Presentation to the

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Interim

Science, Technology, and Telecommunications Committee

[49th LEGISLATURE of the State of New Mexico]

Understanding Narrowbanding requirements and why we should plan for the transition now

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Narrowbanding Mandates:

(Time is Growing Short)

What is it all about?

(It's unfunded, It's necessary, and It's the Law)

{Both the Law of the Land and Law of Physics}

Will it Affect The State of New Mexico?

[Yes!!]

Narrowbanding Will Be Expensive!

[Only Three Budget Cycles Remain Until 1/1/2012]

History of FCC. Narrowbanding Mandates

WT Docket 99-87

Promotion of Spectrum Efficient Technologies

February 2003-- FCC Adopts WT Docket 99-87, Second Report & Order

July 2003-- WT-Docket 99-87 officially published in the Federal register

January 2004-- FCC places a temporary stay on the licensing deadline.

December 2004 FCC adopted WT Docket 99-87, (FCC 04-292) which effectively changes the 12.5/15 kHz narrowband migration deadline to January 1, 2013.

March 2007-- FCC:

-Declines to establish a fixed date for private land mobile radio (PLMR) systems in the 150-174 MHz and 421-512 MHz bands to transition to 6.25kHz narrowband [Digital] technology.

The Major Decisions

1. ***After*** **January 11, 2011 - The FCC will *no longer accept new applications* for operations using 25/30 kHz channels, in the spectrum below 512 MHz (i.e..- no new radio station authorizations)**
2. ***After*** **January 1, 2011. - The FCC will *no longer accept modification applications* that expand the authorized contour of an existing station if the bandwidth specified in the modification is greater than 12.5 kHz (i.e.-no modifications to existing radio stations authorizations)**
3. ***After*** **January 1, 2011. - The FCC will *prohibit* the certification of any equipment capable of operating at one voice path per 25/30 kHz of spectrum. (*i.e.* equipment that includes a 25/30 kHz mode.)**
4. ***After*** **January 1, 2011. - The FCC *will prohibit the manufacture and importation* of any 150-174 MHz and 421-512 MHz equipment that can operate on a 25/30 kHz bandwidth.**

5. ***January 1, 2013. – Deadline for completion of migration to 12.5 kHz technology by non-public safety and public safety systems*.**

****** Exception: Paging Channels******

- ***ONLY TWO VIOCE CHANNELS can remain in 25.0 kHz bandwidth***

Why?

Electromagnetic (Radio Frequency) Spectrum Efficiency

- **Critical need for additional Radio Frequency (RF) spectrum to provide for Public Safety and Health needs of our citizens.**

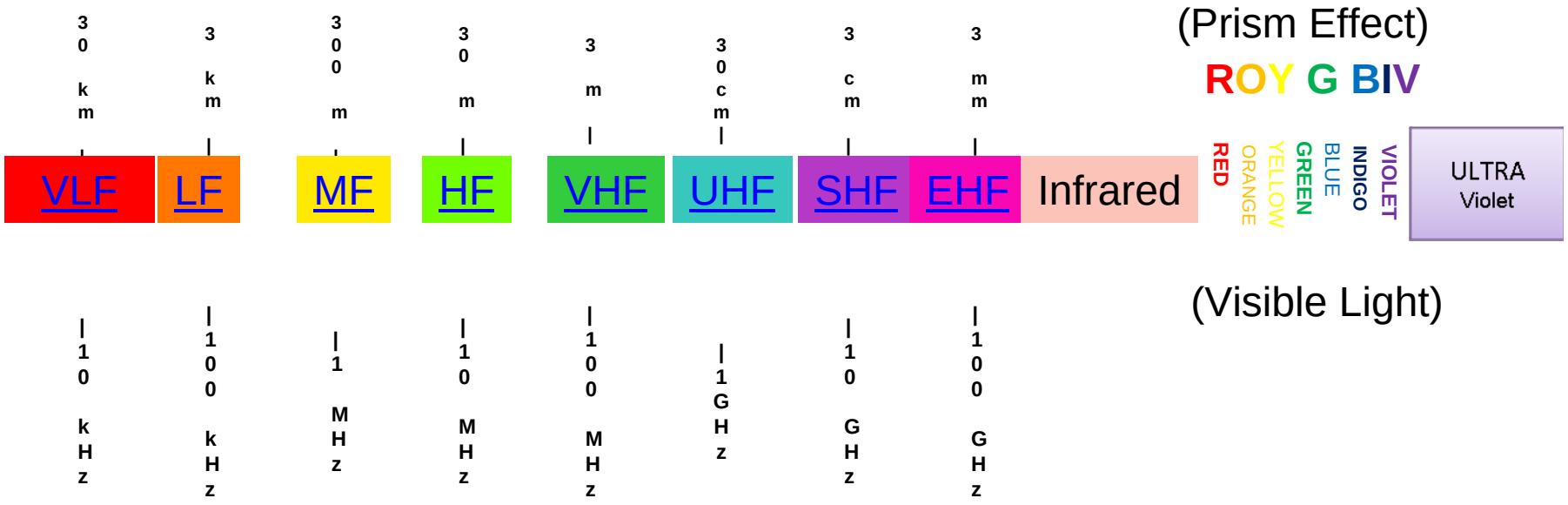
- **Currently the VHF and UHF (RF) Spectrum is heavily congested.**

- **Difficult to coordinate new applications for Radio Station authorizations, especially in more populated counties in New Mexico.**

- **As population increases and technology advancements emerge, the demand for more spectrum will increase.**

Why?

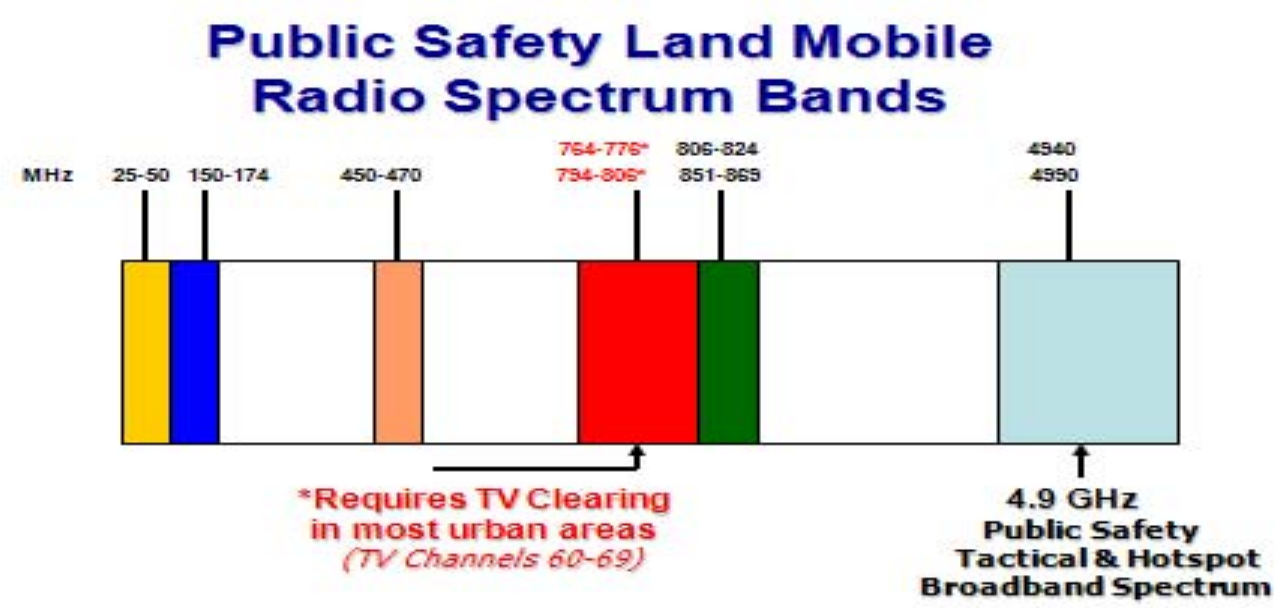
The RF Spectrum is a finite resource, with a *beginning*, *middle* and *end*.



Spectrum Can't be borrowed from our Children and Grandchildren

Why?

RF Spectrum for Public Safety & EMS: always a challenge to obtain.



So what? Who cares?

The citizens of New Mexico who need Public Safety and Government Services

- Public Safety Answering Points (PSAP'S: such as E-911 Dispatch Centers)
- Law Enforcement
- Fire Services
- Emergency Medical Service (EMS)
- *Receiving* Health Care Facilities (Emergency Rooms/ Trauma Centers)
    - Pre-arrival notification
    - On Line Medical Control and Physician Consultations.
- <u>Access to ancillary emergency response recourses:</u>
    - Chem-Track - (hazardous materials database)
    - New Mexico Poison Control
    - State Consolidated Radio Control Center (Santa Fe Control)
    - State and Local (EOC) Emergency Operations Centers

The Responders Care--It's a life- safety issue

<u>They And Their Families Deserve Nothing Less!!!</u>

Don't Forget Other Systems!

- Public Utilities, such as:
  - Water, Sewer, Gas, Electric (SCDA systems)
- Schools
  - K-12 as well as Colleges & Universities
- Highway and Road Departments
- Parks and Recreation Departments
- Incident Command /Communications Vehicles
  - Cache Radios – Transportable Systems

How?

21st Century RF Propagation Technology

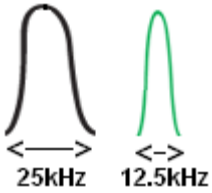
A Channel is Defined By Its…..

Frequency

Every channel on a radio has a specific frequency.
FM frequencies are shaped like a "bell".
The "bell" seen on a (RF) spectrum analyzer and indicates the signal strength as a function of frequency.

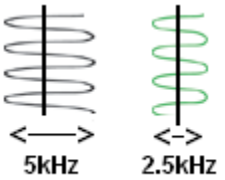
Bandwidth

The width of a frequency's bell.
Wideband – uses a range 25kHz wide.
Narrowband – uses a range 12.5kHz wide.
(half the wideband bandwidth)



Deviation

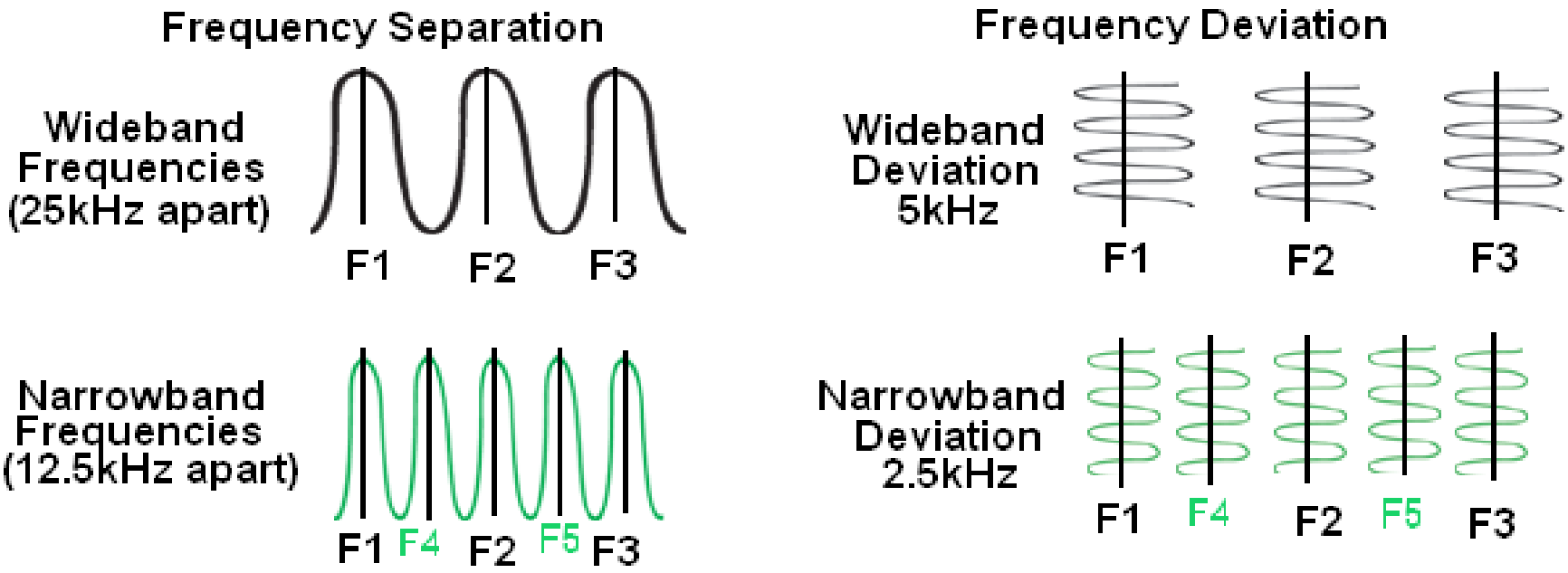
The amount of modulation (voice/data) carried on a frequency within its assigned bandwidth.
Wideband deviation is 3-5kHz.
Narrowband deviation is 1.5-2.5kHz.
(half the wideband deviation)



How?

(Continued)

Wideband vs. Narrowband

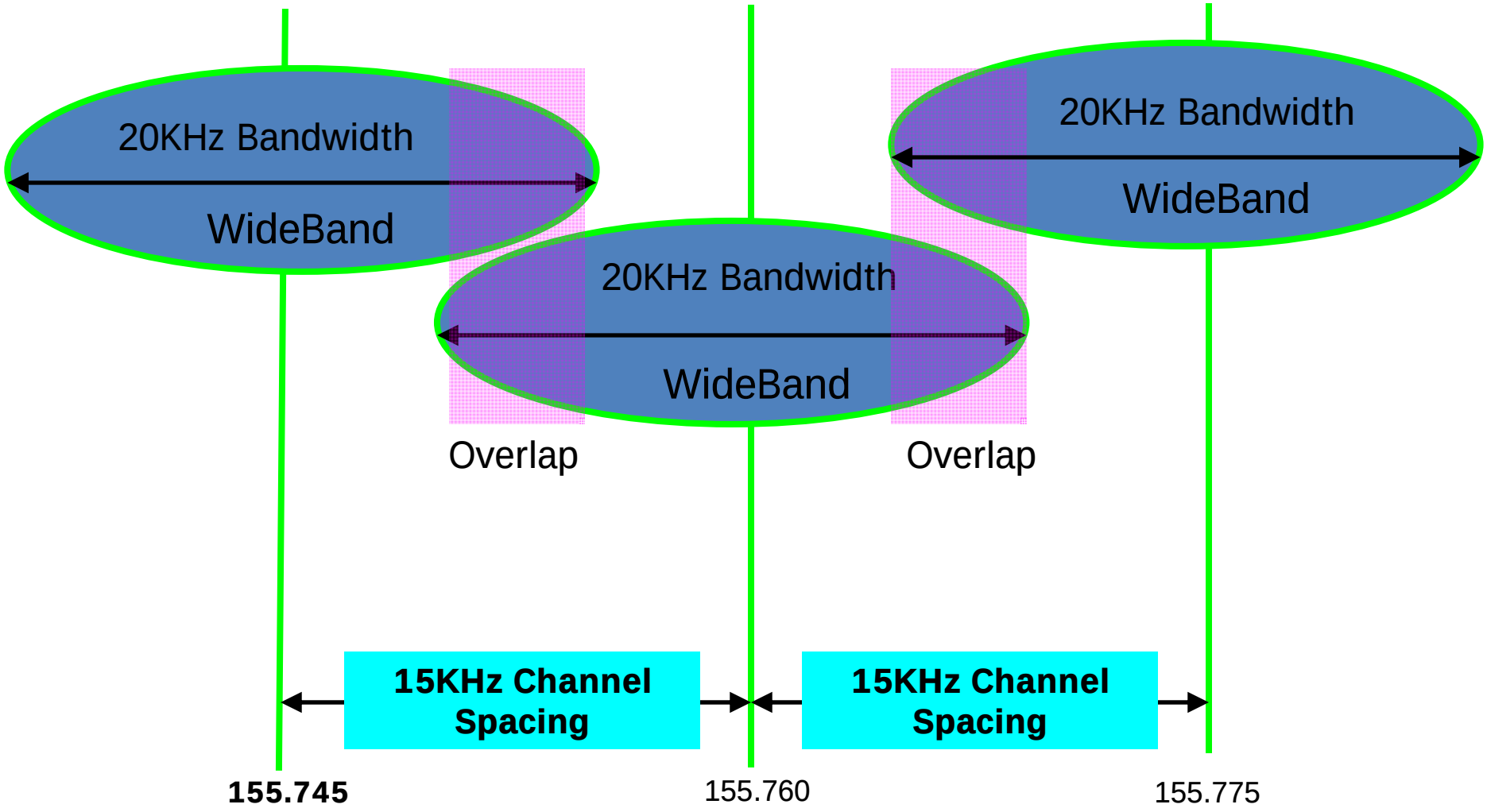


Note: Signals do not touch their neighbors.

Existing VHF Systems:

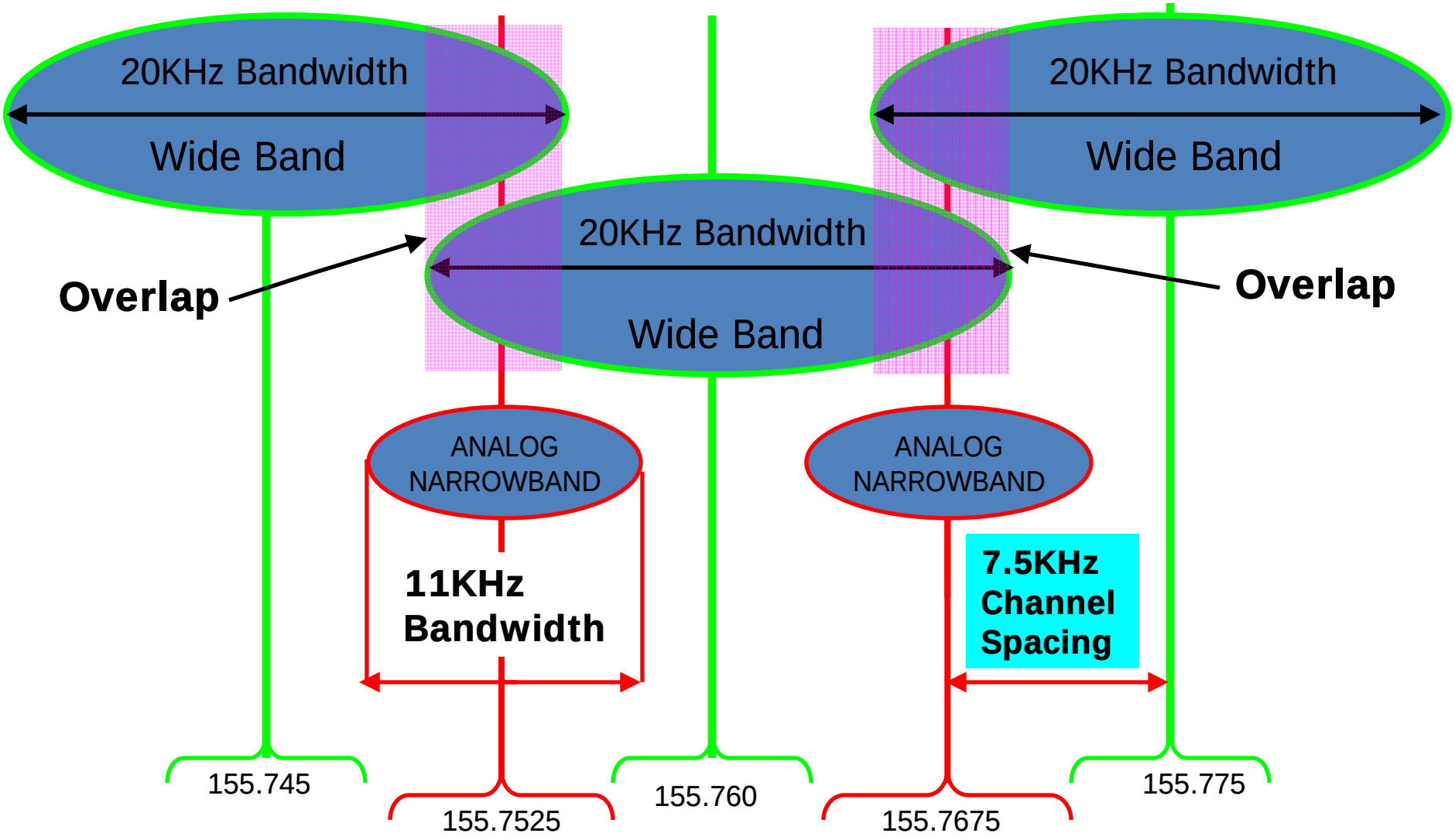
Already a problem.

Not able to use adjacent channels at close distances.



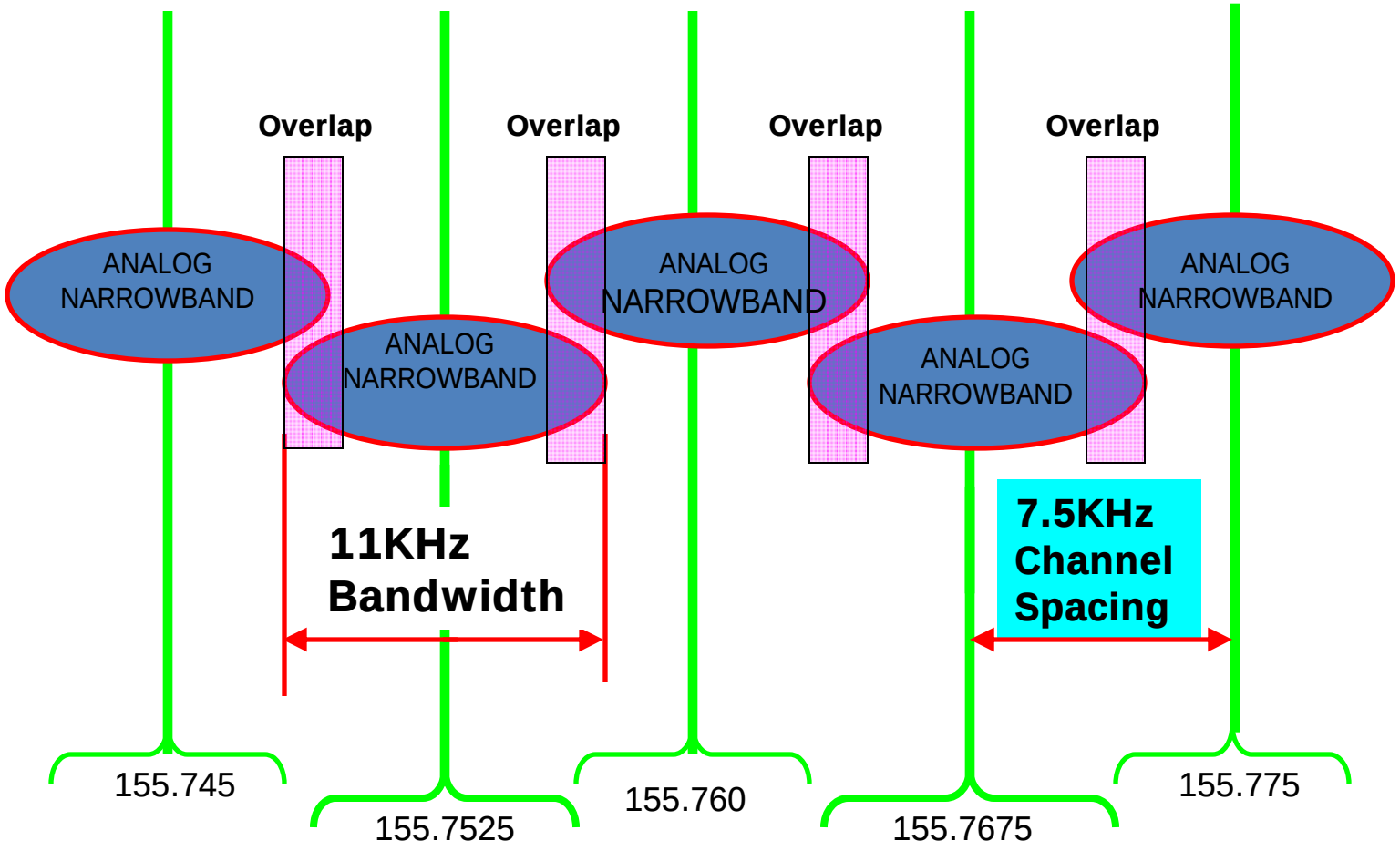
Narrowband Beginning

Narrowband channels* not *usable until wideband users convert.



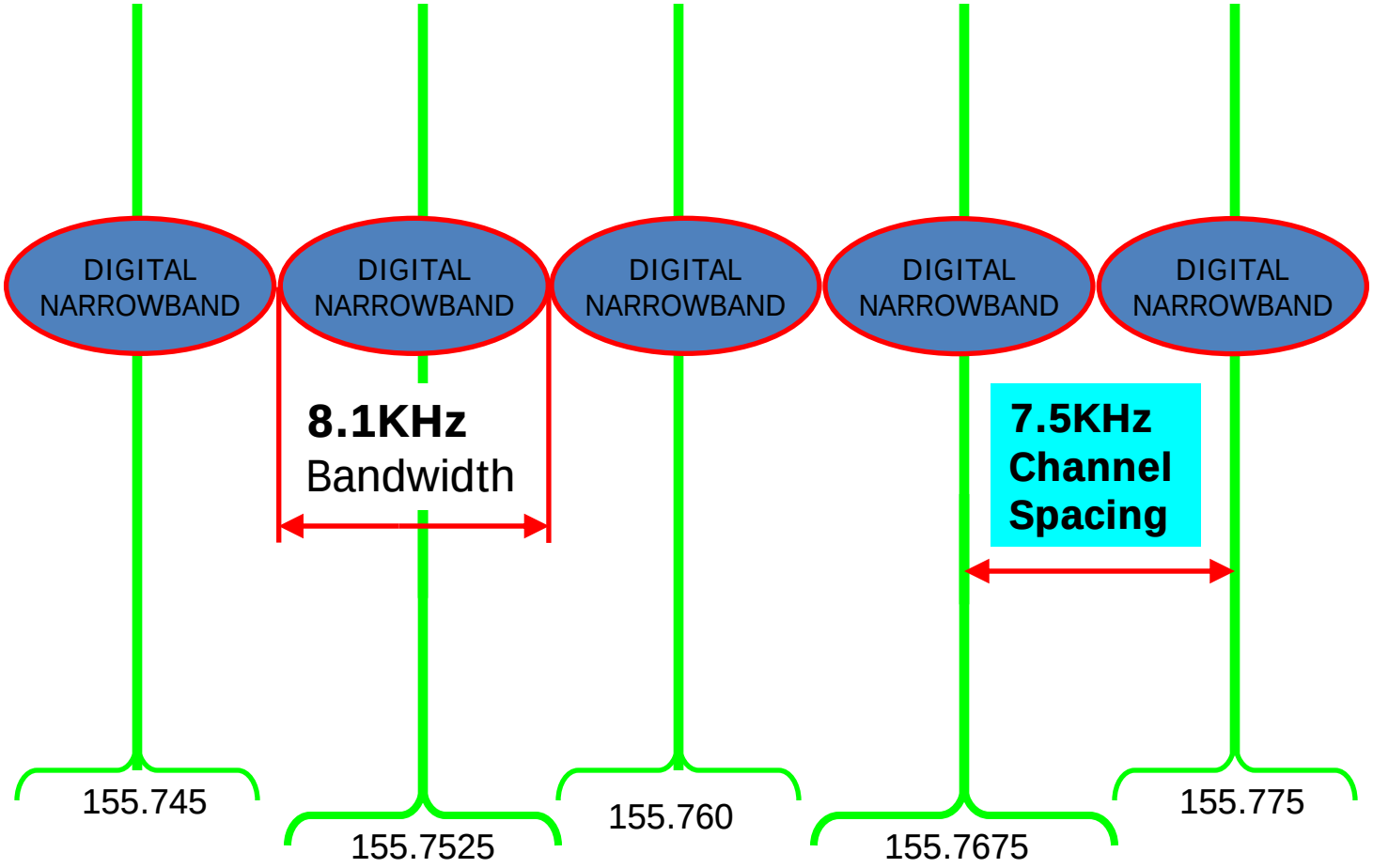
RESULTS: After all convert to Narrowband

This represents analog voice with a 11KHz necessary bandwidth



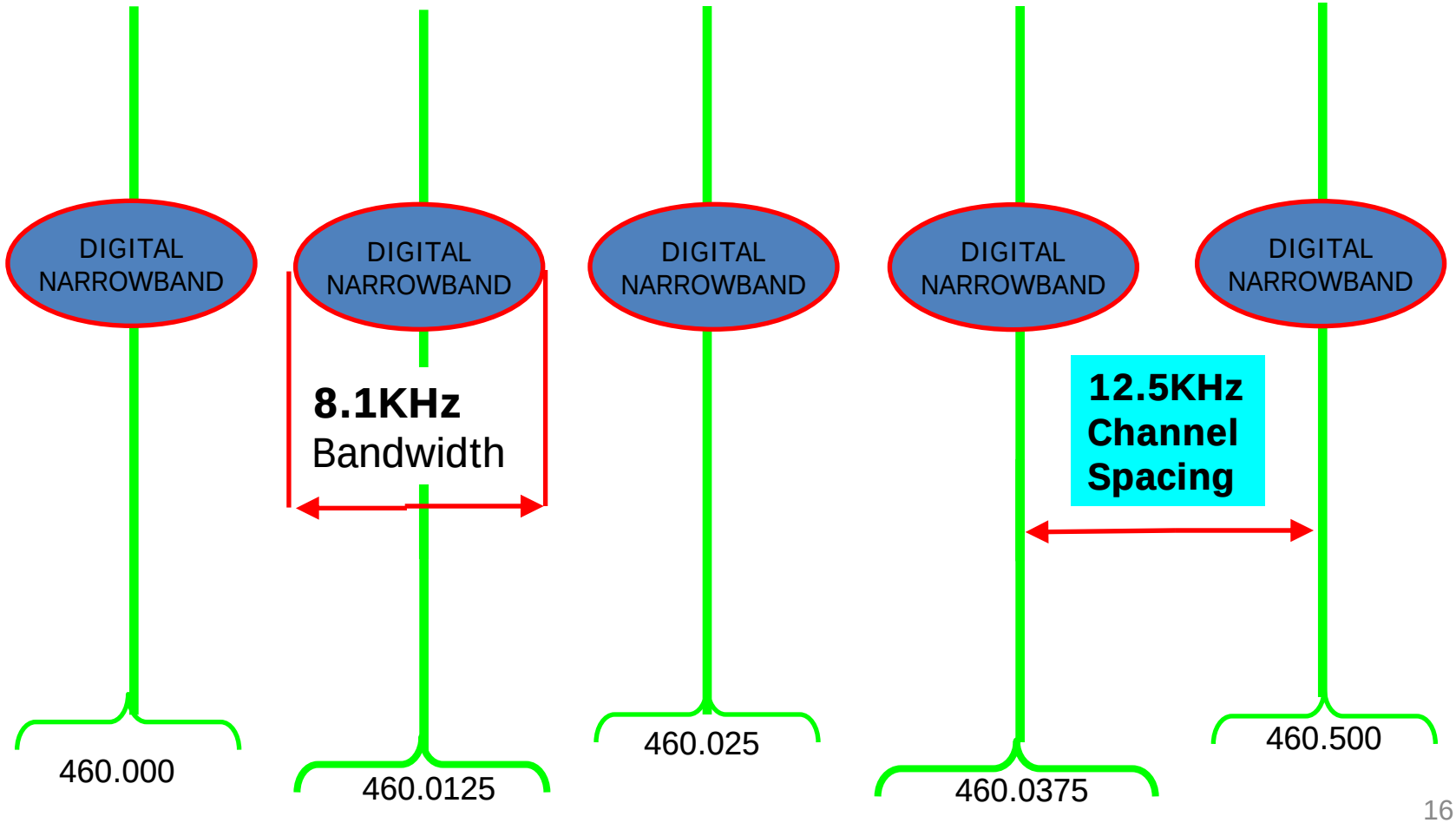
No overlap with Digital

P25 with C4FM Modulation only requires 8.1KHz Necessary Bandwidth



UHF Digital

P25 with C4FM Modulation only requires 8.1KHz Necessary Bandwidth



Implications of WT-Docket 99-87,

What's coming down the pike?

- **The FCC ordered narrowband migration in two phases:**
- **Phase-1-- mandates migration to 12.5 kHz Analog; *digital not mandated, recommended***
- **Phase-2-- will mandate 6.25 kHz; only accomplished through digital technology. No Deadlines yet.**
- **Today-- most NM Public Safety Licensees (State and Local Government) use wideband. Narrowbanding requires all users of this RF spectrum to migrate to 12.5 kHz narrowband**
- **Incompatibility between WB & NB radios is inevitable between interoperating agencies.**
- **Agencies must coordinate Narrowband cutover to insure minimal mismatch time.**
  - **Complicates Migration of Statewide/Local Land Mobile Radio Systems wile retaining existing**
  - **Creates Communications Interoperability.**
- **Narrowband Migration impacts rural areas most.**
- **Future -- Narrowbanding will continue to be the standard:**
- ***When technology permits, each 12.5kHz frequency will again divide in half, resulting in mandates for systems to migrate to digital technology.***

Implications of WT-Docket 99-87,

(Continued)

- **Requires current users to update and license to narrowband prior to January 1st, 2013**
- **Eliminates Purchase of New Wideband Capable Radios after January 1, 2011 (No Backwards Compatibility)**
- **Places extreme financial burden on State & Local Government users.**
- **Radios and equipment must be upgraded and/or reprogrammed expeditiously to insure minimal cutover time.**
- **Wideband emissions overlap new Narrowband frequencies resulting in interference.**
- ***FCC urges licensees to consider migrating directly to digital technology rather than first adopting 12.5 kHz technology and later migrating to 6.25 kHz technology.***

Impact on New Mexico

Things to Consider

- Replacement of infrastructure
- Replacement and/or improvements to Physical Plant Facilities
- Reprogramming Repeaters & Base Stations.
- Reprogramming Subscriber units. (Mobile & Hand-Held devices)
- Cooperative Collaborations & Coordination!

  COMMUNICATIONS INTEROPERABILITY: Must be retained & promoted
- Project Management
- Budget issues

Why New Radio Equipment?

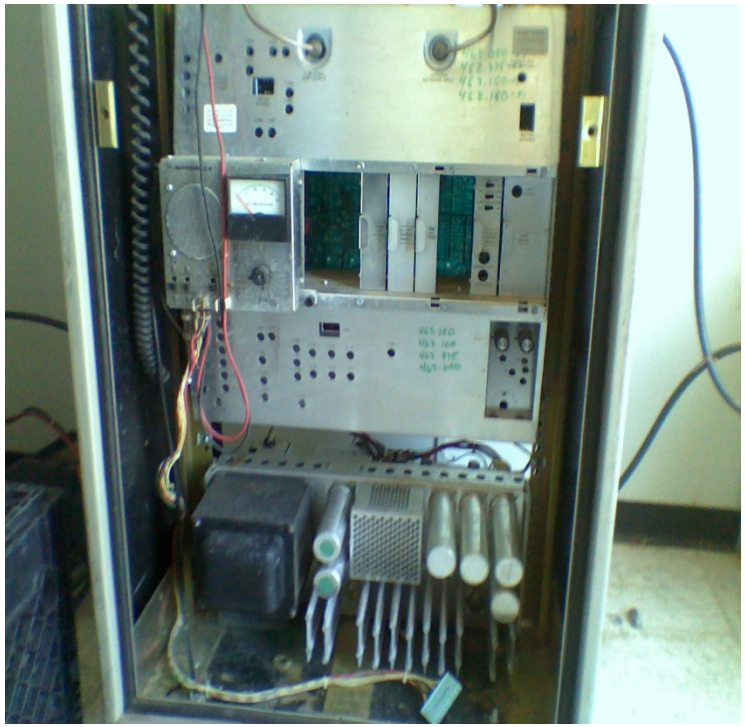
- Narrowbanding halved a frequency's bandwidth and deviation.
  - Many older wideband radios will not operate on frequencies set 12.5kHz apart.
  - An older wideband radio's bandwidth is 25kHz wide; bandwidth would interfere with both new 12.5kHz narrowband frequencies on either side of the old 25kHz frequency.
  - An older wideband radio's deviation is 5kHz. New narrowband radios would either:
    - Not process the wideband deviation into a received audio signal or
    - Process it into a bad received audio signal (garbled, distorted, etc.).

Replacement of infrastructure

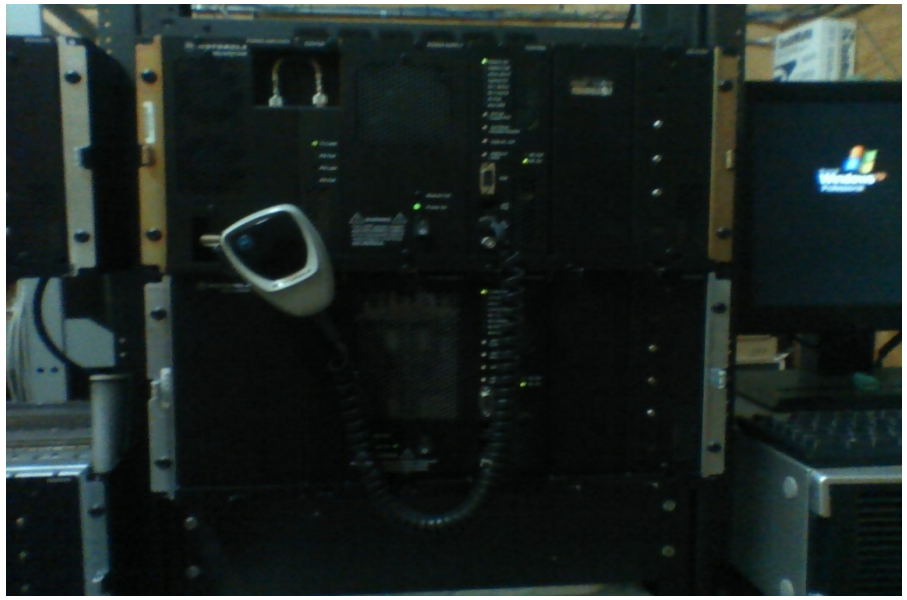
Remote tower sites

Out of sight-Out of mind!

Typically the most inadvertently overlooked and taken for granted



Hidalgo County EMS today



What EMS in Southwest New Mexico needs after 2013

1970's era Equipment continues to be pressed into service and utilized today!

- Many remote Base Stations and Repeaters used in NM **ARE NOT** capable of narrowband emissions.

Physical Plant Facilities

Remote tower sites

All Remote RF sites should assure protection of Quality of Service (QOS), reliability, and public investment in the infrastructure

This is *NOT* acceptable

Juan Mesa site- Grant County, NM

Meets standards set by SICWG-TAC as authorized in sec. 6 of SB-173

Foreground – Public Safety (Fire & EMS).

Background – Private Interest.

Project Management is important to establish, and assure cooperative collaborations & coordination!

Imperative we all avoid unintended consequences

State & Local

Project Management

To develop a plan and lead State and Local Agencies into the future of Land Mobile Radios.

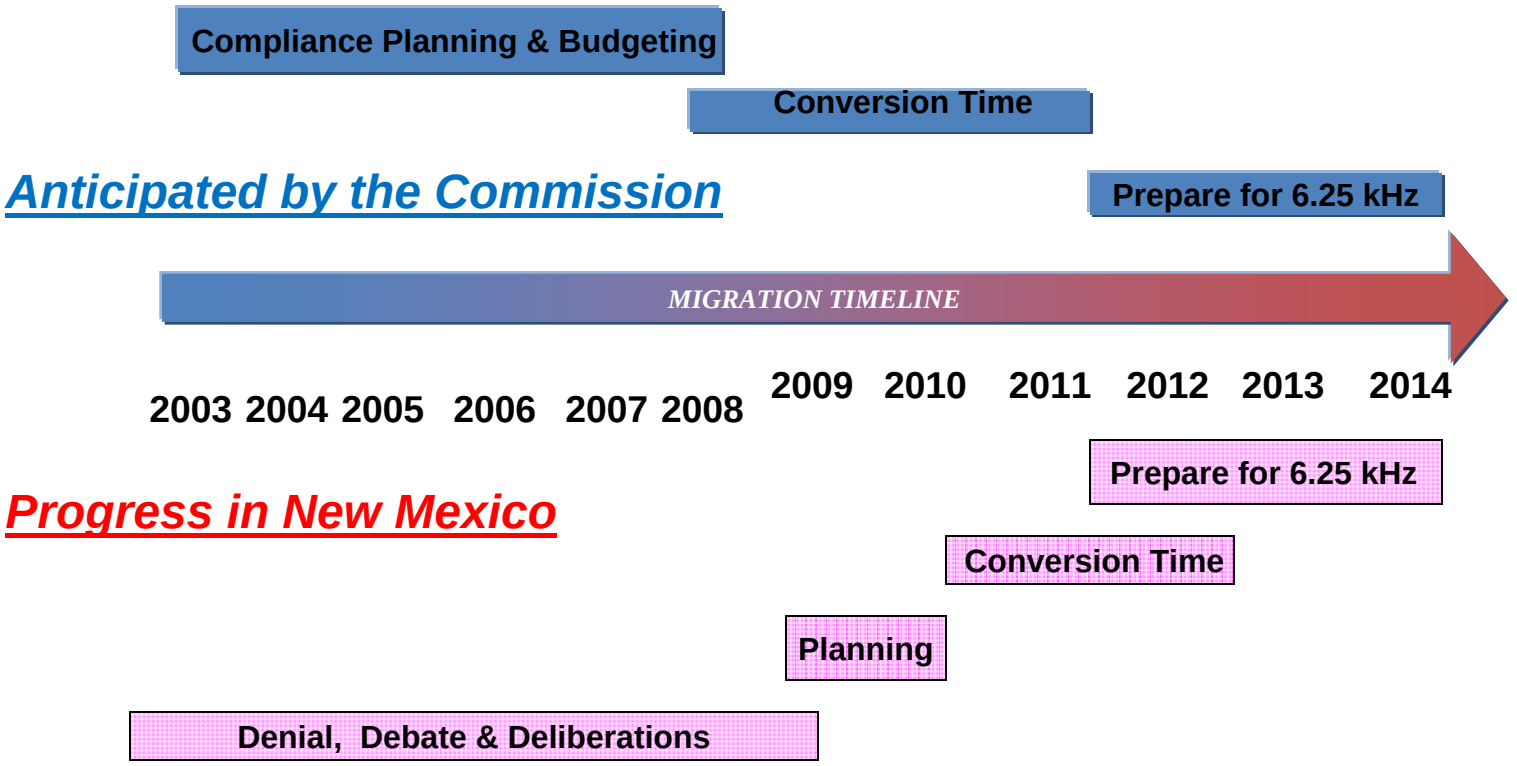
THE SINGLE MOST IMPORTANT ELEMENT!

- **Inventory state and local systems to determine equipment replacement needs.**
- **Develop Local – Regional – Statewide Plans for migration to narrowband operations**
- **Establish a schedule to meet the 2013 date**
- **Review site placement and coverage of planned narrowband systems.**
- **Work with equipment suppliers & contracted consultants**
- **Review site engineering for the narrow-banded systems.**
  - **Adequate Signal Coverage?**
  - **Simulcast holes created?**
  - **Fringes and In-Building?**
- **Infrastructure Cutover Planning**
  - **Site By Site.**
  - **Channel By Channel.**
  - **Overlay System**
- **Coordination With Mutual Aid Providers**
  - **Maintain Interoperability**
- **Modify licenses for narrowband – work closely with frequency coordinator**
- **Add Narrowband Emission Designators to current FCC authorized frequencies**

Narrowband Migration Schedule

Several State and Local Agencies are behind

- ***Migration over several budgetary cycles***



Budgeting

- ***Project Management***
- ***Replacement of infrastructure equipment***
    - Represents most significant investment in narrowband migration.
    - May take several years to secure necessary resources.
    - Add the cost of new radios to agencies' budgets immediately.
- ***Replacement and/or improvements to Physical Plant Facilities***
    - Budget for replacement and/or improvements to remote shelters/towers.
- ***Reprogramming Repeaters & Base Stations***
    - Most radio equipment purchased since 1998 has a narrowband mode and software programmable for narrowband mode. Narrowband may be no more than programming.
- ***Reprogramming of Subscriber units.***

  (Mobile & Hand-Held devices)

Grant Funding

- No funding provided explicitly for narrowband migration.
- ***Unfunded Government Mandate.***
- Some Narrowbanding cost could be piggybacked onto other communications grants such as PSIC, IECGP, grants, i.e., site upgrades, radio programming

Going Digital

6.25kHz

Digital upgrades NOT required as a result of Narrowbanding.

- **Agencies using costs associated with the replacement of non-compliant equipment to build-out digital systems.**
- **Many new radios are capable of operating in analog and digital modes.**
- **Transition from a wideband *analog* to a narrowband *digital* system will result in a reduction in coverage.**
- **A coverage analysis will be necessary to insure coverage reductions will not result in the loss of radio coverage in key areas.**
- **Increased power and/or additional transmitter locations may be required to prevent lost coverage.**
- **Narrowbanding is intended to encourage development and use of most efficient data modulation techniques.**
- **Users may continue operating in WB as long as they meet the equivalent efficiency requirements of 4800 bps for a 6.25 kHz channel (19200 bps for a 25 kHz channel.)**
- **Equipment utilized in data systems not meeting the FCC's efficiency requirement will need to be replaced.**

Interoperability Channels

- **Narrowbanding should be in collaboration with NMDHS-EM Technical Advisory Group of the (SICWG) Statewide Interoperable Communications Working Group.**
- **Channels immediately adjacent to Interoperability channels in the VHF and UHF bands already designated as Narrowband.**
- **Agencies operating adjacent to an Interoperability channel with a wideband system operate on a secondary basis. (accept resulting interference and not cause interference to Interoperability systems)**
- **Agencies using an Interoperability channel for regular communications should plan to relocate.**
- **Narrowbanding provides opportunity to add Interoperability channels to existing systems.**

Summary

- **After midnight December 31st 2012, all Part 90 transmitters authorized by the FCC must comply with RF spectrum efficiency mandates.**
- **P-25 digital: No FCC deadline for required migration to 6.25 kHz bandwidth.**
- **FCC requirement that all users "narrowband" their VHF and UHF radio systems before the end of 2012. No new applications or modifications of wideband licenses will be granted after 2010.**
- **Equipment incapable of operating in a narrowband configuration must be replaced. Equipment capable of operating in both wideband and narrowband configurations must be programmed.**
- **Start planning now. The deadline is about 3 FY away!**

Questions?

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