

WWARA Narrowband FAQ



Summary

In Western Washington there has been no spectrum for new 2m repeaters since creating a few narrowband pairs in June 2012. The 70cm band has also filled completely several times. This prevents the expansion of linked systems and spectrum for new modes. In 2013, the FCC mandated that commercial users migrate to narrowband modes to mitigate this issue. Amateur radio was exempted from this requirement, but the issue remains.

WWARA uses the FCC definition of wide band FM which is 5 kHz deviation for an occupied bandwidth of 16kHz (16K0F3E¹) by Carson's Rule². Similarly, narrow FM is defined as 2.5kHz deviation with a 11kHz occupied bandwidth (11K0F3E³). This is generally rounded up to 12.5kHz (12K5F3E³) to include some guard band on the channel.

Adopting the FCC's solution was the most reasonable since all modern repeaters and radios support this method of narrowbanding. In the December 7, 2024 public meeting of the WWARA, its members voted overwhelmingly in favor of adopting a change in the coordination policies which will start the migration to use of narrowband channels for the most crowded amateur repeater sub-bands of 144-148 MHz (2 meters) and 440-450 MHz (70 centimeters). No new wideband coordinations will be accepted starting January 1, 2025. The plan allows for renewals of the current wideband coordinations until December 31st, 2029. With a coordination renewal period of 5 years, all wideband coordinations will have expired by December 31st, 2034, and all 2 meter and 70cm repeaters will need to have migrated to narrowband channels by January 1, 2035.

Narrowbanding the 70cm repeater spectrum is straightforward because the existing 25kHz channels are simply narrowed to 12.5kHz. FM repeater owners can simply change the modulation to FM narrow and the conversion is complete. Existing digital modes (DMR, P25, DSTAR, NXDN, etc.) are already narrow so no change is necessary.

The 2m band is more problematic because the existing channels were narrowed to 20kHz long ago. This means most machines will need to narrow and move slightly to fit into the new 12.5kHz channel raster. Given there are currently no open channels and limited space to move, some coordination may be necessary to facilitate the migration.

These moves will also need to be coordinated with the repeater's user community. It is recommended that notice is given well in advance so users can pre-program their radios in anticipation of the move to minimize disruption.

¹ <https://fccid.io/Emissions-Designator/16K0F3E>

² https://en.wikipedia.org/wiki/Carson_bandwidth_rule

³ <https://www.apcointl.org/services/radio-frequency-management/emission-designators/>

FAQ Questions

1. Are all the repeaters going to Narrowband?

No. Only repeaters in the 2m and 70cm bands will need updating.

2. The bands seem quiet. Do we really need more channels?

The FM machines may be quiet but with the many digital modes, it is difficult to tell how many users are on the bands at any given time. Many repeaters are quiet much of the time. WWARA doesn't evaluate the value of these systems. Any new mode is likely to be extremely low volume, yet one of the fundamental purposes of amateur radio is experimentation. Whether systems are experimental, emergency use only, a personal system for friends or an entire club does not matter to WWARA. The goal is simply to attempt to accommodate the requests.

WWARA continues to receive new repeater requests. Additionally, there will be new modes that will need infrastructure. There is every reason to think more channels will be needed in the future.

3. What impact, if any, can we expect on digital modes (DMR, P25, DSTAR, etc.)?

All existing digital modes are already narrowband and make up the majority of new coordination requests. In the 70cm band, they are already compliant and don't need to do anything. On the 2m band, they will likely need to move slightly to fit in the new channel raster.

4. What "features" may be required for a repeater to go to Narrowband?

The repeater only needs to be narrowband capable. Digital systems meet that requirement. FM repeaters need to switch to FM narrow. Any repeater built after 1997 should meet this requirement. No changes to the duplexers or antenna(s) are required.

5. Will coverage and range be adversely affected?

In Western Washington, repeater range is largely terrain limited. In the clear, there is a 25% theoretical reduction in range when migrating from FM to FM narrow. In the land mobile market this motivated many to migrate to digital modes where forward error correction can make marginal signals usable and extend the range. An upgrade to power, feedline or antenna can also recover this loss.

6. What equipment will need to be changed at the repeater site?

If the repeater doesn't support narrowband or isn't frequency agile, it will need to be replaced. Nothing else is required for 70cm systems. On the 2m band, the duplexer could need some tuning for best performance. No other components need to be replaced. This may be a good time to evaluate all the system components and determine if they are still performing properly.

7. How can our club afford a new system?

The good news is that there is a 10-year window to make this change. Generally, only very old systems are impacted and there is no guarantee it will function for 10 more years. Used

and new repeaters can be quite reasonably priced. Hopefully, the club already has a hardware replacement fund and has nearly 10 years to create one.

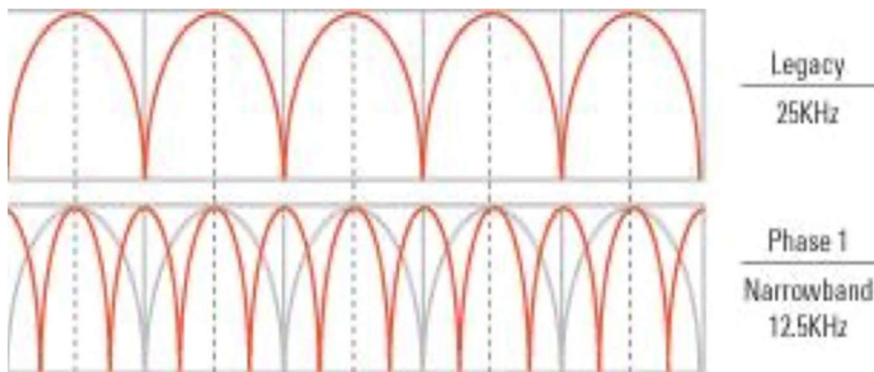
Additionally, there are two grant programs available from the ARRL that could be used to update system hardware, beyond just the repeater. The justification for the grant is to migrate to narrowband to free up additional spectrum for new systems. Contact the ARRL Section Manager or Division Director for more information after reviewing the [ARRL Club Grant Program](#) and [ARRL Foundation Grant](#) programs.

8. What is required to migrate a 70cm system?

Digital-only systems don't need to do anything. Systems that offer FM must convert to FM narrow. When migration is complete, notify WWARA immediately by completing a new Tech Data Sheet (TDS). This will be processed immediately, and the database will be updated to show the change for users.

9. Why do 2m systems need to move but not 70cm systems?

The existing 70cm band has 25kHz channels. These systems can be narrowed in place to 12.5kHz which opens additional 12.5kHz splinter channels shown below.



The existing 2m band has 20kHz channels which does not divide into 12.5kHz channels evenly. The diagram below is an approximation of how the existing and new narrow channels will appear. This is just a small portion of the spectrum but it is possible to see that some (~20%) of the new channels line up with the old channels. The remaining systems need to move at least a little.

Existing	New	Existing	New	Existing	New
145.1100	145.1000	146.6200	146.6250	147.0000	147.0000
145.1300	145.1125	146.6400	146.6375	147.0200	147.0125
145.1500	145.1250	146.6600	146.6500	147.0400	147.0250
145.1700	145.1375	146.6800	146.6625	147.0600	147.0375
145.1900	145.1500	146.7000	146.6750	147.0800	147.0500
145.2100	145.1625	146.7200	146.6875	147.1000	147.0625
	145.1750		146.7000		147.0750
	145.1875		146.7125		147.0875
	145.2000		146.7250		147.1000
	145.2125				147.1125

10. What is required to migrate a 2m system?

There are four issues to consider.

- A. Digital-only systems are already narrow but will likely need to change frequency.
- B. 20% of the systems don't need to move based on the narrow channel raster.
- C. FM systems will need to switch to FM narrow and will likely need to change frequency (see issue B).
- D. Best practice for migrating from wide FM to narrow FM is to also change the repeater access tone/code. This ensures users will have to update their programming to continue to access the system.

There are two options to migrate a 2m system.

- a. They can potentially narrow and move into their narrowband slot in a single move. This will require changing mode and frequency on the repeater and likely tuning the notch cavities a bit. Changing the tone can be helpful to ensure users have programmed the system correctly. They will need to complete a new Technical Data Sheet (TDS) with the updated details. Because of the frequency change, there may need to be a testing period. During that test period, the system will be placed on the Pending list. If there is an interference issue, this will need to be resolved before coordination can continue. Once testing is complete, there will be a published public comment period before it will be issued a new certificate of coordination.
- b. The other option is a two step process. Step one would be to simply narrow in place without changing frequency. This can be done quickly and easily by just changing the mode and ideally tone in the repeater. There will need to be a Tech Data Sheet submitted to record the change but no test period is required because there is no increased risk of interference by simply narrowing the signal. The system can stay in this state until an adjacent user moves to a narrow channel. When ready, the system can slide into its final narrow slot which will require changing the repeater frequency and retuning the notch cavities. A new Technical Data Sheet will need to be submitted. The system will be placed in a Pending status during testing and with no further issues will be coordinated after a public comment period.

11. When should I migrate my system?

As soon as practical. WWARA is ready to accept updated Tech Data Sheets and has processed a number even before the narrowband requirement was in place.

12. How do I identify a new 2m narrowband destination channel when moving?

The 2m band plan shows the wide and narrowband channel alignment. It is generally simplest to choose the move to the closest narrowband slot. It is worth looking to see if the adjacent repeater system has narrowbanded and verify how far away it is geographically. Contacting the band chair or the narrowband committee will help validate the choice or potentially provide other options.

13. What happens to FM simplex channels?

Most non-repeater channels are not impacted. The data and experimental areas will remain wide at 25kHz channel spacing. There are two FM simplex ranges on 2m. 146.520-

146.600 will remain wide because it contains the National FM Call Channel at 146.520. WWARA recommends the 147.520-147.600 range become narrow to provide 3 additional simplex channels. The full band plans are available on the WWARA website with all those details visible.

14. How will users know about the changes?

WWARA publishes the latest data nightly to the web site at <https://www.wwara.org/coordinations/coordination-data-files/>. The data is available in CSV and CHIRP formats. When repeaters simply narrow in place, there is no additional coordination required and the database will be updated as soon as a new application or Technical Data Sheet (TDS) is received. On 2m, when moving to the final narrowband frequency, there may be a new test period required and during that time the repeater will only appear on the Pending list.

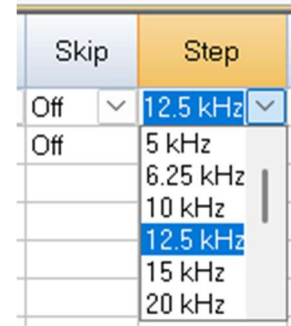
15. What if we need technical assistance migrating a repeater?

The WWARA Groups.io user group is an excellent source for assistance from other repeater owners. WWARA board members can also help identify assistance.

16. I can't program the new 4 decimal place narrow channel in my radio.

There are a number of VHF radio frequencies (national interoperability VTACs in fact) that require a 2.5kHz step capability in the radio. They have 4 digits of precision. Commercial radios can generally manage 2.5kHz steps, ham radios generally cannot.

That is not necessary for the channels in the WWARA band plan. WWARA ensured our channels align with 12.5kHz steps which all ham radios can do. It is often necessary to change the step rate to 12.5kHz in the radio when programming but it will go in. When programming manually, once the channel is programmed, the step rate can be set back.



TStep is one of the fields available when programming a channel in CHIRP. Step is visible in other software as well. Internally the radios store the frequency information as a binary value with a multiplier. The Step value determines the multiplier to use. This allows the radios to store the frequency data very compactly.

17. What radios might be obsolete by doing this?

The FCC required all land mobile radios manufactured after 1997 be narrowband capable. Amateur radios were not included in the mandate but most manufacturers started building narrowband compliant models. Virtually all radios manufactured after 2000 were nominally narrowband capable. Some models met the requirement with a system-wide setting (e.g. Yaesu FT-90, Kenwood TM-D700, Kenwood TH-F6A), meaning all channels are narrowband or none. This makes it impossible to program both narrow and wide channels in the radio at the same time. The Kenwood TM-D700 was discontinued in 2007 and is the last radio we identified with this issue. If there are others, let us know so we can add them to the list.

Icom narrow FM programming issues – Most modern Icom radios can be programmed for narrow FM by simply changing to narrow FM mode. The modern multiband, multimode

radios (IC-7000, IC-7100, IC-9100, IC-9700, IC-705 and IC-905) can transmit narrow FM by selecting FM mode and Filter 3.

Yaesu narrow FM programming issues – Yaesu have historically mislabeled wide and narrow FM. Yaesu radios label FM broadcast (200KF8E⁴) as wide FM. Wide FM (16K0F3E⁴) is labeled narrow FM. Many Yaesu radios can support narrow FM but it is a menu option or a checkbox in programming software labeled Half Deviation.

Chinese radios (Baofeng, BTech, Wouxun, Anytone, TYT, VGC, Retevis, QYT, etc.) – Because these radios are certified under FCC part 90 rules, they all support narrowband FM operation.

18. How do we get more information for our club/users?

Reach out to the WWARA Board and we are happy to arrange a meeting to address the anticipated changes and specific questions folks may have. (narrowband@wwara.org)

⁴ <https://www.apcointl.org/services/radio-frequency-management/emission-designators/>