

# DMR EXPLAINED

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Looking at DMR history and usage in Amateur Radio

Presentation by VA3ISP  
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# About Me

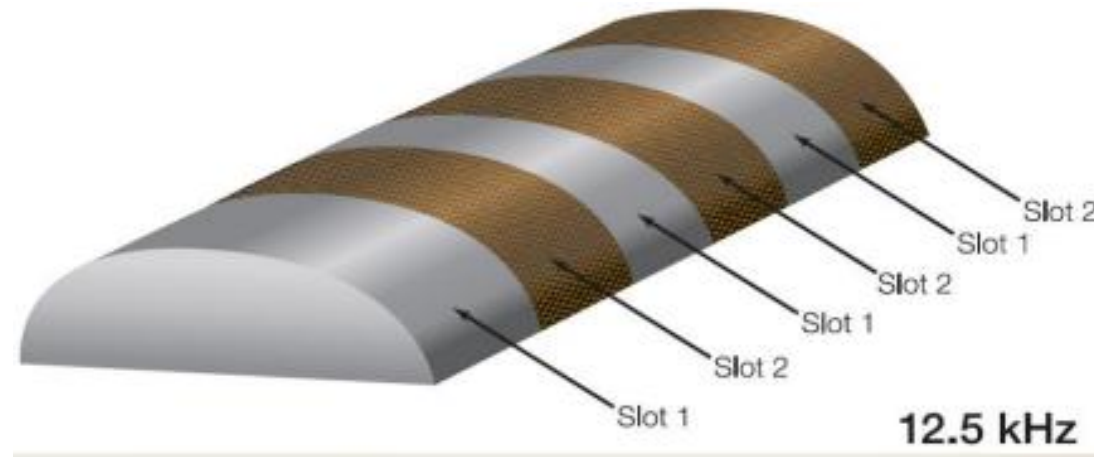
- Home QTH Ottawa in May-Dec / Ft-Lauderdale Jan – April
- Operate WISP – [countrywifi.ca](http://countrywifi.ca)
- Licensed in 2002
- VA3ISP / VA3ES
- Helped Develop IRLP Software
- Operator and Maintenance on ontest station VE3RM (SK)
- President of Prescott-Russell Amateur Radio Club Inc. 4 Rpt
- Technical Advisor to ARAI (Association des Radio Amateurs Indépendants ) 23 Rpt

# DMR Origins

- DMR was developed by the ETSI ( European Telecommunications Standards Institute)
- It was developed as a direct replacement for traditional FM analog radios in the Land Mobile industry.
- Only 8 channels existed in the EU for “GMRS” use, using DMR gives them 16 channels without having to get licenses issued for the use.
- Developed 3 tiers
  - Tier 1 – Simplex Transmission, No repeater use, Similar to our GMRS ( 6.25 kHz FDMA )
  - Tier 2 – Used in Commercial applications with repeaters to extend range (12.5kHz TDMA)
  - Tier 3 – Same as Tier 2 but adds functionality of Trunking operations

# How does it work

- Two Slot TDMA uses 12.5 kHz Channel Bandwidth with 6.25kHz per Slot



- Each timeslot is 30ms in length with 27.5ms TX and a 2.5ms gap
- Repeater transmits continuously even when only 1 TS is being used

# Early Stages of DMR

There were 2 major players in DMR in North America

- Motorola ( MotoTrbo )
- Hytera ( Not to be confused with Tytera or TYT )
- First DMR system widely used was the DMR-MARC network (Motorola Amateur Radio Club )
  - Only Motorola equipment was allowed to be used. To get around the expensive licensing and restrictions from Motorola's IP Site Connect network a device called a C-Bridge was used as the central point to link multiple repeaters.
- Hytera users came out with DMRplus network with the similar functions as MARC

# Along came a Brandmeister

- Formed to add greater flexibility for other radios in the market and to add Hybrid/Homebrew repeaters on the air.
- Developed with integration in mind they allow for cross-mode linking other modes like Echolink, Dstar and APRS
- This new network spawned great interest from 3<sup>rd</sup> party manufacturers like CSI, TYT, BTech

# DMR Features

- Error correction built-in. TDMA allows for rebroadcast of failed packets
- Channels are pre-set by repeater admin
- Text messaging is possible via keypad
- 2 channels. Allows for Voice/Voice or Voice/Data at the same time
- Allows for roaming ( feature dependent on radio model )

# Terminology

- Codeplug – Configuration File
- ID – Your unique ID on the DMR network
- Timeslot – Which of the two TDMA slots will be used
- Color Code (CC) – Unique code assigned to a specific repeater ( Similar to PL Tone )
- Zone – Group of channels stored in the radio. Like a memory bank
- Roaming – List of repeaters that the radio will scan thru to find the best signal
- Admit Criteria – Indicates when the radio can transmit CC Free, Always, Channel Free
- Contact – ID number of a group or individual
- RX Group – Same as Contact
- Channel – Frequency, RX Group, Contact, CC Selection, Admit Criteria



# Radio Options - Hytera

**MD785 ( 550\$ )**  
**1024 Channels**  
**50W VHF / 45W UHF**



**PD785 ( 550\$ )**  
**1024 Channels**  
**5W VHF / 4W UHF**



# Radio Options - Motorola

**XPR 4550 ( 500\$ )**  
**1000 Channels**  
**50W VHF / 45W UHF**



**XPR6550 ( 500\$ )**  
**1000 Channels**  
**5W VHF / 4W UHF**



# Radio Options - Connect Systems

**CS800/801( 280\$ )**  
**2000 Channels**  
**50W VHF / 45W UHF**



**CS750 ( 240\$ )**  
**2000 Channels**  
**5W VHF / 4W UHF**



# Radio Options - TYT



MD-380 (90\$)  
1000 Channels  
5W



MD-2017 (160\$)  
3000 Channels  
5W



MD-9600 (280\$)  
1000 Channels  
45W V/U

# Hotspots

130\$ / 230\$

## DV4Mini/AMBE

Needs PC to operate

AMBE version can use PC-Mic

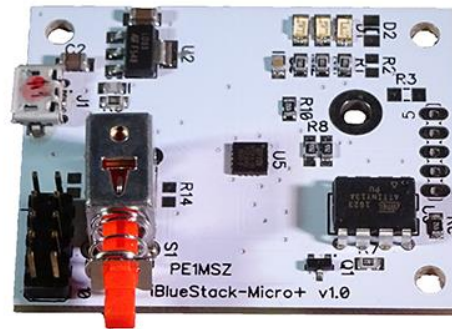


60\$

## BlueStack Micro+

Needs PC /Rpi / DVMega to operate

Connects via Bluetooth to Phone



200\$

## SharkRF openSPOT

Self Contained

Cross Mode Ability

Needs Internet via Ethernet



# Questions?

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