Review

Anytone AT-D878UV Plus 144/432MHz DMR/ Analogue handheld transceiver

Coverage of Digital Mobile Radio (DMR) is quite new to *RadCom*, although not, I know, to many readers. Having said that, it's perhaps worth spending a few moments looking at DMR in general before diving in to have a look at the AT-D878UV Plus.

The Anytone AT-D878UV Plus is a dual band (144 and 432MHz) DMR and FM handheld.

There are three digital voice systems in regular amateur VHF/UHF usage, with another two more occasionally used. They are all mutually incompatible – at least without some clever stuff in the middle, which is beyond the scope of the current article.

Icom brought D-Star to market first (and although Icom is synonymous with D-Star, it's in fact an open standard). DMR networks then came to be developed, with a number of amateurs who'd used DMR commercially, starting to think about applying it to amateur use. Finally, Yaesu brought their own System Fusion to market, of which the digital component is C4FM. The two other less commonly used systems are NXDN and P25 – however, you almost certainly won't run into these protocols in day-to-day amateur use. It took me a while to realise that it's very unlikely that any one of the systems will 'win-out' and be a sole digital presence on VHF/UHF.

If you are thinking about which of the systems to try out, then one of the factors in your decision – possibly the main one – is likely to be 'what are the people around me using'? If there's a DMR repeater in your locality, that might be a good place to start. If you've got more than one system in use in the surrounding area, lucky you! But seriously, in that case, talk to the locals and try and find out about the use of the systems locally and what appeals to you most of all. If you've got no repeaters around you at all, then all is not lost, but you might need a digital hotspot of some variety to connect to the different networks. That's something for another time. For what it's worth, because of the use of DMR in commercial networks, typically, DMR radios are cheaper than either D-Star or Fusion radios.

Digital Mobile Radio

This article is about DMR though, so let's concentrate on that. The really good thing about DMR is that it can carry two conversations at the same time in the same 12.5kHz channel. This happens by use of Time Division Multiple Access (TDMA) that separates the two data streams by 30ms. These two data streams are known as time slots; time slot 1 and time slot 2. A repeater can carry traffic on both time slots at the same time, but your transceiver can't, even if you could yourself!

Of course, you can use your DMR radio simplex and work someone else in simplex

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range. By convention this is normally done on Talk Group 9. What's a talkgroup, I hear you ask! The excellent DMR for Dummies website [1] says:

'Talkgroups can exist for many purposes. You can have talkgroups for countries, states, counties, regions, cities, special interest groups etc. Just about any group of DMR users could have a talkgroup assigned to them if they wished to organize traffic that they can all monitor and take part in, without having to talk to each other one by one'.

So, as well as a local talkgroup, your DMR repeater will cover other talkgroups, including, probably, several worldwide talkgroups, a UK-wide talkgroup and other talkgroups that the repeater keeper or group have decided to carry.

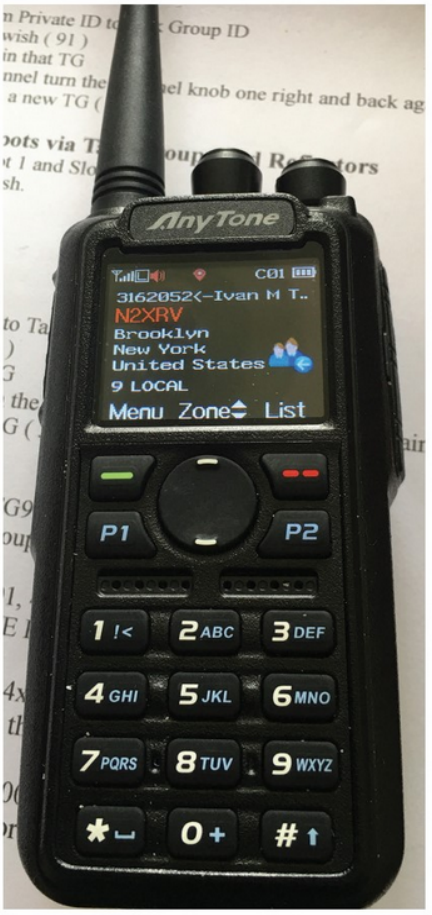
The other thing to be aware of is that there is more than one DMR network. What's a DMR network? As you might imagine, it's a group of repeaters, hotspots and end users all interconnected between themselves. They may, or may not, depending on their approach, have interconnectivity to other DMR networks.

Although DMR is by nature able to talk to all other DMR systems – this may not be the case with the users that run the networks – some of whom passionately hold certain positions, which are at odds with other groups' approaches. There are two main DMR networks in the UK, which you'll probably hear referred to as Phoenix and Brandmeister. There are some smaller networks too, such as the Salop network, the South West Cluster and the Northern DMR network.

Each user on a DMR network needs an ID number. No matter which DMR network you are using, you can use the same ID number. If you have more than one radio, you can use the same DMR ID on each radio. You can obtain your DMR ID, free of charge, at [2].

If you've listened to DMR users talking, you're bound to have heard 'codeplug' mentioned. A codeplug is simply the configuration file for a radio – so it'll include your DMR radio ID, the repeaters and talkgroups that you can use, amongst many other variables. Actually, building your own codeplug for a radio isn't as bad as you might first imagine, but it's probably best to leave that until you are a bit more experienced with DMR. You don't need to do it with the AT-D878UV Plus that we're shortly going to look at, at least as it is supplied from Moonraker.

The other thing that newcomers to DMR sometimes comment on, is how it sounds. I have known Chris, G4CCC for years. We met back in the late 1980s and have worked each other on FM, SSB and indeed FT8. When we first worked on DMR, I remember we barely recognised each other's voices! It's not that DMR gives bad quality audio, but you won't get the rich tonal quality that you might experience on a fully quieting FM signal. It's something you quickly get used to.



The AT-D878UV Plus reviewed here was loaned by Moonraker.

Getting started with the Anytone

The Anytone DMR transceivers, both the AT-D878UV Plus and its little brother, the AT-D868UV, come well packaged and presented. Both radios are dual band, 144 and 432MHz and will work on both DMR and regular FM.

Unpacking the radio, it comes with an antenna (SMA female), 3100mAh battery, drop in charger, AC adapter, belt clip, USB programming lead, wrist strap and instruction manual. Because the AT-D878UV Plus is also fitted with a Bluetooth module, additionally, it comes with a Bluetooth PTT button, Velcro strap and USB charging cable (all to be used with the Bluetooth PTT button).

The instruction manual states that the power levels on VHF are 7/5/2.5/1W whilst on UHF, they are 6/5/2.5/1W. I found the power levels were a little lower than stated, but was quite happy with that, being cautious of running higher power close to my face or head, particularly at UHF.

The AT-D878UV Plus comes from Moonraker already configured for you with a codeplug installed. The aim is that you can switch the radio on, your DMR ID will already be installed in the radio (you'll have to say what it is when you buy the radio, of course) and it will be set up for all the DMR repeaters in the UK (as well as the analogue repeaters, complete with CTCSS tones).

Getting started

Where I live is on the fringes of handheld DMR coverage for both 2m and 70cm repeaters, so my first test of the AT-D878UV Plus was to use my digital hotspot, which you can think of as a very low power, local repeater. I did have to quickly install the Anytone Customer Programming Software (CPS) for the AT-D878UV Plus on my laptop, connect to the radio using the USB programming lead and amend the frequency of the channels that had been configured on the AT-D878UV Plus for hotspot access, but you may or may not need to do this. The Anytone CPS will only run on Windows machines, although I get around that on my MacBook by running a Windows virtual machine, although there are some other approaches such as containerisation if you are so minded.

Having amended the frequency of the hotspot channels in the codeplug and uploaded it back to the rig, I realised I could have done it from the front panel, without needing to go near the computer! Simply go into Menu/Settings/Chan Set and within that menu, change the Tx Freq and Rx Freq to the frequency of your hotspot and you're ready to go.

Very quickly now the radio burst into life on the Brandmeister Wales Chat talkgroup TG23570 and it was Peter, GW4VRO in Pembroke Dock operating through the new GB7DP repeater at Treffgarne in Pembrokeshire. I work Peter quite frequently on a variety of modes, so it was useful to be able to confirm that the AT-D878UV Plus sounded OK.

The AT-D878UV Plus has a few features built in that may not readily be apparent. For example, there's the Digital Monitor. This is really handy if you don't know what talkgroups are being carried on a repeater. You can switch the Digital Monitor on (Menu/Digi Moni) and then choose whether you want to monitor both time slots and various other parameters. Depending on what you select, you can then see all traffic on a repeater and see which talkgroups are in use. This is also handy for determining which 'Colo(u)r Code' is being used on a repeater. You can think of Colour Code as the digital equivalent of CTCSS on an analogue radio, it establishes access into a repeater or hotspot. I should add that in most cases, with the codeplug supplied with the AT-D878UV Plus, you probably won't need to do this, as the repeaters you are likely to use should already be in the codeplug. As you get more advanced in your use, though, it's a good feature to have.

Even more handy, is the ability to enter ad-hoc talkgroups. In other words, if you discover

a repeater is carrying a talkgroup that hasn't been programmed into your codeplug. You long press the 0 key and then press # to change from Private ID to Talk Group ID. You can then type the number of the talkgroup you want to move to and hit the PTT. You'll now be on that talkgroup. Note that before you try this, you'll need to check that the Group Call Hold Time in the Digital Function section of the Programming Software is set to 30 minutes. I've suggested that the Moonraker codeplug is changed to include that setting as a default, as it's really powerful to be able to change talkgroups on the fly.

A built in GPS

The AT-D878UV Plus also has a GPS included. Switch it on and it will lock to the satellites. It took a while when I was inside the house, and in fact, I read that if you are handy with a hex editor, you can make a configuration change that will speed up the lock – have a look at **[3]**. You can switch the GPS on or off using Menu/GPS/GPS On-Off and there's an icon on the screen of the rig that goes from blue to red when the GPS has found your position. Under Menu/GPS/GPS Info you can see all the data you'd expect, like latitude, longitude, altitude, speed, date and time. In a perfect world, wouldn't it be nice if it also displayed a Maidenhead locator square? Unfortunately it doesn't.

You can use the GPS Info and save it to an outbox in case you want to send the information to another DMR user as an SMS type message. DMR supports text messaging between handsets, but don't get too excited – not all handsets will talk to each other and some networks are not set up to pass messages! But if you and your friend have similar radios, you should be able to send each other messages.

Digital and analogue APRS

The GPS information can also be used by the AT-D878UV Plus for APRS applications. You can configure the AT-D878UV Plus to send the digital version of APRS, DPRS. Note that not all DMR networks will pass DPRS information (Brandmeister does), allowing your position to be reported onto the APRS website **[4]**. The AT-D878UV Plus also has a limited implementation of analogue APRS. It's able to transmit APRS packets but not receive them. You can set the APRS type to either digital or analogue. I first tried analogue and you'll need to edit the frequency as it defaults to 145.000MHz – you'll need to change that to 144.800MHz. You can configure the transmission to be made at the beginning or end of your transmissions – end is probably preferable to avoid a delay to each transmission starting. You can change packet path, beacon message as well as the power. However, when I tried monitoring the APRS transmission on my Yaesu FT-2DE, although it *sounded* like a packet transmission, it didn't decode, which was the same on a Kenwood TH-D72E. I tried varying the frequency, in case something wasn't quite right. A bit of research and I discovered that there is a bug in the firmware so that if the Digi Path is left at the default WIDE1-1, WIDE2-1 the packet transmission cannot be decoded. Remove the comma and WIDE2-1 from the end and you'll find it works perfectly!

The AT-D878UV Plus is fitted with a Bluetooth module and comes with the Bluetooth PTT shown here.

Digital recorder

The AT-D878UV Plus has a record feature that you can switch on. This records the transmissions that it receives as well as your outbound transmissions. This only works when the rig is in digital mode; you cannot record FM transmissions. It also only records traffic on the channel/talkgroup the rig is on. That might sound obvious, but if you have Digital Monitor running, although you can hear traffic on other talkgroups, these will not be recorded.

Bluetooth connectivity

Unlike any other DMR portable I can think of, the AT-D878UV Plus features Bluetooth as standard. It comes with a Bluetooth Push to Talk (PTT) button. In addition, the AT-D878UV Plus can pair with many in-car hands free systems, so that you can attach the PTT with the supplied Velcro strap to a convenient spot, perhaps on the gear stick and have true hands free operation with the rig using the microphone from your handsfree kit and with the audio from the rig coming through your car audio system. It's nice to see this level of functionality built into a radio rather than having to add an expensive option into an already expensive radio, which has been the case with all other Bluetooth options from other manufacturers up to now. This is a real major benefit of the radio and the nice thing about it is that it just works. There are obviously other possibilities – use a Bluetooth headset when you are out walking and have the PTT strapped to your hand, with the rig in a pocket or a rucksack. With the APRS beacon enabled, this might make a nice hiking setup.

Roaming

The AT-D878UV Plus also supports Roaming, where the rig will check across several repeaters that are carrying the same talkgroup to see which is the best signal, then switch to that channel. As supplied, the Moonraker codeplug didn't have any roaming configured and unfortunately where I live, there is little opportunity to try and configure it as a test.

Conclusion

I enjoyed using the AT-878 Plus. It's probably one of the most flexible DMR handhelds I've used and one of the least quirky. It behaves as you would hope it would and 'just works'. Believe me, this is not a given! Also, unlike many other DMR handhelds, the instruction manual is clear and well written. The Bluetooth option really sets it apart and the ability to support roaming may be of interest to you. The ability to send analogue and digital APRS is a feature that you may enjoy on top of standard DMR and FM operation.

Although this review is about the AT-D878UV Plus, it's worth noting that nearly everything I've said also applies to the slightly cheaper AT-D868UV. The AT-D868UV does *not* have Bluetooth, Roaming or analogue APRS built in, but if you do not need these features, it is a rig that you may want to look at. There is also the AT-D878UV available with roaming and APRS, but without Bluetooth.

My grateful thanks to Chris Taylor of Moonraker UK Ltd (www.moonraker.eu) for the loan of the AT-D878UV Plus and his help and willingness to answer my questions. The AT-D878UV Plus costs £199.99 and is available configured as described from Moonraker UK Ltd. The AT-D878UV, without Bluetooth costs £169.99 and the AT-D868UV costs £129.95.

Websearch

[1] www.dmrfordummies.com/talkgroups
[2] https://register.ham-digital.org
[3] http://members.optuszoo.com.au/jason.reilly1/868mods.htm
[4] https://aprs.fi