

Fifteen Tips You Can Now Implement to Ensure a Smooth Transition to Narrowbanding

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Narrowbanding...The Clock is Ticking

1.0 Background

Many public safety and business/industrial licensees currently operate land mobile radio systems in the high band VHF and UHF frequency bands, from 150 MHz to 512 MHz. In order to increase the availability of spectrum and the resultant system capacity to licensees in these bands, the FCC has mandated that all land mobile system licensees operating in these frequencies must reduce the bandwidth of their systems to create space for additional systems in the same amount of spectrum. There are several dates where the availability of equipment capabilities is mandated, as well as deadlines for the actual reduction in bandwidth. In the narrowbanding process itself there are multiple operational, logistical, and financial considerations. The purpose of this paper is to present these dates and operational considerations, and to present guidelines for consideration in undertaking this process.

First, let's discuss what narrowbanding is and is not. Narrowbanding is the reduction of the spacing of the now-standard 15 kHz VHF and 25 kHz UHF radio channels by dividing the current 15 kHz VHF assignments into two channel assignments spaced 7.5 kHz apart, and 25 kHz UHF channel assignments into two 12.5 kHz bandwidth channel assignments at UHF by 2013, and then further dividing these assignments into two 6.25 kHz channel assignments. This ultimately creates four channels, or talk paths, for four simultaneous radio conversations where the capability for only one conversation exists today at UHF. Narrowbanding also creates two talk paths spaced 7.5 kHz apart at VHF. The FCC has further mandated that the emission (signal) bandwidth of the transmitted signal must be reduced from 20 kHz to 11.25 kHz to fit within these new channel spacings.

The FCC has rewritten Part 90 of the rules governing the operation of land





HIGHLIGHTS

Why? VHF and UHF spectrum is becoming increasingly crowded... Eventually saturation and interference (will be) so high that reliable communications (will become) impossible.

mobile radio systems to reflect these new frequency assignments.

Thus the term "Narrowbanding."

Further, the FCC has set deadlines for radio equipment manufacturers to develop equipment capable of operating on these frequencies, and deadlines for licensees to modify their systems. To operate on the narrower bandwidth channels it is necessary to either modify current equipment or replace older equipment with equipment capable of complying with these new rules.

Narrowbanding is not 800 MHz rebanding. That is a separate action which only impacts 800 MHz system licensees. Narrowbanding does not apply to Part 90 frequencies below 150 MHz or above 512 MHz. Narrowbanding does not apply to systems operating in these bands under other than Part 90 of the rules (Common Carrier, Marine Service, and others).

Why go through this process and what are the desired results?

In most metropolitan areas and some rural areas in the country, VHF and UHF spectrum are becoming increasingly crowded as more and more public safety and commercial enterprises implement land mobile radio to increase the efficiency of their operations through use of wireless technology. The result is increasingly congested spectrum, and eventually, spectrum saturation and interference levels so high that reliable communications become impossible. In the early 90s the FCC recognized this trend and began a process known at the time as "refarming." In 1995, the FCC released the first order, giving the land mobile industry and user community notice of its intent to increase spectrum availability by reducing channel bandwidth and provided time to modify systems and obtain narrowband capable equipment.

The desired final result will be more than double the current number of frequencies available for land mobile radio systems to operate on.



HIGHLIGHTS

Don't wait until the last minute...Give (your legislators) a heads-up to be expecting and prepare to budget for the expense.

2.0 When will this happen? What dates are important?

Over the last 12 years, there have been multiple orders and revisions of those orders from the FCC relating to this effort. Those dates have changed and been modified over the years. There are currently only two dates which impact all licensees, and must be heeded — January 1, 2011, and January 1, 2013.

JANUARY 1, 2011 – NEW SYSTEMS:

All applications to implement new systems on Part 90 frequencies between 150 MHz up to and including 512 MHz must employ technologies that either operate at 12.5 kHz (11.25 kHz occupied bandwidth), provide one voice path per 12.5 kHz of occupied bandwidth, or provide a data rate of 4800 bps per 6.25 kHz of bandwidth occupied. We highly recommend that ANY new system being constructed be designed to operate at 12.5 kHz or less channel spacing.

JANUARY 1, 2011 – MODIFICATIONS TO EXISTING SYSTEMS:

All applications seeking modifications to existing systems that would increase the station's service area must employ equipment and technologies that either operate at 12.5 kHz (11.25 kHz occupied bandwidth), employ a technology that provides one voice path per 12.5 kHz of occupied bandwidth, or provide a data rate of 4800 bps per 6.25 kHz of bandwidth occupied. These systems may operate at 25 kHz bandwidth until January 1, 2013.

JANUARY 1, 2013 – NARROWBANDING DEADLINE

All incumbent Part 90 systems operating on frequencies between 150 MHz up to and including 512 MHz must operate at 12.5 kHz (11.25 kHz occupied bandwidth) or employ a technology that provides one voice path per 12.5 kHz of occupied bandwidth or provides a data rate of 4800 bps per 6.25 kHz of bandwidth occupied.



HIGHLIGHTS

Start now to plan how you will accomplish the narrowbanding tasks.

3.0 What action should be taken today to prepare for the January 1, 2013, deadline?

Act Now!

Don't wait until the last minute — there is much to be done!

It's all about Money!

If you need to replace equipment or pay to have reprogramming work done, get your legislators and decision makers into the process now! Even if you don't have firm costs give them a heads up to expect and prepare to budget for the expense.

For most public safety jurisdictions you have three budgeting cycles remaining until you have to act. Remember that 2012 is the latest implementation year so you need the money budgeted in 2011 or sooner.

At this time there is no grant or other funding available for this mandate. It is a locally-funded item.

Funding Alert!! Don't forget the replacement cost of your volunteer first responder pagers. This may be a major financial and political issue in many communities.

Plan, Plan Plan

Start now to plan how you will accomplish the narrowbanding tasks. Determine the logistics of touching every radio. What is the timing? How will the transition from wide band to narrowband actually take place? How will you maintain quality of service? Is more than one touch required? What is the cost and how will you budget (see item above)? What are the interoperability considerations with mutual aid partners? What about intra-operability within your own jurisdiction departments? Is this a good opportunity to do things to your system you have been putting off until "another day"?



HIGHLIGHTS

Review your equipment infrastructure. We highly recommend against field Retrofits of this equipment.

FCC Licensing

Review your FCC license(s). Ensure that your license reflects that you are authorized to use the narrowband emissions. This typically is emission designator 11K0F3E. Kimball can assist you in this process. The Land Mobile Communications Council has recommended to the FCC that any license not showing authorization for narrowband emissions be automatically cancelled on January 1, 2013. This is a good opportunity to update your license to reflect changes such as added user radio quantities, as well as address and contact personnel changes.

Check for Conflict with the VHF Interoperability Channels

If you are licensed for channels on or adjacent to any one of the new VHF interoperability frequencies, you should consider relocating to avoid interference to and from these frequencies.

| LOWER ADJACENT | INTEROPERABILITY FREQUENCY | UPPER ADJACENT | INTROPBERABILITY DESIGNATOR (NPSTC) |
|----------------|----------------------------|----------------|-------------------------------------|
| 155.745 | 155.7525 | 155.760 | VCALL10 |
| 151.130 | 151.1375 | 151.145 | VTAC11 |
| 154.445 | 154.4525 | 154.460 | VTAC12 |
| 158.730 | 158.7375 | 158.745 | VTAC13 |
| 159.420 | 159.4275 | 159.435 | VTAC14 |

Is your Equipment Capable of Narrowbanding?

Ensure your equipment is capable of 7.5 kHz channel spacing at VHF or 12.5 kHz channel spacing at UHF. Any equipment certified for manufacture or import since February 1, 1997, must have the capabilities of being retuned to narrow bandwidth. Some VHF equipment, however, has been found not to be programmable on every 7.5 kHz-spaced frequency. Kimball, your dealer, or equipment supplier can help you determine if your equipment is capable of narrowband channel spacing and operation.

Don't forget your base stations and repeaters. Review your equipment infrastructure. This includes base stations, satellite receivers, and control stations. In many cases this equipment is not capable of being



HIGHLIGHTS

Make sure your current tower sites will provide the needed coverage.

reprogrammed to narrowband operation and is better replaced with current production equipment. We highly recommend against field retrofits of this equipment.

Don't forget your dispatch consoles. Audio and paging tone levels will also need to be checked and reset.

Many vendors' narrowband equipment includes a "companding" or compression and expansion software feature (Motorola X-Pand and others). This software is designed to improve the quality of the received audio in narrowband operation. If companding is desired, make sure all the radios in your fleet are companding-capable. If you mix companded and non-companded radios, recovered audio will be distorted and often unacceptable. If you use multiple vendors and wish to use companding, make sure the companding algorithms are compatible between vendor equipment. Test before you buy or before you distribute radios to the field.

System Coverage

Contract with a qualified engineering and consulting firm to review the coverage of your system at narrower bandwidths in comparison to your current wideband system. Coverage may be reduced somewhat, especially at the edges, in current weak spots and in-building. Make sure your current tower sites will provide the needed coverage.

If your system is a simulcast system, review the overlap coverage and system timing to ensure no new "holes" are created.

Paging and volunteer alerting must be considered. Pagers by their very nature often operate at the edge of coverage for the system (in buildings, plants, mobile homes, etc). Transmitter sites may need to be upgraded, relocated, or added, to continue to get the desired coverage.

Paging

The Report and Order exempts paging-only channels from the narrowbanding requirement. These are frequencies which are designated as paging-only frequencies by Part 90. If you are providing alerting or paging on any frequency other than the frequencies shown below, your paging frequency must be narrowbanded.



HIGHLIGHTS

Plan to replace any wideband monitor equipment. Investigate digital systems for station alerting and siren activation.

The public safety pool paging-only frequencies are, per 90.20(C), Limitations 13 & 30:

- VHF – 152.0075, 157.450 and 163.250 MHz
- UHF - None

The industrial/business pool paging-only frequencies are, per 90.35(B)(3), Limitations 29 & 36:

- VHF – 152.480 MHz, 157.740 MHz, 158.460 MHz.
- UHF – 462.750 MHz, 462.775 MHz, 462.800 MHz, 462.825 MHz, 462.850 MHz, 462.875 MHz, 462.900 MHz, 462.925 MHz, 465.000 MHz

First Responder Paging and Alerting

Fire/EMS/EMA alerting and paging is normally done on dispatch channels which, as indicated above, must be narrowbanded. We highly recommend planning to replace any wideband monitor receivers, siren, house alerting receivers, and monitor pagers with current production narrowband capable equipment. Many older wideband pagers will not work in a narrowband system and will need to be replaced.

We recommend investigating digital paging systems for station alerting and siren activation.

4.0 What else do I need to know?

Work with your “neighbors” to eliminate interference

Coordination with adjacent channel licensees is a critical step in the rebanding process if interference is to be minimized.

Narrowbanding gives us more frequencies at UHF and VHF. At VHF, we were already using a 15 KHz bandwidth and the FCC mandated narrower bandwidth will tend to reduce adjacent channel interference.



HIGHLIGHTS

By January 1, 2011, any equipment submitted to the FCC for certification and sale must incorporate 6.25 kHz technology. Plan ahead.

In the UHF bands, the new 12.5 kHz channel spacing has a short term potential to increase adjacent channel interference as additional 12.5 kHz systems are licensed in between existing 25 kHz systems.

There will be interference generated to the 25 kHz systems by the 12.5 kHz systems due to the wider receiver bandwidth of the 25 kHz systems. Likewise, the wider modulation emission mask of the 25 kHz system, typically 16 to 20 kHz wide, will “slop over” into the 12.5 channel. This situation will only be resolved by the current 25 kHz licensees migrating to narrowband 12.5 kHz emission mode.

Why not reband directly to 6.25 kHz?

The Commission has stated its intent in the future to mandate, splitting the 12.5 kHz bandwidth channels again to a bandwidth of 6.25 kHz per talk path and listing those channels in the Part 90 rules. There has been no specific date set for licensees to transition to 6.25 kHz at this time due to the lack of a 6.25 kHz equipment standard. This does not, however, preclude anyone from moving to available 6.25 kHz compliant technologies at this time.

In the Third Report and order, released March 26, 2007, the Commission did mandate to equipment manufacturers that by January 1, 2011, any equipment submitted to the FCC for certification and sale must incorporate 6.25 kHz technology. The commission further urged that licensees consider migrating directly to technologies which meet the 6.25 kHz requirement.

This is a good move for anyone planning a complete replacement of their system. The equipment that meets the letter and intent of the FCC recommendations to bypass 12.5 kHz rebanding and move directly to 6.25 kHz equivalent will soon be available.

Available 6.25 kHz technologies.

Manufacturers have realized the eventual impact of the move to 6.25 kHz and are beginning to offer equipment and systems which meet the requirement of one analog voice channel per 6.25 kHz or a data rate of 4800 bps or greater per 6.25 kHz channel. The emerging equipment



HIGHLIGHTS

Project 25 Phase 2 standard creates two simultaneous talk paths in a 12.5 kHz channel, thus meeting the 6.25 kHz equivalent requirement.

available can be divided into product groups which serve either the public safety market or the business, industrial, and land transportation market.

Public Safety Applications Available

The Project 25 (P25) radio systems on the market today meet the functional and operational requirements of the Public Safety community. The P25 Phase 1 technology is narrowband compliant, utilizing a 9600 bps data stream in a 12.5 kHz bandwidth channel.

The Project 25 Phase 2 standard, which is close to final approval, employs Time Division Multiple Access (TDMA) technology to create two simultaneous talk paths in a 12.5 kHz channel, thus meeting the 6.25 kHz equivalent requirement. Major vendors, such as Motorola and M/A-COM, have committed to this standard and anticipate having complete systems on the market in 2009.

Motorola currently offers a non-P25-compliant, two talk path TDMA system.

Business, Industrial and Land Transportation Applications

Several technologies have been introduced by various manufacturers targeting the non-public safety users with 6.25 kHz compliant systems. While not containing the needed features for use by public safety, they fill a need within the broad range of non-public safety users. These systems are digital systems using both TDMA and Frequency Division Multiple Access (FDMA) to meet the 6.25 kHz requirement.

These systems include competing technologies from the three leading B/I/LT systems manufacturers:

- MotoTrbo from Motorola - a two talk path TDMA solution operating on a 12.5 kHz channel.
- NXDN Digital from Kenwood and ICOM - a single digital talk path FDMA solution operating on a 6.25 kHz channel.

Both of these systems are capable of 12.5 analog narrowband operations as well as their respective 6.25 kHz equivalent proprietary digital formats.



HIGHLIGHTS

Begin the process now!

5.0 Conclusion

The narrowbanding process can seriously impact today's VHF and UHF public safety and business/industrial licensee. Time is growing short. Licensees must begin the process immediately to determine the scope of work which is required on their system, obtain funding, plan the work and logistics, while maintaining service to the user agencies and ensure all licensing and operational details are met.

Kimball stands ready as your partner to guide you through this process with our best-in-class consulting, engineering, planning, regulatory, and project management services.