

Wyoming

Narrowband Workshop



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Office of Emergency Communications / Interoperable Communications Technical Assistance Program

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Outline

- Narrowbanding Introduction Overview
 - What, Why, When, Warnings
- Narrowbanding Execution
 - Narrowbanding Options
 - Narrowbanding – Step-by-step process
- Statewide Channel Narrowbanding
 - Robert (Bob) Symons
- Questions and Answers



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What and Why

- All public safety and industrial/business systems in the frequency bands from 150-174 MHz and 421-512 MHz must be operating in narrowband mode by Jan 1, 2013
- This includes voice, data and paging* operations
- Narrowband mode is defined as:
 - At least one voice signal per 12.5 kHz channel width
 - For data, at least 19.6 kb/s in 25 kHz, 9.6 kb/s in 12.5 kHz or 4.8 kb/s in 6.25 kHz
- Why: Narrowbanding will alleviate congestion immediately and should allow for additional channels in the future

** Except for 152.0075 & 157.450 in the public safety pool and 12 frequencies in the industrial/business pool*



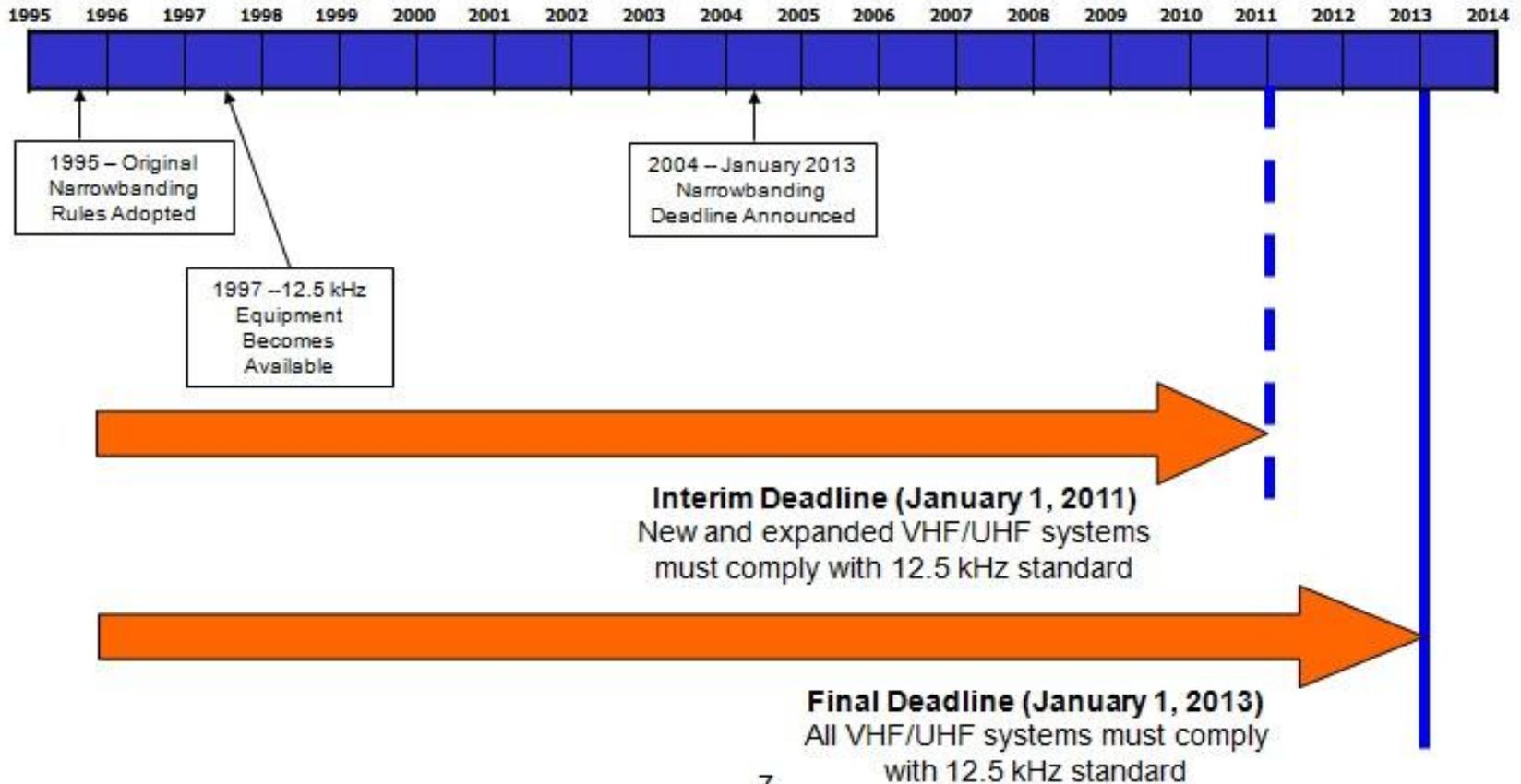
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Narrowbanding Timeline



Warnings

- Do not assume:
 - That the FCC will delay the timeline
 - That the FCC will ignore violation of its mandate
 - “...enforcement action may include admonishment, monetary fines, or loss of license”
 - That the FCC will grant a waiver from narrowbanding
- The FCC intends to mandate 6.25 kHz minimum spacing
 - From FCC 08-127 (5/13/2008): “...when 6.25 kHz technology matures to the point that sufficient equipment is available for testing, we will expeditiously establish a transition date for users to convert to the spectrum-efficient technology”



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Narrowbanding Options

- Convert to WyoLink or some other pre-existing narrowband shared system
 - Using WyoLink would result in the highest level of interoperability = standardized shared system
- Convert to a new P25 system - conventional or trunked
 - Better coverage than analog FM & possible migration to 6.25 kHz
- Convert to 12.5 kHz analog FM
- Convert to 6.25 kHz
 - P25 Phase 2 is the only 6.25 kHz standardized protocol. Trunked operation only. Equipment this year



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The remainder of this presentation will assume the chosen option is to convert to 12.5 kHz FM

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Narrowbanding Steps

- The following is a list of steps to achieve narrowbanding
The process can be long. Hopefully you have started but if not, get started immediately. **Start Planning Now!**
 1. Conduct a comprehensive inventory of radios
 2. Determine if radios can be narrowbanded or must be replaced
 3. Determine cost to reprogram or replace and budget
 4. Add narrowband emission designators to licenses
 5. Coordinate transition with interoperability partners
 6. Transition to narrowband operation
 7. Remove wideband emission designator from licenses



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1) Conduct a Comprehensive Inventory of Radios

- For each radio collect: Model #, Serial #, **FCC ID**, etc.
- Perform a complete inventory – and don't forget:
 - Backup base stations and repeaters
 - Cache radios
 - Gateway radios
 - Incident response vehicle radios
 - Radios loaned to or owned by neighboring agencies
 - Portable radio in the mayor's office
 - Pagers, monitor receivers, alert receivers



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2) Determine if Radios Can Be Narrowbanded or Must Be Replaced

- Any radio model **certified** by the FCC after Feb 1997 must be narrowband capable.
 - Previously certified models could be sold after 2/97 without narrowband capability
 - Some vendors offered narrowband prior to this; mid 1990s
- Your radio shop might know which radios can be converted to narrowband operation. However:
 - **The licensee is responsible to ensure that it is legal to do so**
- Kits to retrofit a radio are not legal
- The only iron-clad assurance is the FCC authorization that the radio has been designed and tested to operate narrowband
 - Every radio model/type has an FCC ID
 - The FCC ID points to the FCC certificate for the radio
 - An example confirmation of narrowband authorization follows



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Example of a Radio Label



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FCC Equipment Authorization Search Entry

- FCC Equipment Authorization Search Website URL:
 - <https://apps.fcc.gov/oetcf/eas/reports/GenericSearch.cfm>

FCC > FCC E-filing > EAS > Authorization Search

Equipment Authorization Search

Application Information:

Grantee Code: (First three characters of FCCID)

Product Code: (Remaining characters of FCCID)

Applicant Name:

Final Action Date Range (mm/dd/yyyy): to

Grant Comments:

Application Purpose:

EAS Search Result

The image below is a screen capture of part of the search results

1 results were found that match the search criteria:
Grantee Code: **AZ4** Product Code: **89FT4824**

Displaying records 1 through 1 of 1.

Display bits	Display Grant	Display Correspondence	Applicant Name	Address	City	State	Country	Zip Code	FCC
il mary	<input checked="" type="checkbox"/>		Motorola Inc	8000 West Sunrise Blvd	Ft Lauderdale	FL	United States	33322	AZ4

[Perform Search Again](#)

Clicking on the check box under “Display Grant” produces the image in the following slide



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Grant of Equipment Authorization

FCC - OET EAS Form 731 Grant of Equipment Authorization - Windows Internet Explorer

https://fjallfoss.fcc.gov/oeetcf/eas/reports/Eas731GrantForm.cfm?mode=COPY&RequestTimeout=500&application_id=194978f_cc_id=AZ489FT4824

COPY **FEDERAL COMMUNICATIONS COMMISSION** **COPY**
 WASHINGTON, D.C. 20554

GRANT OF EQUIPMENT AUTHORIZATION
 Type Acceptance

Motorola Inc
 8000 West Sunrise Blvd
 Ft Lauderdale, FL 33322
 United States

Date of Grant: 11/25/1997
 Application Dated: 09/30/1997

Attention: Mike Ramnath , Manager, Regulatory Compliance

NOT TRANSFERABLE

EQUIPMENT AUTHORIZATION is hereby issued to the named GRANTEE, and is VALID ONLY for the equipment identified hereon for use under the Commission's Rules and Regulations listed below.

FCC IDENTIFIER: AZ489FT4824
 Name of Grantee: Motorola Inc
 Equipment Class: Licensed Non-Broadcast Transmitter Held to Face
 Notes: Single Channel
 Modular Type: Does not apply

Grant Notes	FCC Rule Parts	Frequency Range (MHZ)	Output Watts	Frequency Tolerance	Emission Designator
BM	95, 90.210	458.0 - 470.0	2.0	0.00025 %	11K0F3E
BM	90, 95	458.0 - 470.0	2.0	0.00025 %	16K0F3E

BM: The output power is continuously variable from the value listed in this entry to 50%-55% of the value listed.

Mail To:

Done



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Grant of Equipment Authorization

Partial screen capture of grant – 11K0F3E authorization for 12.5 kHz channel spacing using analog frequency modulation of voice. 11K0 = 11 KHz bandwidth required for signal. FCC spec. is < 11.25 kHz

Date of Grant: 11/25/1997
Application Dated: 09/30/1997

TRANSFERABLE

VALID ONLY for the equipment identified hereon for use under the Commission's

[REDACTED]

to Face

<u>Frequency Range (MHZ)</u>	<u>Output Watts</u>	<u>Frequency Tolerance</u>	<u>Emission Designator</u>
458.0 - 470.0	2.0	0.00025 %	11K0F3E
458.0 - 470.0	2.0	0.00025 %	16K0F3E



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Narrowbandable but not Tunable

- Some older radios may be narrowbandable but they may not be able to be tuned to all the narrowband frequencies
- Some frequencies require a different step size in order to synthesize the frequency
- Two of the interoperability channels, VTAC11 (151.1375 MHz) and VTAC12 (154.4525 MHz) are examples of this
- If a radio can tune to these frequencies and to VCALL10 (155.7525 MHz), then it should be able to be tuned to any FCC authorized frequency



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3) Determine the Cost to Reprogram or Replace and Budget for This Cost

- Obtain quotes to replace those radios than cannot be narrowbanded and maybe those that cannot tune all frequencies
 - Include cost to install vehicular radios
 - If replacing base stations, replace surge protectors and consider new transmission line & antenna system (if old)
- Obtain quotes to reprogram radios
 - May have to reprogram multiple times dependent on transition method and coordination with others
- Include cost for programming software, firmware and cables
- Perform RF coverage prediction for narrowbanded system
- 12.5 kHz analog FM requires 3 dB more signal at DAQ = 3.4 than 25 kHz analog FM*
 - A 3 dB change could cause 10% to 20% reduction in useable distance from a fixed station dependent on terrain, etc.



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**Reference: TSB-88.1-C, Table A-1*

Cost and Budget (Continued)

- If the reduction in coverage is not acceptable, the following mitigation techniques could be used (but might increase the cost):
 - Lower base receiver sensitivity, higher base transmitter power out, less loss in transmission line, better antennas
 - Additional RF sites
 - Use companding* (but not all radio models have it and not all manufacturers use the same algorithm)
 - Avoid companding on interoperability channels
- Budget cycles are long – start early
- There are grant programs available; see:
 - <http://www.fcc.gov/pshs/public-safety-spectrum/narrowbanding.html>

4) Add Narrowband Emission Designator to Licenses

- Make a list of all licenses (call signs) that you are responsible for
- Ensure you don't neglect to list some long forgotten license that may be important to your operation
- A FCC database search tool that was developed by OEC/ICTAP could be used to ensure the list is complete
 - Access it at: <http://publicsafetytools.info> and choose the "Narrowband License Status Tool" icon
- An example search using the OEC/ICTAP tool follows



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Search Criteria and Resulting Map

Location: Search Box Area

State: Wyoming

Regions: Goshen, Hot Springs, Johnson, Laramie, Lincoln, Natrona

Use the Ctrl key to select / de-select more than one county

Cities: Select a City

Frequency: UHF & VHF Freqs UHF Freqs VHF Freqs

Transmitter Type: Fixed Mobile

Radio Services: Public Safety Conventional/Trunked: (PW,YW)

Include/Exclude FRNs and/or Call Signs:

include FRN:

include Call Sign:

Map Data Report Reset



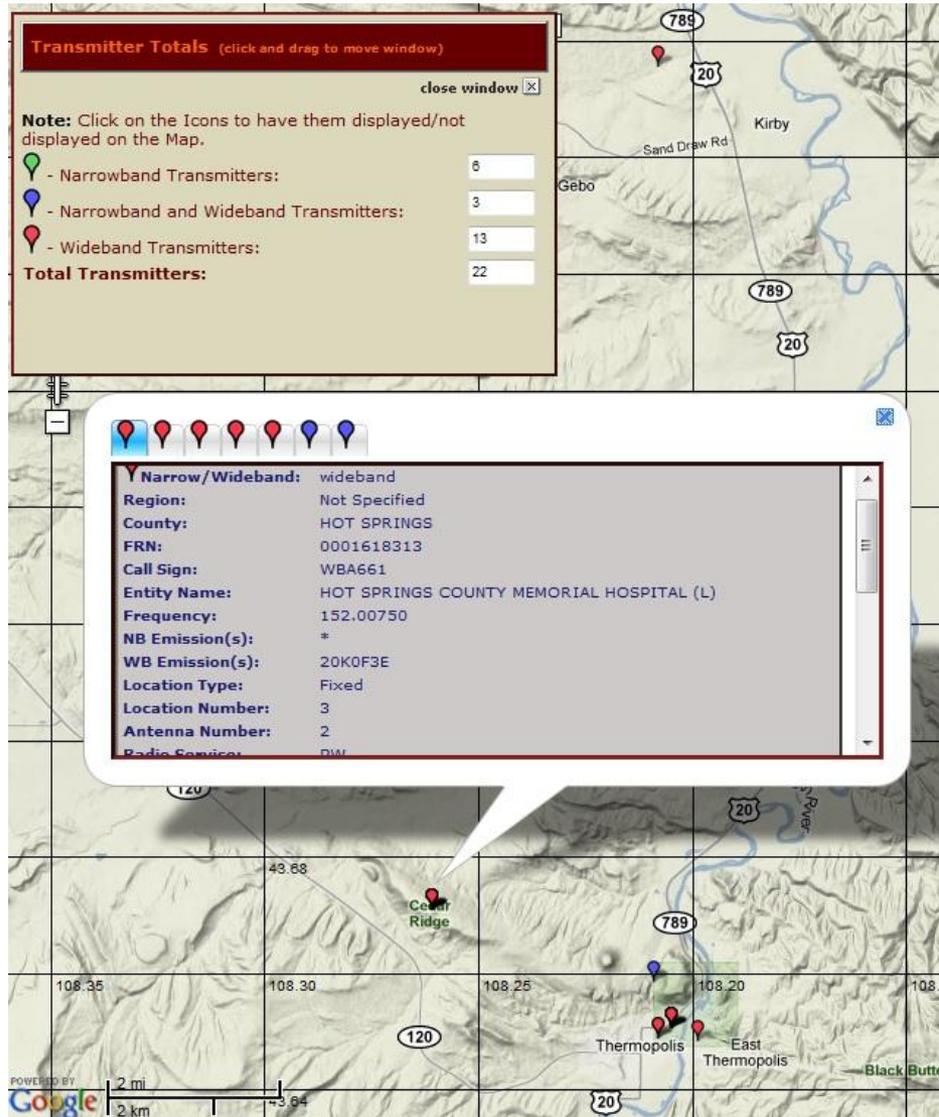
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Map - Expanded with Pop Ups



Partial Excel Report Results for This Example

1	FRN	CALL SIGN	ENTITY NAME	FREQUENCY ASSIGNED	NARROW EMISSION	WIDE EMISSION	POWER ERP	LATITUDE
2	0001618313	WBA661	HOT SPRINGS COUNTY MEMORIAL HOSPITAL (L)	152.0075	Not Specified	20K0F3E	265	43 40 14.8 N
3	0001618313	WBA661	HOT SPRINGS COUNTY MEMORIAL HOSPITAL (L)	155.2800	Not Specified	20K0F3E	265	43 40 14.8 N
4	0001618313	WBA661	HOT SPRINGS COUNTY MEMORIAL HOSPITAL (L)	462.5000	Not Specified	20K0F3E	60	43 40 14.8 N
5	0001618313	WBA661	HOT SPRINGS COUNTY MEMORIAL HOSPITAL (L)	467.5000	Not Specified	20K0F3E	55	43 38 53.8 N
6	0001618313	WBA661	HOT SPRINGS COUNTY MEMORIAL HOSPITAL (L)	467.5250	Not Specified	20K0F3E	120	43 40 14.8 N
7	0001618545	WZT966	THERMOPOLIS, TOWN OF (L) - CARA Enterprises, I	154.8000	Not Specified	20K0F3E	85	43 38 55.8 N
8	0001624915	WPBU239	HOT SPRINGS, COUNTY OF (L) - LAO/EWA 2073530	155.4300	Not Specified	20K0F3E	250	43 43 59.8 N
9	0001624915	WPBU239	HOT SPRINGS, COUNTY OF (L) - LAO/EWA 2073530	155.4300	Not Specified	20K0F3E	250	43 38 55.8 N
10	0001624915	WPBU240	HOT SPRINGS, COUNTY OF (L)	154.8750	Not Specified	20K0F3E	250	44 43 59.8 N
11	0004536264	WQAC894	WYOMING, STATE OF (L) - HOT SPRINGS STATE PA	154.0850	Not Specified	20K0F3E	100	43 39 1.8 N
12	0004536264	WQJA425	WYOMING, STATE OF (L)	161.8500	10K0F1D,11K0F3E,8K10F1E	Not Specified	200	43 39 1.8 N
13	0004536264	WQJF491	STATE OF WYOMING (L) - STATE OF WYOMING (CL	150.8750	10K0F1D,11K0F3E,8K10F1E	Not Specified	200	43 39 1.8 N
14	0004536264	WQJF491	STATE OF WYOMING (L) - STATE OF WYOMING (CL	151.1000	10K0F1D,11K0F3E,8K10F1E	Not Specified	200	43 39 1.8 N
15	0004536264	WQJF491	STATE OF WYOMING (L) - STATE OF WYOMING (CL	151.1975	10K0F1D,11K0F3E,8K10F1E	Not Specified	200	43 39 1.8 N
16	0004536264	WQJF491	STATE OF WYOMING (L) - STATE OF WYOMING (CL	151.2875	10K0F1D,11K0F3E,8K10F1E	Not Specified	200	43 39 1.8 N
17	0004536264	WQJF491	STATE OF WYOMING (L) - STATE OF WYOMING (CL	151.3325	10K0F1D,11K0F3E,8K10F1E	Not Specified	200	43 39 1.8 N
18	0006841738	WPWD424	THERMOPOLIS CITY OF (L) - LAO 20207107 (CL)	154.4150	Not Specified	20K0F3E	200	43 43 59.9 N
19	0013237664	KNCR497	HOT SPRINGS COUNTY SCHOOL DISTRICT (L) - CAR	152.4200	11K2F3E	20K0F3E	265	43 40 14.8 N
20	0013237664	KNCR497	HOT SPRINGS COUNTY SCHOOL DISTRICT (L) - CAR	462.3750	11K2F3E	20K0F3E	16	43 40 14.8 N
21	0013237664	KNCR497	HOT SPRINGS COUNTY SCHOOL DISTRICT (L) - CAR	467.3750	11K2F3E	20K0F3E	16	43 39 30.8 N
22	0013283312	KNJR564	HOT SPRINGS, COUNTY OF (L) - CARA Enterprises,	155.0550	Not Specified	20K0F3E	160	43 40 14.8 N
23	0013283312	KNJR564	HOT SPRINGS, COUNTY OF (L) - CARA Enterprises,	155.0550	Not Specified	20K0F3E	240	43 48 55.8 N



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Add Narrowband Emission Designator to Licenses (Continued)

- Frequency coordination isn't required to add a narrowband emission designator to an existing frequency
- Frequency coordination is required
 - To add a P25 emission designator
 - If sites are added
 - If transmit parameters are changed
- You can change your licenses on the FCC Universal License System (ULS) if you have your FRN and ULS password
- References for a step by step illustration to add a designator:
 - Appendix C of the OEC publication 'A Practical Guide to Narrowbanding' at <http://www.safecomprogram.gov/SAFECOM/oecguidancedocuments/>
 - FCC Presentation: <http://www.fcc.gov/pshs/docs/summits/narrowbanding-2011/Simmons-Tracy-Narrowbanding-FCC-Panel-01262011.pdf>



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5) Coordinate Narrowband Transition with Interoperability Partners

- Significant degradation can occur if all entities are not using the same emission protocol
 - Narrowband signal transmitted to a wideband receiver will result in low volume and low sensitivity
 - Wideband transmitted to narrowband will result in distortion – some information is lost by narrow filter
 - Companded signal transmitted to un-companded receiver and vice versa will result in distortion
- Subscriber radios may have to be reprogrammed multiple times as various shared channels are narrowbanded if transition is not coordinated



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6a) Transition Process – Abrupt Method

- Program all radios with duplicate sets of channels – one set with wideband operation and one with narrowband
 - Radios must have the channel capacity for both sets
 - Include fixed end equipment – repeaters, base, etc.
- Test every type of radio at every site in narrowband mode
- Schedule a date and time to switch the entire system
 - Communicate with all users when and how to switch
- Perform the abrupt transition
- Reprogram all radios to remove the wideband channels to ensure wideband operation cannot be used in the future



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6b) Transition Process – Gradual Method

- Adjust the transmitter deviation of all repeaters and base stations to narrowband level; that is, 2.5 kHz maximum
- Do not program the repeater/base receiver to narrowband
- Sequentially reprogram all subscriber unit radios (SU) to narrowband in as little time as possible – this may take days for a large system but only have to reprogram once
- When all subscribers are programmed to narrowband then program the repeater/base receivers to narrowband
- During the transition, when the wideband receivers receive a narrowband transmission additional degradation will occur due to the wide bandwidth of the receiver



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7) Remove Wideband Emission Designator from License

- The FCC has not set a date for the removal of designator
- The FCC will be adding a special condition to all licenses that have a wideband emission designator
 - The special condition is: “Beginning January 1, 2013, this station must operate on channels with a bandwidth of 12.5 kHz or less, or with equivalent efficiency, regardless of the emission bandwidths set forth on this license. See Section 90.209(b)(5) of the Commission's Rules. Note that the narrowbanding requirement does not apply to specific channels designated in Rule 90.20 or 90.35 for paging only”



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Remove Wideband Emission Designator from License (Cont)

- We recommend removal of the wideband emission designator after narrowbanding is complete
- Removal allows administrators to monitor the progress of narrowbanding by examining the FCC database, and the FCC will know that the channel has been narrowbanded



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List of Helpful Resources

FCC Narrowbanding: <http://www.fcc.gov/pshs/public-safety-spectrum/narrowbanding.html>

FCC Equipment Authorization Search:
<https://apps.fcc.gov/oetcf/eas/reports/GenericSearch.cfm>

FCC License Modification:
<http://www.fcc.gov/pshs/docs/summits/narrowbanding-2011/Simmons-Tracy-Narrowbanding-FCC-Panel-01262011.pdf>

DHS OEC 'A Practical Guide to Narrowbanding':
<http://www.safecomprogram.gov/SAFECOM/oecguidancedocuments/>

DHS OEC/ICTAP Narrowband License Status Tool:
<http://publicsafetytools.info>

NPSTC Narrowbanding: <http://www.npstc.org/narrowbanding.jsp>

Website Providing Links to Narrowbanding Information:
<http://wirelessradio.net/>



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WYDOT Narrowbanding Schedule - 2012

ID	Task Name	Start	Finish	Duration	Jun 10 2012						Jun 17 2012						Jun 24 2012					
					11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
1	WYDOT District 1 – Albany, Carbon and Laramie Counties	6/11/2012	6/15/2012	5d	█																	
2	WYDOT District 1 – Complete, if needed	6/18/2012	6/22/2012	5d							█											
3	WYDOT District 2 – Converse, Goshen, Natrona, Niobrara and Platte Counties	6/25/2012	6/29/2012	5d													█					

ID	Task Name	Start	Finish	Duration	Jul 1 2012							Jul 8 2012							Jul 15 2012						
					2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20		
1	WYDOT District 2 – Complete, If Needed	7/2/2012	7/6/2012	5d	█																				
2	WYDOT District 4 – Campbell, Crook, Johnson, Sheridan and Weston Counties	7/9/2012	7/13/2012	5d								█													
3	WYDOT District 4 – Complete, If Needed	7/16/2012	7/20/2012	5d															█						

ID	Task Name	Start	Finish	Duration	Jul 22 2012						Jul 29 2012						Aug 5 2012					
					23	24	25	26	27	28	29	30	31	1	2	3	4	5	6	7	8	9
1	Break Week	7/23/2012	7/27/2012	5d	█																	
2	WYDOT District 3 – Lincoln, Sublette, Sweetwater, Teton and Uinta Counties	7/30/2012	8/3/2012	5d							█											
3	WYDOT District 3 – Complete, If Needed	8/6/2012	8/10/2012	5d													█					

ID	Task Name	Start	Finish	Duration	Aug 12 2012						Aug 19 2012						Aug 26 2012					
					13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	WYDOT District 5 – Big Horn, Fremont, Hot Springs, Park and Washakie Counties	8/13/2012	8/17/2012	5d	█																	
2	WYDOT District 5 – Complete, If Needed	8/20/2012	8/24/2012	5d							█											
3	Catch Up and Complete	8/27/2012	8/31/2012	5d													█					

Questions?



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