

# DMR

## Digital Mobile Radio

A primer (because that's all I know...)

# What it is....

- Digital Mobile Radio  
is an open [liars] standard for  
digital mobile radio.

Helpful, ain't it. But it's hard to be more specific,  
because it's a suite of standards.

- Primarily, it's a way to squeeze a voice channel into less  
bandwidth. But wait; there's more . . . .
- Popular. There are something like 500 DMR repeaters in  
the Houston area.

# Vocoding, Multiplexing, and Modulation, Oh my!

- Digital radio systems have
  - A **VOCODER** that converts analog speech to digital data. Currently every digital mobile radio standard uses a proprietary vocoder from DVSI. Think who's gonna be president is a corrupt process? \$\$\$
  - A **MULTIPLEXING** scheme that allows multiple signals to occupy one 12.5 kHz channel
  - A **MODULATION** scheme that imposes the baseband bits onto the RF carrier

# The Grid from Hell

Scheme	Vocoder	Multiplexing	Modulation
DMR Tier-II / III	AMBE + 2	TDMA 30-ms slots	4FSK
Yaesu System Fusion	AMBE + 2	FDMA	C4FM
P25 Phase 1 ( <i>e.g.</i> , TxWARN)	IMBE	FDMA	C4FM
P25 Phase 2 ( <i>e.g.</i> , TxWARN)	AMBE + 2	TDMA	H-DQPSK H-CPM
D-STAR	AMBE	FDMA	GMSK
NXDN	AMBE + 2	FDMA	4FSK

# Color Codes, Slots, and Talkgroups, Oh my!

- Any one repeater (or radio in peer-to-peer) always sends the same **COLOR CODE**, CC0 to CC15. It's half of the DMR equivalent of PL, DCS, *etc.* CC does *not* go along with the baseband intelligence in an IPSC; it's purely local.
- Any one subscriber radio always talks on just one **TIME SLOT** at a time, 0 and 1 (or is it 1 and 2??). Slot does *not* go along with the baseband intelligence in an IPSC. But there are some network-specific slot-for-TG conventions.
- Any one transmission includes a **TALKGROUP**. It's the other half of the DMR equivalent of PL, DCS, *etc.* TG does go along with the baseband intelligence in an IPSC (sort of). Many non-amateur conventional DMR repeaters use just one TG. Sorta defeats the purpose, doesn't it?

# Benefits

- What's the most obvious benefit of only transmitting ½ the time?
- The repeater can talk to your radio while you're talking to the repeater. It can acknowledge you. It can turn you off. It can stun you. *Etc.*
- Digital: It sounds great. Until it doesn't, and then you hear nothing.
- Your radio can tell you who's calling you.
- Short messages (although currently discouraged).
- IPSC

# Equipment

- Largely a UHF mode (except in Pave PAWS areas [*i.e.*, Beale and Cape Code])
- There are a couple DMR repeaters in Houston. The one I can reach the best is KD5DFB, 441.77500, +5, CC7. [The Repeater Book says it's closed; you can use it.]
- Demo in radio room after meeting if anybody's that bored

# Equipment

- No amateur radios from the big guys currently do DMR.
- The Tytera MD-380 and MD-390, and the Connect Systems CS-700 are popular. Rich hams and hams in the communications biz use commercial gear, largely from Motorola and Hytera.
- To program a radio, you create a **CODEPLUG**, which is Motospeak for a profile. You must get a Radio ID from DMR-MARC!
- There are also hot spots, sticks, APs, *etc.*: DV Dongle, Thumb DV, DVAP, dv4mini, openSPOT, dvMega, BlueDV, *etc.*), and even a tri-band mobile Fusion / D-STAR / DMR / dPMR / P25 / NDXN / VoLTE / FM dv4Mobile (currently vaporware). Some require a computer; some don't.



# Not your grandfather's "channel"

- Local repeater's receive and transmit frequencies
- Local repeater's color code
- Talkgroup and Time Slot that you want to use (and not necessarily the Talkgroup or Time Slot that the other guy's using)
- Zone, Channel #, Name, and lots of other stuff
- And to be thorough, basic or enhanced privacy key

**BUT NOT ON PART 97 FREQUENCIES!**

# IPSC: The Wild, Wild, West

- IPSC is not part of the DMR spec
- It's cool. TG1 = WW. TG3 = NA. TG9 = local. TG99 = simplex. TG3148 = All TX. TG3175 = OK/TX region.
- It's frontier life: dangerous, no rules, *etc.*
- Lots of servers (DMR-MARC [the US central master], NorCal, Brandmeister, *etc.*) patching repeaters and APs and PCs from TG to TG
- It can be very confusing. A repeater might carry 20 TGs from a server. What if 2 of them are active at the same time? [Trick question.] What if >2 of them are active at the same time? E.g., TAC310
- Why have TAC310 work that way? How many watts does a PTT on TG3 burn?

# Trunking

- DMR has three tiers
- Tier I is not used in the US. It's for unlicensed 446 MHz portables in EU.
- Tier II is conventional licensed DMR, used in the US for LMR.
- Tier III adds trunking (FDMA with large) standards to Tier II. But you won't find much in the US. Instead, you will find MotoTrbo Capacity Plus and Connect Plus. *E.g.*, in Houston, there are a jillion of them. Listen from 460 to 465 MHz some afternoon.
- Not used by amateurs currently

## See also...

- There's a lot more to it, but don't let that scare you off:
  - Admit criteria
  - Scan lists
  - Contact Lists
  - IPSC
  - APs
- Get the "Amateur Radio Guide to Digital Mobile Radio". It's a bit OOD, but it's still a good read.

# Questions?

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