

DMR (Digital Mobile Radio) vs. Analog LMR (Land Mobile Radio)

Which one is right for me?

Many folks new to radio (and some old-timers as well) generally believe that anything a manufacturer produces that's "newer" is nearly always "better", so many marketing departments go out of their way to make their marketing match or exceed customer expectations (and take advantage of customer's not knowing what's accurate information).

Within the radio communications world, a lot of marketing noise is being made regarding DMR (digital mobile radio) without most folks ever realizing the various hidden issues regarding DMR choices. There are many places to go on the internet to get technical information regarding radio technology choices, but this paper will attempt to provide an overview of the pros and cons of DMR vs. LMR (land mobile radio) technology - without getting bogged down into the various technical differences between the two formats.

Anyone considering DMR has probably assumed that any newer DMR radio will automatically have the features of their older LMR radios (many manufacturer's marketing departments count on this basic mistaken assumption). Unfortunately, many of the DMR radios currently on the market do not have the features of previous analog LMR radios.

For example, most DMR radios (handheld or mobile) only ship with one radio band included (VHF or UHF), but not both. Yes, you can get dual-band DMR radios, but they are NOT the ones you generally see at attractive pricing on the internet (various lower cost TYT, Tytera, and Hytera models come to mind). If you plan on using both VHF and UHF communications, you'll need to shell out additional money for either a second single band DMR radio (and carry that second radio on your belt), or spend the extra money for a higher priced dual-band DMR radio.

Another big problem (within the DMR market) is the lack of common digital standards. Again, we're not going to debate the various pros and cons of the various digital modes available (like P.25, MotoTrbo Tier I/II, NXDN, IDAS, C4FM, or D-Star). The important thing for you to realize is that these digital modes are normally not compatible with each other!

As an example, think Beta vs. VHS, or (if you are younger) Blue-Ray vs. HD DVD. In both cases, the technically higher quality products (Beta tape and HD DVD) both lost out in the consumer marketplace. Until the various digital manufacturers establish either a common DMR standard (or a way for each digital radio to talk to another digital radio using a different DMR format easily and at low cost), you may spend your hard-earned money only to find out a few years from now you picked the wrong horse in that digital radio race.

So "if" you get a TYT MD-380 MotoTrbo Tier II radio and your buddy is using his Icom's D-Star radio just a mile down the road (or even a MotoTrbo Tier I radio), you can't talk to one another using your "digital" simplex radio mode. "if" both radios have an analog option (not all DMR radio do), and "if" both operators understand why they can't work (hear) each other (and switch their radios to analog mode), and "if" both radios have the same frequency range, and "if" both radios are easily programmable in the field, they'll be able to communicate, but only in analog mode.

"if" you can accept giving up the entire VHF band (to get one of the cheaper single band only UHF DMR radios), another big issue is less range (distance) using DMR radios. Most DMR users (under actual field conditions, not

marketing lab test results under perfect conditions) report digital transmissions are up to ½ less range than their LMR analog counterparts (on the same frequency with the same power level and antenna type). DMR radios are just like your HD television, you're either within range completely (with a great picture) or you're not getting a picture at all (there's no in-between signal).

TV manufacturers get around this problem by getting TV users to subscribe to cable or DirecTV. DMR radio manufacturers get around this problem in much the same manner (by selling you more DMR repeaters with their proprietary protocols to extend your range).

Government agencies can easily overcome this loss of DMR distance by simply taking our tax dollars and installing more DMR repeaters, but for most end user's, unlimited radio budgets are not an option, and many amateur radio operators that first dive into DMR for the new "wow" factor end up admitting that DMR simplex range is far less (up to ½ vs. their previous analog radios), plus there are far fewer DMR repeaters available to fill in the large coverage gaps.

In my home state of Arizona, for example, there are only 18 open DMR ham radio repeaters in the entire state, and of those, 10 of the 18 are in the immediate Phoenix or Tucson areas (leaving very little DMR ham radio repeater coverage for the remainder of the state). Compare that to over 325 analog ham radio repeaters in the state and you begin to see the challenge using DMR (to get the same coverage area) vs. analog LMR. Even our Arizona state police still use analog LMR UHF radios and repeaters for their statewide coverage needs (at least for now).

Another common mistake is thinking that all DMR radio users are on the same frequency bands (although this is also a problem with some new analog radio users as well). Just because you own a DMR radio doesn't automatically mean your new DMR radio will be able to chat with local law enforcement using their own DMR radios, for example, as they may be on completely different frequency bands as you, plus they may also be using a completely different DMR protocol as you.

As an example, if you purchase a common UHF only DMR handheld that covers the 400-520 MHz band and your local law enforcement is using a portion of the 800 or 900 MHz band for their communications, you're flat out of luck. If you purchase a Motorola style MotoTrbo Tier II radio and they are using Kenwood's NXDN DMR radios (even if you are on the same exact frequency), you're again out of luck, as these two different DMR protocols don't play well together (as discussed previously).

Various commercial companies have expensive DMR protocol conversion hardware tools to allow agencies to communicate across these DMR incompatible issues, but again the purpose of this email is to point out some of the issues you'll face implementing DMR as your "standard" on a personal (non-governmental) level, and for the purpose of this paper, I've assumed that you want maximum simplex range in the field, you don't own several expensive DMR repeaters (in your choice of protocol), and that you don't own one of several expensive commercial DMR protocol converters to allow one group of DMR users to talk to another (even when you're within sight of one another).

So, with various DMR issues like these, why have some agencies (local, state, and federal) jumped into DMR?

Well, one big reason is that after the 9-11 terrorist attacks in New York City, the federal government offered grants to law enforcement agencies nationwide urging them to purchase newer radio technology, and most

government bureaucrats jumped at the chance to purchase shiny new toys (at taxpayer expense), when their local budgets weren't impacted (at least not at first).

Many new 400-500 MHz DMR systems were installed, and many agencies were also told that a side benefit would also be fewer taxpayers being able to listen in on their agency communications, which may have been true at first, but soon cheap smartphone apps appeared on the market that streamed many of those same DMR "secure" communications to anyone (willing to install it on their Android or iPhone device for free or at minimal cost).

Many agencies then moved their communications to the less used (and thus more secure) 800-900 MHz band, but again third-party app programmers simply adjusted their software code, purchased a newer scanner, and again streamed those communications to folks that purchased their phone apps.

Seeing a marketing opportunity, many commercial radio manufacturers offer various forms of digital encryption at very high costs (per radio) to government agencies. Many state and federal agencies (again using our tax dollars), think nothing of dropping \$5,000 (or more) for a handheld radio with encryption (to block folks from listening in), but then those same government agencies prevent consumers from purchasing that same level of encryption for their DMR radios by pressuring Congress to pass laws preventing encrypted communications by consumers.

Again, many folks new to DMR think they can simply order government level encryption for their personal radios (they can't), or that DMR radios have encryption built in (they don't).

Even "if" you find that your local Police or volunteer Fire Department are using DMR radios within the 400-520 MHz UHF band, don't assume that any purchase you make for a DMR radio (within the same frequency range) means you'll be able to chat with them, as the DMR protocols may be different, or they may have government approved encryption enabled, plus the FCC generally frowns (with large fines) anytime they catch non-approved radio users on government frequencies or channels, even "if" your local Police or Fire Department Chief said he thought it would be "ok" to help them out during any number of local issues.

So "if" you want the maximum simplex range available for your group (and you don't have a virtually unlimited budget thanks to U.S. taxpayers), analog LMR radios are clearly the better choice, plus several of them offer higher power (10 watts on a dual-band handheld, or a temporary cross-band repeater to extend your range even further). I haven't found a single DMR radio that offers 10 watts of power in a handheld, and since most DMR radios are UHF only, none of them offer any cross-band repeat capability either.

If you have a need for more OPSEC requirements than most (or during certain critical situations), there are analog radios available with some interesting options that will provide far more security than just using open FRS/GMRS channels. Give me a call if that's a direction you (or your group) need to go, and we can discuss your options.

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