# How do I?

## An occasional series

## This week: FM Digital Modes. NXDN

Another installment in the series ***Fun With VHF***

For more information, please visit the Kenwood website
https://comms.kenwood.com/en/products/list.php?func=nexedge
Some of the material shown below is explained in greater detail on their website.

**NXDN** is an open standard radio communications protocol. It originated in commercial circles and can best be thought of as the city cousin of D-Star. This is an extreme over simplification and the two systems are not really related. Two of the major amateur radio equipment manufacturers, Kenwood and Icom, make NXDN equipment, though Kenwood began selling NXDN commercial radios in 2008 under the NEXEDGE trademark.

NXDN stands for **N**ext **G**eneration **D**igital **N**arrowband and applies digital radio technology to narrow band radio frequencies. Initially VHF ñchannelsòwere spaced 25 KHZ apart as FM is wider than the single side band signals used on HF. As equipment improved, and the airwaves became more crowded, the signal bandwidth was reduced to 15KHZ. Circa 2010 this was reduced for commercial land systems (first responders, railroads, other commercial users to 7.5 KHZ. These narrow signals require digital processing to be understood and existing radios cannot be modified, at least cost effectively, to produce them.

Due to government mandated change which triggered a need to replace tens of thousands of radios the US railroads wanted to create a single interoperable system so that essentially any railroad could talk to any other railroad. (See elsewhere in this series for articles on monitoring railroad communications). This was a multi-million dollar market and while no single manufacturer got all the business, Kenwood and Icom took significant business from the historical OEMs such as Motorola, GE, Harris and Johnson as they appear to have done a good job selling the NXDN protocol and their solutions to implementing it.

NXDN radios are interesting. They generate a narrow bandwidth signal which can do the job with less transmitter output power. I believe one of the selling points is that a 25 watt digital radio, given the same antenna and conditions, has a greater range than a 50 watt analog radio. However, they are very sensitive to distortion. Moving a few feet to either side can make a transmission unreadable. The railroad industry has dealt with this by installing more remote bases (simplex repeaters). The Commonwealth of Pennsylvania invested hundreds of millions of dollars into a NXDN competitorôs system and had so many issues, cost overruns and required so many more towers than initially planned that after about a decade they scrapped it and are trying to start over, possibly with NXDN.

NXDN began to leak into amateur radio circles as people realized the potential offered by the commercial radios. I would not call this approach to be main stream. The ARRL Repeater Directory lists NXDN repeaters but casually glancing through the book I can find none.

One of the challenges for amateur use is that NXDN uses a Code Plug. This is software programming that assigns the radio to a user group. In theory, a railroad operating on 160.800 MHz and a taxi company operating on 160.800 MHz, both using NXDN, can operate on the same frequency and neither will hear the other. With analog transmissions that is not possible. While this could be beneficial for amateur use, as multiple users can talk without interference, it would seem to make striking up casual conversation more difficult and require more user set up time and coordination.

At this point in its development, buying and adapting a NXDN radio for amateur use is probably not a good use of resources.

Catch óya on the air!