifications for Universal Terrestrial Radio Access (UTRA) networks
  - LTE working group started in 2004
    - Created E-UTRA – Evolved UTRA
    - LTE = EUTRA = Super3G = 3.9G
    - Specifications start with 36 series in 3GPP – [www.3gpp.org](http://www.3gpp.org)
      - Radio Access Network (RAN) group running most of the LTE development. See Release 8 for latest specifications

# Evolved Packet Core

- Concurrent with LTE development, the 3GPP core network is being optimized for packet data
- 3GPP SA WG2 started its own Study for the System Architecture Evolution (SAE).
  - Objective: "to develop a framework for an evolution or migration of the 3GPP system to a higher-data-rate, lower-latency, packet optimized system that supports, multiple Radio Access Technologies."
    - NOTE: Assumption that voice services are supported in PS domain.
- EPC – Evolved Packet Core is the output from SAE

# LTE Roadmap



Courtesy Rohde & Schwartz

# LTE Performance Requirements

Category	E-UTRA Rel. 8	Public Safety
Bandwidth	Scalable 1.4, 3, 5, 10, 20 MHz	Likely 5 or 10 MHz channel sizes
DL Peak Data Rate	15 bps/Hz (class 5)	Theoretical peak 43 Mbps*
UL Peak Data Rate	3.75 bps/Hz (class 5)	Theoretical peak 18 Mbps
Est. Average DL spectral efficiency	1.6 bps/Hz (2x2)+	8 Mbps*
Est. Cell-Edge DL spectral efficiency	0.05 bps/Hz (2x2)+	0.25 Mbps*
Est. Average UL spectral efficiency	0.9 bps/Hz+	4.5 Mbps*
Est. Cell-Edge UL spectral efficiency	0.03 bps/Hz+	0.15 Mbps*
VoIP Capacity	40 users/MHz	200 Users per sector*

+Denotes Conservative Estimates

\*Assumes 5 MHz Channel size

# Broadband Task Force

- June 2009 NPSTC created a Broadband Task Force (BBTF) to address interoperability issues and asked DHS OIC to help lead this effort with PSCR staff.
  - Technical working group presented draft to APCO 2009 audience in mid-August
- 700MHz NPSTC Broadband Task Force (BBTF) delivered report to NPSTC on schedule August 26th, 2009 ([www.npstc.org](http://www.npstc.org))
  - NPSTC voted unanimously to submit report to the PSST – September 15, 2009
  - NPSTC ex-parte with FCC to discuss BBTF Report - September 25, 2009
  - Overwhelming support from public safety, press and vendors

# Waiver Responses

- FCC Public Safety and Homeland Security Bureau sought comments on waiver requesters to deploy public safety broadband systems on a local or regional basis in the 10 megahertz of 700 MHz public safety broadband spectrum currently licensed to the Public Safety Spectrum Trust (PSST) (763-768/793-798 MHz). (06-229)
  - Comment Date: October 16, 2009
  - Reply Comment Date: November 16, 2009
- FCC has suggested that in conjunction with the information from the waiver comments and the National Broadband Strategy, rulings may be enacted around Feb, 2010.
  - Waiver approvals may come earlier

# PSCR

- Currently PSCR is working with the FCC PSHSB, NPSTC, PSST and vendor community to continue the technical analysis of LTE and the issues with the 700 MHz spectrum