



➤ DMR: A NEW MODE FOR AMATEUR DIGITAL RADIO

Slides for NEAR-FEST
April 30, 2016 By Bill Barber, NE1B



Digital Mobile Radio

- An ETSI published worldwide standard
- Over a DOZEN manufacturers of radios (Connect Systems, Tytera, Vertex, Motorola, Kenwood and Alinco)
- Superior voice quality (AMBE+2) vs older digital modes (AMBE, IMBE, GMSK)
- Longer battery life! Automatic Roaming!
- Supports multiple talk groups on one freq.
- Supports data applications (txt, email, gps)

DMR Association Equipment Mfg Members

aselsan

 **AVTEC**

consoles you can count on

 **BFDX**[®]

 **emc**
www.emc-spa.com

**FYLDE
MIKRO**

HARRIS

 **HQT**

 **Hytera**[™]
Respond & Achieve

 **ICOM**

JVC **KENWOOD**

 **IRISUN**

 **LARIMART**

 **MOTOROLA**

 **Radio Activity**
Omsk Manufacturing Association
named after A.S. Popov
www.radioactivity.ru

Radio Activity
Solutions

RADIODATA

 **Selex ES**
A Finmeccanica Company

sepura

taii
communications

 **simoco**

 **Vertex Standard**

ZETRON[®]

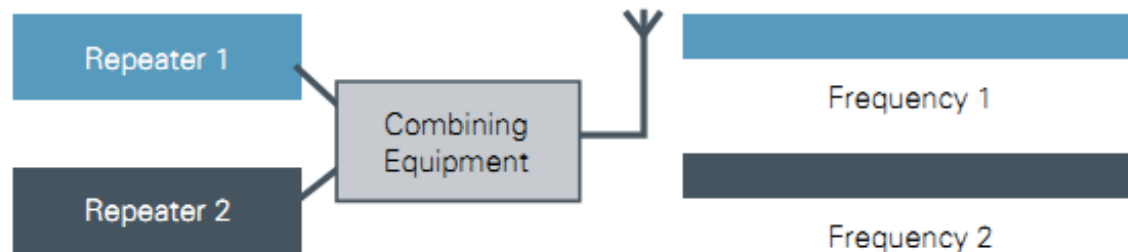
DMR Standard-ETSI TS 102 361

- Tier 1 (Unlicensed)
 - FDMA, Consumer applications, .5 watt
 - dPMR (446 MHz European unlicensed service)
- Tier 2 (Conventional)
 - 2-slot TDMA
 - IP Site Connect (Vendor specific)
- Tier 3 (Trunked)
 - 2-slot TDMA
 - Multi-channel, Multi-Site

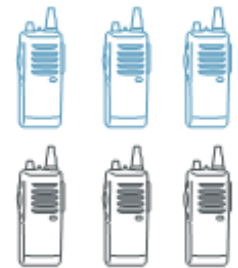
TWO Repeaters in One!

TDMA saves licensing and equipment costs by enabling the equivalent of two 6.25 kHz channels within a single licensed 12.5 kHz channel

Two-channel Analog or Digital FDMA System



One call per repeater and channel



Radio Groups

Two-channel Digital TDMA System



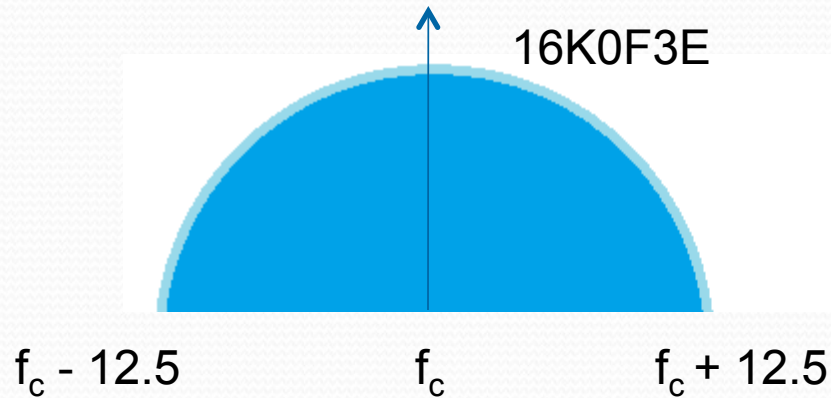
Two calls per repeater and channel



Radio Groups

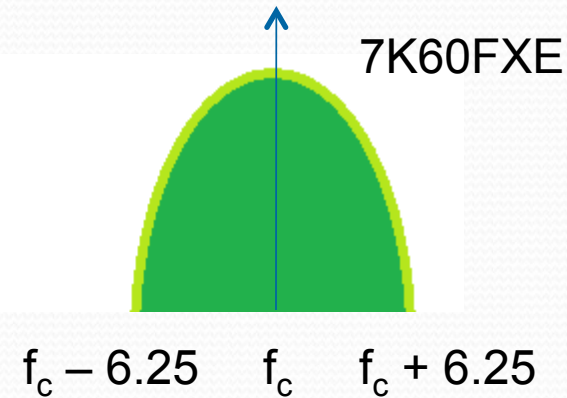
Lower infrastructure cost, 1 box in rack
TWO voice/data channels from one repeater

Half the Channel Bandwidth



Traditional Analog
25 kHz
Channel Bandwidth

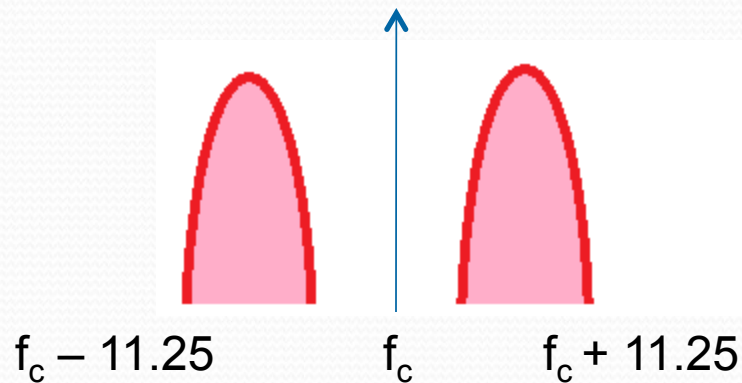
1 Channel
1 Repeater



DMR
12.5 kHz
Channel Bandwidth

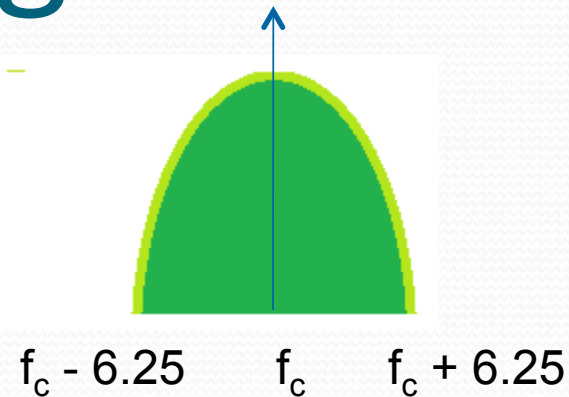
2 Channels
1 Repeater

More Spectrum Efficient than Older Digital Modes



Guard Band
as large as 10 kHz
between channels

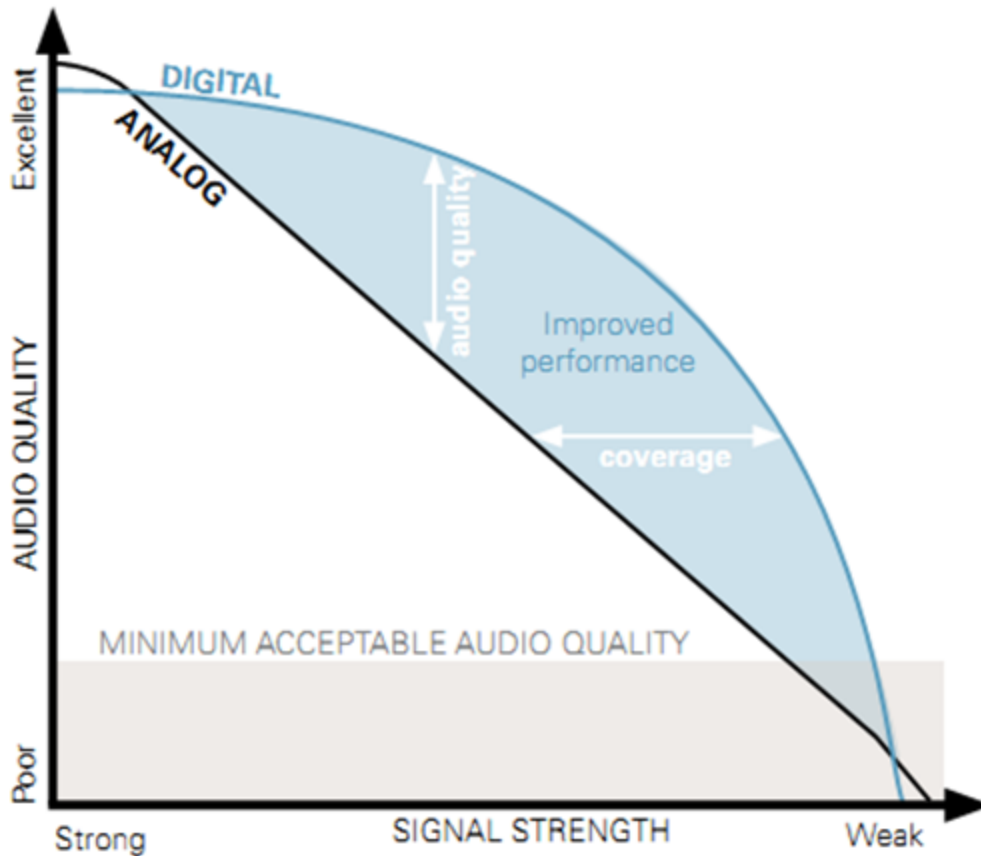
Total BW= 22.5 kHz



No Guard Band
between 2
channels

Total BW= 12.5 kHz

Better Signal Quality



Digital voice retains better quality than analog as signal strength decreases.

- No hiss, popping, or static
- Better RF range than older digital technologies
- Forward Error Correction and Cyclic Redundancy Check coders

Better Audio Quality

- Listen for yourself. DMR does sound better than older digital technologies.



Longer Battery Life



Older Digital Modes
(FDMA)



DMR
(TDMA)

“For each hour of usage the TDMA radios show between 19% and 34% less battery capacity is required than for the FDMA models.”

“40 percent improvement in talk time in comparison with analog radios “

Free Text Messaging



Send to one person, or a group of people.

- Weather Alerts
- Club Meetings
- Announcements

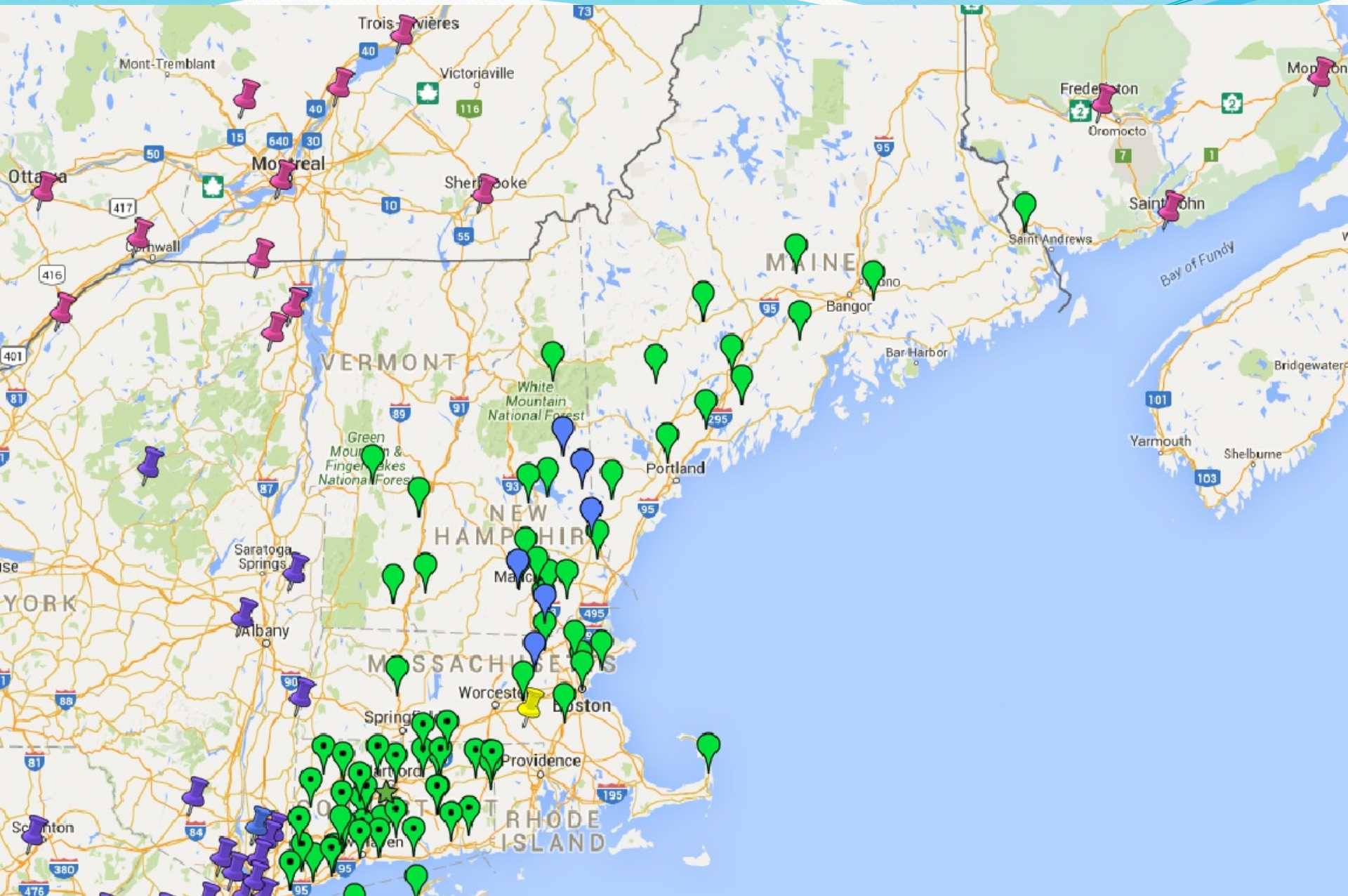


DMR-MARC

Motorola Amateur Radio Club Worldwide Network



- Motorola Amateur Radio Clubs and other private repeater owners
- 500+ site network in 47 countries
- Also bridged to other networks DCI, AZ, NC, MI, KS, CO and Texas DMR networks
- 100% Pure Digital
- More than 29,500 registered users
- To register or learn more <http://dmr-marc.net>



Local DMR Repeaters

- NH – Hudson K1MOT 145.26
- NH - Hudson K1MOT 447.725
- NH – Derry K1QVC 145.31
- NH - Chester K1OX 145.19
- NH - Manchester W1RCF 145.22
- NH - Goffstown N1PA 145.20
- NH - Bow K1OX 145.17
- MA – Chelmsford N1IW 145.18
- MA – Acton NO1A 146.42
- MA - Southboro AE1C 145.270

New England and Maritimes

- Recent Network Expansions

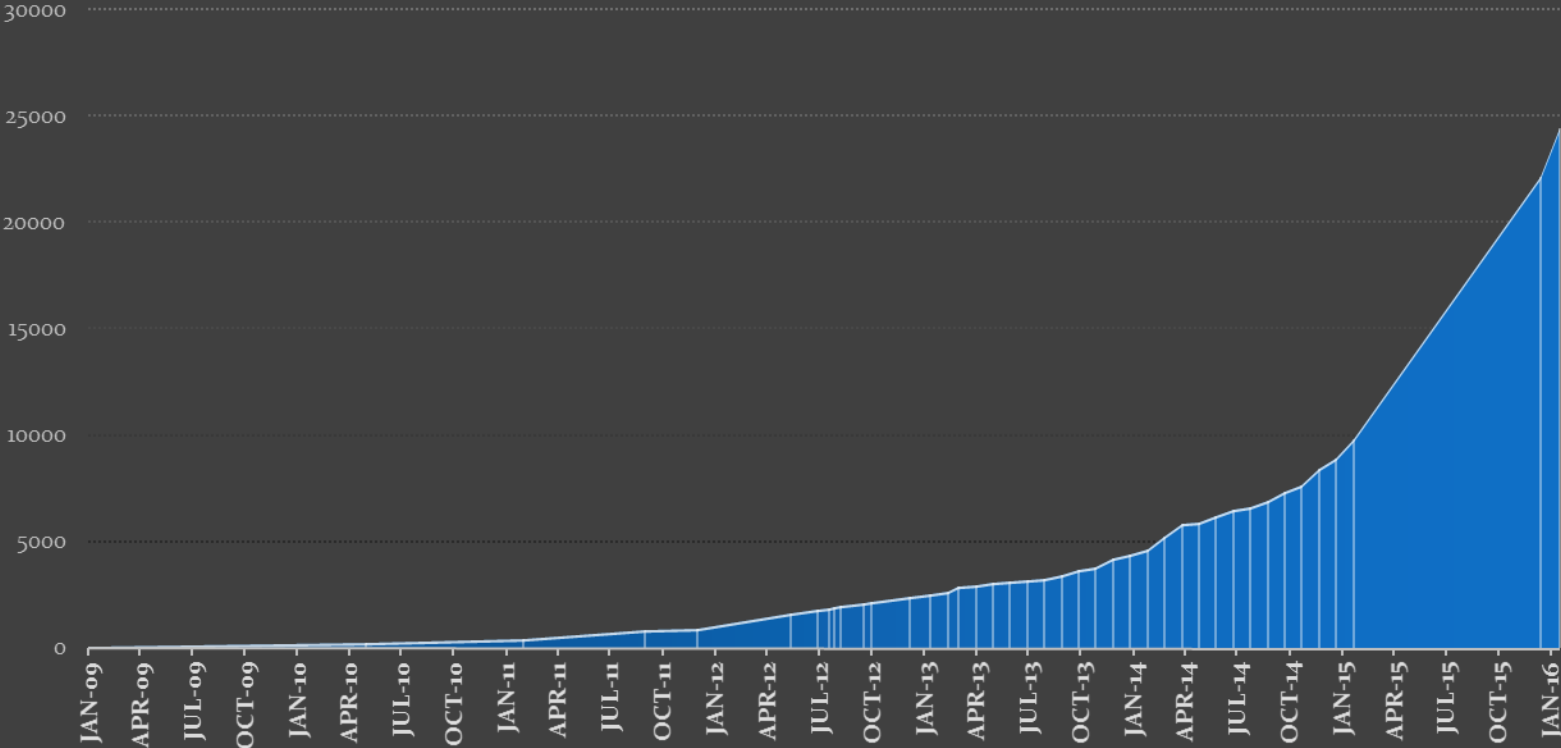
- Fredericton, NB
- Moncton, NB
- St. John, NB
- Calais, ME
- Bangor, ME
- Augusta, ME
- Mt. Ascutney, VT
- Pico Peak, VT

More sites welcome!

New England States

- Maine report – Tom and Dave
- NH report – Bill on MURP, North Country
- VT report – Chris and Tony
- MA report - Jim
- RI report - Bill
- CT report -

Amateur DMR Growth by # Radio IDs



Amateur DMR is Trending

- Jan 2013 = 2511 Users
- Jan 2014 = 4618 Users
- Jan 2015 = 9802 Users
- Jan 2016 = 24,388 Users
- April 2016 = 29,520 Users

This past year, a 149% increase. Primarily fueled by the competition among radio manufacturers and features offered.

DMR-MARC/NEDECN

Timeslot & Talk Group Pyramid

Pyramid



WW = approx. 750 repeaters
WW English = approx 325 repeaters
North America = approx. 275 repeaters
Northeast = approx. 90 repeaters

World Wide

WW: TG1 (PTT)
WWEng: TG-13

National

North America: TG-3
TAC 310/311 PTT Reflectors
UA 113/123 (PTT)

US Regional

Northeast: NE Wide + NY/NJ/PA
(TG-3172)

Regional

New England Wide: TG-3181
(All New England + New Brunswick)

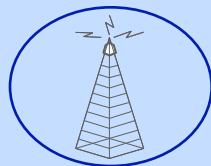
Sub-Regional/Statewides

NH: TG-3133, MA: TG-3125, ME: TG-3123, VT: TG-3150
SNE: TG-3109 (CT & East Long Island)
Region North: TG-8 (MA, NH, ME, VT hailing)

Repeater

Local: Single Site TG-9
Parrot Echo: TG-9998 (TS1)

NE WIDE= 47 repeaters
REGION NORTH=33 repeaters
NH SW= 24 repeaters
SNE= 11 repeaters
MA SW= 7 repeaters
ME SW=6 repeaters
VT SW= 3 repeaters
Local = 1 repeater



Time Slot 1

Time Slot 2



K1MOT Hudson Site

145 and 447 MHz MotoTRBO

- 50 watt Repeaters on
- 1400 VA UPS
- Kohler 14 KW Auto-start Generator

Ham Friendly Dealers

- Sandy's Comm., contact Jeff,
866.993.9011
- TwoWayDigitalRadio.com, contact Ken
706.896.0000
- Connect Systems <http://csi-radios.com/>
- E-Bay or Local Dealers

TRBO DMR radios are DMR-and-Analog
monoband

Some DMR Web Sites

(check out the links below)

- <http://dmr-marc.net/> (WW Net)
- <http://nedecn.org> (New England)

DMR: A NEW MODE FOR AMATEUR DIGITAL RADIO

- Spectrum Efficient !
- Supported by multiple manufacturers!
- Automatic Roaming for Safe Driving!
- Longer Battery Life!
- 3 Year Warrantees on many radios
- Resilient Networks (no servers needed at sites)
- To learn more <http://dmr-marc.net>

Questions?

- Contact Bill Barber, neib@arrl.net
- Or <http://dmr-marc.net/contact.html>