

Q5

North Bristol Amateur Radio Club

S.H.E.7, Braemar Crescent, Northville, Bristol BS7 0TD
G4GCT, M0NBC, G6PNB

May 2022

Blue Peter Badge (3D Printed)

Ever since I had been licenced (1988) when timing out on GB3WR I was told that I had won a Blue Peter badge. I don't know who started this but, no one had actually won one until now.

The Wednesday net on GB3BS always gives us a bit of a laugh when someone timed out. I do more than my share of timing out. My excuse is well, as The Chair I get caught by the 2 pips taking only 1 when calling a breaking station. One Person who said they never time out was poor Mat G7FBD. Long Story Short, he got caught by the pip trap and won a Blue Peter Badge. Well we had a bit of a laugh then I had a thought, said nothing but got on the CAD programme, the following ensued.



If you have timed out on a repeater and want an award, Have a kind word with me. Bear in mind I cannot possibly print piles of them as there are a lot of stations timing out every day of the week. It was just a bit of fun, the term “You have just won a Blue Peter Badge” has now come to fruition.

Take a look at page 11 for information on how it was made. It looks like there is no end as to what can be done in the world of 3d printing.

Also in this edition the conclusion to Mat's Mammoth QO-100 satellite transceiver project prior to G3ZXX's demonstration with his portable set up. (See the calendar of events)

Club Talks & Demonstrations

Over the last year or so we have had a number of talks and demonstrations, And it is always the club's intentions to have guest speakers. In the main, these come from our own ranks and are members or stations associated with club activities. However you will notice that we have invited several Guest speakers in the forthcoming calendar of events. Please try your best to attend these events as it is only courteous after all.

Dennis, M0IYQ gave us an insight to the preparation of satellites and their subsequent launch.

The follow up to this talk was another in the series on transponders, in particular the Q0-100, the worlds first geostationary Radio Ham Satellite. There is a talk and demonstration soon by G3ZXX



Special Events and Rallies This Year

The events booked so far by Mat,G7FBD are Mills on the Air and Railways on the Air. It was hoped that the 40's weekend was to take place at the same time but however this is not to be. On my meeting with the station manager, (That is railway station manager) I was informed that because of the war in Ukraine, it is felt that it was not appropriate at the moment. We understand that 4 other preserved railways have also cancelled their events. By the way, we will still be allowed to operate Railways On The Air with our own gazebo on the lawn. An alternative event maybe organised a Victorian day perhaps! Watch this space as they say.

The mill is as it was 2 years ago. That is the beautiful mill at Ashton. A problem with the pub just down the road closing lead to Mat trying to find another supplier of toilets. Mat, with his classic sweet talking, way managed to talk a shop near the mill to let us use their facilities. We will of course return the favour by supporting the shop for some cakes and other goodies. By the way, your committee has passed the Risk Assessments with just the antenna separation to go.

Railways On The Air has all of it's facilities open to us so we don't need to worry too much about Loos or food.

Rallies Near Us

Luke 2E0VHV has been busy organising some rallies. The one near us and is very soon is the Mendip Rally On Sunday 12th June. There are other rallies further afield, Luke promises to keep us informed of the dates. Keep an eye on the club web site for details.



The Chippenham Club has their Rally at the end of July. This is beginning to be a good year for rallies.

Any rallies I do find I will publish, using their own advertising poster where possible. That way I cannot get any facts wrong and details are as accurate as possible.

I will try and twist Luke's arm to give some details of up and coming rallies next year.

We are also confident that Shaun will bring the Frome Rally back onto the calendar next year now that Covid-19 is no longer the threat it once was, although we must all be cautious when going into large crowds of people.

Mat's last episode of his Satellite adventure.

If you remember at the end of the last episode Mat went in for a cup of coffee, then.....

A short while later I was joined by Leyan (M6LF) my daughter who was concerned I was in a bit of a mood and was already on my second coffee. She had a few harsh words and marched outside. She grabbed the spanners and VERY annoyingly spent no more than 5 minutes swinging the dish around and finding Badr 4 again, How!!?? She locked the bolts down and said calmly "is that it?"

Slightly (no VERY) embarrassed I thanked her and she went back to getting her breakfast (at 1pm mind you!)

I was back listening to QO-100. I also went on to ordering the box, and the pre-amp that would sit between the Pluto and the PA as the Pluto only produces 7dBm not enough to drive a power amp. I also re-visited Dave's original picture as wanted to check the picture against the spreadsheet as I started questioning myself.

While I was looking at the picture I noticed everything was stuck to the box with self adhesive cable tie points and cable ties. The thought of how good these would survive in a warm summer. I also started wondering about how to get fresh air into a water proof box. I had ordered cable ties and sticky pads already so plan A was still a goer.

By Tuesday the box arrived and I started mocking up the layout on paper. I noticed the box had 4 turrets you could screw into. I decided I would not go down the route of sticky pads and cable ties; instead I placed an order for an A4 sheet of 5mm thick nylon. The idea would be I cut the sheet to fit inside the box and then drill 4 holes for screws to screw the sheet into the box using the aforementioned turrets, I would then build the transceiver onto the sheet using proper fixings, I could then take this "palette" in and out as and when I needed it.

That week the pre-amp arrived along with right angled SMA pigtail cables (pre made), SMA to F-Type adapters and the band pass filter.

All were logged into the spreadsheet as having arrived.

On that Friday my order from France arrived, this was the POTY patch antenna for the transmitter. As I had the day off from working from home so I vanished up the workshop and changed from a computer/electronics guy to a gas fitter. The antenna assembly was pretty straight forward flame soldering job, lots of cleaning the surface first and the lightest of wipes with some flux and off you go, heating the pipe and brass plates then the smallest dab of solder and watch it flow around the joint very quickly just in the same way as you would make off a water pipe solder joint.

Once the reflector was mounted, cooled and inspected it was then the turn of the driven element once I had fitted the SMA connector to it. Once that was cooled although not in the instructions I filled the protruding threads of the SMA fixing bolts to maintain 3mm clearance between driven element and reflector. The complete antenna was then visually checked before being connected to a mini VNA2. The match was not bad and only needed a slight bending of the driven element to get a return loss of 20dB



The POTY antenna or PATCH OF THE YEAR to give it its correct name is a piece of waveguide, the tube which allows signals to pass through it and onto the LNB larger disk is a reflector and the smaller is the driven element. The picture on the bottom shows the Teflon lens attached to the end of the waveguide.

How exactly the antenna works is not 100% clear to me, other than it takes the electromagnetic wave travelling in a linear plain and converts it to a clockwise circular polarization wave. At the time of writing there is not much theory of operation out on the web. At this point I stopped for a week to get my nerves sorted for the next step, that is taking a perfectly working LNB and drilling a 22mm hole right in the central in the LNB's raydome (red cap bit).

Okay I cheated a little as I sprudgered the red cap of the LNB as I did not want anything to fall into the LNB cavity. The cap on the inside has a moulding spot right in the centre which makes starting the drill job off, Pilot hole of a 1.8mm Drill, then in with a tapered bit. There was no going back now.

Once the 22mm hole was drilled I fitted the raydome back onto the LNB and then slotted the POTY into the hole. It was very wobbly, so I back filled the conical waveguide of the LNB with hot melt glue all the time making sure the POTY was vertical, central and making good electrical contact to the part of the conical waveguide where the POTY rests when pushed all the way home.

It took an absolute age for the glue to cure at that point I had enough for the evening. Saturday I mounted the LNB back on the dish, and retired off to the office to go listen to QO-100, Bad luck Mat, the Dish had once again moved, or had I destroyed the LNB hmm? I did spend a hour or so trying to align the dish again but had to give up when it got dark.

I switched back to the transceiver for about 3 weeks in total while I waited for a builder to pop over with an auger and drill two 750mm deep holes and set two masts in the holes for me.

In this time I bit the bullet and ordered the missing part, the PA from SG Labs in Bulgaria. Just my luck there was 2 weeks lead time before shipping. I had already emailed SG Labs prior to my order to request prices and technical drawings of the box so I could use that to drill the mounting holes etc in my nylon sheet. I set about rough laying out the "palette" as per my paper drawings I had made, and added the RF cable layout for size. Yes there were some moving things about to make them fit. I then covered the nylon with paper and masking tape and used that to mark and drill holes. I then drilled a 80mm hole where the fan was going to be mounted to allow air to be drawn in.



I then started mounting 3.5mm plastic stand-offs for the various PCBs to be fitted. The Pluto got taken out of its plastic box and just the PCB was fitted to the palette by 4 mounting posts. I spent a day just drilling and mounting things.



Left to right: Fan with 80mm hole under it. The small PCB is the PA Driver board below it is the now naked Pluto. To the left is the Bias-T then the 4 PSUs for +28, +18, +12 and +5vs

Not long before the above picture was taken a book fell off the shelf directly above the palette.

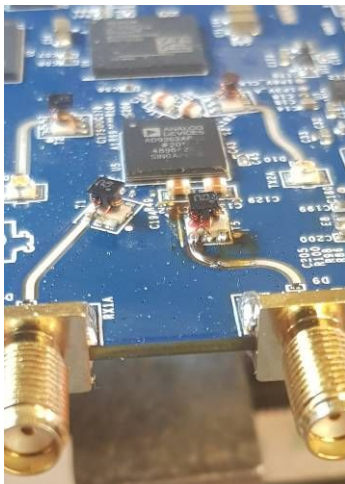
Now out of all the parts mounted on the palette, the book chose the most expensive part which was the Pluto! It's a bit hard to see but if you look carefully at the second SMA down you will see a silver trace that goes from the SMA to the black square chip. As you follow the trace you will see a small white rectangle with a red dot in the centre of it. That is meant to be a small inductor, well not any more! The book had cleanly snapped it off the PCB when it hit the board. Thankfully that was the only damaged.

Full instructions and circuit diagrams are available on the Analogue Devices website so I identifying the part was a fairly easy task.

Mouser was the only stockist that would ship to the UK at a reasonable price, but to hit the minimum cost I also added to the order a high stability 40MHz oscillator.

48hrs later a package arrived by UPS, that was the inductor and oscillator. Now came the tricky part. The red dot is actually glue used in SMD PCB assembly. Lucky superglue remover also removes that glue and the part came off very easy with my SMD re flow station. Once the part was off, the area was cleaned of any remains of the glue and solder used on the inductor fitting. It was then the start of some immense fun. You see I sometimes get hand shake thanks to the MS so concentration sometimes kicks the shaking off and true to life, it started in this instance. So here I am with a small 3.5mm square transformer and a pair of ceramic tweezers trying to hold it in place while I try to re flow the component.

Three or so failed attempts I smelt the unmistakable smell of cooking pork. Yeah, I managed to touch a finger against the re flow pen (its basically a fine pencil that jets heated air at the PCB. You can adjust air flow and temperature in this case it was set to 420'c as the PCB used lead free solder so a massive pain in the ass and my finger), again thanks to the MS I had not felt it. Anyway I stopped and went off to run my finger under the cold tap and make another coffee. About an hour later I returned and tried again. This time all went well as you can see from the picture below just before I popped the board into the ultrasonic bath to get rid of the flux off the board.



I forgot to say this transformer sits in the transmitter path so rather critical. Now the new one fitted we were back in business. I then flipped the board over and removed the stock crystal oscillator and replaced it with the new high stability one that had arrived along with the transformer. That was bigger at 5mm square so not so much a problem to handle.

I refitted the Pluto back onto the palette.

On the Tuesday of that guy turned up with the petrol drilling machine and after by station manager showed him where I wanted to drill the holes he then spent a good 10 minutes trying to start the drill, then some time on the phone to I believe was his dad and finally his visit ended with him managing to pull the starter string out of the machine all together. He came to the house and said what had happened and he would be back once the machine was fixed.

So yet another two weeks passed before I got a phone call from the builder saying he was about 15 minutes away and was it okay to pop around and try again.

On his arrival he told me what all the problems with the drill had been and that it had been away for service and repair.

Thankfully this time it started on second pull and no more than 5 minutes later he was back at the house asking where the mast bits were, I pointed at the floor next to him and said the longer one is for the satellite dish.

He then went ahead and planted them and filled the hole in with fast setting epoxy cement. Its odd its like two part araldite but one part being a fine sand looking material the other being a clear liquid. Once he had planted both masts. The second is for my doublet but that's next years project) he returned to the house to say he had finished and to leave them for about 20 minutes or better still 24hrs.

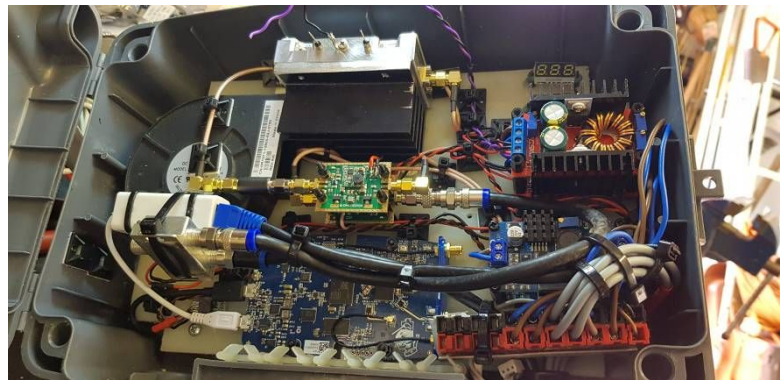
I left them both until the following Saturday. I then managed to drop the dish off my mast and carry (roll) it over to the part of the garden where the mast for the dish is located. My garden is on two levels, the upper is about 1m higher than the other par of the garden closest to the house. I was able to slide the dish onto the upper level. I grabbed my wheelie walker you see me at the club and managed to get it up to the upper level of the garden using the main steps. It was hard work to get it up there. I then returned back to the garage using the Zimmer and grabbed my plastic bag containing all the tools and ties I needed to fix the dish to the mast (I find putting tools and kit into shopping bags makes it so much easier to carry things and a walker or Zimmer. I chose to use the steps nearest the garage.

Now I was aware that the hand rail was weak and said to myself not to use it or lean on it. So off to the top level I started to ascend. Not sure what happened but I over balanced on the bottom step of all things and automatically reached out for the hand rail, all the time saying to myself "Don't grab the rail!" So, I did. And it gave way and down I fell. It was not so bad as that sounded as I was able to turn into a position I ended up partly kneeling on the step with one knee , but sadly the other cleanly planted itself in my wife's prized lavender bush, I am not sure who was more pissed off, me or the bees I had disturbed by my lumbering mass descending on their lunch. After a moment or so to finish swearing at myself for using the rail I knew was broken and then spent a few moments trying to bush the lavender back into something that looked like its original shape I got myself back on my feet and managed to stretch over put the bag onto the upper layer.

I then grabbed my Zimmer frame and with it I struggled up the centre steps. Once up there I Zimmered over the grass (That is incredibly hard work to cross grass with a Zimmer by the way). I then set the seat walker up, moved the dish so it was leaning on the new mast and grabbed the bag of tools. I am not sure how I did it, I managed to lift the dish onto a flower pot and clamp it to the mast. Okay it knackered me out but it was on the mast, not looking at anything but it was there.

I then went back to the house after putting my tools back in the workshop and made yep you guessed it, made another coffee. About a week or so later the PA arrived and I was the able to completely build the RF Pallet. Okay its not a work of art but it did work, Testing the PA into a load I was able to produce 28dBm which was more than enough. Yes I know in this picture, the power for the PA was disconnected. This was deliberate. The output is open circuit so to protect it removing the power was the best way to avoid mistakes.

It was then I started thinking about system ventilation. I had a fan that would circulate air, and potentially hot air. The box needed an air intake, and of course an outlet. This would involve drilling into a waterproof box. Some thought was needed.



Internet searching I found and ordered some motorbike air filters that would fit onto a plastic water tank overflow. I then had to drill a number of holes in the box at one end and then chop around the holes to make a hole slightly smaller than I needed and then filed out the rough hole to the size required to allow the plastic overflow to fit into my water proof box.

I then repeated the process at the other end of the box and mounted a second overflow fitting. The filters fitted perfectly when they arrived. I have some sticky back rubber door seal that's about 7mm thick. On the reverse side of the pallet I glued the strip to the pallet around the fan to form a flexible rubber air gasket.

When the Pallet is screwed into the box, this rubber gasket presses down onto the base of the box around the top of the air filter intake thus making sure the fan was drawing air in through the air filter into the Then pushed through the PS heat-sink and pre-amp boards and then around the power supplies before being pushed back out the exit port.

I fitted another filter onto that port and added a little restriction to the exit port in the shape of a thin 2mm baffle. The idea is that the box itself then becomes slightly pressurised helping keep any water out of the box.

On the Wednesday of that week on the Wednesday North Bristol ARC 'Covid' net I got talking to John G4WOD who is an avid motor bike enthusiast specifically about air filters. He pointed out, even though the filters are on the bottom of the box, they can still draw in water vapour. I had to re-think and re-design the filter system, or did I?

Previously I had asked the station manager to purchase a plastic beaker to help me mount the poty into the LNB. She had bought a pack of 4 of these beakers; sadly they were too small in diameter to fit the LNB, so they just sat on the end of the bench collecting dust.

While staring at an up turned plastic box trying to work out how I was going to construct a U-bend water trap my eyes kind of fell onto the stack of beakers. I slid one over one of the air filters and to my amazement it fitted nicely over the filter, there was room on two of the sides (The filters are slightly oval) for air to pass freely, yet with it push fully home it fitted inside the outer grooved edge of my water proof box again with around 5mm of space between the air filter and the base of the box, Okay it was still possible to pull damp mist in. Also from a repair I had to do on a PCB that had been inside a sealed waterproof box that had cracked under UV exposure and had spent several months under water, I made sure I drilled a number of holes in the base of the plastic beaker so any water that collected to escape.

Yes it looked odd but I was comfortable that the filter system would protect the radio equipment from water ingress, yet allow air to circulate and vent any hot air back out of the box.

While I was thinking about how to fix the filters I also with the help of G7BYN and G4SDR a replacement satellite TV system was installed, okay our viewing habits have not increased and FreeSat is more than enough!

Editor's notes

For the story of Mark and myself rigging Mat's Freesat dish see the August 2021 edition of Q5. This has been a mammoth build by Mat. He has worked many stations around Europe. The man who got him interested in QO-100 was Dave G3ZXX. Dave also has a portable setup that he is going to display at our club. He will be showing live contacts direct to QO-100 Over 22,000 miles each way to the satellite. Take a look in the calendar of events for the date.

Mat is enjoying this part of the hobby so much that he is also in the process of making a portable setup.

Well done Mat.

3D Printing For The Amateur

After arranging the talk we had on 3D printing by John G4WOD I went out and bought a printer. I chose the Flash Forge Pro 3 By the time we had the talk back in October 2021 I had the printer for about 3 weeks.

As everyone, the first things we print is generally from the “Thingiverse” web site. But first of all I set the thing up and printed a test box. It is about 3.5cm square and 1.5cm thick. This took only a few minutes to print. This was OK so I went for it.

I printed out a little box spanner for tightening nuts on the front of little switches. You know, the ones that if you tighten with a pair of pliers it puts great big scratches over the front of your new project. A metal spanner is not much better.

Other little projects were Dipole centres of various types. One for Coax and the other for ladder line.

I had been printing things for my model railway designing a few things on an on line CAD (Computer Aided Design) programme called Tinker Cad. Simple boxy things to replace things I had broken and have now been able to replace.

All of these projects took up to an hour to print each. Not long by the way as projects can take all day. I was a bit frightened to print any large project as I had heard of people getting half way through a print then having a great big ball of tangled mess. The hot filament pumping through the nozzle, going where it shouldn't for a few hours until it is spotted.

I grabbed the bull by the horns as it were and my download of a coil former from Thingiverse was started. The author said his Ender 3 machine took 22hrs to print. I was going to set this to start early in the morning. I need not have worried too much as the Slicer programme that makes up the file for my machine said on it's screen, X meters of filament and 7hrs 55min to print. All loaded and pressed the go button.

It bounced into action. I then retired down stairs to watch the print on my laptop. My printer has a camera built in so I could watch out for problems. I need not have worried, after the set time I heard the printer playing tunes from up stairs. It had finished.

3D Printing Continued

Now all the printing I have done was using PLA, a type of plastic made from corn starch. This makes it biodegradable, although looking at the data, not as quick as grass cuttings in your composter. One trial took place over years. A test piece was buried for 3 years and there was no sign of it rotting or degrading. However we shall see in the future.



A Coil former 3d printed ready for winding

The other negative comments about PLA is that it is hygroscopic, That is that it absorbs moisture. Yes, it can cause a problem printing if the filament has absorbed moisture. It is said, as it goes through the hot nozzle the filament can steam causing mini bubbles in the finish of the print. The truth is, lots of things we use absorb water. Wood that we use for radio cabinets, card speaker cones, cotton T shirts and similar things. Well, you get the gist. Oh by the way nylon is also hygroscopic so don't get put off by PLA. It is also not stable to UV light and can also soften with heat, OK, antenna centres and the like would not last in the sun (If We See Any This Summer) but there are lots of plastics that disintegrate in sunlight.

I bought some traps from a rally that only lasted 2 years before they fell apart. The general use for PLA printed items should be used for portable and temporary antenna fittings. I have however made these to test to see if they last or not for myself.

How the Award was made

Continued from the front page is a close up of the badge itself. This was 3d printed in 2 parts. The badge itself in white PLA and the plaque in black PLA.

The raised lettering on the plaque was painted white and the badge was painted in blue.



The badge was then superglued in place. All this is to be taken as a bit of fun. There is no intension of making his a commercial venture and all of this was at my own expense. I believe that I have not infringed the copyright that is owned by the BBC.

Other News

GB3AC Has had an upgrade and has superb audio. Obviously, the antenna has very little room for improvement owing to our QTH. With the tall buildings surrounding SHE7. However, the signal to the East and north is exceptional. Thanks to Tony, G4TJZ for all the hard work he has put into this project.

I hope to organise a Net via GB3AC soon. I am aware that some members like to join the club nets and we would not deliberately exclude them if they cannot work into AC. However, you could all try your best to improve your own station to work AC. In other words don't just say "I can't work AC" say what can I do to my station so I can work AC. QED

Donations

Thanks to Mat G7FBD we have had a donation of two high end laptops from his employer. Before you say anything, his employer does know about it and a letter of thanks was duly sent from your secretary.

One of them has a touch screen and will be in the shack connected to the 7600 for data work and logging, the other one is in the "GO Box" for logging when we are portable.

On the subject of donations. I know that a lot of you like donating your unused bits and pieces to the club. This we don't wish to stop. Unfortunately some of the items are of no use to us either. I must admit I have done the same. About four years ago I donated a Pack Rat AX25 system to the club. Yes, you guessed it, it is still there. Well at least it is out of my way. What I should have done is when donated, connect all the wires and looms to the rig and got it set up and working.

Your committee propose therefore that any donations should be something that the club is in need of and the item comes without strings. Check with the Chairman first. In other words, if the club decides that we don't require the donation don't be offended. We may at a latter date also decide to sell the item with the funds going to the club.

Anything brought up to the club for sale to others, must be removed no latter than 4 weeks latter if not sold. The club reserves the right to dispose of the items if not removed.

The Shack is now on It's way and looking better. We want it to be a show piece so please don't use it as a dumping ground for donations.

Now, does anyone want a Pack Rat system?

Calendar of events

May 6 th	General Meeting (Collect Kit For Tomorrows event	Training
May 7 th - 8 th	Mills on the air at Ashton Mill (Saturday And Sunday)	
May 13 th	Large Bring & buy Tabletop Sale	
May 20 th	Shack Night. Have a play in the shack	Training
May 27 th	Live Demonstration Communicating with QO-100 by G3ZXX	
June 3 rd	Bank Holiday No Meeting	
June 10 th	General Meeting	Training
June 17 th	Club on The Sea Walls (Unless there is Rain or snow)	
June 24 th	RSGB Talk by Andy G7KNA	
July 1 st	General Meeting	Training
July 8 th	Radio Programming Night	Training
July 15 th	Film Night	
July 22 nd	General Meeting	Training
July 29 th	RAYNET by Mike, M0DXV	
Aug 5 th	Shack Maintenance	Training

We do our very best to put on the events listed but, due to unforeseen circumstances, things can change. If the event is important to you, you can always phone the secretary just to check if it is still on or not.

Secretary's phone is 07533933831

Club Nets & Contact Details

To spice up our nets, the Wed net will be a Technical net (If we can). If members have a problem, or just want to know how something works, ask your question here.

This came about because some participants of our nets didn't want to spend the night talking about the weather and general chit chat. They said it was boring, so wouldn't come on any net. The Chit Chat evenings will be the Sunday net. We hope this will cater for all.

Wednesday net (This is the regular Net) GB3BS 20:00 to 21:00

Sunday Evening Net This is on GB3BS 20:00 to 21:00 hopefully moving to GB3AC after the first half hour. (Check both repeaters)

Saturday Mat's DMR Net GB7BS 19:00 to 20:00 South west cluster TS2 (950) This cluster now consists of 10 repeaters in the SW

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Next Q5 August 1st

Q5 Publication

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It is hoped that I will get articles sent to me from time to time. I thank all of you that have submitted items over the past couple of years. All back issues are available on the club's new web site.

www.nbarc.org.uk