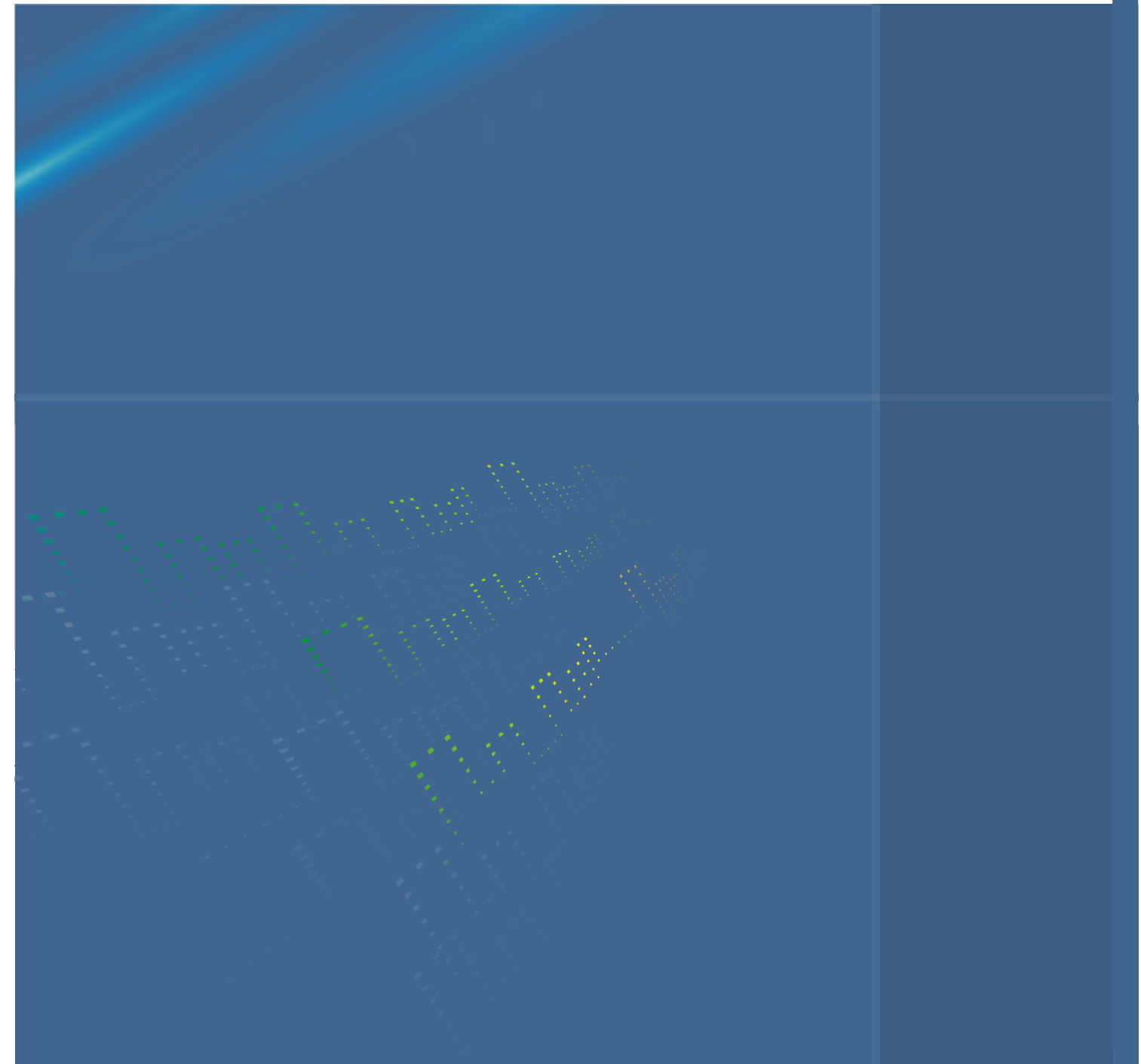




White Paper on Hytera DMR

ETSI DMR Standard



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About DMR »

The limitations of analogue technology

Although analogue technology still offers some great benefits low total cost of ownership, customizable coverage and features and simple/reliable implementation it has reached its peak. Among its chief limitations are battery life, voice quality (near the edge), low productivity in communication and integrated data applications. In addition, analogue radio users are facing spectrum limitations resulting in crowding and interference.

LMR systems have used 25 kHz-wide channels. The current spectrum efficiency can not meet the requirement. In December 2004, the Federal Communications Commission mandated that all private LMR users operating below 512 MHz move to 12.5 kHz narrowband voice channels and highly efficient data channel operations by January 1, 2013. If you are operating a wideband (25 kHz) system in the VHF or UHF land mobile band, you may continue to do so until the deadline January 1, 2013. As a practical matter, however, you may want to start planning and preparing for your narrowband conversion now. In addition, beginning on January 1, 2011, licensees will be permitted to apply for new systems or to expand their existing systems only if they will be utilizing 12.5 kHz bandwidth (or less) equipment or equipment that satisfies the efficiency standard. Therefore, you will need to take this deadline into consideration if you are planning to implement a new system or to make modifications to your existing system.

On Dec. 16, 2009, Ministry of Industry and Information Technology of the People's Republic of China (MIIT) announced that 25kHz radio mode will not be approved after Jan. 1, 2010, analogue radio will not be approved after 2011, and all radios have to be migrated into digital by 2016.

DMR Standard Introduction

DMR (Digital Mobile Radio) is a digital radio standard for Professional Mobile Radio (PMR) users developed by ETSI (the European Telecommunications Standards Institute). It is specifically targeted at systems where analogue PMR is currently applied and designed to deliver digital voice, data and other supplementary services in a simple and low cost manner, and first ratified in 2005.

About The DMR Association

The DMR Association was first set up in 2005 as the DMR-MOU Association by a group of leading public mobile radio manufacturers to support ETSI during the DMR standardization process. The DMR Association is open to any organization or individual interested in using or building DMR products or in supporting the DMR standard in other ways. The Association maintains links with regulators, trade bodies and standards organizations around the world.

The companies below are members of the DMR Association. But, Only HYT and Motorola own the DMR terminal products so far.



The DMR Standard

Digital Mobile Radio (DMR) is a digital radio standard specified for professional mobile radio (PMR) users developed by the European Telecommunications Standards Institute (ETSI), and first ratified in 2005. The DMR protocol covers unlicensed (Tier I), licensed conventional (Tier II) and licensed trunked (Tier III) modes of operation, although in practice commercial application is today focussed on the Tier II and III licensed categories.

The standard is designed to operate within the existing 12.5kHz channel spacing used in licenced land mobile frequency bands globally and to meet future regulatory requirements for 6.25kHz channel equivalence. The primary goal is to specify affordable digital systems with low complexity. DMR provides voice, data and other supplementary services. Today products designed to its specifications are sold in all regions of the world.

The difference between DMR and other standards

Although DMR, TETRA, P25, and MPT-1327 are all based on open standards, they are also based on different protocols and targeted at different markets (e.g., TETRA and P25 are largely used by public safety organisations) and are not technically compatible. Another standard created by ETSI, dPMR, is considered a competitor to DMR in the business market, but as of today, products built to the standard are targeted at the low power, unlicensed part of the specification, best suited for personal use, recreation, small retail and other settings that do not require wide area coverage or advanced features. Moving forward, we hope to see more and more systems work in conjunction with DMR, where it makes market/business

The coverage area of a TETRA base station is approximately between half and one third compared to that of an analog or DMR radio system, therefore TETRA needs a lot of more sites. A medium size TETRA system may costs 3 to 5 times more than a DMR one. The features of these systems are near the same (digital encryption, positioning, messaging ...) and the younger DMR is developing rapidly the applications.

TETRA is a trunking system targeted to point to point communications in multi cell and high traffic density environments. Like a telephone network, hundreds of users in a little area require a lot of radio cells to deliver the communications. DMR is a dedicated channel or trunking system targeted to provide robust coverage rather than

Capacity.



The Market Tiers of DMR

The PMR market can be divided into three broad tiers: commercial, public safety and business-critical professional. Different products and standards address different tiers. DMR crosses all three tiers. Such as Public safety, Private security, Government, Education, Campus & Hospitality, Manufacturing and construction, Utilities, Transport, and Oils & Gas.

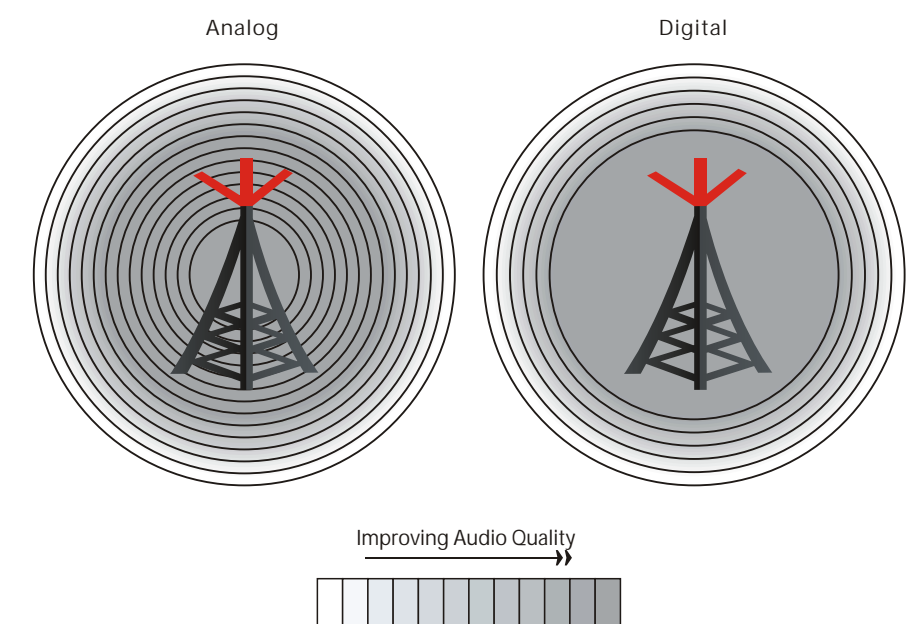
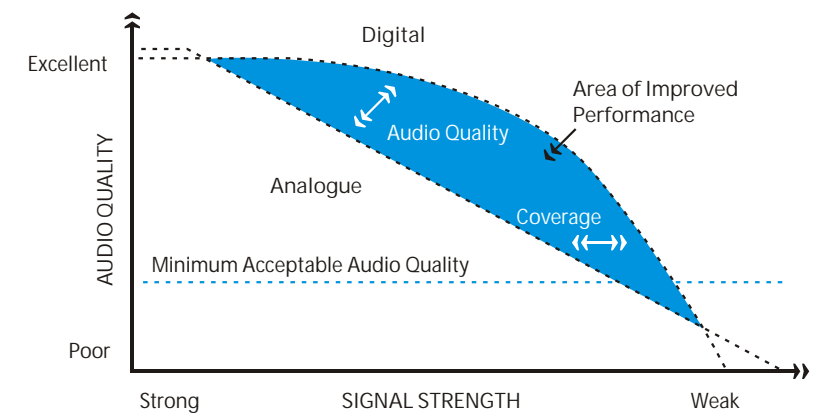
Public Safety	Mission Critical or Community Link	APCO P25, TETRA
Utilities Security Public Service	Professional Tier Products	DMR
Education Construction	Commercial Tier Products	
Retail Services	Business Radio Tier	DPMR

The Advantages of DMR Technology »

Superior audio performance

DMR Digital technology provides better noise rejection and preserves voice quality over a greater range than analogue, especially at the farthest edges of the transmission range based on the combined application of narrowband codec and digital error-correction technology.

The digital processing is able to screen out noise and re-construct signals from degraded transmissions. Users can hear everything being said much more clearly increasing the effective range of the radio solution and keeping users responsive to changing situations in the field.



Predictable doubling of capacity in your existing 12.5kHz licensed channels

One of the principle benefits of DMR is that it enables a single 12.5kHz channel to support two simultaneous and independent calls. How this is achieved?

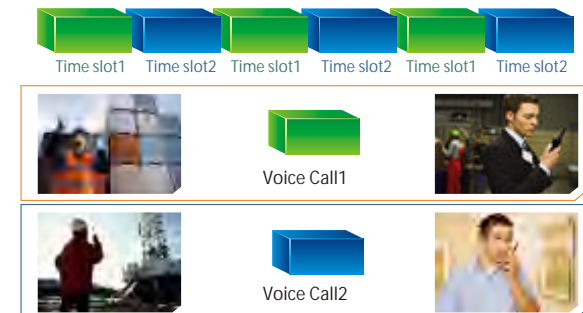
Under the DMR standard, Time Division Multiple Access (TDMA) retains the 12.5kHz channel width and divides it into two alternating timeslots. Each timeslot acts as a separate communication channel with an equivalent bandwidth of 6.25kHz, but the channel as a whole maintains the same profile as an analogue 12.5kHz signal.

This means that DMR will fit into your existing licensed PMR bands, meaning that there is no need for re-banding or re-licensing and at the same time doubling the capacity of your 12.5kHz channel.

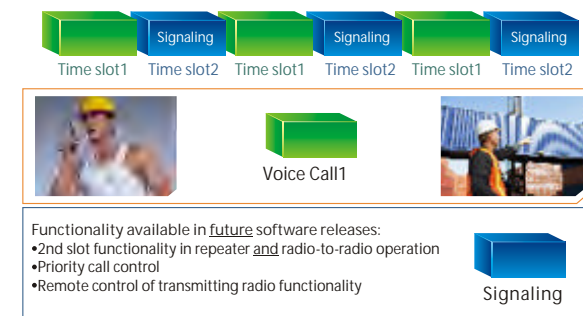


While voice is utilising the first time slot the second time-slot can, in a TDMA system, be used for transmitting application data such as text messaging or location data in parallel with call activity useful, for example, in dispatch systems that provide both verbal and visual dispatch instructions. In an increasingly data rich world this enhanced data capability may become important. The future roadmap for two-slot TDMA applications includes the ability to temporarily combine both slots to effectively double the data rate, or to use both slots together to enable full-duplex private calls. FDMA solutions can not deliver these capabilities on a single channel.

TDMA Advantage: Double Voice Capacity

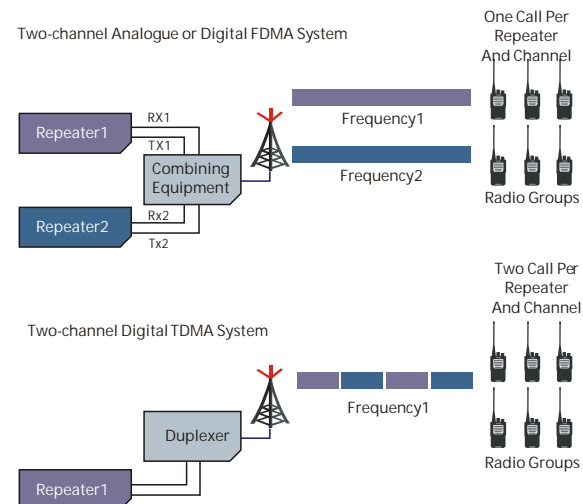


TDMA Advantage: Unique Future Functionality



Efficient use of infrastructure equipment

Another advantage of the DMR TDMA approach is that you get the two channels with one repeater, one antenna and a simple duplexer. Compared to FDMA solutions, two-slot TDMA allows you to achieve 6.25kHz equivalent efficiency while minimising investments in repeaters and combining equipment. The required equipment of the two approaches for a simple system is shown below.



FDMA requires a dedicated repeater for each channel, plus expensive combining equipment to enable multiple frequencies to share a single base-station antenna. It can be particularly expensive to make combining equipment work with 6.25kHz signals, and there's typically a loss in signal quality and range when it's used in this way.

Two-slot TDMA achieves stable two-channel equivalency using single-channel equipment. No extra repeaters or combining equipment are required (and there is lower drain on air conditioning and less back up power supplies needed). This means lower cost and simpler site planning for DMR users.

Longer battery life and greater power efficiency

One of the biggest challenges with mobile devices has always been battery life. In the past, there have been limited options for increasing the talk time on a single battery charge.

Two-slot TDMA, however, offers a good way forward. Since each call uses only one of the two timeslots, it requires only half of the transmitter's capacity. The transmitter is idle half the time that is, whenever it's the unused timeslot's turn. For example, in a typical duty cycle of 5 percent transmit, 5 percent receive, and 90 percent idle, the transmit time accounts for a high proportion of the drain on the radio's battery. By cutting the effective transmit time in half, two-slot TDMA can enable up to 40 percent improvement in talk time in comparison with analogue radios. (One manufacturer's published product literature gives a talk time of 9 hours operation for analogue mode but 13 hours for digital mode on the same radio). With overall battery consumption per call dramatically reduced longer usage time in the field between recharges is enabled. Modern digital devices also include sleep and power-management technologies that increase battery life even further.

These power efficient features give DMR users a leaner and greener radio network as well as one with the benefit of long

Compatible with current FM analog system and support to migrate to DMR system easily stage by stage

DMR can operate in either analog or digital mode. Accordingly, you can get rid of worries about its compatibility with the analog system that you are using, and just enjoy the benefits it brings. DMR allows migration to take place one radio at a time, one channel at a time or the entire system at a time

Enhanced privacy with digital technology

On analogue channel, the audio signal can still be monitored even it is not easy to identify. DMR offers inherent protection against casual eavesdropping using scanner etc. On a digital channel, the audio signal cannot be heard if the signaling or ID doesn't match and there totally has 16776415 ID



battery life on the radios themselves.

Ease of use of and creation of data applications

The end-to-end digital nature of DMR enables applications such as text messaging GPS and telemetry to be easily added onto radio devices and systems.

As the DMR standard also supports the transmission of IP data over the air, this enables the easy development of standard applications. In a world which increasingly relies on data as well as voice communication this ability to add a wide range of data applications to your system results in the greatest possible return on your investment.

Security of supply through a fully open, well established, widely backed standard

As DMR is a fully public open standard backed by a wide variety of vendors, buyers can be assured of continuity of supply. Today DMR is the most widely adopted digital two way radio system, is in active use in over 100 countries and is the market leading digital PMR technology.

Conclusion »

DMR is the best established digital technology in the market today and is the clear choice for organizations looking to deploy new digital two-way radio systems, or to upgrade their existing analogue radio to digital.