Ridgeway Repeater Group Newsletter Fourth Quarter 2021

Messages/Notices

GB3TD Update October 2021

Most of our users of the repeater know that over the past few years, we have suffered from QRM from unknow sources in the 433 to 434Mhz section of the band. The situation does not seem to be improving with at least 3 different types varying from pulses to short term wideband (3Mhz) to transmissions at various times 5Khz either side of our input frequency of 434.675Mhz.
Over this time, myself and a few others including visits from OFCOM, have tried to identify where any of this comes from without a definite location or the causes of it.
After all this time, being the guy who has the NOV and is responsible for the repeater, has spent countless hours trying to work out where the QRM is coming from.
This is now something I and the committee could do without but of course always wanting to provide the best service for our users.
As you will be aware, in October2019 we changed frequency to a 7.6 Mhz wide split on UR67 which for us worked well and got away from the QRM immediately. Hooray we cried!
But wait - due to the setup at GB3BS (Bristol) and the interference we caused them, we offered to revert to back to RB3 after consulting with the ETCC. Thankfully we kept our original filters ready to go!
We then informed the ETCC that we would continue for the foreseeable future to operate on RB3.
I am sure you will appreciate that any change in frequencies on the repeaters, particularly with a change of shift, requires lots of extra work and a change of filter systems.
Also bearing in mind that GB3TD is combined with GB7TC on the same filters and antenna.
As mentioned earlier, the QRM is if nothing else, very annoying and therefore I made enquiries with G8DOR of the ETCC to see if another channel was available.
One was offered to us but we could quickly see a problem with another adjacent (presumably non amateur) 24/7 transmission.
We have now been offered UR63 which would put the repeater output Tx 438.3875Mhz and Rx 430.7875Mhz which I have now applied for. Currently the application is with OFCOM.
You can follow the application progress on the ETCC website www.ukrepeater.net
If this goes ahead it would give us the benefit of having both GB3TD and GB7TC transmitters at the high end of the band and the receive at the low end.
I will keep you informed of the outcome and when if any, to reprogram your radios again – sorry!!

Now, how did I do that last time? 73 Rob G4XUT

GB3WH Checks/Updates 29th September 2021.

Purpose - 1. - To investigate issues with top antenna, 2.- check correct methods for accessing repeater, 3. - change back up battery & fit charger. 4. - General performance checks.

1. a. Antenna disconnected, so still going through band pass filter, but still routed through the antenna changeover switch, output through Bird Thruline into 50 Ohm dummy load. Power out = 10 w with reverse = 0.

   b. As above but into bottom antenna – Power = 10w, reverse = < 0.2

   c. As above but into top antenna – Power = 10w, reverse = < 0.2.

These results suggest that there is nothing wrong with the top antenna itself.
Later tests done without the changeover relay in circuit and the results were the same with very minor differences in reverse.
Some further tests with weak input signals confirmed that there is an issue with either the top antenna & feeder or it's position on the mast. This latter refers to the fact that there is a lot of new "metalwork" installed at the same level as our top antenna. Needs further investigation.

2. a Check for CTCSS access. Ok

   b. Check for 1750Hz access. OK

   c. Check for no access with carrier only – Not correct.

Settings all checked, and some changed one way then back with no difference.
Logic powered down, left for more than 30 sec then powered up – no changes.
Conclusion that logic was faulty in allowing carrier only to access repeater.
Replacement logic fitted & checked. Found that all access functions now operated correctly. Initial levels all set similar to current logic but there were issues with the CTCSS output level. Closer inspection revealed some added mods to the original logic. These were then added to the replacement logic which solved the issue.
It is worth reminding users accessing with 1750 tone that 2 seconds of audio need to be applied as well to hold the repeater open.
However it was noticed that the mains failure facility appeared to operate correctly except the R beep did not change to P to indicate no mains power. This was traced to a small wiring fault in the extra "power failure" board in the replacement logic. Corrected.

3. Existing battery now only showing 3 volts. New batteries (2) fitted, charger connected and appears to work correctly after a repair.

4. No detailed performance checks made but all appears to be operating satisfactorily including the remote antenna changeover system.

Tony Bettley, G4LDL, 29th September 2021

Update on GB3TD

NoV holder Rob G4XUT has received the NoV so that the change to UR63 can go ahead but no changeover date has been set as of now, but members will be informed as when this will go ahead.

A Last minute addtion from Rob, he has received the NoV for 'Echo Link' so that will work with the new setup when it is changed.

Two Articles For Your Pleasure.

We have this quarter two articles written by Richard G4MUF and I want to say a big thank you to Richard for all his hard work in putting these articles together. First one is “Getting Back Into Weather Balloons” and the second one “Metric System Part 3”

Getting back into weather balloons

I stopped my hobby of using “Sondemonitor” software (hereinafter SM) (PS previous RRG article) to decode and track weather balloons a few years back partly because I had by then amassed 80-odd sondes found on our forays into the countryside. More seriously, a new model of sonde, the Vaisala RS41, had come into general service, and decoding these needed a dongle and SDR radio which I knew nothing about. Now, after prompting from Ken G0PPM, who painstakingly taught himself how to do it all, I have tracked some of the new sondes.

A little sonde history

High-altitude balloons and aviation led to the discovery of jetstreams in the 1920s and 1930s and weather balloons carrying sensors were part of the discovery, and “jetstream” is a now household word, being so important in how weather systems are steered across the globe.

After WW2, the global network of regular weather balloon launches was set up to monitor the upper-air situation. The sondes going aloft measure the pressure, temperature and humidity every second or so as the balloon ascends way up to the stratosphere. It eventually bursts and the sonde descends on a parachute (to minimise hitting someone or something at speed). The ascent data is radioed continuously back to the launchsite team. To measure the upper level winds, the sonde was tracked on radar screens, and the kit had a radar reflector, being an umbrella-like fine mesh of wires. The early sondes were valve-operated and the weight of all the kit meant a big balloon to lift it all. Transistors of course made for weight savings

The advent of GPS

GPS accuracy made a big leap forward around 2001 when the US Department of Defence removed ‘Selective Availability’ for the general public’s use of GPS. Accuracy went from about 300-500 metres to today’s 10-15 metres and enabled satnavs etc. It meant a sonde could contain a GPS receiver so the winds could be derived from its movement, with no need for radar tracking. In about 2005 I read, in a now-defunct hobby radio magazine, of “Sondemonitor” software for decoding the data-stream, and I downloaded it from COAA (also of PlanePlotter and ShipPlotter fame). Soon I was hooked and tracking sondes and hunting for any coming to earth near to home. The key to this was that the sonde usually kept on transmitting after balloon-burst, and even for 2-3 hours after landing, so ‘DF-foxhunting’ was possible as one got within about 200 metres of it, and if dense vegetation was there, by unscrewing the handheld’s antenna and finding a signal showing you were only c. 20 metres away. The Vaisala sonde used then was the RS92-SGPA. Although the sonde itself received and retransmitted the GPS signals, the ground station had to marry that data to the GPS satellites’ orbital positions (got from a special NOAA website) to get the sonde’s actual latitude/longitude coordinates and hence calculate the wind. SM did all this as well.

The RS92-SGPA was replaced by a new sonde, the RS41 which is now the main one used in Europe. All the GPS calculations are done onboard the sonde and it transmits its position thus obtained within the telemetry. SM was soon updated to decode these as well. To do the reception and decoding of an RS41, a vertically polarised antenna (any 70-CM one will do) sends the raw signals into the RTL dongle via the coax, thence via USB port into the SDR (software defined radio) via the virtual audio cable within the PC, then finally to SM. I soon got the hang of tuning the SDR (HDSDR in my case) to the right mode (FM), bandwidth (12 KHz) and frequency. For using Windows 10, make sure that Settings/sounds/… is set to use the Virtual Audio Cable (VAC) for both input and output. Don't forget to return the settings later if listening to or streaming music etc (usually Stereo Mix input, speakers or headphones for output).

The nearest sonde launch site for me is Larkhill, on Salisbury Plain, and they launch one at 0630 and 1030 local time on 404.400 nfm, most weekdays (ex-bank holidays) and I get strong, S9+10 signals from the sonde as soon as it comes above nearby rooftops after launch, which is interesting in view of the sonde power being about 60 mW. They can be decoded up to 200 Km away when they are way up high in the sky.

Frequency history

After WW2, 26-27 Mhz was widely used by sonde transmissions, but obviously this band was prone to high-sunspot 'DX' effects, and after the CB hobby got going around 1970 things got much worse. Sondes moved to c. 35 MHz for a while around 1980, and later to the 400 Mhz band now used. The worldwide official main radio spectrum allocated is 401 to 406 Mhz, plus another band at around 1680 Mhz. Nearly all European sondes are to be heard on the 400 Mhz band. The channels are mainly set at 100 Khz intervals but sondes can be tuned pre-launch to 10-Khz channels. The RS41 models are NFM mode, and a bandwidth of about 12 Khz will span the signal's bandwidth.

There is the need for non-interference between different stations over the up to 200 km distance that a sonde might travel away from the launchsite. Therefore each launchsite has an allocated frequency plus a backup one. The latter may be used if the sonde produces corrupt data after release and another sonde is launched soon after while the original one is still blocking the channel. Occasionally intense research work involves sondes sent up at say 2-hour intervals and again more than one frequency may be needed.

The synoptic network and other launchesites

The main global synoptic sonde station network launch at around 00Z and 12Z, so that the data can be used for plotting upper-air charts of winds and heights valid at a fixed time. These balloons are large enough to go up to a maximum of about 35 Km (115,000 feet) where the barometric pressure is only about 6 hPa.   Other stations launch for user requirements, such as Larkhill for the artillery range on Salisbury Plain. They may use smaller balloons where the data is only needed up to say 50,000 feet. They burst sooner because of their smaller size. Both sizes rise at about 5 metres/second (18 Km/hr, 10 knots or 1000 feet/minute). In the southern half of GB the synoptic stations are at Camborne (405.7), Watnall(404.2) and Hestmonceaux(404.8). Of these, cost-cutting measures mean some only do 00Z. Apart from Larkhill, other more occasional user-required launches are from the missile range at Aberporth(405.6), Shoeburyness(from universities' Meteorological faculties such as Reading, Oxford and Cambridge etc, and from Cardington near Bedford.

Official uses for sonde data

Weather charts are plotted for 00Z and 12Z, for each of several standard barometric surfaces, i.e. 850, 700, 500, 300, 200 hPa, etc, and each station plot has the height at which that pressure was reached, the temperature, and the wind speed and direction. Contours of constant height value are then drawn to produce a chart on which the wind flows parallel to the contours and you get stronger winds where the contours are closer together. Hand-plotting with pens is history now, and it's all done on PC screens automatically.

Another way to look at the data is to examine just one sonde's record in great detail. A graph, called a tø (tephi), of temperature (and dew-point), against height is the answer to this and contains up to 5 sets of lines or isopleths: pressure, temperature/dewpoint, dry adiabats, wet adiabats, and humidity mixing ratio isopleths. The vertical profile of a sonde's record is a pair of lines, one for temperature, the other for dew-point. The graphs especially allow one to predict cloud levels, and see whether the atmosphere is unstable, allowing cumulus or cumulonimbus clouds to grow as the day warms up to produce showers.

Hobby uses for sonde data with Sondemonitor

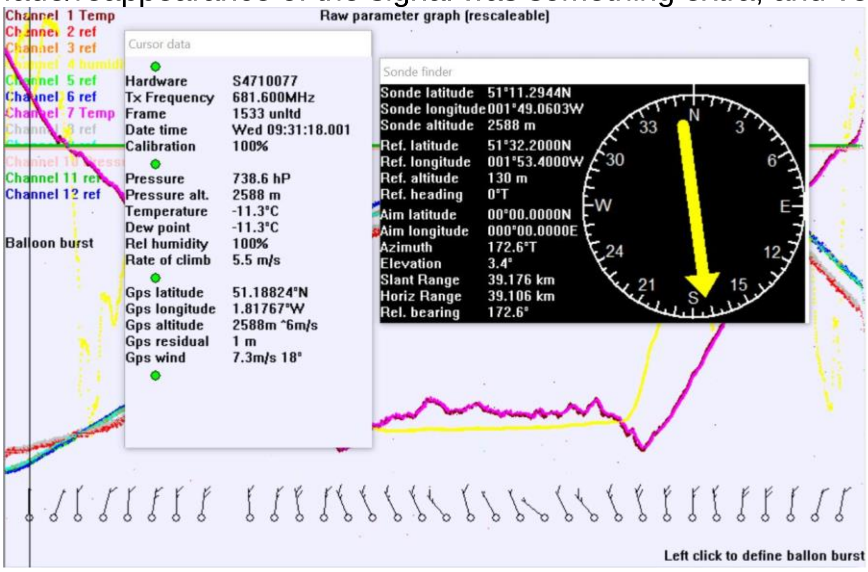
SM can be downloaded from the COAA website, fully functional for 28 days' trial. SM can be used in 2 ways: monitoring a flight in-progress, or opening a sonde's files or graphs later. The buttons shown below are to get started on a new recording.

1 select sonde type RS41
2 select graph #2
3 click on green button to start recording. (after SDR already tuned and working OK and minimised)
4 The tephi option for use later during the ascent or a replay.
5 The wind graph for use later during the ascent or a replay.
6 The map or Google map display, which needs internet connection of course.
7 File, then open a previous sonde record.
8 Sonde Finder, giving the direction and distance on a compass.

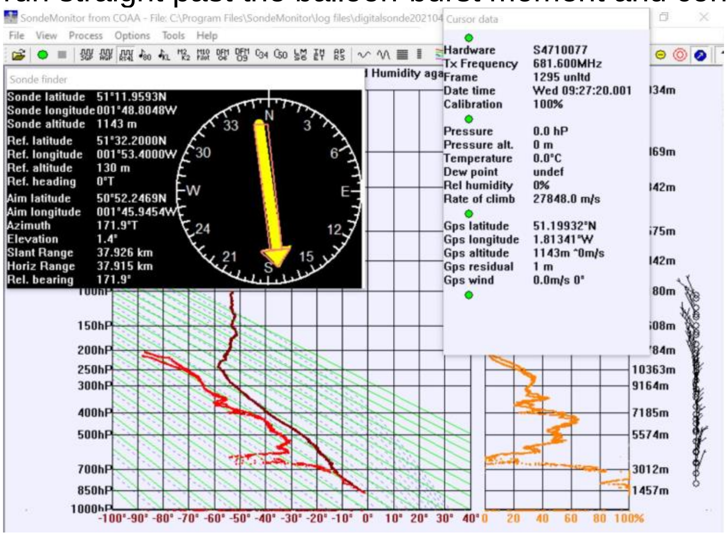
Exiting SM during or after a recording saves the data automatically (there is no 'save' option therefore) to a folder within wherever you placed the sondemonitor.exe. As well as the graphs, one can look at txt or csv files of the data using 'wordpad' or 'Excel' etc, and those data sheets show the second-by-second refresh rate if the sonde signal is strong enough.

SM is a superb way to study meteorology. Examples are spotting an inversion where warmer dry air overlies cooler moist air, and comparing that layer with clouds you can see with your eyes or listen for on VOLMET or ATIS aviation broadcasts (118-136 Mhz AM). People enjoying SM or similar software might include glider pilots, paragliders, hang-gliders, hot-air balloonists, powered aircraft pilots, meteorologists, amateur radio operators, scanning enthusiasts, and of course sonde-hunters. I note that the RS41 has a 1-hour switch-off option, and this is often set, sadly, which makes it impossible to track a sonde down to near the ground.

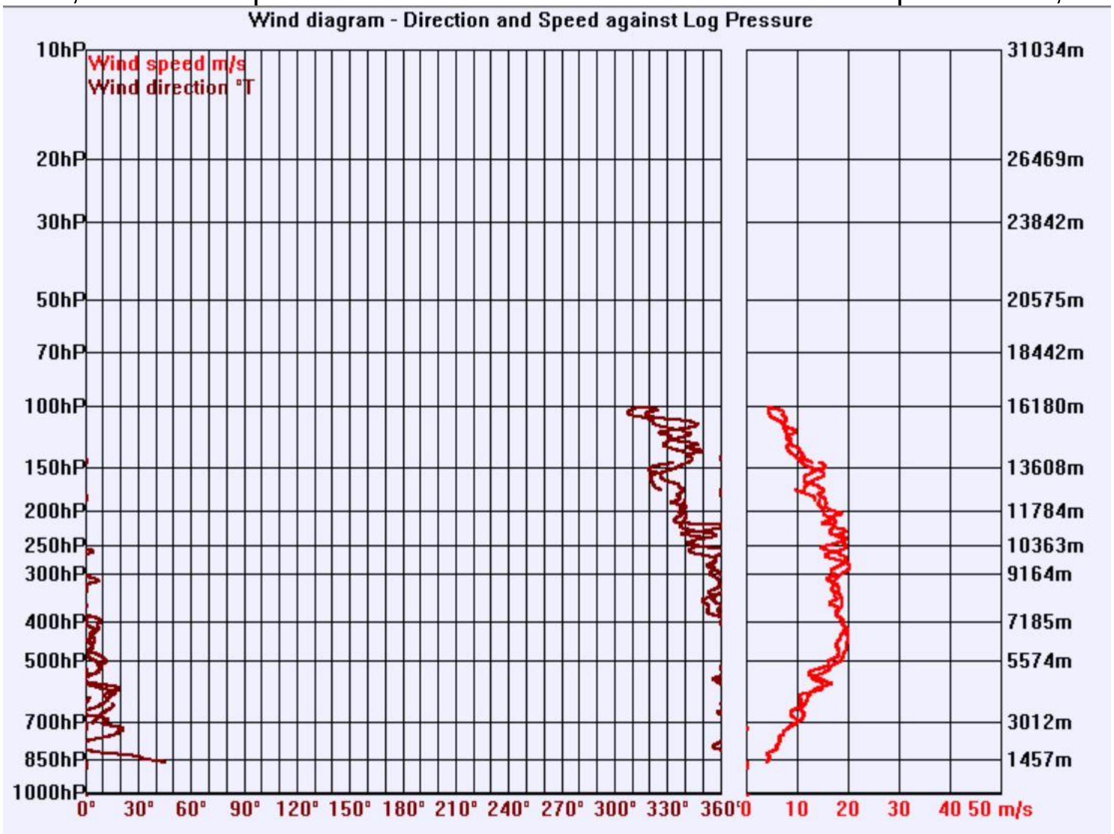
A special example of using SM was when I tracked a sonde which came down in Hertfordshire. Its signal had faded away while still 2-3000 feet up (normal for that far away), but the signal briefly returned and I tracked it right to the ground. There was a big low-level inversion, of the sort that produces big VHF/UHF ‘lifts’ (tropospheric ducting), and as the sonde sank on its parachute out of the very dry air into the cold foggy air, it entered the duct which gave me the signal return. This is information you would not get so graphically if merely looking at tephigrams on weather websites. Those websites do indeed allow prediction of how strong the ducting will be, but having that fade/reappearance of the signal was something extra, and very interesting.



Here, above, is the graph I call graph #2 in which the x-axis is basically time, but the scale is constantly rescaling. It is the best one to choose when starting recording. The left hand overlay box is the info box and the 4 traffic lights go green if good data is being decoded and the data changes second-by second. If some are red or keep flashing green/red the data is more scrappy. A few minutes after starting recording there will be small dots, forming at 1-second intervals, which gradually condense to become lines. The y-axis has no particular meteorological meaning, just giving an idea of signal strength. This graph will run straight past the balloon-burst moment and continue.

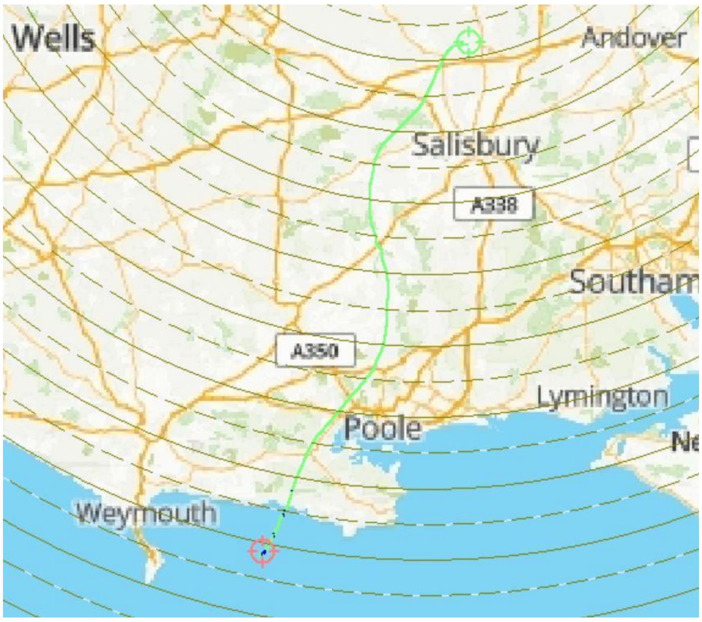


Here, above, is the "Tø" graph option produced by SM (The brown line is temperature, the red one is dew-point), plus humidity graph in orange beside it, and wind arrows along the edge of that. The Sondefinder (yellow compass arrow) shows an estimated landing QTH (Aim), and other data as shown.
The wind-arrow code here and in graph #2 is a long fleche for 10 units, a half-fleche for 5 units, and a solid pennant for 50 units. Units in SM are metres per second, not knots.

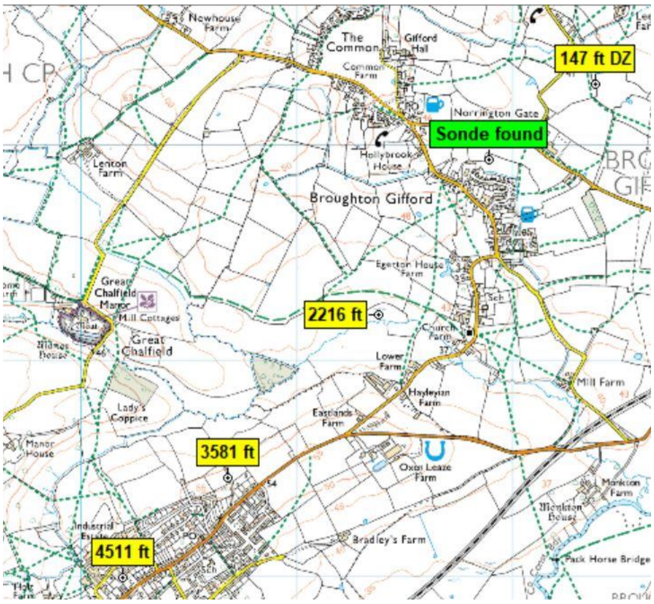


A further graph option, of wind, is shown above. Note that a doubling of the traces on this graph and on the tø (tephi), is apparent, and this happens because the descent data is printed on top of the ascent data. The descent info is usually similar to the ascent, for obvious reasons.

The sonde's journey can also be displayed within SM on a Google Map shown by the pale green line (below) or Google Earth or your own scanned-in map image. In Google Earth the track can be examined in 3D. These map options may allow going out and looking for a downed sonde, being careful to stick to rights-of-way footpaths and avoiding livestock or crops in fields. If the sonde comes down near enough to your QTH, you may notice how it usually turns to the left (in N hemisphere) over the last few seconds before reaching the ground. This demonstrates the ground-friction effect which is why surface winds usually blow from 35 degrees to the left of the gradient direction, i.e. obliquely across the isobars. If the sonde and parachute are found lying on the ground 20 metres apart on the string, the compass-bearing of the string illustrates this offset even better.



Just as I was about to send this document to Ken, G1NCG, the editor of the Ridgeway Repeater Group newsletter, Judy and I went on a foray to look for an RS41 that had been launched from Camborne in SW Cornwall. Strong SW winds had brought it to Broughton Gifford near Melksham. In fact, I had not recorded this sonde's journey, but Andrew, M1CJE had done so. He does not use Sondemonitor, but uses his own 'home-brew' method to make an abbreviated record of the sonde's journey including its coordinates at intervals, and inputs his data to HAB-HUB (high altitude balloon forum). Andrew kindly sends me records from his shack combined with the input of other HAB-HUB recorders around the country. This particular sonde was recorded only down to 2216 feet above sea level, so guesswork was needed to find where it came down to earth. I did that by plotting the last 3 fixes from Andrew's (and other recorders unknown) as plotted on the accompanying map, and projected the path on and down, to give the point marked 147 ft DZ.



I retrieved it, as shown

As usually happens, the wind near the ground was less so it fell upwind of the DZ position and also slightly left of the centreline, due to ground friction causing the low level wind direction to be backed (anticlockwise) from the gradient or geostrophic wind.

Happy hunting, and I hope to hear from anyone who tries SM, on GB3TD repeater.

Richard Gosnell, G4MUF, April 2021

Metric System Part 3

Measuring the Metre

In order to decide on the exact length of one metre, the exact distance from equator to pole along the Paris meridian needed measuring to unprecedented accuracy, otherwise they could have got a metre's length wrong and that would be perpetrated for ever. The genesis of the Metre in the 1790s was turned from theory into practice when the French surveyors, Delambre and Mechain, made a triangulation survey, the most detailed yet, from Dunkirk to Barcelona along the Paris meridian and used that distance, along with accurate sextant (actually a 'Repeating Quadrant') star-shot measurements of the two places' latitude, to calculate the pole-equator distance. A very detailed history of the origins of the metric system is "The measure of all things" by Ken Alder.
He delved into archives and discovered that Mechain thought he had made an error in the latitude measurements at Barcelona thus invalidating the Metre's length. It caused him years of heartache but the French mathematician Legendre later used the new 'Least Squares' method of processing lots of data (leading also to Fourier analysis and standard deviation), to show the error was mainly fictitious. The assumed shape of the Earth was a larger source of error which implies that the International Metre is also in error. Mr Alder's book implies that modern GPS surveys would mean you reach exactly 10,000 Km from the equator while still 2.29 Km short of the N. pole. In other words the International Metre is slightly too short, by 0.229 millimetres. The International Metre had already been set in stone (actually a platinum rod in a glass cage) before the later research.

There had been debate on using the length of a pendulum which swings at exactly one second to define the Metre, before settling on the one ten-millionth of the sea-level distance from the N pole to the equator, but gravity varies from place to place so pendulums were discarded as an idea.

Maps and Grids

Maps and surveying were at the heart of the Metric System's creation so metric grid reference squares, so useful for publicising outings and in scientific publications, were a natural follow-on and also enabled Coordinate Geometry using Cartesian Coordinate theory (Rene Descartes being a French mathematician and philosopher) to be applied to cartographic surveys. The worldwide grid system, Universal Transverse Mercator (UTM) Grid measures its Northings (in the N hemisphere) from the Equator northwards, so harks back to the original Metre's definition. For the Eastings the grid repeats at meridians 6 degrees apart. Another global grid in this format is the one used on the U.S.S.R. mapping project. The Soviet Union's Red Army mapped much of the world, copying local Survey maps outside Russia's sphere of influence. These maps use a worldwide grid similar to UTM but the gridlines don't match up with UTM ones due to using a different spheroid. Collectively these repeating grids are known as Gauss-Kruger grids. Germany uses yet another G-K grid for their local topographic survey.

A famous units mixup.

A spacecraft going to Mars crashed into the planet due to an infamous mix-up of units. The rocket makers worked in imperial units but NASA worked in S.I. units but someone evidently just typed in numbers without realising this. The spacecraft needed a retro-rocket burn of a specified length to slow it from the approach orbital speed to the final descent speed. The maths are basically very simple, using Newton's Second Law of Motion. This states that force = mass X acceleration. The force is the rocket motor's thrust, the mass is that of the spacecraft, and the acceleration (actually deceleration) is the

slowing-down from the approach orbital peed to the deployment of parachute.
The required duration of the motor's burn is then worked out, but the mix-up of units caused the wrong burn time! It's not rocket science….Oh yes it is!

Richard Gosnell, G4MUF, Sept 2021

The Next snippet is for a familiar voice on GB3TD he calls it "Fame at Last" as this article was posted on the RSGB website in September 2021, I've taken a screenshot of the article for all to read and thanks go to the writers of the article and as it's for a friend we all know I would like to say well done Robin as I think everyone would.

Also a final congratulation to G8VVY on his hard work in competing in the "The UK Six Meter Goup" Europe 40 Competion for forty country's contacted.

The article is on the next page and the award certificate on the page after that.
If any members have any awards that they would like to be added in a future newsletter then please send details and a copy of the award to me via our secretary.

Robin Shelley, G8VVY

Communications Manager | September 2, 2021

Robin, G8VVY was licensed in 1979 and has been a VHF aficionado since those early days as a class B licensee. Although restricted to the bands 2m and higher he was always striving for dx. In the 1980s this meant working into places like Poland, what is now the Czech Republic and former East Germany, using 25 watts and a 9-element yagi on 144MHz.

After the mid-life gap in radio that many experience for various reasons, Robin renewed his interest in amateur radio in 2018 and has been very active since. His particular interest is QRP, enjoying the combined challenge of low power – maximum 5w – with indoor antennas, to see what can be achieved.

This is where awards and contests fit into Robin's hobby, because both exercises provide a recognition of achievement under challenging circumstances.

Most recently, Robin has achieved the **RSGB 50MHz DX Countries (30 countries) and Continents & Countries (1/30) awards**, using his compromise VHF station, and has achieved creditable positions in the 2019 144MHz Backpackers contest and the related championship of that year, out portable operating.

Robin has grasped with both hands the availability of weak signal digital modes – they are ideally suited because of his operating constraints with indoor antennas. This has also tied in with relevant knowledge from his IT career too, and operating in these modes has enabled further awards and contests to be within his reach.

> Robin says that awards of all types are fascinating and that "Knowing you've done well amongst others who haven't had such a limiting [setup] is always a 'feel good' situation"

Currently, Robin is concentrating on the RSGB 50MHz awards, taking advantage of the excellent season we seem to be having this year on the "magic band". His latest score is 251 squares and 41 countries, so he will soon be applying for upgraded awards!

The UK SIX METRE GROUP

Europe 40 Award

This certificate has been awarded to

G8VVY

for achieving two way contact with ***Forty*** *European countries*
on the 50 MHz / 6 Metre band

FT8

Signed:	Dave Toombs, G8FXM	*Dated:*	*30 August 2021*
Dave,		*Certificate No:*	*102*

Items For Sale

Icom SM-30 Desk Microphone
In Mint Condition and Unused with it's box.
Current new price £114 at MLS – You can have this for a bargin price of £60 ono.

Please contact Rob G4XUT g4xut@rrg.org.uk

The Last Word

My Loop project has had some last minute upgrades and as I an going to fully document them you will have to wait until the next newsletter. It will will have pictures aswell so hopefully it will aumse and perhaps inspire some to have a go at making one themselves.