INTRODUCTION TO DMR

Franklin County Amateur Radio Club

INTRO TO DMR

- DMR, or Digital Mobile Radio, is an Open Standard defined by the European Telecommunications Standards Institute (ETSI), and used in commercial and amateur products around the world

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Designed to operate within the existing 12.5 kHz channel spacing used in licensed land mobile frequency bands globally AND to meet future regulatory requirements for 6.25 kHz channel equivalence.

Affordable digital systems with low complexity.

DMR products are sold in all regions of the world.

The DMR protocol covers:

- Unlicensed (Tier I)
- Licensed Conventional (Tier II)
- Licensed Trunked (Tier III)

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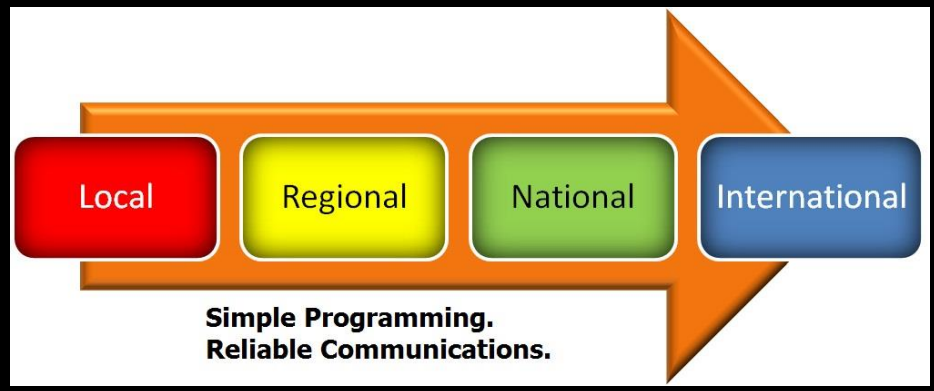
- DMR, similar to P25 Phase II, both use two-slot TDMA (Time Division Mulitple Access) in a 12.5 kHz channel, while NXDN uses discreet 6.25 kHz channels using frequency divison

- The primary goal of the DMR standard is to specify a digital system with low complexity, low cost, and interoperability across brands, so radio communications end users are not locked into a proprietary solution.

- However there are brands that have not adhered to the open standard and have introduced proprietary features that make their product incompatible with some networks.

INTRO TO DMR

- DMR and Ham Radio
- All-digital network of over 500 repeaters in 79 countries (and growing)
- More than 83,000 registered users (and growing)
- Repeaters are connected all the time
- Excellent voice quality and extended battery life.
- Less than 1/3 the channel bandwidth of analog FM with twice as many voice channels
- Reliable and scalable choice in connectivity
- www.dmr-marc.net



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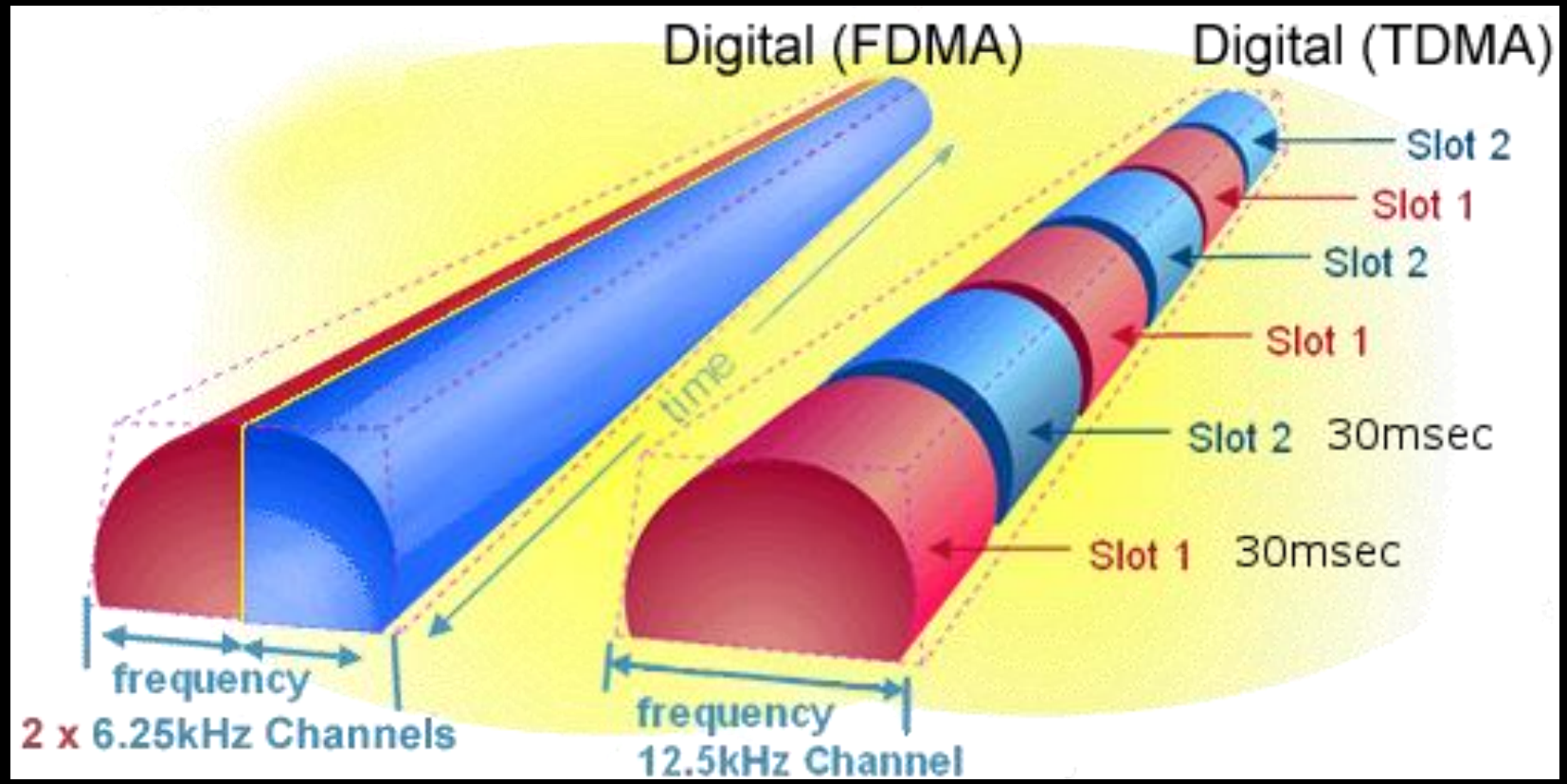
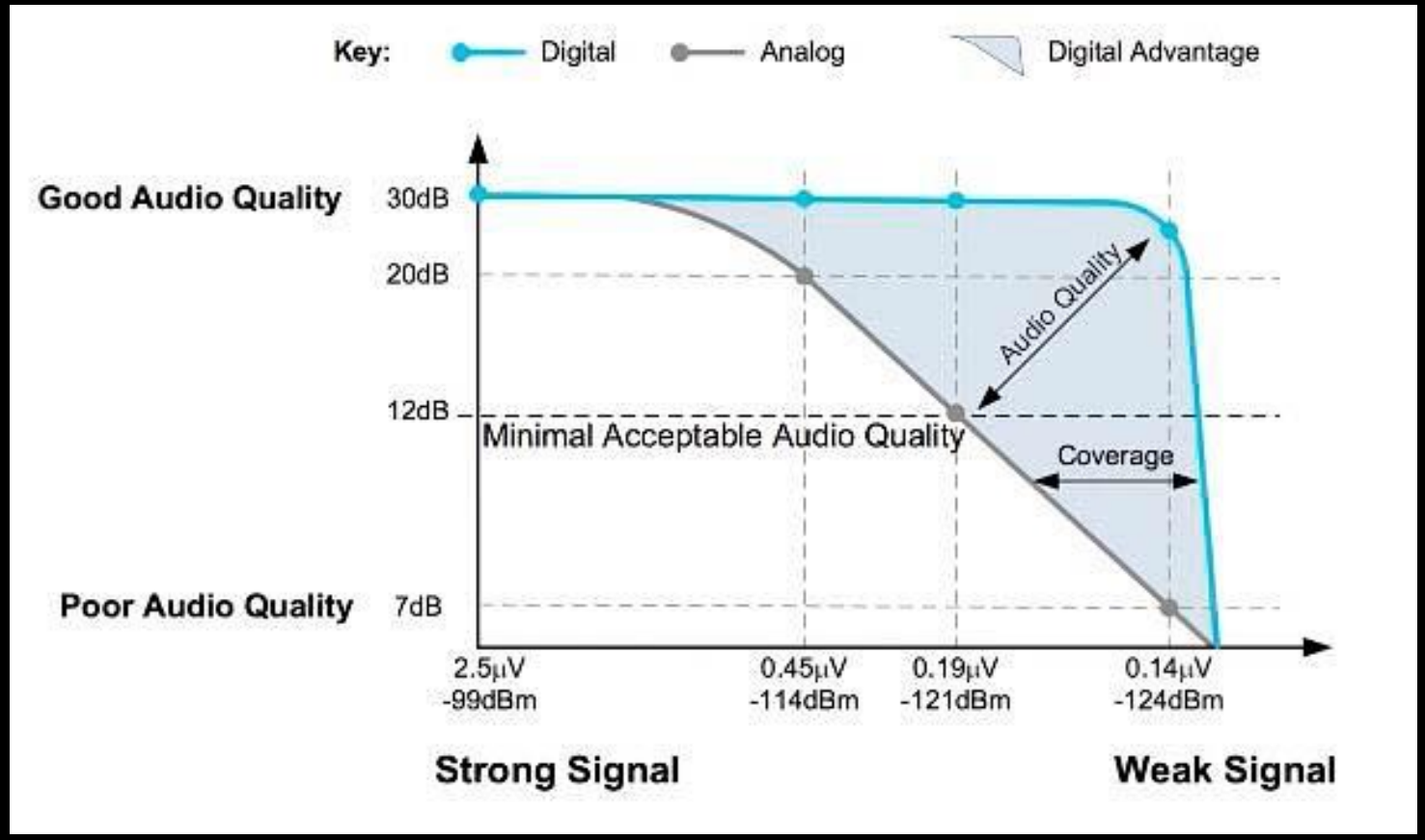
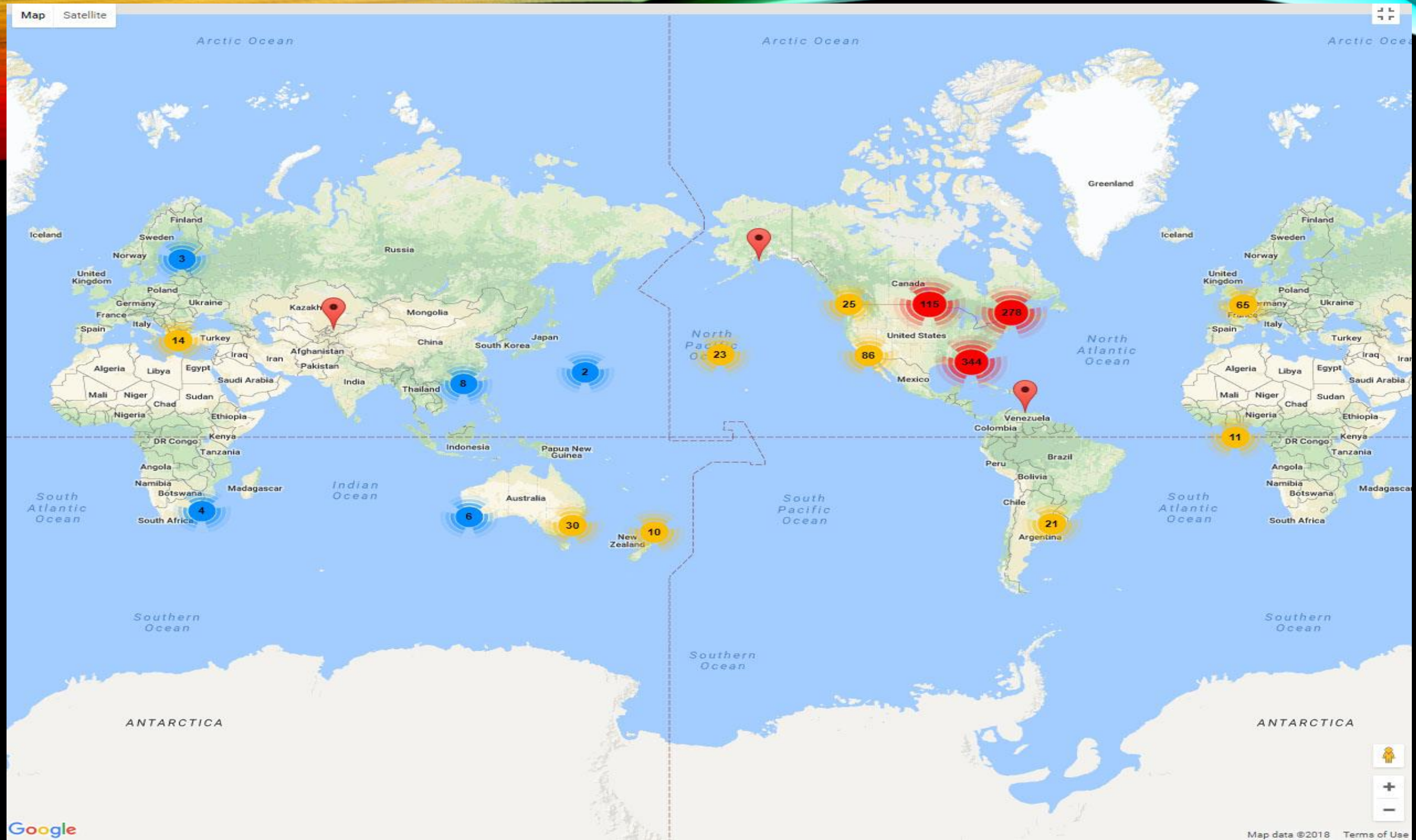

Digital (FDMA)
Digital (TDMA)
Slot 2
Slot 1
Slot 2
Slot 1
Slot 2 30msec
Slot 1 30msec
time
frequency
2 x 6.25kHz Channels
frequency
12.5kHz Channel

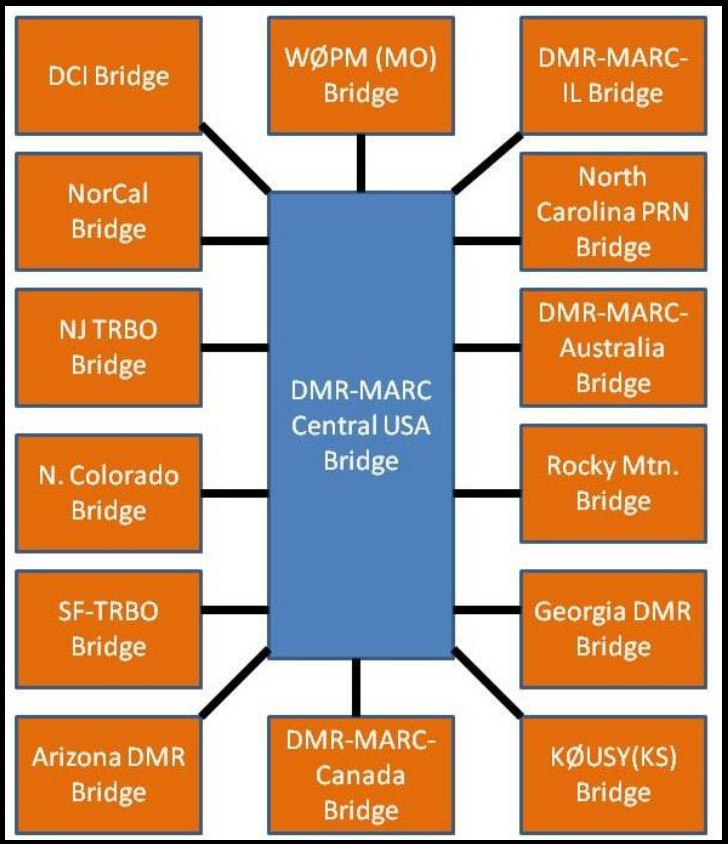
INTRO TO DMR


Key:
Digital
Analog
Digital Advantage
Good Audio Quality
30dB
20dB
12dB
Minimal Acceptable Audio Quality
Audio Quality
Coverage
Poor Audio Quality
7dB
2.5µV
-99dBm
0.45µV
-114dBm
0.19µV
-121dBm
0.14µV
-124dBm
Strong Signal
Weak Signal


Map
Satellite
Arctic Ocean
Arctic Ocean
Arctic Ocean
Greenland
Iceland
Finland
Sweden
Norway
United Kingdom
Poland
Germany
Ukraine
France
Italy
Spain
Russia
Kazakh
Mongolia
China
South Korea
Japan
Turkey
Iraq
Iran
Afghanistan
Pakistan
India
Thailand
Indonesia
Papua New Guinea
Australia
New Zealand
Algeria
Libya
Egypt
Saudi Arabia
Mali
Niger
Chad
Sudan
Nigeria
Ethiopia
DR Congo
Kenya
Tanzania
Angola
Namibia
Botswana
Madagascar
South Africa
Canada
United States
Mexico
Venezuela
Colombia
Peru
Brazil
Bolivia
Chile
Argentina
North Pacific Ocean
North Atlantic Ocean
South Pacific Ocean
South Atlantic Ocean
Indian Ocean
Southern Ocean
Southern Ocean
Southern Ocean
ANTARCTICA
ANTARCTICA
3
14
4
8
2
6
30
10
23
25
115
278
86
344
65
11
21
Google
Map data ©2018
Terms of Use

INTRO TO DMR

- DMR-MARC bridge system
- C-Bridge system
- This diagram is now outdated. Additional bridges have been added.
- Talkgroups (TG) are assigned through the central bridge AND the smaller bridge links. They can be either always on or push-to-talk (PTT) activated. PTT TG generally “time out” after a given period of time.
- The repeater owner has final assignment of the 16 channels on that repeater.
- One of the channels is always “local” and another is nearly always “parrot” or “echotest”.



INTRO TO DMR

- Brandmeister Network
  - Is software on master servers that participate in a worldwide network of amateur radio digital voice systems.
- Brandmeister Allows…
  - Roam automatically from repeater to repeater
  - Make private QSOs on any time-slot
  - Make world-wide QSOs with any type of amateur DMR network
  - Send my location to APRS
  - Send and receive SMS messages
  - And More…….
- BrandMeister allows you to connect to MOTOROLA DMR-MARC and Hytera DMRplus networks, this means you can operate with other DMR amateur radio operators on both infrastructures the same time.

INTRO TO DMR

- Code Plugs
  - This is the program for the radio
  - Terminology is carry over from older Motorola radios
  - The configuration was written to a module that was “plugged” into the radio
  - Now configured on the PC and via USB cable transferred to the radio

  - Fortunately Hams are willing to share their code plugs to get you going quickly
  - As you become familiar with the software you can modify to suit your tastes.

  - Code Plugs are radio specific
  - Terminology needed to write a code plug

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- Some Common DMR Terminology
  - Color Codes
    - Every repeater has a color code.
    - Color codes can be thought of as the PL or CTCSS tones of DMR
    - You MUST know the color code
  - Timeslot
    - Time slot is important for fixed talkgroups
    - On networks like the DMR-MARC time slots are assigned specific talk groups
    - On Brand Meister talk groups can be configured on any time slot. Some talk groups can be fixed but that is up to the repeater owner.
    - If Talkgroup A is being used on TS1 that means that no other talkgroup can use that timeslot. If you key up Talkgroup B on TS1 in between exchanges, you will "steal" the timeslot away from the folks on Talkgroup A. Good amateur practices are a must!

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- Some Common DMR Terminology (Cont'd)
  - Talk Groups and Private calls
    - DMR radios have ID numbers that resemble phone numbers
    - You have private calls and group calls.
    - In general you configure a channel for a group call
    - Private calls are considered "not in the amateur spirit" but the system can handle it. Some networks and repeater owners do not allow this. Private calls busy out a time slot with no way for others to join in.
  - Contacts
    - Talk groups are group contacts
    - Other amateurs are private contacts

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- Some Common DMR Terminology (Cont'd)
  - Channels
    - Can be analog or digital
    - Channels include all repeater information including
      - Frequency
      - CTCSS/DCS codes if analog
      - Color Code for digital
      - Time Slot for digital
      - Contact (This your talk group or group contact)
      - RX Group (depending on the radio)
      - Other options... TOT, VOX etc..

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- Some Common DMR Terminology (Cont'd)
  - Zones
    - Zones are banks of channels
    - Most Radios allows 16 channels per zone
    - Zones are not forgiving in order
      - It is easy to delete zones and recreate them then to try to reorder
    - Zone ideas:
      - Repeater names
      - City Names
      - Region Names
    - Other zones (For listen only):
      - FRS
      - GMRS
      - MURS
      - Weather
      - School frequencies
      - Emergency Services

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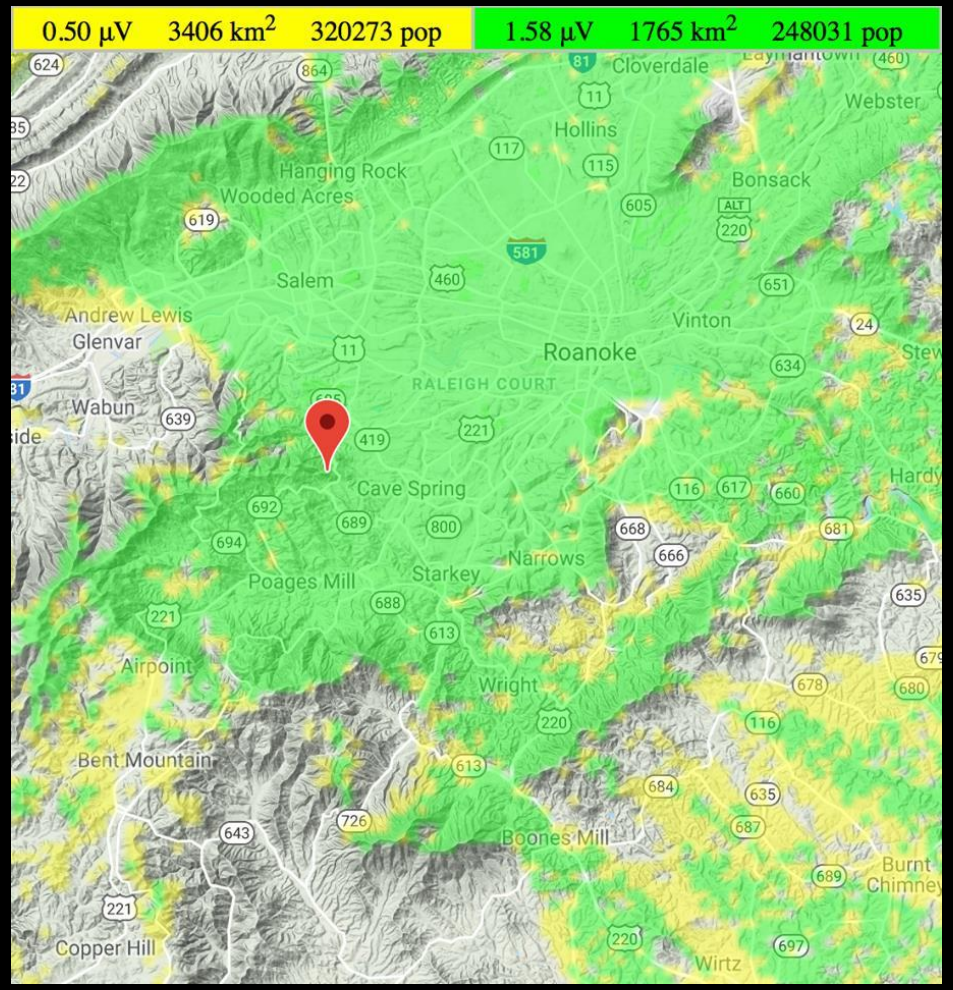
Coverage map for KD4EG repeater.



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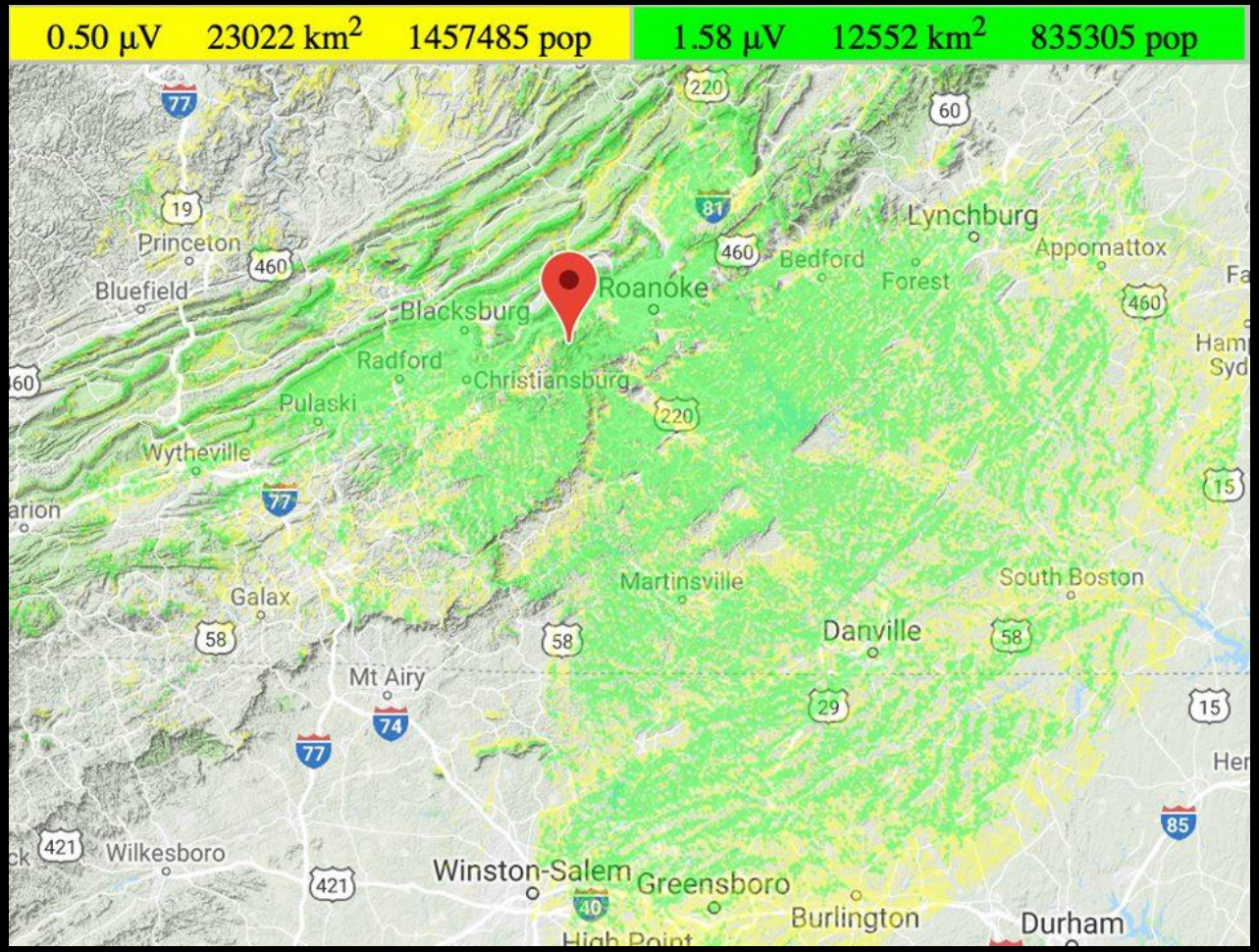
Coverage map for W5CUI repeater.



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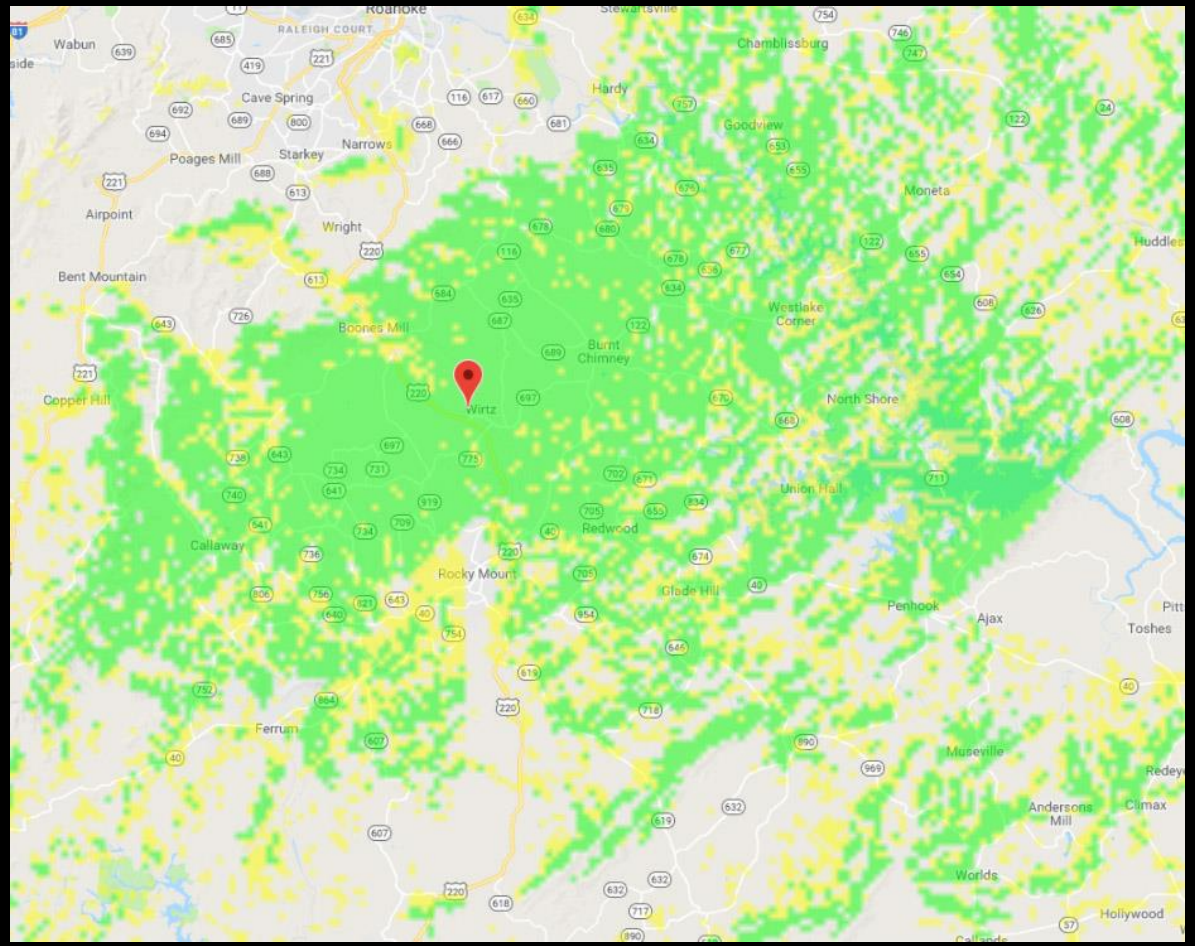
Coverage map for W4JWC repeater.

- (future)



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- Questions??

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- Resources
  - DMR-MARC.net
  - Brandmeister.network
  - DMRfordummies.com
  - va3xpr.net
  - Youtube.com/results?search_query=dmr+radio
  - Papasys.com/dmr101/