# DERBY AND DISTRICT AMATEUR RADIO SOCIETY

**Incorporating Derby Wireless Club (1911)**

DADARS Newsletter
December 2019

## EVENTS RECENT AND FUTURE

**NOVEMBER 2019**

| | |
|---|---|
| 5th | Junk Sale |
| 12th | Committee Meeting |
| 19th | 405 Line Evening |
| 26th | Christmas Meal at 2.00pm - No evening Meeting |

**DECEMBER 2019**

| | |
|---|---|
| 3rd | Junk Sale |
| 10th | Committee Meeting |
| 17th | Natter Night |
| 24th | No Meeting |
| 31st | No Meeting |

**JANUARY 2019**

| | |
|---|---|
| 7th | Junk Sale |
| 14th | Committee Meeting |
| 21st | Tentative Talk |
| 28th | WSPR/FT8 |

For the latest information, please view the Club website or look out for emails from the Secretary.

We meet at 7.30pm on the FIRST and THIRD Tuesdays of the month. There will be NO meeting on the FOURTH Tuesday or the FIFTH if there is one.

## Introduction

Welcome to the December 2019 edition of the DADARS newsletter. The next issue will be in June 2020 so I will take this opportunity to wish everyone a 'Merry Christmas and a Happy New Year'.

Although this is the period of goodwill to all men and peace on earth, after trying to park in the Derby INTU centre last Saturday morning, 'goodwill' is probably not the word that springs to mind!

It is hard to believe that eight years have passed since we celebrated the 100 years centenary of Derby Wireless Club. In September 2021 it will be 110 years. Assuming that we are all still alive, is it worth considering another celebration? I think waiting for 150 years (the next logical denomination) will be pushing it a bit for most members! We should celebrate while we can. What do you, the membership, think?

As per usual, I have not received a huge amount of content from members for publication - actually, it was zero. However, I was inundated with people (well, one person actually) asking for more detail on how to interface old transmitters to sound cards for use with digital modes. With this in mind I have included a technical article outlining how to overcome EMC earth loops and clean up the audio reaching the microphone socket.

## Christmas Social Event

Once again, the Club ran a social event on 26th November 2019 at the King's Highway, Derby DE22 3NH at 2pm.

It was well attended and judging by the lively discussion and the noise, it was considered a success This year, I can report with authority that there were no complaints regarding the parsnips. Thank you for attending.

## Club Subscriptions

Just a reminder that Club subscriptions are due on January 1st 2020. The Committee made the decision to freeze the fee to £5.

## Congratulations

If you have read the December 2019 issue of RadCom then you may have noticed on page 10 that our President, Jack G3KQF, reached 70 years continuous Membership of the RSGB. That is a remarkable achievement. Well done Jack.

## Talks and Presentations

On June 18th, Chris G8DXT treated us to an excellent talk and demonstration titled 'An alternative look at aerials and measurements'. Chris demonstrated how to assemble a complete antenna measurement system using affordable modules available from eBay. The modules included a wideband noise source, a return loss bridge and an SDR dongle. Open source software automated the process and provided a nice graphical output.

Christopher Presenting

The whole system cost less than £50 but performed very effectively over a very wide

frequency range. Chris completed the talk with a practical demonstration showing us how to optimise the VSWR of a VHF ground plane by sloping the ground elements.

We invited Chris back on 20th August to present part 2 of his talk 'An alternative look at aerials and measurements'. Chris's talk covered new ground including an explanation and method of equating VSWR, Return Loss, Antenna Loss and a variety of other parameters that are often heard within Amateur Radio circles but not always well understood. Chris demonstrated a design for a magnetic loop antenna and illustrated how to measure and predict the performance. The membership appreciated the quality and depth of this excellent series of talks. Thank you very much Chris.

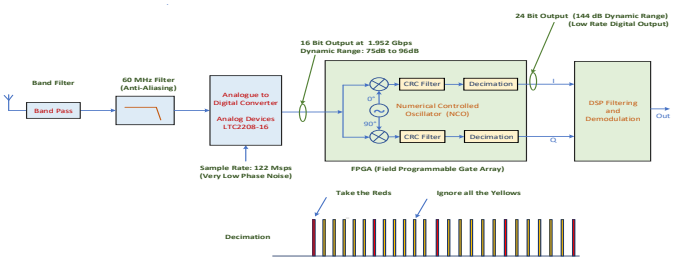
On 15th October we witnessed an FT8 Demonstration by Chris G4AKE. The equipment on the day consisted of a FT1000MP transceiver, a Focusrite Scarlet 2i2 24bit external sound card, an I5 laptop running WSJT-X version v2.1.0, GridTracker v1.19.1026 and the Club Comet H422 dipole mounted

FT8 Demonstration Setup

above the roof of the Club room.

It was very much a case of the blind leading the blind - Chris G4AKE is new to the mode. Despite this, we shared tips and enthusiasm making the evening a success. We worked lots of stations all over the world. The icing on the cake was working VK2 in Tasmania on 40m at 8.30 pm using 25 Watts. I suppose once you work VK, you may as well pack up and go home - so we did.

On 22nd October, Chris G4AKE presented a talk on SDR receivers that compared the latest offerings from the main amateur radio suppliers and the circuit architecture adopted. Subjects discussed included, the four rules of direct sampling, an outline of direct sampling topology and a peek into the future of digital radio.




On 19th November, John G8IHA treated us to a '405 Line evening'. John brought in a number of valve vintage 405-line television sets ranging from a very early 1950's single channel TRF 9-inch set to a later 1950's 12-inch set. It was surprising just how good the video and audio quality were on these early sets. It was very nostalgic to smell that wonderful aroma emerging from the hot valve chassis and from the hot carcinogenic Bakelite. Of course, most of us remember early black and white TVs as children - our parents bought them ready for the Queen's Coronation in 1953. Thanks John - much appreciated.

## Visit from VU2JAW

The Club extended a warm welcome to Jojith VU2JAW and his daughter Neena who attended the Club meetings on a number of evenings. Jojith is visiting the UK for a few weeks and has taken the opportunity to meet with other radio amateurs in the Derby area and exchange notes.

VU2JAW and DADARS Members

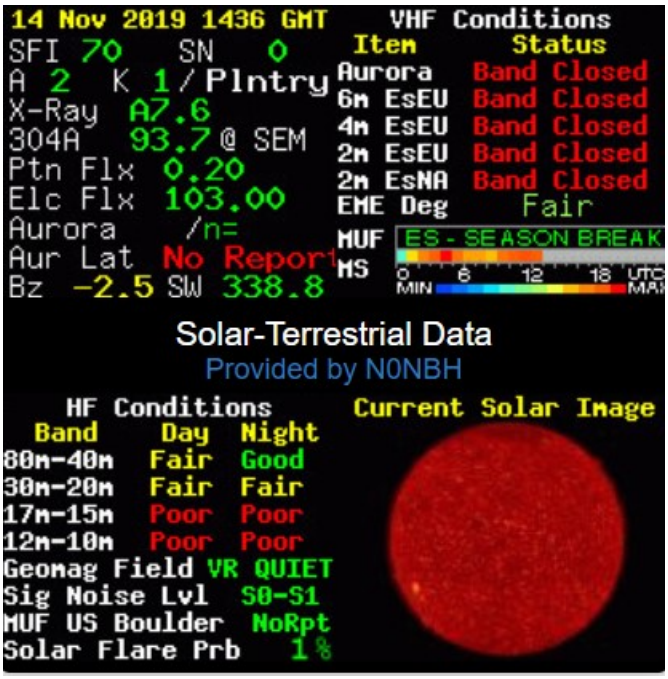
Jojith and Neena witnessed the FT8 demonstration and the talk on SDR receivers. The members of DADARS wish them both well for the future and hope that they enjoyed the meetings.

## Space Events and Sunspots

Sunspot numbers remained stubbornly close to zero throughout most of the year although we did experience three on 3rd November apparently. NASA forecasted that cycle 25 could be the weakest over the last 200 years with levels around 30% to 50% of those recorded during cycle 24. They also suggested

that the next cycle could start in 2020 and will reach a maximum in 2025. NOAA suggested that cycle 25 could be similar to cycle 24. Either way, it will not be particularly good.

Fortunately, the threat of a 70 year Maunder Minimum is




receding. In fact, bright spots on the sun surface in November corresponded to a cycle 25 polarity suggesting that cycle 25 activity is already starting deep within the star. This is good news - earlier this year, there was speculation that cycle 25 may not happen at all.

Using NASA predictions, 2025 could peak to an average sun spot figure of around 58 compared to a peak of 285 in 1958 and 156 in the year 1969. No wonder people consider the period 1958 to 1969 as the heyday of amateur radio - it must have been so easy to work DX.

During the solar minimum the lower bands tend to be better with lower band noise (VDSL2 and QRM permitting).

On Saturday night 9th November I decided to try WSPR on 160m using a genuine 40 Watts. I received spots from all over Europe and beyond including 8 stations from the USA, an eastern Russian station near the border of Mongolia and a Chinese station in the Guangdong Province near Hong Kong. Not bad for topband. In 1971 when I first started on topband with AM gear, I thought working Harry G3XFU in Sheffield was DX!

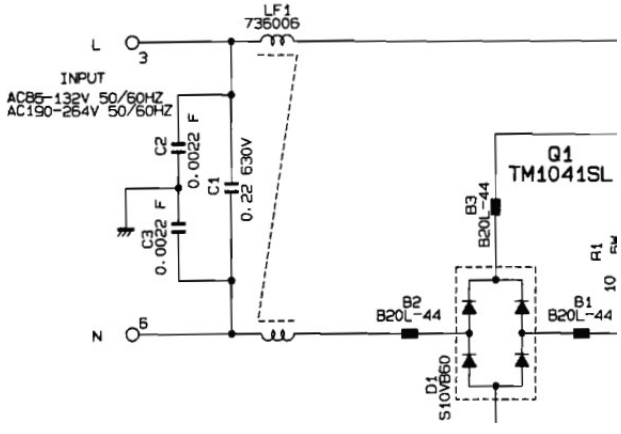
## The Fight Against VDSL2 Noise

It is interesting to observe the politicisation of broadband and the various pledges by various political parties to wire the UK using fibre to the home (FTTH). This is good news and essentially makes VDSL2 fibre to the Cabinet (FTTC) potentially a moribund technology. According to the BBC, the number of homes receiving full fibre reached 10% on 11th November 2019. This is up from 8.1% in June 2019 and represents a huge increase in the number of lines. Fibre to the home does not generate the obscene levels of noise currently generated by VDSL2. Every line that goes FTTP is one less VDSL2 circuit.

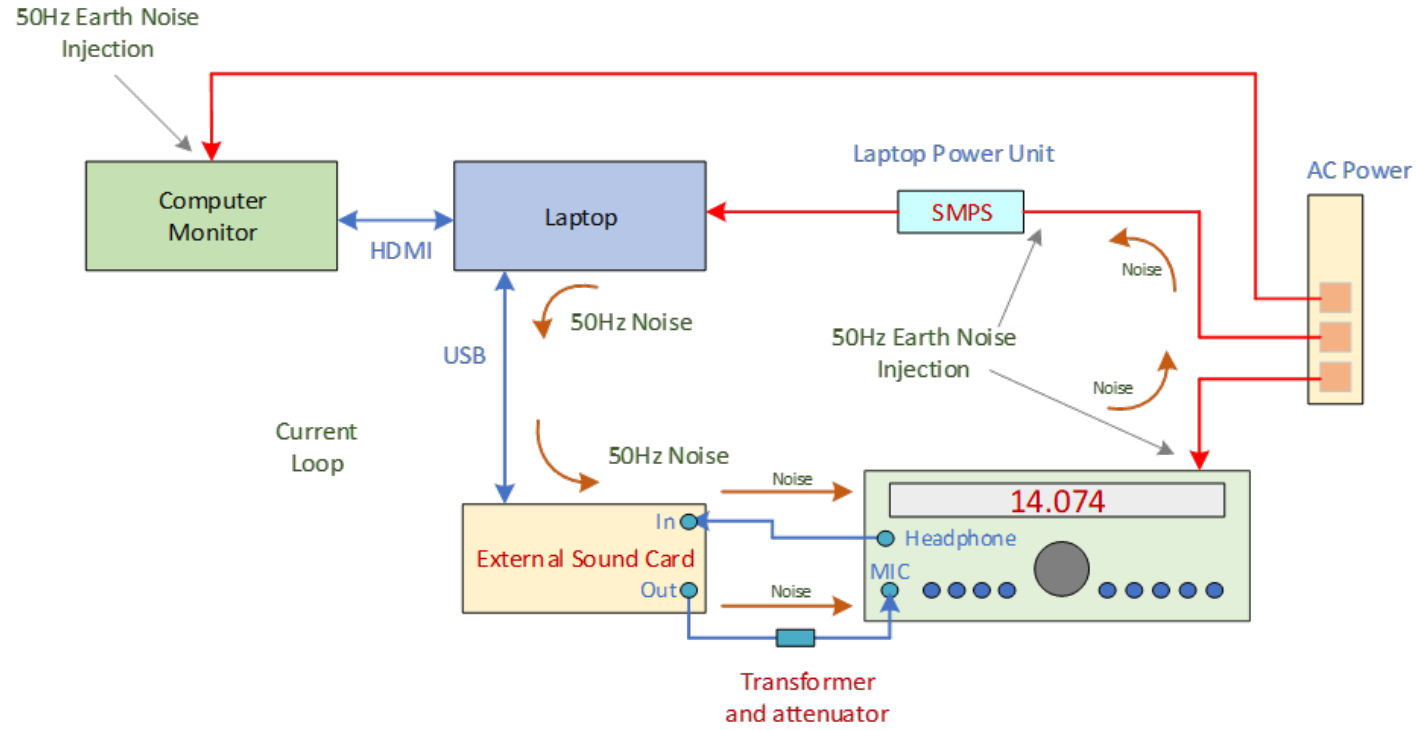
## FT8 Current Loops - Technical

The FT8 band scope on WSJT-X occasionally shows stations transmitting rough signals containing 50Hz sidebands that appear as bars on each side of the main signal. This is usually caused by 50Hz current loops generated by the AC supply. Surprisingly, 50Hz noise on the signal does not seem to degrade the readability of FT8.

The best way to avoid this is to use modern equipment with built in soundcards that permits digital transmission of audio to and from the radio using a USB cable. This avoids audio hum but the USB connection will be part of a conductive loop and may suffer from interference if you wind up the power.




Whenever a piece of equipment such as a radio, computer or monitor is connected to the AC supply, current is induced into the supply earth. To see how this occurs, please inspect the above diagram. This is the input circuit of the FT-1000MP transceiver but it is also typical of many types of equipment.



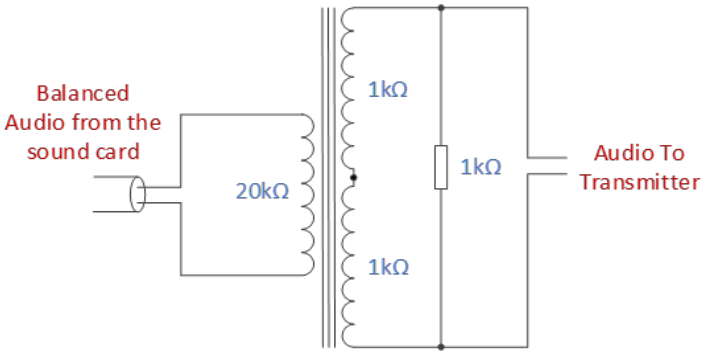

The 0.0022uF capacitor C2 is designed to bypass and minimise the egress and ingress of RF emanations. It connects between the 230V live and the earth connection and results in a current of approximately 0.158 mA injected into the earth connection. Ideally, any current drawn on the live should return on the neutral – the earth connection should not carry current.

This is a tiny current but it must travel around the current loop formed by the radio, computer and the interface cables. Ultimately, a proportion of this current will travel through the microphone cable that feeds the transmitter.

You may think that as long as the microphone cable is shielded then it will be ok. However, the skin depth of copper at 50Hz is about 8mm! Hence, any 50 Hz current on the microphone cable will saturate the shield resulting in voltage drops and hum. It is very difficult to avoid.

Some amateurs advocate a heavy duty 'shack earth bar' to bond all the equipment to a common point. This provides an alternative path for these currents. This can reduce the hum but it will not eliminate it completely.

One solution to this problem is to place an audio transformer in the microphone lead. I used an Eagle Miniature output transformer available from Potts Derby. It was originally intended to provide push pull drive for a pair of transistors in an audio amplifier. It has a primary of 20kΩ and two centre-tapped secondaries each 1kΩ. As well as providing a desperately needed step down voltage



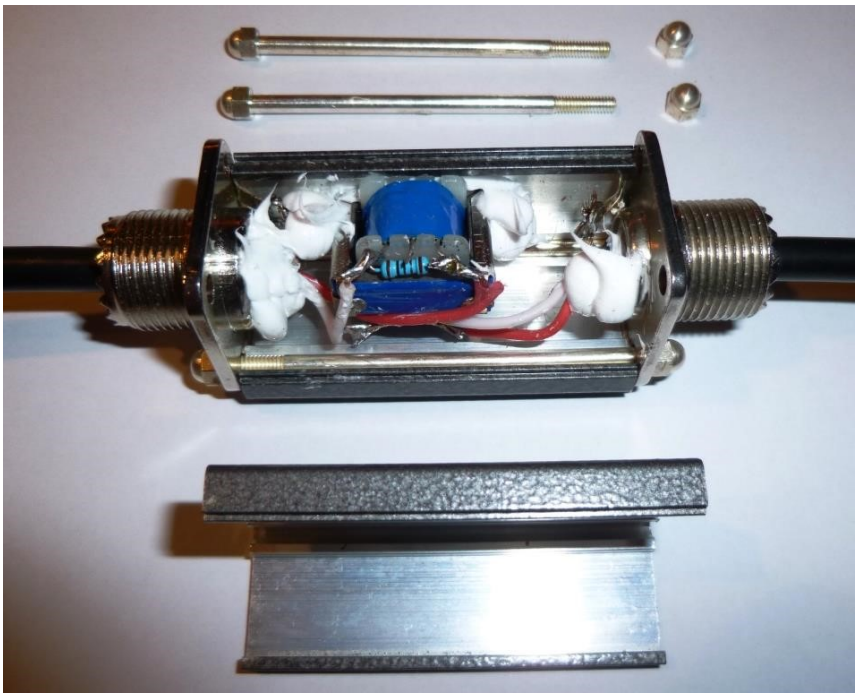

Eagle Minature Output Transformer

ration of approximately 3.16, it breaks the 50Hz current loop removing all traces of hum completely.

The 1kΩ resistor helps reduces the output voltage further to a level suitable for the FT-1000MP microphone input. The quality of audio through the transformer is excellent and quite suitable for SSB usage.

The Scarlet 2i2 sound card is a professional grade 24bit audio preamplifier that can accept balanced XLR or unbalanced input. The output is a balanced source that drives the transformer very nicely.

The Scarlet is a very competent device and appears to be naturally resilient against RF interference. As an additional precaution, it is prudent to wind part of the USB cable onto an FX2400-31 or similar core. Material 31 is high permeability so 10 turns provides a significant common-mode impedance that reduces the circulating current. This can increase the system immunity significantly.



The above photograph shows the construction of the microphone transformer. The cable screen is terminated where it enters the box on each side. The internals are held together by silicon goo. To avoid shorts, I use a flat piece of thin plastic that slips under the transformer and wraps around the front so the lid cannot touch the terminals. It looks awful but works a treat.

That is all for this issue

73 Chris G4AKE