



# Which radios should I buy for my group or section?

When we hold presentations or radio demonstrations, one of the most common questions we get asked is “*which radios should I buy for my group or section?*”

**This document aims to answer that question.**

In this document the term ‘radios’ means handheld battery powered radios, sometimes called “walkie talkies” or two way radios.

The typical use cases we are presented with are for hiking/hillwalking, scouting events, overnight camps, games or other outdoor activities involving scouters and youth members. These scenarios normally involve what we call *one-to-many communications*, for example communications among multiple people at a particular event, or between scouters and patrol leaders on a hike.

The necessity for an unlicensed radio service, available to the general public and made simple enough for even the most inexperienced users to access, has long been recognised. In the 1990’s the European Union formalised a specification precisely for this purpose called PMR446. Ireland was the first country to introduce PMR446 for licence-free use on 1st April 1998!



PMR simply means “*Personal Mobile Radio*” and 446 is the frequency on which it operates.

Importantly, PMR446 is a ***licence exempt service***. This means that anybody in the EU can buy an approved PMR446 radio and use it as they see fit, without incurring any subscription or licence costs and without having to pass a test or obtain any qualification to use them.

PMR446 is limited to handheld battery powered radios with a fixed antenna (aerial) and a low power output of 0.5 watts. When introduced, PMR446 was limited to eight channels, later increased to sixteen channels to cope with the demand as popularity grew.

So the answer to the first question, "*which radios should I buy for my group or section?*" is that ***you should buy type approved PMR446 radios***. But that is not the whole story as we shall see.

## Analogue vs Digital

Almost all PMR446 radios are analogue, like the FM radio in your car or home. Analogue signals will fade as the distance from the transmitter increases, often introducing a hiss or crackle which can make it difficult to hear the transmission.

There is a digital version of the PMR446 standard, called dPMR446 which is less common and for which the radios are significantly more expensive. For scouting use, the dPMR446 radios are less suitable, and though they offer some advantages, these are outweighed by the flexibility, low cost and wide choice of analogue PMR446 radios in almost all cases.

The remainder of this article deals with the typical analogue PMR446 handsets.

## Range

The second most common question is "*how far can these radios transmit?*"

This question is more difficult to answer because it depends - among other things - on the terrain, the battery level, the quality of the radios, and whether there is interference from other radio sources nearby.

PMR446 radios operate on a "line of sight" principle. If one radio can "see" the other radio, it'll normally be possible to communicate. From hilltop to hilltop with no obstructions, ranges of over 10 kilometres are possible. In an urban environment with lots of obstructions or within buildings range may be just a few hundred metres, sometimes less, because the obstructions weaken the radio signal as it passes through and in some cases, such as metal clad buildings, signals may be blocked completely.

As a rule, in open countryside ranges of 1 to 3 kilometres are achievable, but two radios on either side of a hill may not be able to communicate at all because the terrain blocks the signal

between them. Someone in a cave or tunnel may not be able to communicate with someone on the ground just a few metres above them.

Be wary of manufacturers who claim ranges of 10 kilometres or more - this may be true, but only in exceptional circumstances. In general, all PMR446 radios have the same limitations so bold claims about range should always be considered dubious.

## Privacy and security

The next most common questions we get are around privacy and security.

All PMR446 radios must, by design, offer a means of blocking out unwanted transmissions. This is implemented by use of CTCSS (or DCS) tones. For simplicity, we will talk about CTCSS as the two types do exactly the same thing.

Without getting technical, CTCSS tones are additional signals that are sent when you transmit. You can't hear them, but your radios can. When multiple radios use the same channel *and* CTCSS tones, they will hear each other's transmissions on that channel.

Other users on the same channel, but who use a different CTCSS code, will not hear you and you will not hear them.

In this way, different groups of users can share the same channel without talking over each other. It is required for PMR446 users to use CTCSS tones in Ireland.

This is where we encounter another problem introduced by some manufacturers referring to them as "privacy codes" or "privacy channels". *It is very important to understand that CTCSS tones do not make your conversations private.*

Anyone can listen to all the users on a channel simply by turning off their CTCSS tones entirely, meaning they hear everyone regardless of what tones others have set.

For this reason, it is important to ensure that end users are aware of the limitations and understand that they should *never disclose personal information* such as full names or phone numbers over the radio.

Good radio protocol can include the use of code words to communicate a name or location - for example *“waypoint one”* instead of the *“the car park at Larch Hill”*.

## Misuse

Although rare, it is possible for malicious users to scan the channels and determine the CTCSS tone used, then set a radio to disrupt or harass the legitimate users. Again, awareness is key and a pre-arranged response such as switching channel or switching off for a set time will usually see the miscreant get bored and move on. Never respond to any user who abuses the radio in such a manner, as a response is exactly what they seek and will simply ensure they continue to harass and intrude.

In summary, ***PMR446 is neither private nor secure in any way***, but with appropriate awareness of the limitations this need not be an issue in any but the most extreme scenarios.

## Who can I talk to?

Another common question we get is *“Who can I talk to?”* and the answer is that *you can only talk to other PMR446 users, within a range of up to 3 km typically.*

Variations of this question include can I talk to the emergency services/mountain rescue/Gardai/Coast Guard etc.? and again, the answer is No. The emergency services have their own dedicated radio systems and these are not available to the public.

The only exception to this is the marine VHF band channel 16 which is monitored by the Coast Guard, however this requires a Marine VHF radio and operators must be trained to use them.

Marine VHF is not compatible with PMR446, and activities involving boating/sailing on coastal waters or inland waterways should have their own dedicated Marine VHF radios where applicable under the marine regulations.

No PMR446 channels are monitored by any emergency service, so PMR446 is not designed or intended for use in emergencies.

## Features and functions

Although all PMR446 radios must meet the same EU standards for type approval and use, manufacturers are free to add any additional features they consider useful.

For example, some PMR446 models are made waterproof and will float if dropped in water. Others include LED lamps or beacons, USB charging, audible alarms, FM broadcast radio receivers or GPS location functions.

Look for the features you need for your particular use case. For example, you may want to use a headset, have a long battery life, or have a drop in charger to charge multiple radios at once.

One key feature we recommend is the ability to lock the buttons on the radio. Curious beavers and cubs can be especially fond of pushing buttons which can change the channel or CTCSS tone and result in a loss of communication during a game or activity! Most radios will offer a lock function as standard.

Another useful feature is dual watch, whereby you can monitor two channels at the same time. This may be used, for example, to permit communications only among scouts on one channel while permitting communications between youth members and scouts on another.

As a rule, the more features the radio has, the more expensive it becomes. For scouting use, a basic inexpensive entry level radio is normally sufficient for casual use, although more rugged water resistant models with rotary controls may be useful for sustained operation in challenging outdoor environments.

## Interoperability

All type approved PMR446 radios are built to the same minimum EU standard, so regardless of brand they will be interoperable with each other. They all support the same predefined channels and CTCSS codes.

It is thus possible to mix and match PMR446 radios from different manufacturers or with different features, but we advise you to settle on a common model if possible as the way in which manufacturers implement features will vary. It is easier to learn one brand or model than several.

In addition, some manufacturers may offer features such as Bluetooth which generally works better when all the radios match, plus it's much easier to swap out a like-for-like model if one is lost or broken during an activity.

Analog PMR446 radios may be used in most countries in the EU. They should not be used outside the EU as they can interfere with amateur radio communication and military radar systems in some countries.

Conversely, PMR type radios designed for use in countries such as the United States or Australia should not be used within the EU.

## What does Type Approved mean?

Type Approved means that the product conforms to the regulations, in this case the PMR446 standard. The manufacturer must demonstrate compliance with the regulations to gain a certificate of conformity in order to be allowed to put their radios on sale to the public in the EU.

For PMR446, type approval means that radios must be hand portable, pre-programmed to the correct frequencies for use in the EU, have a fixed (non-removable) antenna, and have a maximum output power of 0.5 Watts. There are some other technical characteristics also which we're not concerned with here.

When you buy a type approved PMR446 radio in the EU you are ensuring that your radios will be safe and legal for use on the PMR frequencies in Europe and will meet the relevant technical specifications. You can take them with you anywhere in the EU and use them.

## Caution!

Special care needs to be taken when ordering online, particularly from outside the EU, as radios sold in non EU countries may use different frequencies and will not be legal for use in the EU. They will also be incompatible with any legal PMR446 radios you might acquire later.

In the United States for example, the equivalent of PMR446 is called the "Family Radio Service" (FRS) which operates on frequencies that can interfere with emergency services radio in the EU.

Some radios from China (e.g. Baofeng) use higher power levels and allow transmission on other frequencies which prohibits their use as PMR446 radios in the EU. If in doubt, contact us and we can advise.

## What to avoid

Any radio which has a removable antenna (aerial) or claims to have more than 0.5 Watts of output power is not going to be legal to use on the PMR446 band.

Similarly, any radio marketed as “computer programmable” is unlikely to be compliant. Popular Internet marketplaces including Amazon, Bangood, Ali Express, etc. are flooded with cheap Chinese handheld radios, most of which do not meet the PMR446 specifications.

Some of these radios can be programmed to use the PMR446 frequencies, but this does not make them legal to use as they are not type approved. In practice, it is unlikely there will be any consequences for doing so, but we strongly advise against this approach.

## What to look for

We recommend you opt for a type approved PMR446 radio from one of the respected and established brands such as Motorola, Cobra, Midland, or Kenwood. Buy from a trusted retailer and don't be afraid to ask questions!

## Suggested Models/brands

One set of radios we like and are testing at the moment are the Motorola T82. They are by a reputable brand, rate highly on reviews, are IPX4 waterproof, have a button lock function, and can be bought in a quad pack which comes with a handy and good quality storage case.



We've also used the rugged AM1055 FLT radios from Cobra featuring a floating & waterproof (IPX7) design.

They have a built in LED to attract attention, are quite loud, have a lock button and can be charged by USB.

Again, we strongly recommend sticking to high quality brands such as Motorola, Cobra, Midland, Kenwood etc. Here are some links to reviews which may help.

<https://www.onedirect.co.uk/top-10-best-two-way-radios>

<https://ligo.co.uk/buying-guide/top-10-best-two-way-radios>

## What about CB radio?

Although CB (Citizens Band) radio is a legal licence exempt general use service, it has limited use in the scouting context.

The principal reason for this is that most CB radios are vehicle mounted equipment and thus unsuitable for general scouting use. In addition, the absence of CTCSS tones on most models makes it easier for disruptive/malicious users to intrude.

Handheld CB radios on the market are significantly larger and more expensive than typical PMR446 units while offering less flexibility and portability.

On the plus side, CB radio operates in the upper portion of the HF (High Frequency) spectrum and are capable of long-distance communication under the right conditions. However the band that CB operates in (the 11m band) has nowhere near the reliability of long distance communication that the amateur bands enjoy. CB also has some minor advantages in hilly terrain compared to PMR446. CB radios cannot talk to PMR446 radios because they use different radio frequencies.

For these reasons, CB radio has limited use for general use in scouting activities.

## After you buy

It is very important that you familiarise yourself and any other users with your radios after you purchase them. Simply pulling them out of your backpack and expecting them to work for you on a dark windswept hillside is unlikely to be a happy experience!

Take the time to practise with your section or group. Become familiar with the features of your radios in a relaxed environment. Remember that lock button! Decide on which channels and CTCSS tones your section or group will use, configure your radios accordingly, and then test them to ensure everything works as you would expect. Testing is just a matter of using them at every available opportunity! There are lots of walkie talkie games on our resource page that will facilitate scouts and scouters becoming competent and confident in the use of radio equipment.



It is useful to have youth members learn basic radio operations. Remembering to press the Push-to-Talk button before speaking, holding the radio vertically, and speaking at the right distance away from the microphone. We offer some fun and involving games you can use to help them become proficient. It's fun and easy to learn. (Youth members will enjoy it too!!)

By taking the time to practice with your radios and using them on activities whenever possible you will soon learn their capabilities, their strengths and weaknesses, and you'll quickly become a proficient and competent radio user.

Finally, when storing your radios, your quartermaster or a designated person should schedule regular maintenance checks to keep your radios charged, or have spare batteries if they are of the removable type.

## Summary

We hope the information provided has been helpful to you in answering the question *“which radios should I buy for my group or section?”*

We've outlined what PMR446 is, what you can expect from it, and the key points to consider when purchasing as well as why you should opt for a type approved PMR446 radio over one of the many cheap Chinese radios available online.

Radio Scouting Ireland will be happy to answer any additional questions you may have. We can be contacted via Facebook at <https://www.facebook.com/RadioScoutingIreland/> or via email to: **radioscoutingireland@gmail.com**

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