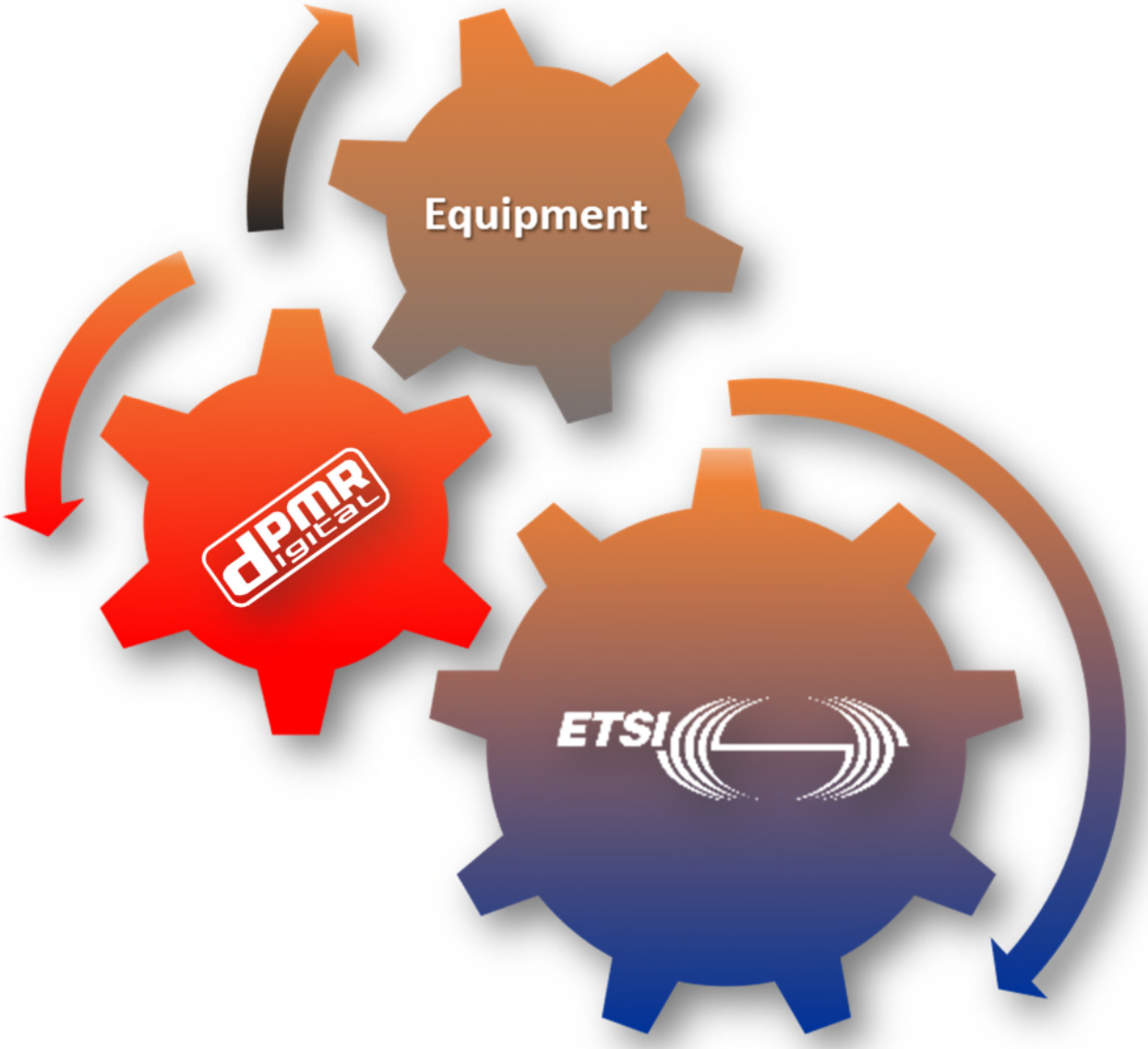
Certified Interoperability

The real difference between two-way radios of the same protocol and their ability to work together.



The increasing migration from analogue to digital two-way radio systems has brought with it quite a lot of confusion, most especially about air interface methods, compatibility between the air interfaces and interoperability of equipment employing the same air interface.

These are all important considerations when deciding on which digital protocol is best suited to your needs, so we have put together this guide to answer some of the most asked questions.

What's the difference between the leading digital technologies?

One difference is obviously the air interface protocol, which is also differentiated by the channel access method, namely, Frequency-Division Multiple Access (FDMA) and Time-Division Multiple Access (TDMA) - the two most commonly employed two-way radio access methods in use worldwide.

Protocols using the **FDMA** channel access method include:

- dPMR (ETSI Standard)
- NXDN (ITU-R Accepted)
- P25 Phase 1 (ITU-R Accepted)

Protocols using the **TDMA** channel access method include:

- DMR (ETSI Standard)
- TETRA (ETSI Standard/ ITU-R Accepted)
- P25 Phase 2 (ITU-R Accepted)

Can all FDMA or TDMA radios communicate with each other?

The short answer is no - if the air interface protocol is different (e.g. dPMR and NXDN cannot interoperate).

A recent example is that of the license-free digital PMR 446 radio from Motorola, the XT600d.

While it employs a 6.25kHz FDMA channel access method, it is not compatible or interoperable with either dPMR or NXDN.

Will radios meeting a standard or acceptance communicate with each other?

There's a common misconception that radios meeting with requirements set out in standards such as ETSI or where accepted by FCC will work with each other.

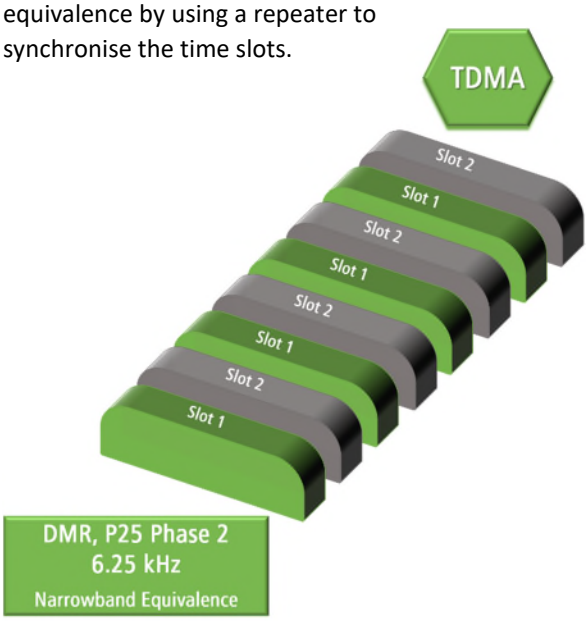
The regulatory standards/acceptance set the technical requirements for a radio technology to ensure that it doesn't harm the radio spectrum or other users and may be interpreted differently by manufacturers of radio equipment and local administrations. Additionally, standards may not specify some aspects of the user equipment which relate to the "customer" side of the design, such as addressing modes, vocoder and speech coding formats etc which can result in incompatibility.

Both dPMR and DMR protocols are covered by ETSI standards, however that does not mean that all dPMR radios or DMR radios can communicate with each other seamlessly.

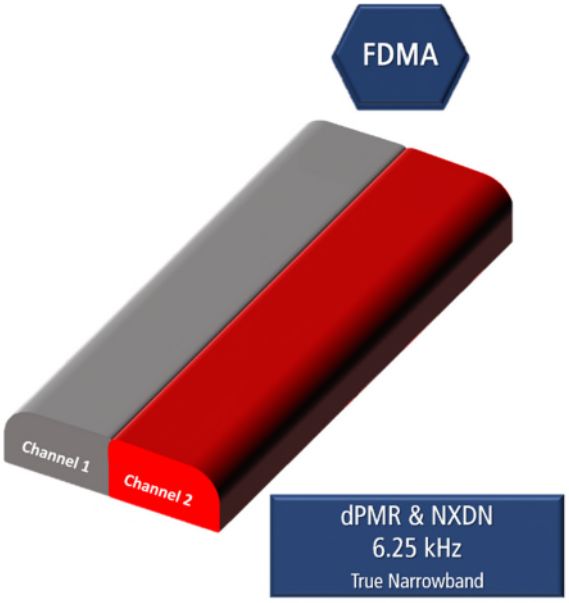
Can a dPMR radio communicate with a DMR radio?

Once again, the short answer is no.

TDMA (Time Division Multiple Access) method divides a channel into alternating timeslots to achieve narrowband equivalence by using a repeater to synchronise the time slots.



The **FDMA** (Frequency Division Access) method employed by dPMR and NXDN uses the physical channel of a corresponding channel width (e.g. 6.25kHz channel). A narrow channel like 6.25kHz allows effective doubling of the capacity of the usable spectrum in comparison to a 12.5kHz TDMA channel without the need for a repeater.



The need for interoperability testing

Having established that radio communications regulatory and acceptance standards alone cannot guarantee two-way radio devices compliant with the same radio standard will necessarily work together with compatibility across all functions, let alone the sheer number of those currently available that purport to meet with standards, the need for interoperability tests within a standard has never been greater.

The dPMR Association's interoperability test process is designed to ensure that once tested and certified, equipment of the same class from different manufacturers will be able to work together which means customers are able to select equipment from a choice of vendors with confidence.

The dPMR Interoperability (IOP) Test

dPMR is an open, non-proprietary, digital Common Air Interface (CAI) developed by the European Telecommunications Standards Institute (ETSI) and published under the reference ETSI TS 102 658.

The standard is developed and maintained by the TGDMR group and covers the following ETSI Standards:

- TS 102 490 for license-free dPMR 446 equipment
- TS 102 658 for licensed dPMR equipment

These standards in turn call up ETSI TS 102 587 for basic inter-operability testing and EN 301 166 to define the minimum requirements to satisfy the requirements of The Radio Equipment Directive (2014/53/EU), which establishes a regulatory framework for placing radio equipment on the European market.

However, there are a number of areas that are not covered by the ETSI documents, either because they are not required in order to satisfy the regulatory bodies or have been left for equipment manufacturers to implement to suit their particular markets and/or customers. As a result, some design decisions that manufacturers make during the development of their equipment could mean that their equipment may not work with another manufacturers' equipment.

That's why the dPMR Association has defined several parameters in addition to those in the standards that, when coupled with practical testing, means that the specified operations have been rigorously tested and compatibility between any devices bearing the same level of "dPMR" logo can be guaranteed.

CLASS R
dPMR™ RALCWI™ Vocoder

CLASS A
dPMR™ AMBE+2™ Vocoder

CLASS M
dPMR™ Manufacturer Specific Vocoder

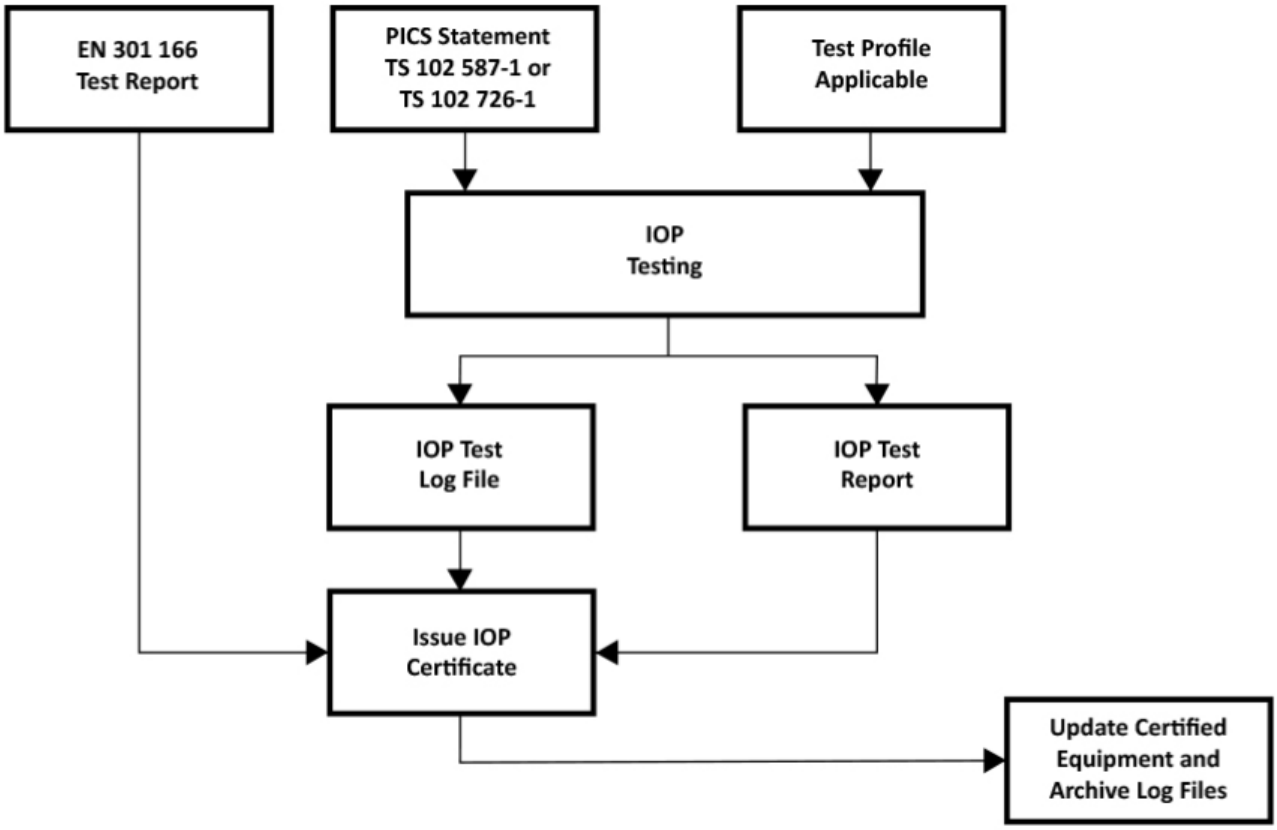
The IOP Test Process

The dPMR Association has published a test procedure for each class of dPMR equipment which includes areas not covered by the existing standards or EN 301 166 that would affect interoperability:

- dPMR 446 ISF and CSF modes TS 102 490 covering license–free equipment
- dPMR Mode 1 TS 102 658 peer-to-peer mode
- dPMR Mode 2 TS 102 658 repeater mode
- dPMR Mode 3 TS 102 658 trunked mode

The association also publishes additional tests that ensure that radio parameters not covered in the standards are also compatible.

The IOP test process checks the operation of a manufacturer's device against existing reference equipment held by the dPMR Association's Technical Working Group that are known to be compliant. Not all features in the standard need to be implemented but if they are, they must be implemented in the specified manner. Each manufacturer must declare which features are supported and which IOP test profile the equipment is intended to support. To date, five IOP test sessions have been conducted in the UK, China and Japan



How to check for dPMR Interoperability

The dPMR Memorandum of Understanding Group (dPMR Association) has adopted the ETSI dPMR conformance and interoperability standards for the purposes of trademarking compliant products.

The dPMR Trade Mark is attributed to any radio, system or infrastructure that can demonstrate compliance with the required conformance and interoperability standards from a member of the dPMR Association.

However, we are aware of a number of 'rogue' two-way products being marketed online and passing-off as being dPMR.

If you're in any doubt about ETSI compliance and Interoperability of any dPMR marked product, check with us at secretary@dpmrassociation.org.

Applying for IOP testing

dPMR IOP testing is open to members and non-members of the dPMR Association, though the use of the dPMR logo is restricted to members of the association only.

Manufacturers wishing to apply for IOP testing should first contact the dPMR Association Secretary or TWG Chairman who will then co-ordinate with other members to establish a suitable time and place for the test.

Derek Love. Technical Working Group Chairman

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