FAQ about Narrowband Technologies

This is an information paper regarding the latest information about the respective narrowband two-way radio technologies in the market at present. It is intended to present a neutral and balanced view of the respective technologies, and also correct misrepresentations and misunderstandings seen in various media publications of presentation materials in circulation in the public domain.

This document has been prepared by the dPMR™ Association Marketing Group with the full consensus and approval of the member companies. The dPMR™ Association hopes this document will provide clarification to the myriad of information currently available. The dPMR™ Association has checked the content for accuracy but reserves the right to amend and/or correct any part of this document without notice or obligation.

****

Q1: What does "narrowband" really mean?
A1: This should probably be clarified before anything else. To keep things simple, narrowband in its current form would refer to the use of *12.5 kHz channels* for two-way PMR/LMR radio communication. However, as 6.25 kHz technologies exist, these would be considered "ultra-narrowband" or "very narrowband".

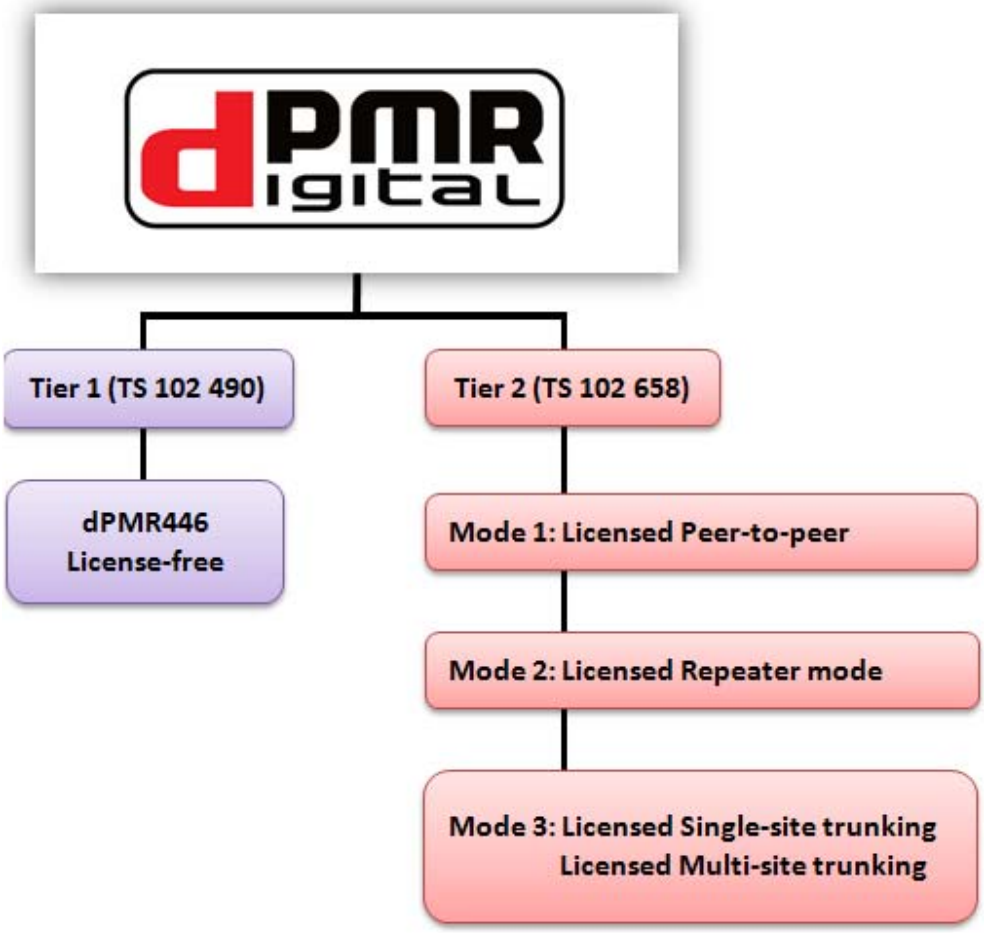
Q2: 6.25 kHz "equivalent" versus real 6.25 kHz capability.
A2: Historically, professional two-way radio has dealt with the problem of congested spectrum/channels by narrowing the channel spacing. I.e. 50 kHz ➔ 25 kHz ➔ 12.5 kHz ➔ 6.25 kHz. The DMR system is often quoted as being 6.25 kHz "equivalent", and dPMR™ or NXDN™ are true 6.25 kHz. Basically what this means is that the 2-slot TDMA architecture of DMR provides the equivalent of two 6.25 kHz voice or data paths in a 12.5 kHz channel and the FDMA systems' channel spacing is 6.25 kHz. For a more detailed explanation of the technical difference of TDMA and FDMA, please see the "What is dPMR™?" tab on the dPMR™ Association website (http://www.dpmr-mou.org/what-is-dpmr-30-minutes.htm).

Q3: Just what kind of narrowband technologies/systems are there?
A3: Notice we have not used "digital" with narrowband. This is because analogue FM is considered narrowband technology based on the explanation in A1 above, and thus the first type of narrowband technology available. Diagrams are provided for the systems relevant to the discussion in this document with references to other systems as required.

Analogue Narrowband:
Good old reliable FM:
As mentioned above, analogue FM 12.5 kHz products have been available for many years now, and fit the description of the current narrowband channel spacing standard of 12.5 kHz.

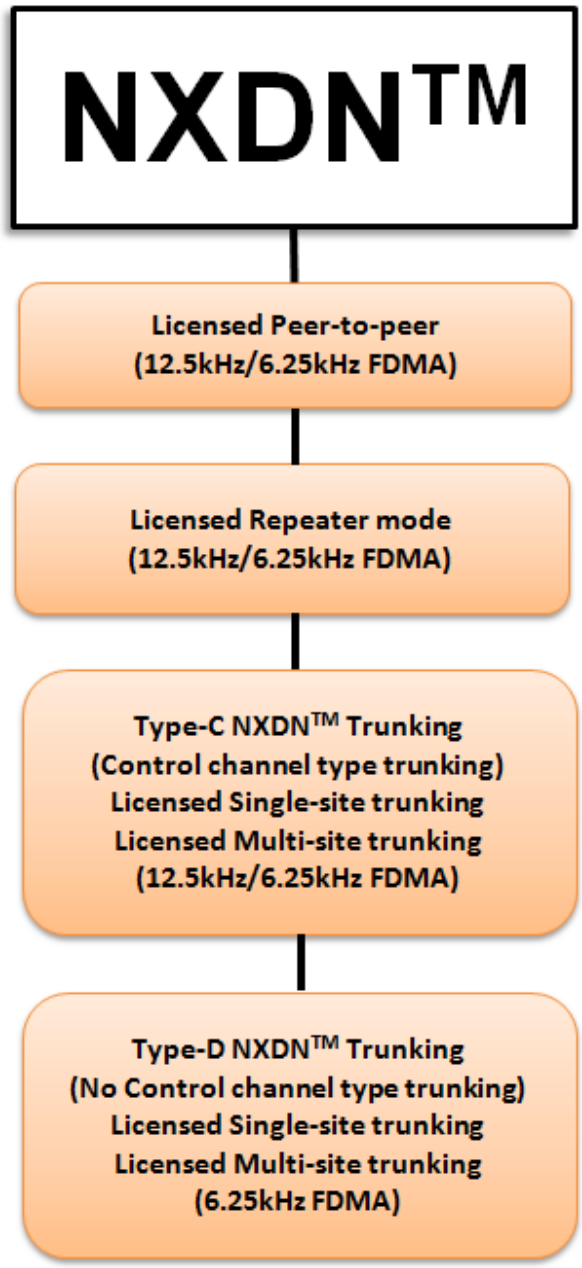
Digital Narrowband:

dPMR™:
dPMR™ is a digital 6.25 kHz FDMA based protocol described in the ETSI technical standards TS 102 490 and TS 102 658. Details of what dPMR™ is and can do, can be found on the dPMR™ Association website, but the basic structure of the dPMR™ standards suite is shown in the graphic below.



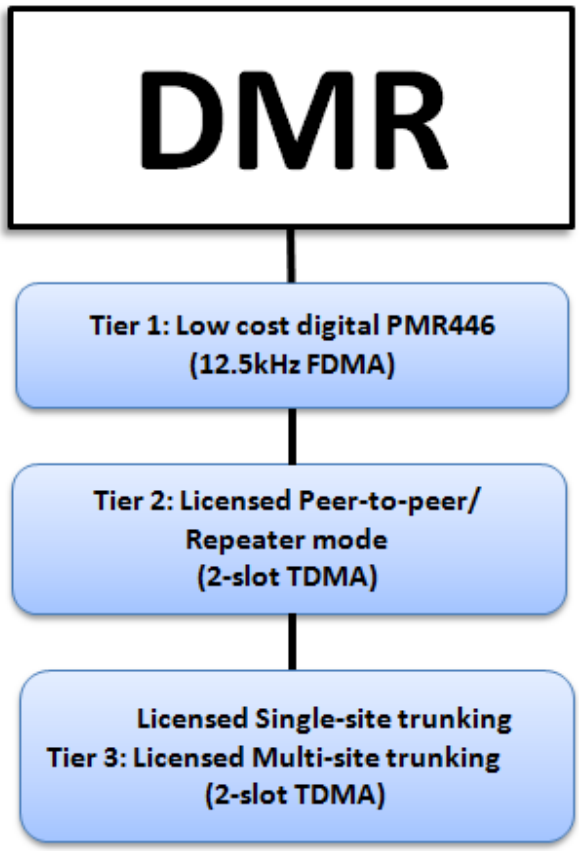
As the diagram shows, dPMR™ is a full featured system capable of providing communications solutions ranging from license-free all the way up to multi-site trunking networks.

NXDN™:
NXDN™ is an open digital 12.5 kHz or 6.25 kHz FDMA based protocol described in the NXDN™ suite of standards. Details of what NXDN™ is and can do, can be found on the NXDN™ Forum website, (http://www.nxdn-forum.com/) but the basic structure of the NXDN™ standards suite is shown in the graphic below.



As the diagram shows, NXDN™ is a full featured system capable of providing flexible trunking solutions for small to medium sized networks.

DMR:
DMR is a digital 12.5 kHz 2-slot TDMA based protocol described in the ETSI technical standard TS 102 361. Details of what DMR is and can do, can be found on the DMR Association website (http://dmrassociation.org/), but the basic structure of the DMR standards suite is shown in the graphic below.



As the diagram shows, DMR is a full featured system capable of providing communications solutions ranging from license-free all the way up to multi-site trunking networks.

Other Digital Systems:
APCO Project 25:
APCO P25 is still an evolving digital standard targeted mainly for the United States public safety market. The current Phase 1 part of the standard is a digital 12.5 kHz FDMA based protocol described in the TIA APCO P25 standards. A Phase 2 standard which is a 2-slot TDMA 12.5 kHz protocol has also been completed.

Tetrapol:
This is a 12.5 kHz FDMA digital standard that is also targeted for the public safety market as well as high-end commercial markets.

Tetra:
This is a digital 25 kHz 4-slot TDMA based protocol described in the ETSI EN 300 392 suite of standards. Tetra is also targeted for the public safety market as well as high-end commercial markets.

Japanese and Chinese standards:
ARIB standards T-98 and T-102 are NXDN™ based 6.25 kHz FDMA standards that are available in the Japanese domestic market. China has also developing a digital standard called Police Digital Trunking (PDT), which is a 12.5 kHz TDMA based standard. They are also looking at creating a separate Business and Industry digital standard, and discussions on proposed candidate protocols has begun.

As the content above indicates, there are also movements to adapt base standards as country specific standards.

Q4: Which is better, 6.25 kHz FDMA or 12.5 kHz TDMA?
A4: This is the million dollar question. The answer is that both technologies have been accepted in the market based on the features and advantages provided respectfully. This basically says there is room for both. Below are some facts and statistics of interest.

Fact 1: At least *65% if not more of EVERY two-way manufacturer's business* (including supporters of TDMA technology) is analogue FDMA based, and will continue to be so for the foreseeable future. FDMA has served the PMR/LMR industry as a reliable and proven radio technology for more than 70 years. Therefore, it is hard to believe that now the PMR/LMR world is going digital, FDMA is suddenly an "inferior" technology. It is still the most efficient method of achieving spectrum efficiency.

Fact 2: As of January 2012, the number of FCC licenses in the USA for narrowband digital technologies were:

- 140,900 FCC licenses for TDMA (DMR), and
- 140,300 FCC licenses for 6.25 kHz FDMA

As stated, this shows the US market alone sees and accepts both technologies equally.

Fact 3: The number of 6.25 kHz FDMA radios in the market is estimated to be over 900,000 units. Based on information in the public domain, the number of TDMA units in the market is estimated to be over 1,500,000 units.

Fact 4: The number of countries where 6.25 kHz FDMA and TDMA digital systems are used worldwide is virtually the same. The majority of countries worldwide now have regulations and/or band plans in place that allow the use of 6.25 kHz in one way or another.

Q5: "Professional" versus "Simple, low cost"
A5: There have been comments in various media articles that dPMR™ is a low cost "non-professional" orientated system. This should not to be confused with the original intention of dPMR™ being conceived as a "low cost, low complexity" protocol. This means that the technology can be achieved by largely using existing FM hardware engineering architecture. Also, as explained with the diagrams in previous pages, each system offers basically the same level of functions, trunking and networking capability. As with the "Which is better?" question, the answer is "the system that best suits the end user's needs".

Q6: What about IPR?
A6: dPMR™ was also developed to avoid IPR and again reduce the total cost for both the manufacturer and ultimately the end user. A statement about dPMR™ and IPR can be found on the dPMR™ Association website. At this time, no IPR has been determined to be essential to the dPMR™ standards and thus no licenses* are required for developing dPMR™.
* No licenses for the CAI, but a vocoder license may be required depending on implementation

Q7: What kind of products are available for dPMR™?
A7: At this time, the following products and services are available from a number of dPMR™ Association member companies. Further details can be found in a Product Showcase document recently made by the Association (website link).

- Tier 1 dPMR446 license-free radios
- Tier 2 dPMR™ Mode 1, 2 and 3 radios, infrastructure and controllers
- Tier 1 baseband IC chips (for radio development)
- Tier 2 Mode 1 and 2 baseband IC chips (for radio development)
- Tier 2 Mode 1, 2 and 3 protocol stacks (for radio development)
- Test and Measuring equipment supporting dPMR™ (for radio development and maintenance)
- Various applications tailored for dPMR™ products

DISCLAIMER

This document has been prepared by the dPMR™ Association as a reference document.

The information in this document has been carefully checked, and is believed to be correct and accurate. However, the dPMR™ Association assumes no responsibility for inaccuracies or mistakes.

Document Revisions
The dPMR™ Association reserves the right to make changes to the content of this document at any time without notice or obligation.

Document Copyrights

Trademarks