

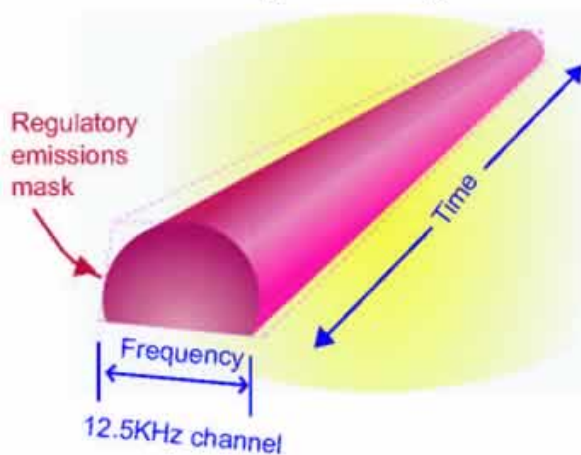
# Delivering Increased Capacity

## Delivering Increased Capacity

MOTOTRBO uses a two-slot TDMA architecture. This architecture divides the channel into two alternating time slots, thereby creating two logical channels on one physical 12.5kHz channel. Each voice call utilizes only one of these logical channels, and each user accesses a time slot as if it is an independent channel. A transmitting radio transmits information only during its selected slot, and will be idle during the alternate slot. The receiving radio observes the transmissions in either time slot, and relies on the signaling information included in each time slot to determine which call it was meant to receive.

By comparison, analog radios operate on the concept of Frequency Division Multiple Access (FDMA). In FDMA, each transmitting radio transmits continuously on a designated channel, and the receiving radio receives the relevant transmission by tuning to the desired carrier frequency.

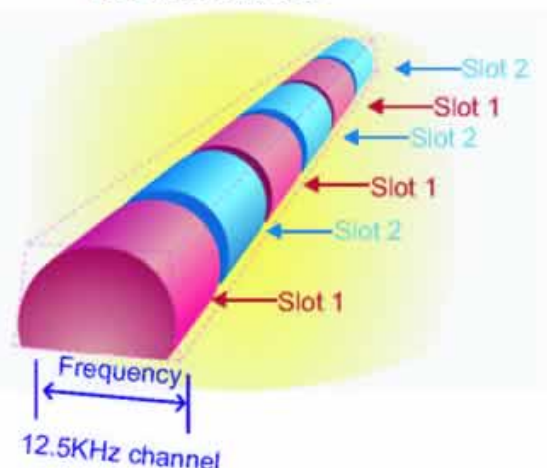
### Today's Analog



#### 12.5kHz Analog

- 1 voice for each 12.5kHz channel
- A single repeater for each channel

### MOTOTRBO



#### 12.5kHz TDMA

- Divides existing channel into two timeslots
- Delivers twice the capacity through repeater
- Performance is same or better than 12.5kHz FDMA
- Single repeater does work of two repeaters
- Reduces need for combining equipment
- Enables 40% increase in radio battery life

TDMA thereby offers a straightforward method for achieving 6.25kHz equivalency in 12.5kHz

repeater channels – a major benefit for users of increasingly crowded licensed bands. Instead of dividing channels into smaller slices of decreased bandwidth – which is what would be required to increase spectrum efficiency with FDMA methods, TDMA uses the full 12.5kHz channel bandwidth, but increases efficiency by dividing it into two alternating time slots. Additionally, this method preserves the well-known radio frequency (RF)

performance characteristics of the 12.5kHz signal. From the perspective of RF physics – that is, actual transmitted power and radiated emissions – the 12.5kHz signal of two-slot TDMA occupies the channel, propagates, and performs essentially in the same way as today's 12.5kHz analog signals. With the added advantages of digital technology, TDMA-based radios can work within a single repeater channel to provide roughly twice the traffic capacity, while offering RF coverage performance equivalent to, or better than, today's analog radio.

### **Two-Slot TDMA Reduces Infrastructure Equipment**

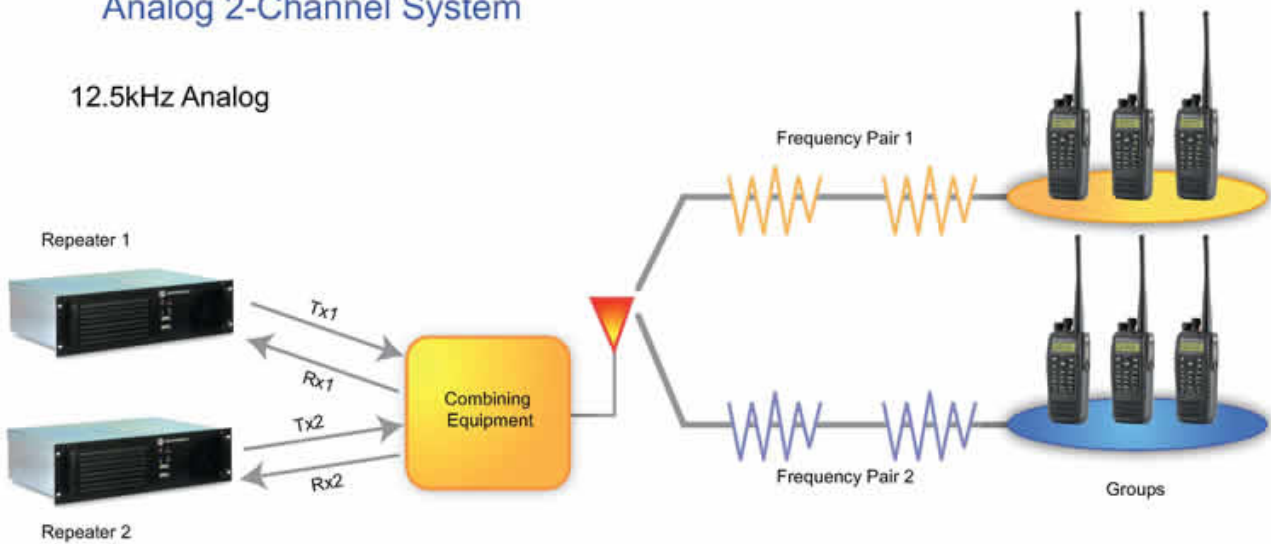
As we have seen, two-slot TDMA essentially doubles repeater capacity. This means that one MOTOTRBO repeater does the work of two analog repeaters (a MOTOTRBO repeater supports two calls simultaneously).

This saves costs of repeater hardware and maintenance, and also saves on the cost and complexity of RF combining equipment necessary in multi-channel configurations.

Just as importantly, there is no need to obtain new licenses for the increase in repeater capacity, and compared to alternative technologies that may operate on different bandwidths, there is no comparative increase in the risk of interference with or from adjacent channels.

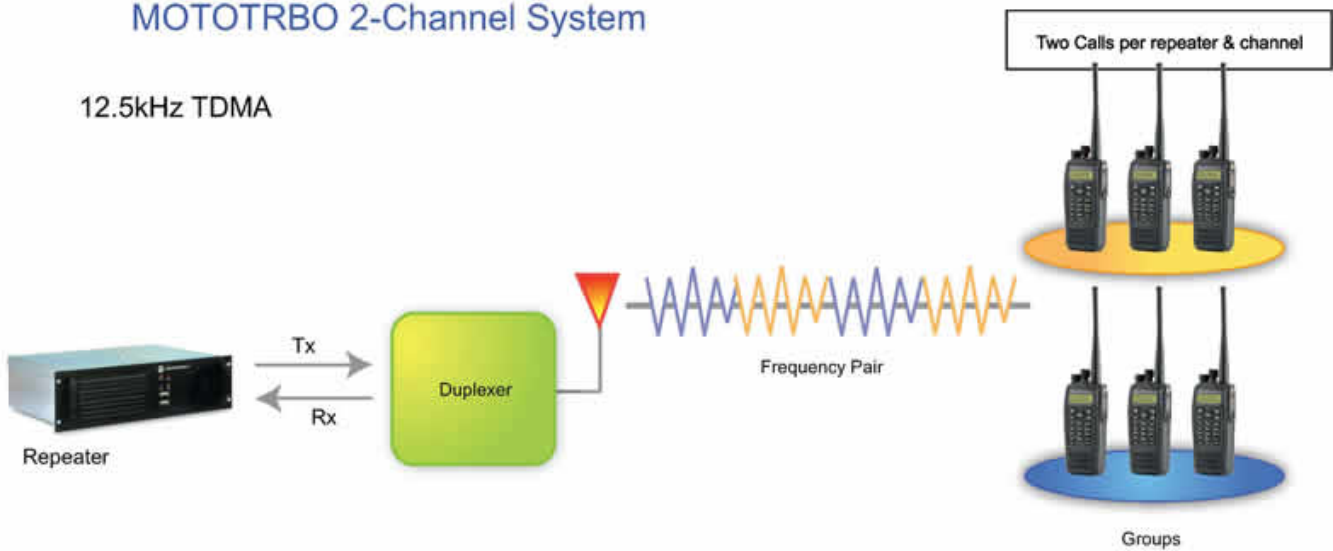
## Analog 2-Channel System

12.5kHz Analog



## MOTOTRBO 2-Channel System

12.5kHz TDMA



An Example below showing how three different DMR repeaters – one in Dundee, Edinburgh and Leeds can all be used at exactly the same time with three different Talkgroups in use.

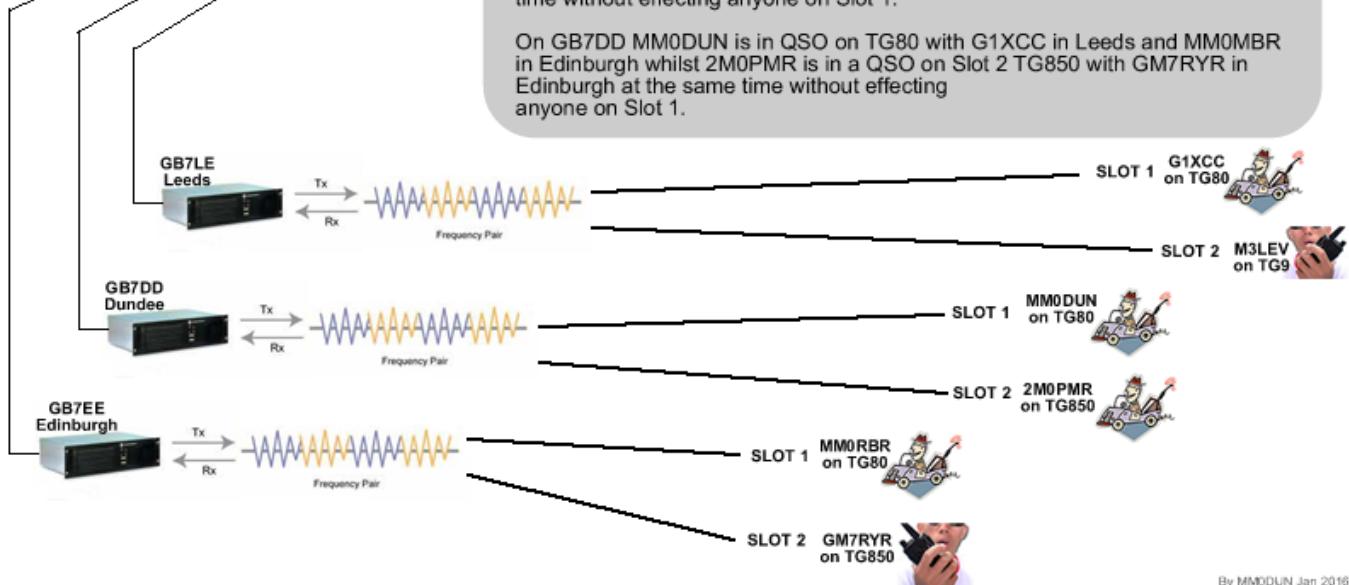
Talkgroup 80 is a User Activated UK-Wide Talkgroup which unlike TG235 which opens all UK Repeaters only opens TG80 on the Repeater that a user keys up on TG80 to activate it, Talkgroup 850 is a Regional Scottish Talkgroup linking Dundee and Edinburgh Repeaters. Talkgroup 9 is a local chat Talkgroup.



This example shows three DMR Repeaters, one in Dundee, Edinburgh and Leeds all with both time slots being used at the same time, Talkgroup 80 is in use for a QSO between 3 people - 1 each in Dundee, Edinburgh and Leeds. At the same time you see time slot 2 is in use in Leeds for a TG9 Local QSO, in Dundee and Edinburgh you can see that the Regional Talkgroup TG850 is in use too.

On GB7LE G1XCC is in QSO on Slot 1 TG80 with MM0DUN in Dundee and MM0MBR in Edinburgh. M3LEV is also in a QSO on Slot 2 TG9 at the same time without effecting anyone on Slot 1.

On GB7DD MM0DUN is in QSO on TG80 with G1XCC in Leeds and MM0MBR in Edinburgh whilst 2M0PMR is in a QSO on Slot 2 TG850 with GM7RYR in Edinburgh at the same time without effecting anyone on Slot 1.



Click on picture to view larger image!