



# Chelmsford Amateur Radio Society

## Newsletter

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**Next meeting: 2nd August - 7.30pm, Oaklands Museum**

**Constructor's Contest—bring along your efforts!**

### Inside this issue:

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- Worked Essex Award
- Things are changing!
- Sandford Mill BIG weekend
- July Club night—G4YTG
- Talk by Fred Lloyd, QRZ founder
- Feedback—antenna grounding
- Miscellany
- UBSEDS15 World tour
- Hustler 6BTV-80s tribulations

*Award Certificate*

*Worked Essex Towns & Villages*

Congratulations to ..... operator of .....

who contacted ..... Amateur Radio stations

in towns and villages within the

**COUNTY of ESSEX**

Date ..... Mode ..... Band .....

Award Manager .....

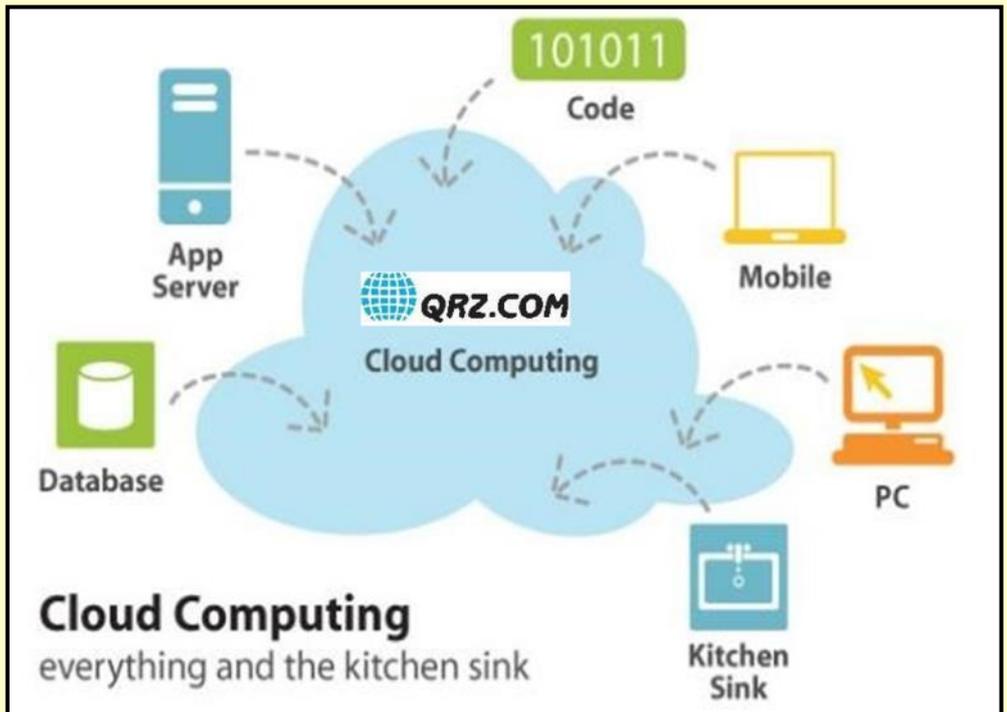
Award Number .....

Welcome to Southend-on-Sea

**Club Nets - Tuesdays 20:00h**  
**Net Controller: TBD**

- #2 - GB3DA 9th August
- #3 - GB3ER 16th August
- #4 - 80m 23rd August  
3.756MHz
- #5 - 160m 30th August  
1.947MHz

**Essex Ham Net**  
**Mondays 20:00h GB3DA**



Contact details for the newsletter: [editor@g0mwt.org.uk](mailto:editor@g0mwt.org.uk)

## Editorial

Hello again, and welcome to the latest edition of this newsletter. First responder Peter Chadwick has again emailed John, G8DET and come up with some comments about the last newsletter:

*John, thanks for the Newsletter. Interesting on the remote ATU project - having seen many comments about MFJ/Ameritron/Cushcraft quality control (or rather lack of it!) on eham.net, I'm not surprised things were rattling around inside!*

*I have found the best way of minimising condensation in an outdoor tuner is to use an IP65 rated box with IP65 rated cable glands and a regularly changed bag of silica gel. For my remote outdoor 160/80 m tuner for the vertical, a 100 ohm 15 watt metal clad chassis mounting resistor with permanently about 30 volts of AC across it seems to keep the moisture out. Photo available if you want it.*

*I went over to the Cheltenham club the other week to lecture on ATUs, and they apparently enjoyed it.*

73 Peter G3RZP

Dave Penny, G3PEN also gives us feedback and writes about his previous antenna grounding experiences elsewhere in this issue.

Congratulations are in order to **Brian Thwaites, G3CVI** for 70 years unbroken membership of the RSGB. Brian sends his 73s to everyone at the club.

For some strange reason I have been asked a couple of times recently if I know anything about antenna planning permissions. Well, no, I don't, but it seems that the first thing to do would be to go to the RSGB's Planning Matters portal <http://rsgb.org/main/operating/planning-matters/>. I did, however, find this rather general site for house mounted antennas: <https://www.planningportal.co.uk/info/200130/common-projects/48/satellitetelevison-and-radio-antenna>. Hopefully, these sites should give a head start to anyone seeking guidance but, if in any doubt, your back stop has to be with the local Council offices, of course.

And don't forget the BIG weekend at Sandford Mill on 6th/7th. Come along for a day out, support the club or have a go operating with the Club's callsign. **Ed**.

## For sale

My brother has two ancient wave meters. They look war issue - definitely ex Govt. Big, green, heavy boxes; suited for a museum? My brother probably would request offers. Any use to anyone at CARS or know of any outlet? Not in good condition by the look of things.

**Melvin 2E0DNS**. Ask for Stuart on 01621 779224 if interested.

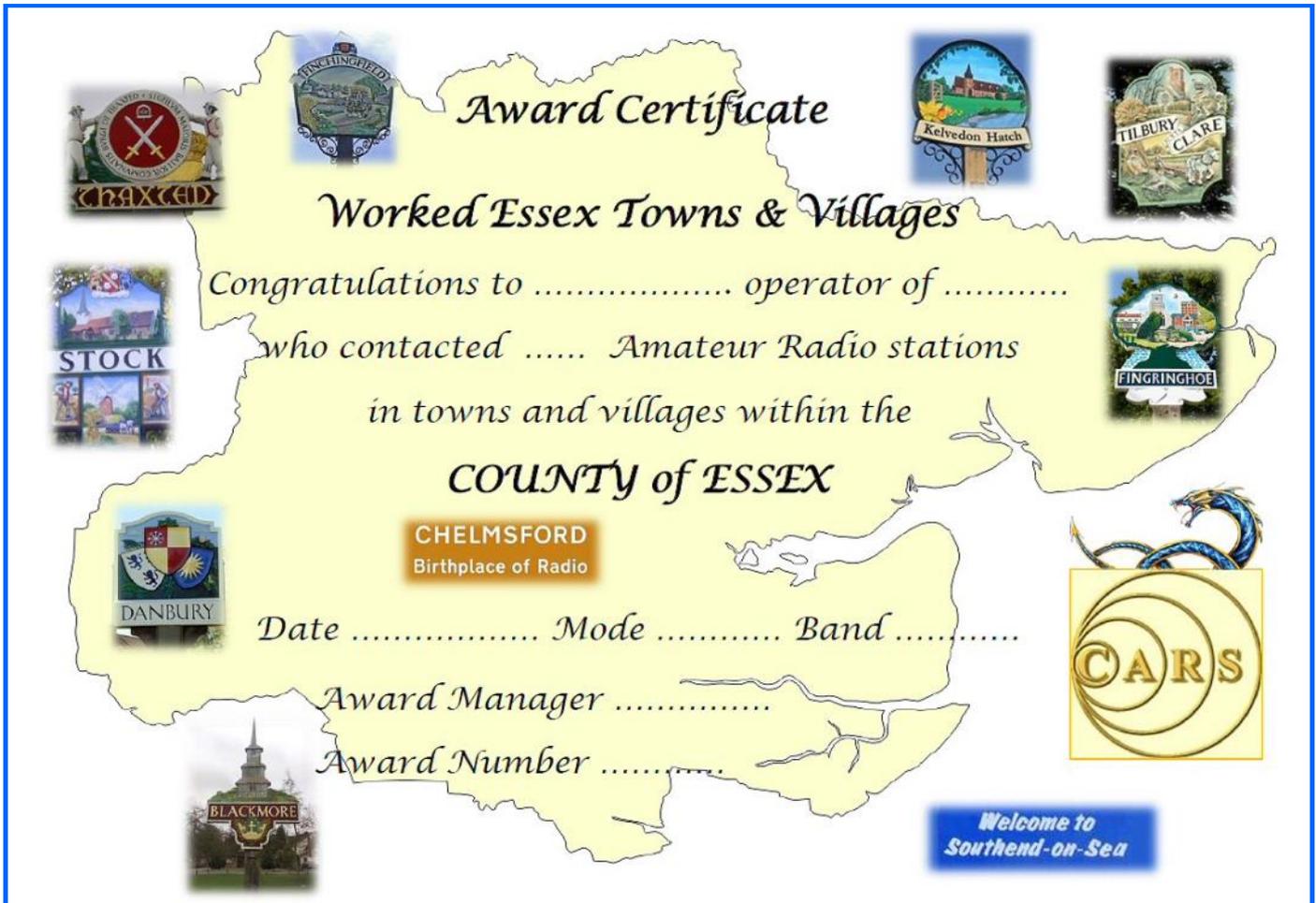
## Dates for your diary

*Please note, the dates may be subject to change...*

Tue. 2nd August	Meeting - "Constructors Competition" - Carl G3PEM
6th/7th August	Sandford Mill BIG Weekend! An interactive historical extravaganza!
Mon. 15th August	Skills Night - Danbury Village Hall
Tue. 6th September	Meeting - "Millimetric Microwaves" - Chris Whitmarsh G0FDZ
Mon. 19th September	Skills Night - Danbury Village Hall
Tue. 4th October	Meeting CARS Annual General Meeting
Mon. 17th October	Skills Night - Danbury Village Hall
Sun. October 23rd	Science Discovery Day at Sandford Mill
Tue. 1st November	Meeting - 25 minute chats (not 25 @ 1min each...)
Mon 21st November	Skills Night - Danbury Village Hall
Tue. 6th December	Meeting - Christmas Social Evening

## Worked Essex Towns & Villages award

It's been a long time in the gestation but, finally, the Worked Essex Towns and Villages award has "gone live". Carl, G3PEM originated this idea and has wanted this to be made available for some while. That moment has now arrived.



The objectives are to encourage contacts between Amateurs living both inside and out of the county of Essex, and to raise money for the Essex Air Ambulance from the surplus of administrative costs.

To qualify for either the Silver or Gold awards, you have to make five or ten **SIMPLEX** contacts respectively on any mode or band **from each operator's home QTH** in separate towns or villages at least **15 miles** apart. Amateurs living outside Essex can also apply for the award and any operator can earn a two town/village bonus by working CARS' club call **GX0MWT**, but this bonus is not available to any CARS member, past or present.

For full details, look on the CARS website [www.g0mwt.org.uk/award](http://www.g0mwt.org.uk/award) where you can download the .pdf file containing the complete set of rules, entry fee amount and claim form to be entered. - **Ed**.

## Things are changing!

The way in which the Newsletter is distributed will soon be changing. Currently, it is sent out via email to the CARS membership list, but in the past this has caused difficulties with keeping databases in sync. The next one will be made available on the CARS website and to get a copy, you will be required to download it yourself. You will get an automatic reminder when the Newsletter is available, but **you will have to sign up for the service** as this will not be done on your behalf.

John, G8DET will send out full subscription details via his regular email distribution list, but it is important to note that in the future, the Newsletter will be more widely available to all who care to sign up for it.. - **Ed**.

SAT 6 and SUN 7 AUGUST, 10am to 4pm



- BBC Essex on site all day Sunday 7th
- Talks by Tim Wander about Marconi and the exhibits at the Museum
- See our restored television cameras in action
- Chelmsford Amateur Radio Society transmitting from the Marconi Writtle Hut
- Trebuchet demonstrations from the Medieval Siege Society
- Have a go archery
- British Canoeing demos and have a go
- Water works trail



# Sandford Mill Big Weekend

Come and visit our wonderful but rarely open museum

£2.00 ENTRANCE FEE. FREE CAR PARKING.

## Sandford Mill

Sandford Mill, Sandford Mill Road, CM2 6NY  
(follow signs from Chelmer Village Way)

Web: [www.chelmsford.gov.uk/museums](http://www.chelmsford.gov.uk/museums)



## CARS 5th July meeting

Justin Johnson gave us a presentation of Bent Element Yagi Antennas which he had previously given at the Dayton Hamfest in the U.S.A.

He began by introducing himself as G0KSC and telling us he started getting interested in Amateur Radio and antennas some 10 years ago. Since then he has progressed, and built a business with a manufacturing facility on Canvey Island. He has produced almost unique designs using computer modelling techniques for both Ham and professional users all over the world.

## Bent Elements within Yagis

Performance and efficiency improvements for the modern Yagi



By Justin Johnson G0KSC



He is clearly a world expert in antenna modelling design, using a very sophisticated program which has thrown up anomalies with the, established over the years, NEC programs. He gave us a few examples, nicely illustrated with his slides.

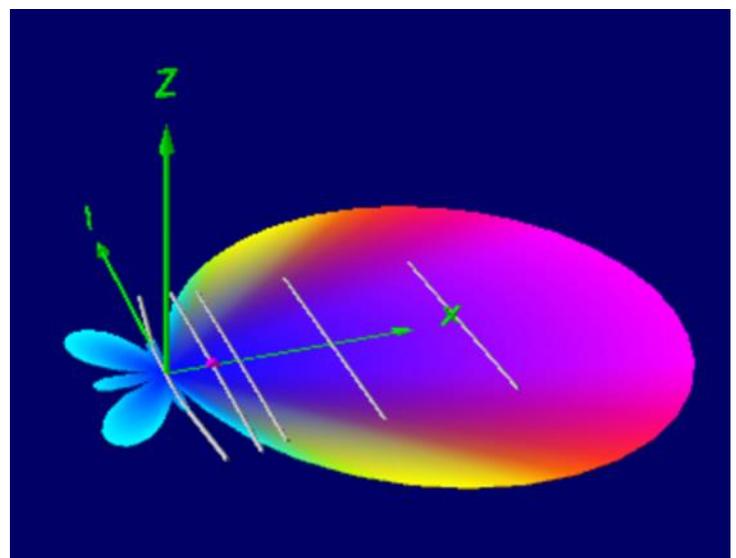
This particular presentation was to show the work and reasons for his designs which are in use worldwide, where the results can be compared with other units. Getting onto the bent elements he mentioned the Moxon square which was really a Yagi with bent elements which altered its parameters (impedance and directivity) from a two element "unbent" (is that a word?) Yagi.

Justin went on to explain that by bending, positioning, adding elements and changing boom lengths, the working parameters of the aerial can be made to optimise the designed or required parameter and produce "horses for courses".

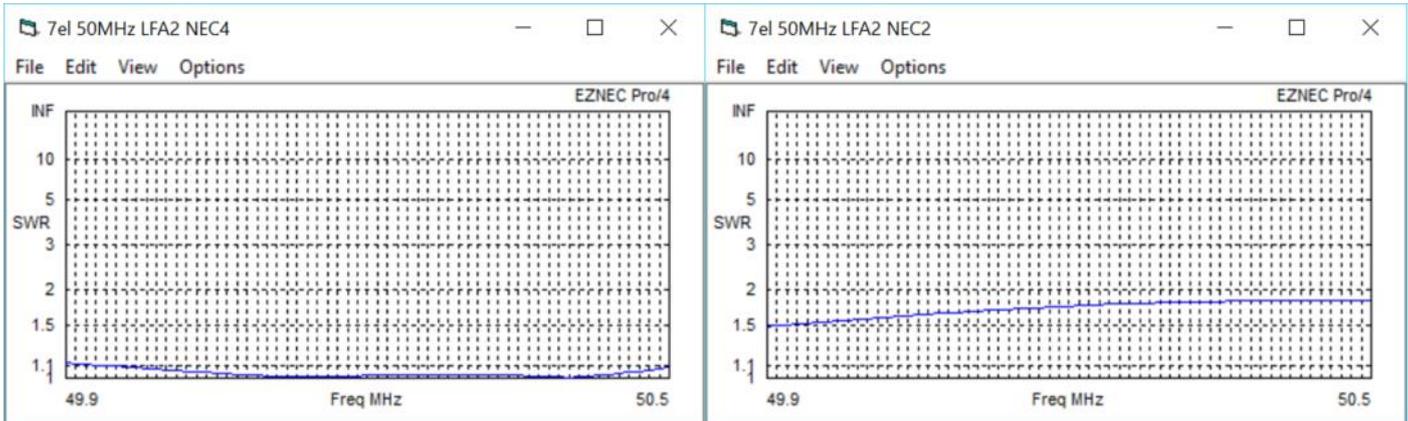
Directivity (gain & radiation pattern), feed impedance, bandwidth, back to front ratio, sidelobe suppression and noise in use can all be adjusted by bending and placing the elements to favour a required performance.

By sacrificing parameters which do not matter in your particular requirement, it is possible to maximise the parameters which you need for your application; however, you do not get anything for nothing!

Justin illustrated this point on a particular over-the-horizon case where the incoming signals were very small and a user had a very high gain (or a very sharp radiation pattern) but, due to the noise



level received, weaker stations could not be resolved. Justin's design sacrificed a little bit of forward gain to minimise the sidelobe and back performance resulting in much better sig. to noise and a workable contact. Justin showed us some plots taken from his computer program against those from NEC and others where his plots are almost exact to the built and tested antennas he has in the field.



He told us about stations he had been involved in with tall masts, stacked and bayed Yagis on mountains, islands and "Dallas" type ranches and illustrated it well. We all envied these people with pots of cash and without the difficulties of our back yards and neighbours!

Justin spent some time telling us of phone reports in to him, of his antennas not working. When asked for photos of the installations, cases of cross polar and wrong bearing (including straight up!) were soon sorted.

The feeders on his VHF and UHF antennas are connected directly on the driven element, eliminating the tails from the coax or feeder which become part of the element length causing problems to the performance.

Well done Justin and thank you for letting us into your design world and killing a few myths.

**Tony Gilbey, G4YTG**

*Tony's note about connecting the feeder directly to the driven element makes a lot of sense. It's something that would probably be done more often with homebrew antennas if the engineering could be solved. Anyone can assemble a kit of parts and anyone can cobble together junk box bits to approximate the required performance or design but the standard of finishing is what makes a good design stand out. Coax -> pigtails -> tinned brass soldertags -> stainless bolts -> aluminium elements = dissimilar metals and corrosion, in addition to the unwanted inductance (as I found out while modelling the 2m Slim Jim) - Ed.*

### See this space?

You could have something put in here (or somewhere like it). It might be an item for sale, a notice for a special activity, or you might just like to have a bit of dedicated open space in the Newsletter. E.g. "I asked for this: GZ1ABC". Let me know! - Ed.



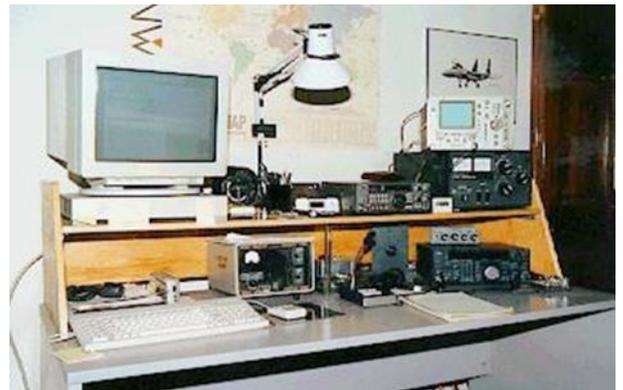
## QRZ.COM - Fred Lloyd, AA7BQ's presentation

15th July saw Fred Lloyd, AA7BQ give a talk at a venue in Corringham. I went along out of curiosity and for the sake of this article. It seemed locally that there wouldn't be as much interest in this as you might expect, but I was very optimistic when I arrived to find a car park full of cars and several people heading toward the social club. It transpired, though, that they were all headed for the Social Club's music night.

Arriving in the lecture hall itself, I was horrified to see only four people seated in a room big enough to take perhaps 200 or so. The Daves, G4UVJ and G4AJY asked where I was from and when it was established that I was representing CARS, the response was "well, that's four clubs, then." I knew Steve, G4HXY from Andy's Morse classes, but not John, G6SPH. Eventually, John, 2E0WJI and G8PMY arrived and with Spencer Tomlinson, M0STO who organised the event and Robin, Fred's XYL, we had a grand total of nine people in attendance.

No matter; Fred said he wasn't phased by the size of the group - he has given talks to just two people before. As the group was so small, there was some discussion before the talk began about the nature of amateurs and that cost of petrol may have contributed to the lack of enthusiasm. Also, with such a small group, some subjects were covered that wouldn't otherwise have been, so there was an upside.

You can read much about the early days of QRZ by looking at the website or AA7BQ's own page, but the start of the enterprise in the old 1993 QRZ bulletin board days was just one desk, as in the picture, right —>

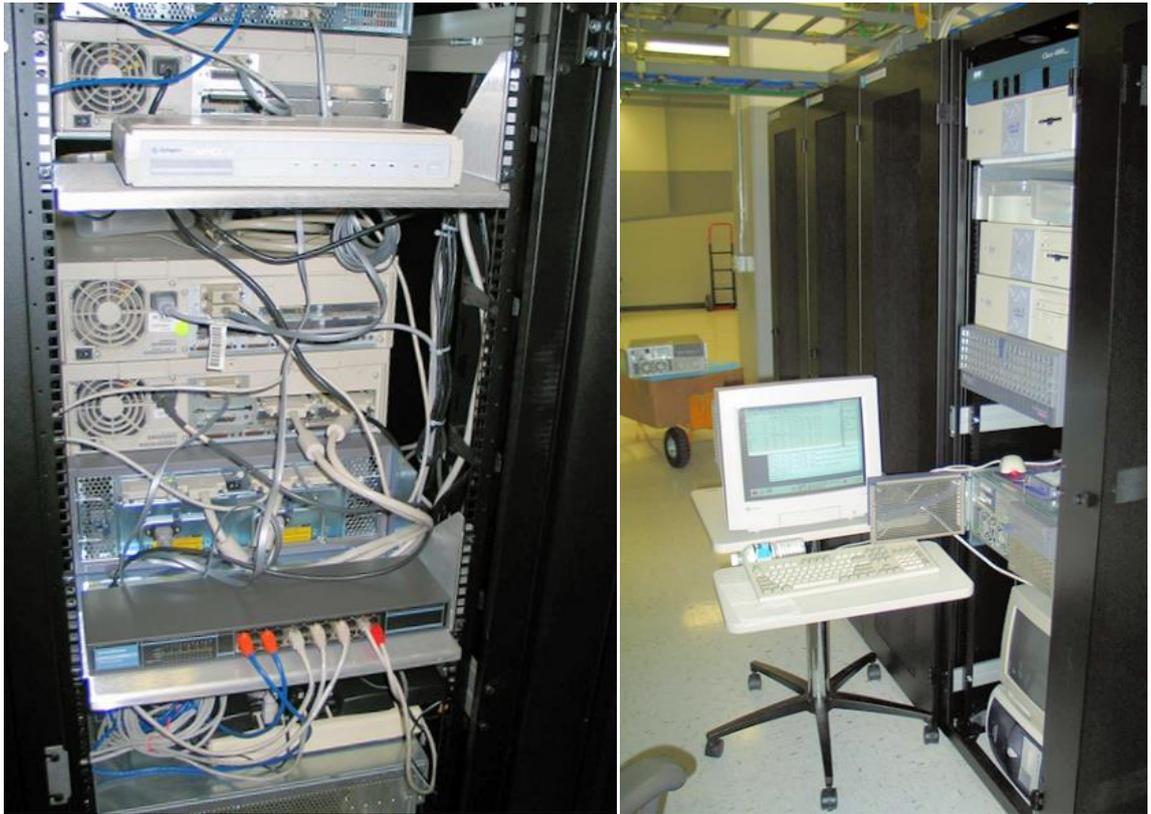


The late '90s saw the "site" relocated and set up in a closet, with multiple servers and tape backups (below left) and 2003 saw further expansion in both server, backup equipment and databases at a new location in central Phoenix (below right).



2004 saw a move to a commercial data centre and then finally, after some hardware problems caused maintenance grief that Fred really didn't want to deal with, they decided to go over to cloud services.

*"It was a failed Cisco router in August 2010. By January 2011 the move to the cloud was ready. There was much anticipation as we prepared to throw the switch, shut down the old system and fire up the new servers which had a completely different architecture. To our delight, the new system hit the ground running and we've never looked back."*



### Current infrastructure

- Amazon Web Services (AWS)
- 6 virtual servers: db, www, xml, forums, lbook, ssl
- Cloud storage: 12Gb, 20M I/O's per month
- Database: 11Gb, 61M I/O's per month
- Network traffic: 500Gb/month
- Located in Northern Virginia

### The QRZ Logbook

- Maintaining 153,000 logbooks
- 152,000,000+ QSO entries
- 34,173,000 confirmed QSO's
- 33,700+ awards issued
- 170,000 new QSO's every day
- Logbook dedicated cloud server
- Works with Logbook of The World

### QRZ Today

- World's #1 Ham Radio website
- 60,000 unique visitors per day
- 1M pages per day
- 1,521,000 callsigns
- 654,000 registered users – 2000 help requests/month
- 2.5 million forum postings
- 468,000+ personalized callsign pages
- 2,000,000+ Ham photos



*Amazon Server: 5th row, third up, six slots ☺.*

Plenty of anecdotes followed and it was very entertaining. In particular, there was an interesting story about the pictures that can be uploaded to QRZ. It was after that facility was added that the site really took off—takeup rocketed. When the service started, unaware of what the interest may turn out to be and worried that people would start to upload “dirty pictures”, Fred took it upon himself to vet all the pictures personally. When he passed the 30,000 mark, he decided to call a halt and let the site sort itself out.

All went well until one day Google’s web crawlers identified them as a porn site and they found that they were blacklisted from Google’s advertising system, with the result that their revenue started to take a hit. They get paid so much per page view and so much per click on an advert so it really started to mount up and it began to hurt financially. As Fred says, You can’t talk to Google—you can’t phone, email or go to their office and, as he had been blacklisted, even the standard customer service web bot was blocking that route. By now, there were so many users, pages and pictures, it would have been impossible for Fred to trawl through them all.

Eventually, and as they were starting to despair, quite out of the blue came a call from a Google marketing type who said “We’re really interested in you using our advertising service”. Fred was gobsmacked (or whatever the USAnian equivalent expression is). The guy had no idea there was an issue, or he probably wouldn’t have called, so Fred enlightened him. Sure enough, the guy tapped a few keys and then said “Oh - yes, I see what the problem is”. “Great,” said Fred “let us know on which page the picture resides and we’ll delete it”.

“I can’t do that”, said the guy “you’re blacklisted”. A classic Catch 22 situation which proved hard to break.

The upshot of all this was that Fred had no choice but to write a program to trawl the database and download all the pictures sequentially into a 10 x 10 thumbnail matrix and go through them page by page in an effort to find the guilty party. Finally, they got the culprit and (according to Robin) it was a really bad example. By now, though, they had a route into Google so they called and were able to say “we’ve fixed it”.

“No you haven’t”, they said.

OK, this couldn't go on, so now Fred contracted out the work to volunteers; he paid them something like \$1 per 1000 pictures examined and after *three times* knocking on Google’s door and getting the same vapid reply, finally they got there, honour was restored and Google let them back into the fold. Fred vowed not to make that mistake again. Now, every picture is vetted; not necessarily immediately, though. They are looked at after the fact and bad stuff is not now allowed to slip through the net.

Some discussion regarding the future of the service was held. Spencer wondered what would happen if and when Fred decided he had had enough and sold out. Fred said he thought it would be a long time until that happened and, in any case, the QRZ staff are family (literally) and a lot younger to boot so they will be wanting to carry it on. The picture below shows the team on an awayday and, as Fred identified the principal players on the slide, pointing out the guy in the dark glasses he said “and that’s someone’s husband”. Robin yelled out “that’s your son-in-law”. “Oh, yes, so it is”, said Fred.

### The QRZ Staff /Family

Fred Lloyd, AA7BQ, President and Founder [aa7bq@qrz.com](mailto:aa7bq@qrz.com)

Jaime Jeffries, KF7WIS, CEO [kf7wis@qrz.com](mailto:kf7wis@qrz.com)

Stephen McLaughlin, VE7STV, Engineering Manager [ve7stv@qrz.com](mailto:ve7stv@qrz.com)

Todd Detter, KG7MAK, Support Manager [kg7mak@qrz.com](mailto:kg7mak@qrz.com)

Spencer mentioned the case of Ham Radio Deluxe that had gone from free-ware to a costly paid product and expressed a concern that QRZ would go the same way.





Fred said that he had that conversation many times with the owner(s). He reckons they haven't got the right ethos; Fred is of the "sell millions for 5¢ rather than 5 at \$1m" school of thought. At one point when the discussion again turned to the parsimonious nature of Amateurs, Fred said that everything had to have a perceived value. Take a box of stuff to a fleamarket and label it "free" and you will go home with the same box untouched. Label it "every item 5¢" and you'll sell out.

That said, however, he wished rather more would subscribe to QRZ at any of the levels that, at a minimum frees you of advertising and at the max, offers a lifetime of unlimited support. They even offer a tame website designer subscription for \$24.99 per year, if you are of that bent.

The talk almost answered the one question I wanted to ask: When I got back into radio a couple of years ago, I hadn't heard of QRZ but was made aware of it by one of my early contacts when he assumed he was working a much greater distance than he actually was. So how did my (outdated) details get on there? Fred said that he uploads the current FCC database nightly, but any other calls on QRZ are put there by the owner (or someone else). When I said that I had discovered my details on there and that they were well over 20 years old, Fred admitted that sometime in the 90's he had been anonymously sent a UK database and so he had uploaded it. I wondered then if there had ever been any privacy issues through that, but didn't pursue it.

All in all, a very nice and intimate chat was had, with a lot of background information. Robin (right) lent a nice personal touch to the meeting by filling in some of the details (e.g. as Fred showed a picture of his shack, she said "hey, wait - that's tidy - let me hold that image" and later: "yes, Spencer can take you

to Duxford Air Museum, but I want to go to Harrod's").

I'm glad I had the opportunity to go along. - **Ed.**



The QRZ antenna tower (well, at least, that's where the antenna is located!)

## Feedback

John, G8DET received this recently vis his reverse distribution system and passed it on to me:

*Hi, John*

*A very full and interesting newsletter this month. I felt I ought to relate my own experiences with sinking earth rods, as a small appendix to the article by the editor.*

*Many years ago (early '60s), I lived between Hainault and Chigwell Row, and the gardens were completely London Clay - we were on the ridge that surrounds London on the north and east. I read about the method of sinking earth rods with water in a QST, and had great fun putting about six 8ft copper tubes, of 1/2" diameter, into the garden, along the fence-lines (as I didn't want my father to dig them up while gardening).*

*The method worked very well, as the ground had no detectable obstructions, and I connected them all together and into the shack (a wooden shed in the garden) with gash ex-military RG8 coax cable - freely and cheaply available at that time. The earths were still working well towards the end of the '60s, when I moved to Braintree. I soldered all the coax to the tops of the copper pipes, and kept the joints greased each year, using heavy-type gear-box grease. I never checked whether the coax was corroding!*

*Imagine my annoyance at the effort involved, although quite small, when a couple of years after putting the rods into the soil, we had a very hot and dry summer, and the ground started to dry out and crack. Eventually, there were cracks about an inch wide all over the garden, and I found that I could lose an eight-foot garden cane down some of them. Naturally, I used the chance to put in a few more earth rods, which mainly had initially to hang from the cable connections as they didn't reach bottom in some cases. Eventually, the rains came, and the cracks all closed up, and I found that they did enhance my previous efforts, as the RF currents into each set of earths were about the same value - I didn't have any more-sophisticated method of checking quality!*

*One thing I did do that wasn't mentioned by the Ed in his article (but was in the QST article I read) was that during the water-sinking procedure I poured copper-sulphate crystals down the pipes every now and then, which I presume were washed out into soil around the pipes as they sank deeper and deeper. Whether this really improved matters was unknown, but is worth considering if you are trying this method. The copper sulphate does kill plants though, so use carefully!*

*Best regards, Dave, G3PEN*

Thanks, Dave - I know about the copper sulphate and dangers therefrom to plant material. Advice to increase the effectiveness of grounding systems is many and varied, but all seem to need replenishing on occasion. It would seem obvious to pour some down the centre of the tube that was driven into the ground but, when I tried that after putting in my 6BTV support (see separate article) I was surprised to find that the soil was so compressed inside the tube that it was almost impossible to soften it with all sorts of mechanical methods of probing the depths and eventually I gave up. Any water poured into the tube just sat there for weeks on end. I suspect evaporation would be a more likely cause of water loss than seepage into the ground. - **Ed**.

## Seen these?

No, neither had I until John, G8DET forwarded me an email from Chris, G0IPU.



The antenna range looks quite interesting, with several loops, controllers and other accessories for their antenna systems.



They look fascinating and are certainly comprehensive, but not exactly budget!

I note that they are selling those large scale high voltage capacitors that were produced as kits several years ago,





but that seemed to have fallen out of fashion.

These are available in kit form as well. I have had experience of a similar one in an old AMA loop antenna and, although not 'elegant', they do seem to be built like the proverbial outhouse. They must also have a huge breakdown voltage capability.

[inac-radio.com](http://inac-radio.com) Electronics for radio aficionados (it says on the website).

Whilst I was doing a search for various information, I came across this homebrew hydraulic concentric Coke can tuning system:

It is quite ingenious and more can be found about it here: [cokecan antenna](#)

There are a couple of videos, but those are in the Brazilian language so if, like me you find yourself linguistically challenged, then you can just admire the pictures.

It's amazing what people come up with - **Ed**.



## 50 shacks of grey

It was my first time. It was wet, uncomfortable and short lived.

You never forget your first shack.

## Unlucky?

When Ralph started his apprenticeship, he had to take a colour blindness test for component identification. He failed the test and Shona from PR told him "I'm sorry, but you won't be able to work in development".

"Oh, he said. That's a bolt from the green".

## Knock knock

Who's there? Woo.

Woo who?

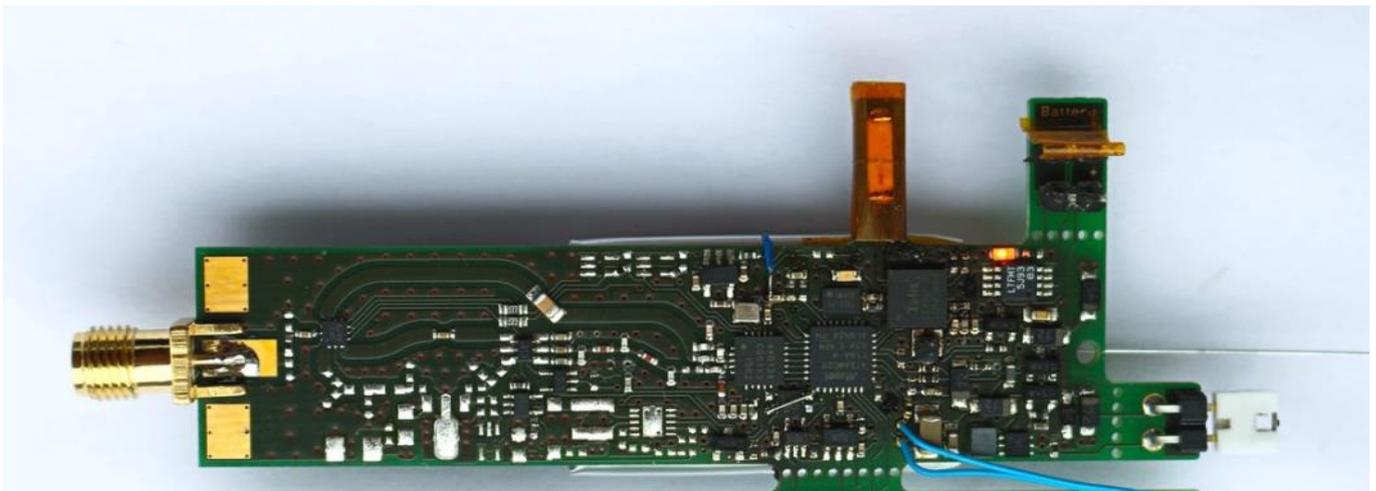
No, don't get excited, it's just another cr@p joke.

## UBSEDS15 World Tour

The latest University of Bristol student high altitude balloon (UBSEDS15) circumnavigated the globe between the end of April and mid June 2016 - UBSEDS is the Bristol branch of UK Students for the Exploration and Development of Space. The 1.5m diameter helium balloon, with a UHF and APRS tracker, was launched from Richard's student QTH in Bristol on 30th April. The previous flight, UBSEDS14, was powered by a single AA lithium battery (from Tesco) and travelled some 35000 km before losing power, and most likely height, near Iceland after travelling almost around the globe. However UBSEDS15 was solar powered! Also like previous flights, the tracker was designed and assembled by Richard.



UBSEDS15 just after launch

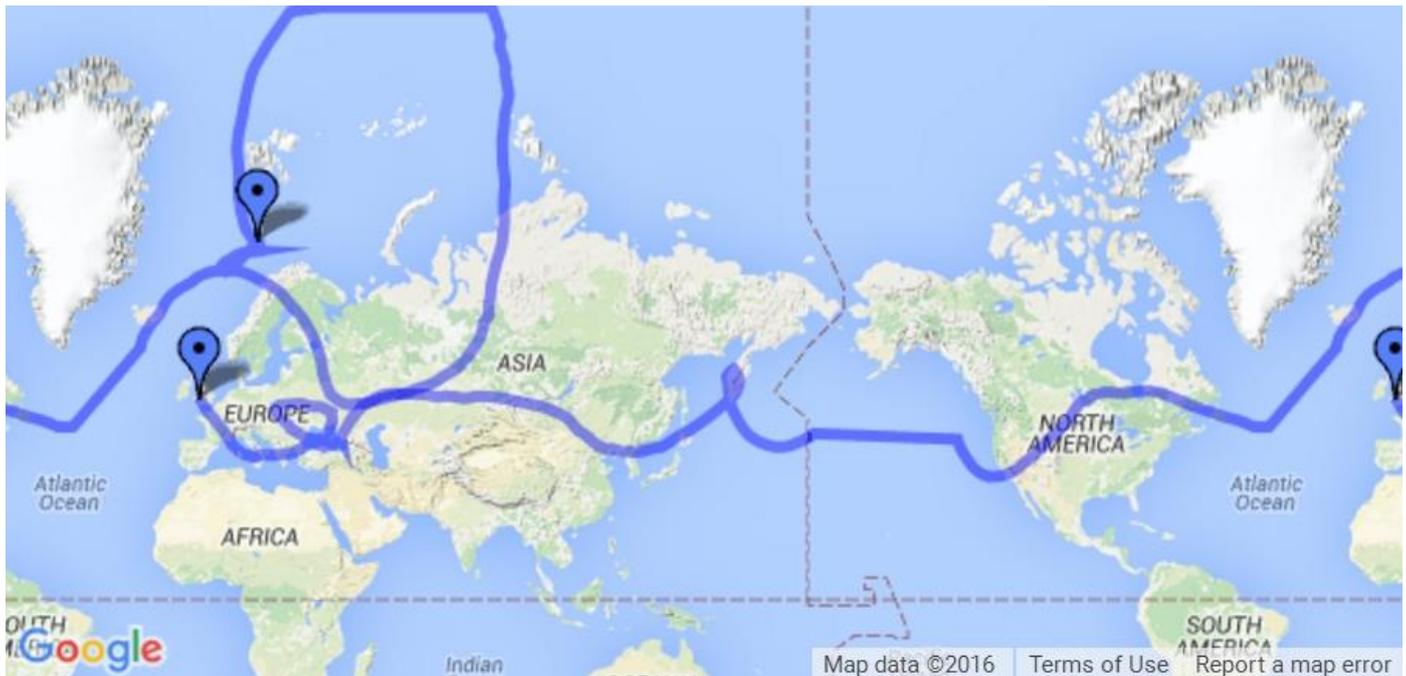


UBSEDS15 Tracker

UBSEDS15 was launched into a clear sunny sky and rose to an altitude of 11.4 km (37,000 ft.) before travelling south-east towards Italy and then eastwards towards the Black Sea. It then processed to loop above a low pressure system before eventually, after a few days, moving eastwards again over Kazakhstan, Russia, Mongolia and China.

There are very few APRS receivers over central Asia but UBSEDS15 records GPS and other information every hour for later transmission (in the APRS comment field). It then passed over South Korea and Japan, plenty of APRS receivers, before looping on its way across the Pacific Ocean. It crossed over California moving north east towards Canada before leaving North America over Newfoundland. After several days without any APRS contact, UBSEDS15 appeared over Iceland before progressing south east over Scandinavia and Russia – now having circumnavigated the world. It then passed over the northern edges of Kazakhstan, for a second time, before moving north to a latitude of 84° (i.e. a few hundred km from the North Pole and in constant sunlight) before moving west and south to the east of Svalbard. Low wind speeds at 11 km altitude meant that UBSEDS15 hardly moved when the last APRS packets were received from north of Norway on 16th June, 47 days after launch and after travelling just over 50000 km. Its altitude was still around 11 km when last heard from.

#### UBSEDS15 Track



Further details of the UBSEDS15 flight can be found at: <http://www.bristol-seds.co.uk/hab/flight/2016/04/30/ubseds15.html>.

#### Peter, M0ZBU & Richard, M0SBU

*That's both quite a trip and an achievement. I clicked on the link above for more information and found it quite interesting. There is so much more to the flight than meets the eye. Amongst the resources is a KML flight map. Not knowing what that was, I Googled the phrase and found it stood for Keyhole Markup Language and with which I could view the flight in 3D. "Of course it does", I hear you say - you, who have been using it for years and are wholly familiar with it. So now, do I have to install Google Earth to view it?*

*The last time I installed that program, many years ago whilst I was still at work, it took up umpteen acres of disk space. Does it still? Is it worse now?*

*The APRS system is used by huge numbers of people (for various reasons I guess) but if you are not an aircraft or shipping spotter, what practical use is it and how do you resolve it? I understand that the cheap dongles with appropriate software will do the job. Something else to learn...*

*On that note, I have recently acquired an SDRplay receiver to get a handle on the HF band noise that is plaguing me. I don't know what is causing it, but it is horrendous, fairly broadband and non-continuous so is it the result of inadvertent RFI or some awful over-the-horizon radar that no-one seems able to do anything about. Whatever, I have had to install yet another suite of bug-ridden software that almost functions as advertised and that I am currently fighting with. Why is nothing ever easy? - Ed.*

**Skills Night 18th July**

And again, we were treated to a nice mix of skills and talents at this ever popular event. All the regulars were there: quiz, callsign badges, antenna engineering, Charlie's Ham Goodies and radio advice etc. Also, we had the following:



Jim, 2E0RMI takes the place of Sarah at the door, but declines to wear a skirt.



Dave, M0HBV (top left) knocked up a Pixie Transceiver kit in the time allotted and several on-lookers admired his skill with the iron.



Chris, G0IPU laid out a test bench for antenna testing and was able to satisfy two happy customers.



Those were the days!

**THE AMAZING BARLOW-WADLEY XCR-30 M.K.2 RECEIVER**

A COMPLETELY NEW CONCEPT IN PORTABLE RADIO DESIGN

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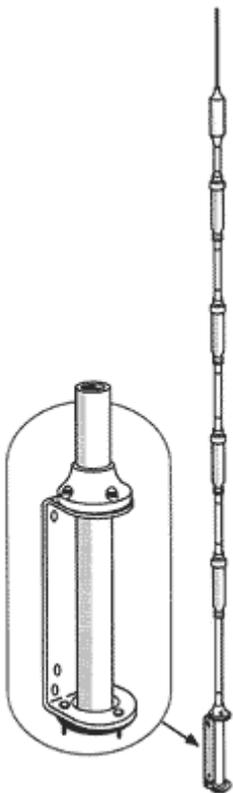
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Nostalgia abounded, courtesy of a free pile of old Short Wave and RadCom mags.

Chris, G0IPU drives himself up the pole and shows us his better side...

## The Hustler 6BTV-80s antenna



I was given this antenna by Rob, M0KCP who no longer had a need for it. The lower 6' section had suffered a bend in some high winds and Rob thought I would need to replace it. With four traps, top and base sections, the antenna has ten joints and these were somewhat blackened and slightly corroded. This is in the nature of aluminium that has been subject to the weather and slight movement, so I lightly cleaned off the worst of the corrosion without removing too much material. First mistake?

The bend wasn't too bad and I managed to straighten it adequately but, nevertheless, I got another piece of tubing to replace it at Waters & Stanton – from Innovantennas' workshop. While I was at it, I got some of their aluminium grease/jointing paste to add to the joints upon eventual re-assembly.

The manual stipulates bashing at least a 4' length of tubing into the ground to act as a ground return, leaving about 18" exposed as a mounting stake. The instructions are quite specific that this is the only acceptable form of inserting the ground stake, so I followed that advice. Going on past experience I wasn't expecting a happy time of things, but I did manage to drive about 3' 6" into the ground using a Kango borrowed from Tony, G4YTG.

I had to make up an adaptor to seat the Kango chisel into the pole, but that was all the special treatment required. All, that is, apart from drilling a hole in the centre of an ornamental stone circle that for some years had done nothing but hold an equally ornamental sundial (its practicality is obviously of limited benefit). The sundial got promoted to the front garden, where it got in the way of my ladder when I was cleaning my windows, but I thought I had to sacrifice something for my hobby, after all.

The instructions call for a certain initial spacing between the pole ends and trap elements as a starting point for checking the SWR. Here I discovered my next problem. The hose clamps that are (presumably) supplied with the antenna are none too strong and I found it hard to tighten them adequately. When the antenna was erected and swayed in the wind, you could actually hear the very faint 'slap' as the joints moved and I assumed that the pole sections would probably move with time. Next mistake: I found that overtightening would deform the clamp thread and render it all but useless. It is possible (just) to carefully reform the clips for another bite at the cherry, but a better solution, I thought, would be to replace them with genuine Jubilee clips. These seemed very much better quality and comparison pictures tell the story in terms of the metal thickness and screw track integrity.



Well; er – no, that didn't help. They were even weaker. I could see that this would likely be a long term problem, so I turned up some spacers from the spare tubing at the recommended spacing dimensions. Any changes to the spacing could soon be implemented, as they don't take a minute to turn up and the 'bent' section offers plenty of spare material!



After putting up the antenna, the first thing I did was check the VSWR and it seemed to be OK (ish) at the end of the coax. The lowest SWR points weren't necessarily where I wanted them to be in the band (and some were out of band) but that should be taken into account by tuning the element lengths, surely? There is about 15m of coax between the antenna and the MFJ remote ATU which I was using just as a convenient cable joiner in bypass mode - with about 50m of coax in total.

However, when I checked the match with an analyser at the base of the antenna, it was 'orrible, with or without the coax outer connected (picture right). This seemed to show that, despite the fact that I am using UR67 the effects of a poor SWR can be mitigated by 50m of (reasonably) low loss cable. Could that be right?

I could just give you the SWR figures, as shown in the graph above, but that doesn't really tell us anything much. How would you know if the impedance was too high, too low or whether it was inductive or capacitive? You could use a resistance-reactance graph that many are familiar with but I prefer a more friendly sort of plot.

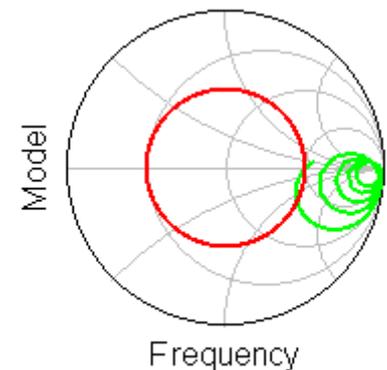
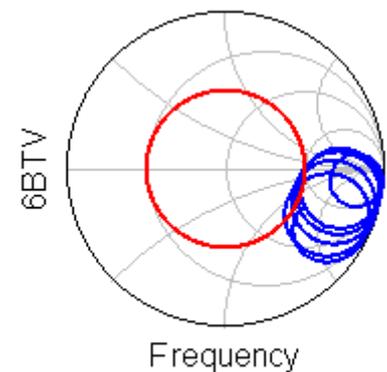
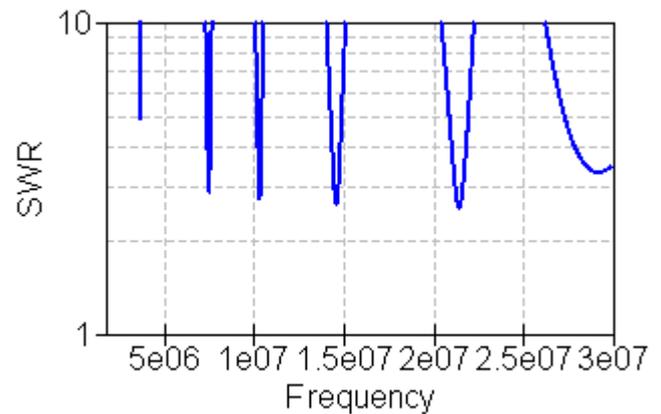
Looking at the SWR on a Smith chart tells you a lot more about what is going on: Any information to the north of the horizontal line is inductive whilst any part of a trace below it is capacitive. Likewise, the centre of the chart represents 50Ω with a log scale depicting higher impedances to the right and lower to the left. The red line is a constant SWR circle of 3:1. This graph says that the load is mainly capacitive and that all the curves are outside a 2:1 SWR circle, but that they are all high impedance, suggesting a series impedance which must be due to the ground impedance, but why the net capacitance?

True, the manual asks that the antenna be sited 15' away from metal objects and 10' from anything else, but that just ain't realistic in my garden. Could that be the problem?

Having made a sweep of the SWR across all the bands, I dismantled the antenna. Next, I measured the traps as best I could (it is really not easy unless you go to town under laboratory conditions) and modelled the antenna using 4NEC2 in the most ideal form I thought reasonable. This model takes nothing into account regarding the proximity of trees, bushes, sheds, etc., but may tell me approximately what it should look like using an average, or moderate ground. Imagine my surprise to find that I got the picture right. There is a huge similarity in the trend of the curves, so I felt I was not looking at a real problem.

As intended, upon reassembly and prior to tuning the antenna, I used the aluminium jointing compound. This was the next BIG mistake. My God, that stuff gets everywhere. Even taking the utmost care with nitrile gloves and a spatula, it seemed almost impossible to avoid getting it all over the place – especially as I found I had to dismantle and reassemble the antenna umpteen times during the cleaning, measuring and tuning process. It actually exacerbated the clamp grip problem and allowed more vertical movement in the poles. Also, it hadn't improved the SWR by an awful lot, although it had helped a little.

I still thought was that the ground return via the mounting stake just wasn't good enough, but then I took apart the traps and found the lower, 10m one was fairly blackened and pitted at the point where the shroud is clamped to the lower tube element. I looked at the others and found that each in turn was less and less affected at the similar joint position as I worked up the antenna – to the point that the uppermost, 30m trap was virtually clean apart from a light oxidation.



The 30m one is shown below with one of the spacers.



I set to and cleaned up the trap extensions (the antenna pole joints) with paraffin and the some wire wool to remove any remaining aluminium grease, corrosion or oxidation. I resolved to re-apply the grease only after the final tune. I re-erected it to find that the SWR was still too high. Hmm... Maybe the trap clamps could be too loose and the associated resistance affecting the desired Q? I ordered some heavy duty Mikalor hose clamps that can be really torqued up and which provide a good solution to the problem of keeping the sections in place.



OK, now to start adding or subtracting spacers to tune the antenna on to the right frequencies. Evidently, unless you have a cherry picker, the antenna has to be taken down and re-erected each time you want to alter anything. The stub at the base of the antenna is about 30cm long and, each time, it is necessary to get the vertical element absolutely in line with the stub or one of two things will happen: a) it won't go on/ come off or b) you will graunch the aluminium and make life difficult. When it's windy, it's obviously a lot more difficult. I'm about 6' and my maximum vertical arm span is realistically about 5' - 5' 6". That, on an antenna which is effectively 25' tall can be quite fun. Also, the heaviest bit is at the top so as you raise or lower it, there is quite a bending moment. It will probably be OK, but it always felt like it was going to take on a permanent bend in the middle somewhere.

The trick was to whip it off quickly, move it vertically to somewhere you could anchor it at one end, then carefully walk it down; reversing the process to put it up and carefully re-insert it. By noting the frequency at the point of minimum SWR and comparing it with the wanted frequency, I got a clue as to how much each section had to be lengthened or shortened. For example, if the frequency of the SWR minimum was 7% high, then I would measure the length of the antenna to the point of the relevant trap, calculate 7% more in length and then increase the total gap by that amount. Mostly, that method was good enough to get me in the ballpark and sometimes it was cock-on, so it reduced the cut-and-try by a fair amount.

I wondered about trying some radials although I don't really have enough space for them. I did, however, try the recommended lengths for 10m, but it didn't make any difference to the SWR, so I abandoned that idea. All the bands are tuned up in strict order: 10, 15, 20, 30, 40 & finally 80m, as the traps are fixed tuned and each adjustment in inter-trap length affects the next lower frequency band.

Now; I worked up the antenna, all the while measuring the impedance at the antenna base. I found that the lengths of the various sections progressively increased. OK, fair enough I thought, until I found that there was no longer enough length left in the trap extension tubes to support the extension poles. I thought this must be due to the surrounding foliage, but I could just cut some longer bits. And so I did.

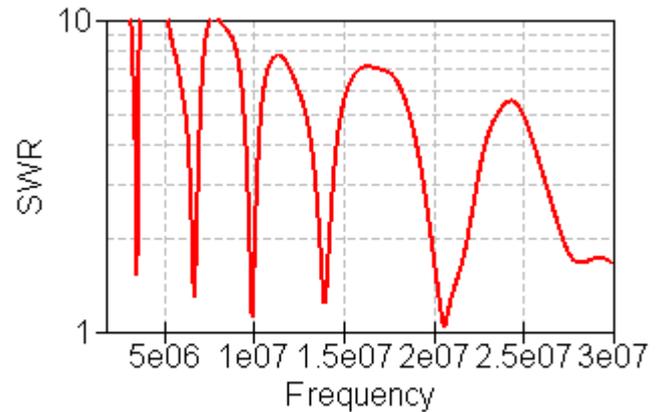
All the measurements you see here were made continuously across all the bands with my VNWA that has much better resolution than my RigExpert AA-600, but I have to use the laptop outside to get these. It's ok for occasional use but, during the tuning process, the weather was stinking hot, the black laptop absorbed heat like nobody's business and it was in a in a dusty, messy, greasy environment so I used the AA-600

one band at a time. All the bands are pre-programmed, so it is no sweat to occasionally go back and see that the previous measurements are still OK as I worked up the antenna.

I finished up with several lengths of tubing longer than recommended or original, but the SWR readings were lowest where I needed them and mostly about 2-2.5:1, with the exception of 80m, which remained stubbornly high. Now to connect the coax and see what effect that had by measuring at the other end.

That was a real puzzle. The SWR had now come down to very low levels indeed (much as I had seen before I started tuning the antenna) but they were way off frequency and seemed suspiciously low (see right).

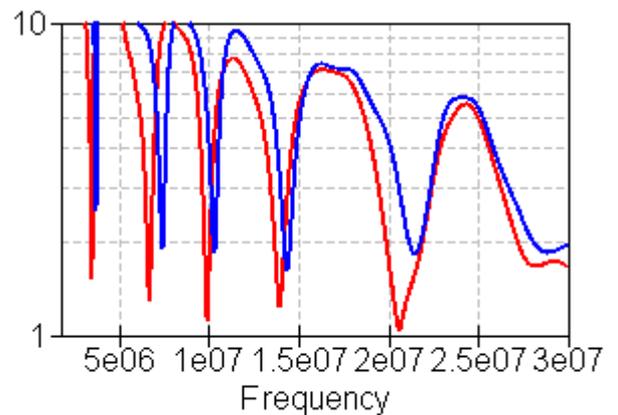
The SWR was well below 2:1 everywhere approximately across the amateur bands with the maximum SWR everywhere else reduced (presumably) owing to the return loss of the coax run. OK. Deep sigh, and resign myself to going back out and doing it all over again to get the frequencies back in line. S'truth...



This time, the tube extensions I made up were redistributed, removed or shortened to suit the new conditions.

Eventually again, I got to the point where it was all (apparently) hunky-dory and everything was where it should be except for 80m. OK. Great stuff. Now all I had to do was take out the whip at the tip of the antenna and shorten it to get the required frequency. Actually, I replaced it with another whip of the same diameter and stainless steel material, suitably shortened, that I had lying about from another project. That done, I checked the SWR on 80m (too high, but on frequency). I packed up, had my tea, mowed the lawn then, as a last measurement, attached a 100Ω resistor to the end of the coax to see what that looked like. It should exhibit a SWR of 2:1 right across the band and, indeed, it was quite close at about 1.7-1.8:1. This suggested that the coax loss was not as bad as I feared and that the readings may well be OK. If the coax loss wasn't lowering the SWR, could it be that the cable itself was acting as a kind of auto-radial?

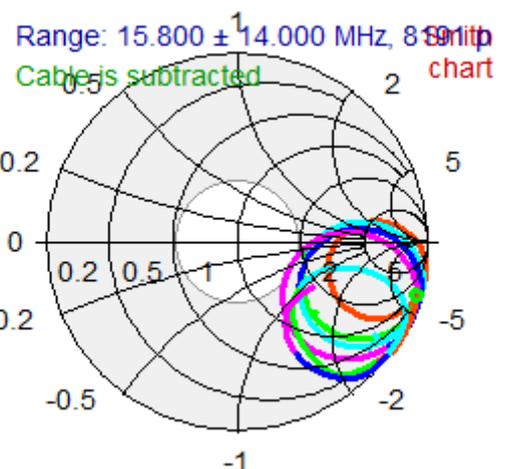
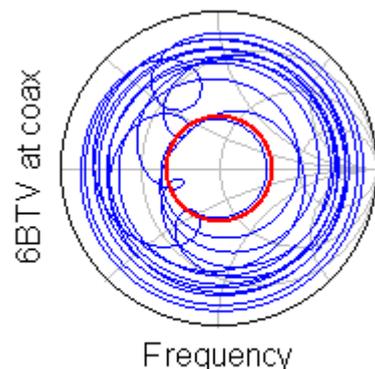
I kinda wasn't concerned, as it seemed that the Tx power would, indeed, get to the antenna and that it would resonate. Let's face it; you can match to any impedance, but if the antenna doesn't exhibit a resonance on the wanted frequency, then you aren't going to do very well.



After I had measured the 2:1 coax SWR performance, I reconnected the coax to the antenna and went back in to give the antenna a whirl. Imagine my disappointment when I found that SWR had shot up and the lowest points were all off tune again. Oh dearie me, I said. (Well, almost).

Now look at the Smith chart (left) at the end of the coax. This shows how each 90° of coax changes the high impedance to low and the phase rotates around the chart leaving a

very messy picture indeed, which is a good reason to eliminate the coax. That requires a calibration to do it properly, but in the chart on the right the AA-600's software has electrically removed a length of RG213 coax with ideal parameters. Much easier to understand the graph now and it hasn't changed much.



So; where was I to go from here? There were three possibilities:

- 1) the antenna had an inconsistency affecting series impedance right across the bands (ground impedance/connection?)
- 2) there was/is a problem with the coax/connections
- 3) it was a measurement error.

If it is the first case, then I'm not sure I'm prepared to put up with it. If there is a dodgy joint somewhere, it may be fixable. The coils in the traps are well soldered to the tags that are in turn riveted to the aluminium tube but the joints looked OK when I checked them as I dismantled the traps. One thing I don't want to do is wiggle them to find out - that will be a recipe for disaster if I loosen an otherwise sound joint.

If it is the second, then I would expect to find a complete open or short and therefore vastly different results, so it's not likely. Finally, I don't believe it is a measurement error as both instruments tell the same story and the cal sets haven't changed.

Thinking that I would just have to steel myself for another set of upping and downing, I went out and had another go at tuning the assembly—again only using measurements taken at the shack end of the coax.

10m was OK (ish). You can see from the plots that it is very broad band and there was little mileage in changing anything there.

15m looked like it was tuned too high so I extended the relevant section by about 3cm. Hmm...

20m looked like it was tuned too high so I extended the relevant section by about 10cm. Why so much?

30m again, was tuned too high. Oh dear, we've been here before. I ran out of adjustment again on the original section so I re-inserted one of the ones I had made previously for tuning at the base of the antenna. This wasn't looking good.

40m was way out. Again, tuned so high that I would have had to put in a silly length of tubing to compensate.

OK, enough's enough. That's it. I could play those games for an eternity and I'm just not prepared to, so I stopped there, dismantled it and stowed it away in the garage rafters. I gave the mounting pole a tug and it gave very slightly but was reluctant to come out, so I drilled a transverse hole in it and inserted a man-sized screwdriver and gave it a twist and... Robert's yer mother's brother. A couple of wiggles, a tug and a twist and out it came, clean as a whistle, with next to nothing in the way of soil clinging to it..

Looking at this pole, there was about 4-5" of very compressed sandy clay in the end, along with flint shards and the odd pebble. As I up-ended it to study the reasons for it not going in the ground further, the water that I had poured into the pole to aid the earthing poured out in a (very) muddy stream and missed me by millimetres (so I have something to be grateful for, at least).

OK. That's me finished now with the 6BTV and never again will I try an antenna of that type and with those sorts of joints. Whatever the reason for the inconsistencies, life's too short to mess about like that and wait for the disappointments to stack up. - **Ed**.

---

## 50 shacks of grey

She looked apprehensive, but agreed to try it. At first, she made some encouraging noises but then yelled sharply as I increased the tension on the ropes. She wasn't strong enough to take it. OK, I had to be gentle—release the tension and try again. "Yes, yes", she said, "go on - I think we can take it to a higher level".

"What?", I asked "put the halyard pulley up on the roof?"