

COULSDON AMATEUR TRANSMITTING SOCIETY
G4FUR  **M1FUR**
CATS WHISPERS



Affiliated to the RSGB

June 2009

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CATS Committee

Chairman: Steve Conway, G7SYO
Secretary: Andy Jackson, G8JAC
Treasurer: Derek Hands, G1PGS
Members: Steve Beal, G3WZK
Stuart Barber, G6CJR
Dennis Noe, M0NDJ
Frank Emery, G3ZMF

CATS Whispers Editor:

email address for contributions: newsletter@catsradio.org

Regular Society Meetings

These are held on the second Monday in each month at:
St. Swithun's Church Hall, Grovelands Road, Purley, Surrey, CR8 4LA at 20:00 to 22:00

Society Nets

1st Saturday of Month - 17:15 - Crescenta Valley / CATS Net on Echolink
Normally via MB7IPL node on 145.2875 MHz
Sunday mornings - 11:00 - Call on 145.2875MHz.
Sunday evenings - 17:00 - Call on 3.700 MHz ± QRM
Wednesday evenings - 21:00 - Call on 70.425 MHz

CATS Website

www.catsradio.org

Email

enquiries@catsradio.org

Forthcoming Meetings

Monday 8th June Talk on Software Defined Radio by Jan Verduyn, G0BBL
Monday 13th July Nigel Cawthorne G3TXF talks about DXpeditions he has organised around the world
Monday 10th August Barbecue at G4RWW QTH



CATS is twinned with the Crescenta Valley Radio Club
Glendale California USA www.qsl.net/cvrc

May Event Report

The 2009 CATS DF hunt was held a month earlier than usual on May 11th. Admittedly the start was sunny, but an extremely fierce and chilly wind prompted one team (Martin, G4FKK and daughter Katy) to make a quick dash home to find something with which to stiffen their antenna elements.



A fierce wind was blowing at the start, as eventual winner Martin's (G4FKK) antenna shows.

Five teams entered the 2009 event, as follows:

Ref	Team Name	Members
1	Token Female No 1	G4FVL & family
2	Last	M0NDJ
3	Get Losts	G0GNQ & M3IGP
4	Wendy and Steve	G7SYO & partner Wendy
5	Katy's Capers	G4FKK & daughter Katy



CATS Chairman Steve (G7SYO – third from left) discusses tactics before the start, while (l –r) Glenn (G4FVL), Len (G0GNQ) and Ian (M3IGP) attempt that elusive first contact with VK/ZL on 144 MHz via the short path.

While waiting for the start, equipment was tested – much to the amusement of a local MG owners group who had picked the same

location as us (Farthing Down near Coulsdon in Surrey) for the start of their evening rally.



As yet another MG arrives, Denis (M0NDJ) is raring to go. His antenna is half (literally) of a 10 element 2 metre yagi

Having checked arrangements and his radio gear, Terry (G4CDY) set off for his secret destination. The MGs set off too and the CATS teams waited in the nearly deserted car park for Terry's first transmission.



Len (G0GNQ) keen not miss Eastenders

Eventually, after CATS secretary Andy (G8JAC) had recorded everyone's odometer readings, at 20:05 the first transmissions were received on 144.725MHz from G4CDY – in a pub car park somewhere in Surrey on OS Map 187. The teams quickly reached a consensus that Terry was "southwest-ish" and sped off for suitable sites from which to take cross bearings.

Terry continued to make short transmissions every 5 minutes and was soon joined on site by G8JAC and Steve (G3WZK – CATS Whispers editor), both of whom knew Terry's

location in advance. As the three waited patiently, the sun set and Terry prepared to transmit the first clue “my bonny lies across from (not over) the golf course” – a reference to the pub’s location at the end of a short lane called “Bonny’s Road” that was opposite a golf course.

At 21:05, exactly an hour after the start, the first vehicle arrived in the car park of the Skimmington Castle pub, near Reigate. It was “Katy’s Capers”. Martin and Katy had won the hunt for the third year running!

Terry continued with the short transmissions and provided further clues as other teams reported their progress from locations such as Box Hill and Walton. By now, the teams were generally experiencing signal strengths too high to get good bearings without using an attenuator so Terry reduced power to 100 milliwatts from a handheld radio. However Glenn, G4FVL, who *had* been using an attenuator, then lost Terry’s signal completely!

Eventually it was agreed that enough was enough and Terry transmitted details of how to find him. By then, two teams were close by in Reigate High Street - Glen’s (“Token Female No 1”) and Len/Ian’s (“Get Losts”).

The “Get Losts” beat the “Token Female No 1” by a car’s length into the Skimmington Castle and “Last” lived up the team title and were last - “Wendy and Steve” having decided to give the pub a miss.

Over a much needed round of drinks inside, G8JAC revealed that the booby prize for having clocked up the most mileage had been won by the “Get Losts”. Full results are as follows:

Place	Team Name	Time	Mileage
1	Katy’s Capers	60 mins	15
2	Get Losts	88 mins	21
3	Token Female No 1	88 mins	18
4	Last	95 mins	20
dnf	Wendy and Steve	-	-

It was then time for the CATS DF Trophy to be presented to “Katy’s Capers”. This new trophy had been designed and engraved in memory of Derek Hills, G6MFM (SK). Derek was an enthusiastic and skilful DF’er and came second in the 2008 hunt.



From (l) to (r) Terry (G4CDY) presents the CATS DF trophy to 2009 winners Martin (G4FKK) and daughter Katy (ace navigator)

Finally, a big thank you to Terry for running the hunt for CATS - and congratulations once again to Martin and Katy for completing a hat trick of victories.

Plea From Chairman

The CATS Chairman, Steve (G7SYO), used to have a collinear antenna for two metres.

He knows that he has lent it to a CATS member – but he has forgotten to whom he lent it! If you are the person who borrowed this item – or know the person who did, please get in touch with Steve: chairman@catsradio.org

CATS June Meeting

The subject of the meeting on June 8th will be a talk by Jan Verduyn G0BBL entitled “Software Defined Radio.” Jan has spoken widely on this topic at other clubs including the Swindon and District Amateur Radio Club, Trowbridge and Yeovil. He also gave a lecture at the Kempton Park Rally in September 2008.

CATS July Meeting

The subject of the July meeting will be a talk by Nigel Cawthorne G3TXF about the various DXpeditions he has organised around the world.

Steve, G3WZK, met Nigel at Bristol University over 40 years ago. Nigel was studying

electrical engineering and was Chairman of the University's Amateur radio Society, G3KAC.

Since then he has been somewhat busier on the air than G3WZK, having amassed a collection of over 300,000 QSL cards!

For more information, see Nigel's website on:

<http://www.g3txf.com/>

CATS August Meeting

Barbecue at the QTH of G4RWW

Back Packers Contest: Sunday 17th May 2009

It looks like a CATS member has set a new and unusual record for this contest for the shortest ever journey from home to a portable field location!

Many of you will know that the 2 metre Backpacker Contests is a 4-hour, all mode event, in which no more than 3 watts transmitter output is permitted. There are antenna restrictions too – eg a maximum of 20 half-wave elements (or equivalent) and the driven element must be no more than 4m above the ground. Operation from a motor vehicle is not permitted, nor may a vehicle supply be used in any way to power the equipment, which must be battery, wind or solar powered.



Not exactly SOTA – but this was Frank's location for the contest (photo M6MAR)

So our very own "mad" Frank, G3ZMF, decided to give it a go and not be put off by his usual domestic QRM. He writes, "Once upon a

time I was quite happy to sit in my warm, comfy shack giving away points to those brave/mad backpackers, until several neighbours in the block of flats where I live acquired posh, new and expensive TVs and hifi gear. Result: BCI/ TVI from my 144 MHz transmissions as their equipment was not EMC-compliant. To cut a long and ongoing story short, for the sake of peace and quiet, I had been QRT on 2 metres, all modes, for some time.



Frank, G3ZMF, pauses between QSOs (photo – M6MAR)

"However, when I realised the 2 metre Backpacker Contest was due on the 17th May, I thought, what the heck, I'll refurbish my 1990 portable trolley (made from an old shopping trolley of my mum's) and give it a go. I would be 2-2-2-2 ie on 2 metres, with 2 watts of RF from my FT290R (with Mutek front end), a 2-element squashed quad (as featured in my lecture last year) and an antenna 2 metres above ground level.

"The site would be the highest point in the car park at the rear of my block of flats, which is 150 metres above sea level with a clear view from West-South-West clockwise to North-North-East and level with the roofs of my block of flats. As it is a contest rule that all equipment must be carried and operated at least 100m from the transportation vehicle, this should

help with the EMC issues, too! The contest runs from 11:00 to 14:00 and coincides with the last 4 hours of the big 24 hour open 144 MHz contest.

“It was just 5 minutes from my front door to being on the air. Wow, that’s what I call going all out for a Dxpedition, hi! Then I had a visit from Martin, M6MAR, (my local QRM source, 200 yards away) and he kindly took the pictures you see here.

“Unfortunately, just like the cricket, rain stopped play at 13:20Z, so I was back inside with kettle on within 5 minutes. Even during this short period I managed 12 completed QSOs, 1 country, 4 locator squares and 9 post codes, all as multipliers. The best DX was G5FZ/P in the centre of IO93 square, all QSOs on SSB. Gotaways include two stations in Scotland who heard my CW call but because of QSB and QRP were unable to get all my callsign. Heard but not worked include a PA0 (JO21), GD8EXI (IO74) and 2E0XLG/P (IO84).



The G3ZMF setup (photo –M6MAR)

“Never mind, I look forward to backpackers No 3 on 2 metres, as when No 2 is going on (14th June 2009) I will be at the Newhaven Rally.

“See yer.”

Mad Frank G3ZMF

Letter from W6 land

Mark, W6MW writes, “Hi All, I have received some bad news. The cartilage in my knee has been completely removed (“denuded” was the word used in the MRI report) due to the continuing inflammation that has been going on for the past 7 months. This means that I will now require a total knee replacement, but before the knee can be replaced, exploratory surgery is needed to determine if the cause of the inflammation is psoriatic arthritis or if it is infection. Attempting to perform a knee replacement on an infected knee would be catastrophic.

“What this means is that I will have to remain in Columbus for several more months. I cannot get around my house or do normal chores like grocery shopping (or rather, getting the groceries into my house and putting them away) on my own. As it is, it’s a fairly major battle that Mom and I tackle every week.

“In addition, I will need help for the period until I can get back on my feet so this is probably the best place to remain.

“I am scheduled for arthroscopic biopsy (the exploratory surgery) on Monday, June 1. They will knock me out but it is an outpatient procedure. I expect to spend at least one night on the hide-a-bed in the living room rather than attempting to tackle the stairs here.

“Thanks for all of your good thoughts. This is a disappointing setback. I had hoped to return next month to LA but now have no idea when I will be able to travel. Laurie (who has been living in my home taking care of it for me) is deciding whether she wants to stay in my house for a few more months or get out on her own. It is a tough decision for her because while the free rent sounds good, she needs to be employed to get an apartment and she will be out of work for the next 3 months or so. You need those paychecks to get a lease!

“Take care...”

Mark, W6MW

CATS sends best wishes for a speedy recovery and successful outcome to Mark.

McMichael Rally 2009

John Kipping, G0GCL, secretary of the McMichael Radio Rally, writes, "Dear fellow Radio Amateurs, this is a note to let you know that the time is approaching for this year's McMichael Radio Rally. Our event will be held on Sunday 12th July 2009 at Reading Rugby Football Club, Holme Park Farm Lane, off Sonning Lane, Sonning, Berkshire, RG4 6ST, with talk in available on 2m FM on 145.550 MHz S22. There is plentiful car parking and good disabled facilities. The start time will be 09:30 and there will be plenty of features and activities, including the flea market/boot sale, main hall traders and special interest groups, catering and a licensed bar, a barbecue depending on the weather (!), demonstrations, and the chance to find that piece of computer equipment you might have been looking for.

"Details of the event may also be found on:
www.mcmichaelrally.org.uk

"Thank you for reading this and we look forward to welcoming you there."

G0GCL

Contests Coming Soon

Jun 6/7: National Field Day (1.8 – 28 MHz)
Jun 10: 80m Club Championship (CW)
Jun 14: 2nd 144 MHz Backpackers
Jun 18: 80m Club Championship (SSB)
Jun 20/21: 50 MHz Trophy Contest
Jun 21: 50 MHz Backpackers
Jul 4/5: VHF NFD
Jul 5: 3rd 144 MHz Backpackers
Jul 6: 80m Club Championship (CW)
Jul 15: 80m Club Championship (SSB)
Jul 19: 4th 144 MHz Backpackers
Jul 19: Low Power Field Day 3.5 & 7 MHz
Jul 23: 80m Club Championship (Data)
Jul 25/26: IOTA Contest 3.5-28 MHz
Aug 1: 144 MHz Low Power Contest
Aug 2: 432 MHz Low Power Contest
Aug 2: RoPoCo 2 (3.520-3.570 MHz)
Aug 13: 80m Club Sprint (CW)
Aug 16: 70 MHz Trophy Contest
Aug 26: 80m Club Sprint (SSB)
Sep 5/6: SSB Field Day 3.5-28 MHz
Sep 5/6: 144 MHz Trophy Contest
Sep 6: 5th 144 MHz Backpackers
Sep 10: 80m Club Sprint (SSB)
Sep 13: Second 70 MHz Contest
Sep 23: 80m Club Sprint (CW)

Local Rallies & Events

14 June 2009

Newhaven Fort Amateur Radio Group Rally

Newhaven Fort, East Sussex
Open 10:30. Parking, boot sale, disabled facilities, family attractions, catering
Contact Eddie G0ECW, 01273300772 or
eddie@zamboodle.demon.co.uk

21 June 2009

Newbury Radio Rally & Boot Sale

Newbury Showground, M4 J13.
Open 09:00. Free parking, trade stands, catering, disabled facilities. Contact
rally@nadars.org.uk

12 July 2009

McMichael Rally & Boot Sale

Reading Rugby Club off A4 east of Reading
Open 09:00. Parking, trade stands, catering.
Contact g0jms@radarc.org

30 August 2009

Milton Keynes 51st Amateur Radio Society Rally

Holne Chase School, Buckingham Road, Bletchley MK3 5HP
Open 09:00 trade stands, catering
Contact: Mike G3LFR: 07866 673192 or
www.mkars.org.uk

27 September 2009

West London Radio & Electronics Show

Kempton Park Racecourse.
Open 10:00. Parking, trade stands, catering, disabled facilities. Contact
info@radiofairs.co.uk
NOTE: CATS involvement in this event.

For Sale & Wanted

WANTED – Loan of simple to operate receiver (HF and/ or VHF/UHF) for very enthusiastic budding disabled amateur. Contact Steve on 01883 620730 or by email
g3wzk@whenland.com

Shak Nowtz

Over the page you will find the fourth in a series of articles written by "mad" Frank, G3ZMF. This one is entitled ATUs. The next issue of Shak Nowtz will cover antennas.



SHAK NOWTZ BY "MAD" FRANK - G3ZNF

SHAK NOWTZ No 4 - ATUs

Introduction

Why use an Antenna Tuning Unit (ATU)? Let me explain with an analogy to a car's transmission system that I used several times in the 1990s at World Scout Camps at Downe, near Biggin Hill. The answer I gave was to relate the transmitter to the car's engine (it produces power), the gear box to the ATU (matches the engine's power/rev rate to the axle/ wheels) and the antenna to the axle/ wheels (they convey the engine's power to the road and therefore cause the vehicle to move). Thus the ATU is simply a "radio gearbox" matching the 50 (or 75 ohm) impedance of the transmitter or receiver to the antenna and thence into the ether. You wouldn't try to drive off from a stationary position in top gear, would you?

ATUs come in various types such as series, parallel, combined series/parallel – and others. They can be used for unbalanced antennas such as long wires, verticals, or coax fed antennas where final matching is required - or balanced so as to match twin feeders of various impedances (50, 75, 150, 300, 450 or 600 ohms) to antennas such as dipoles.

Although there are many ATUs on the market, be careful what you ask them to do, because some manufacturers are inclined to save building costs and fit variable capacitors with very little air gap between the fixed and rotating vanes. The closer those vanes, the lower the voltage they will withstand before flashover occurs!

If you check the ATU maker's specified range of matching impedances, you will probably find it says "30 to 130 ohms." Any higher effective impedance will mean **higher voltages** for the same power handling. Remember Ohm's law: in particular

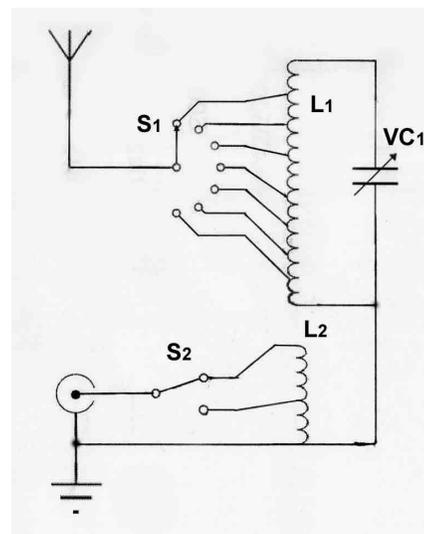
$$V = \sqrt{W \cdot R}$$

For example 100 watts at 50 Ohms = 70.7 volts whereas 100 watts at 5000 ohms (eg end fed half wave antenna) = 707 volts.

Practical ATUs

The following diagrams are for reference only. You will need to check various manuals for specific frequencies and component values. Personally, I use a parallel-tuned, single-ended ATU for 160 metres and a balanced ATU in the style of the old faithful KW E-Z match or KW107 for 80 to 10 metres.

Parallel ATU



The 160m ATU at G3ZMF

S₁ selects a tap equivalent to the aerial's impedance from a few ohms to several thousand ohms on L₁. S₂ is also a multi position rotary switch on the Tx/Rx link winding (L₂) on the earthy end of L₁ to get the best match into the antenna.

As L₁/VC₁ constitute a parallel tuned circuit, VC₁ needs to be a reasonably wide spaced variable capacitor to cope with expected RF voltages at the proposed power level.

Series ATUs

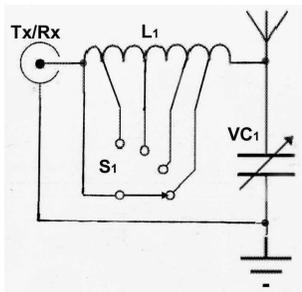
This can be a single component of either L or C. By using series inductance (L) you are simply **lengthening** the antenna, while using a series capacitor effectively **shortens** the length

SHAK NOWTZ No 4 - ATUs

of the antenna.

L-Match ATU

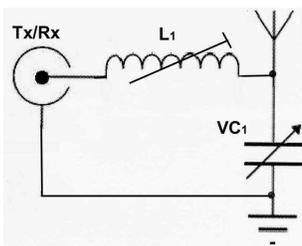
This is the simplest form of ATU, but still very effective. I have built several in compact form, in which the inductance is wound through a ferrite tube of suitable composition and power rating. (Robin of Sycom has them in stock at less than £3 each and they handle 200 watts at up to 30 MHz).



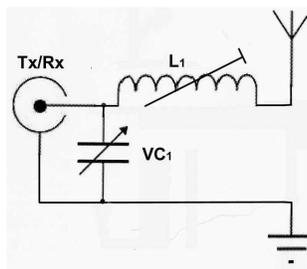
L-Match ATU

L₁ is tapped every 2 turns and progressively shorted out. I use an SO239 coaxial socket for many connections as they also take a 4mm plug in the centre hole. For other connections, I often use 4mm sockets on their own.

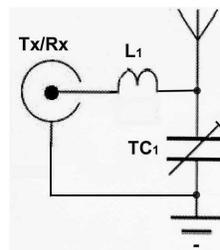
Various L-match configurations are possible depending on whether the impedance presented by the antenna at the desired frequency is higher or lower than the rig's impedance.



L-match for high impedance antennas ie > 50 ohms



L-match for low impedance antennas ie < 50 ohms



L-match configuration for yagi trimming

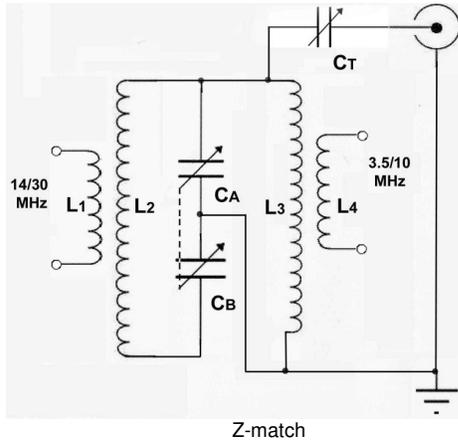
Here, L₁ is almost completely shorted out. The coils used in the above three circuits would often use a preset tap rather than be continuously variable

Of course, the most commonly found fully variable inductor is our old friend, the "roller coaster". But a word of warning – many of these ex-equipment units have their shafts connected to one end of the coil - or in some cases to the variable pick-up contact. In either case, the shaft and knob need to be adequately insulated from the equipment panel to prevent inadvertent contact with the user. Also, some roller coasters automatically short out turns from one end.

Balanced ATU

I use a basic Z-match ATU, where the link windings are wound over, or outside, the tuning winding. I claim **no** originality as the full details can be found in RSGB handbooks from 1968 onwards.

SHAK NOWTZ No 4 - ATUs



Z-match

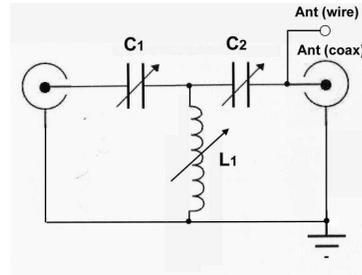
Note that on the LF bands only one side of the twin gang tuning capacitor is used. Also, C_T , the series tuning capacitor is "live in and live out" so must be fully insulated from (a) earth and (b) the tuning drive/ knob.

Ready- made Balanced ATUs

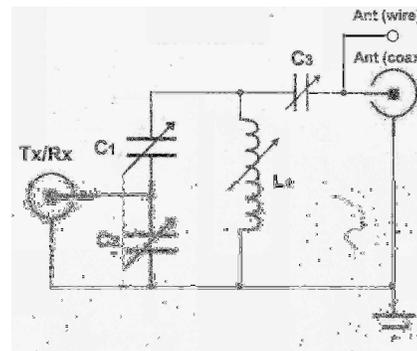
At this point, it is only fair to mention the practice of some manufacturers, who claim to have provided a "balanced" input, by fitting a small toroidal ring balun (balance-to-unbalance transformer) – **clamped to the rear panel**. In my opinion, this surely defeats the effectiveness of the toroid transformer and at the same time it has to suffer quite a mismatch between the variable components of the ATU and the antenna connection points. My opinion only – G3ZMF.

Single Ended ATUs

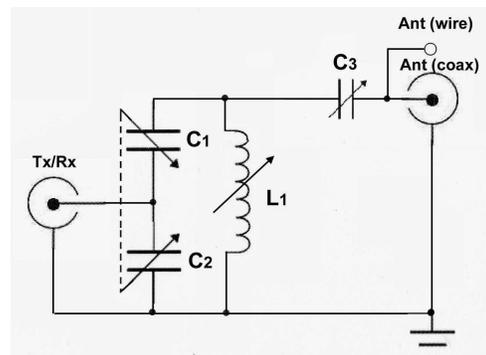
Specifically for long wires and verticals, most are in a Tee format, usually with a variable inductor to earth from the centre point of the Tee. The inputs can be via a single series capacitor (not forgetting that it must be insulated from earth and from its rotation drive) or sometimes as a tapped or even differential capacitance input. See diagrams below.



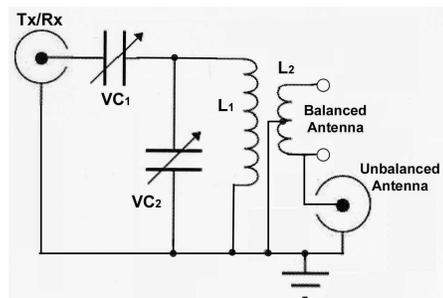
Tee configuration



Capacitance tapped input



Differential input (as C1 increases, C2 decreases, and vice versa)



50/70 MHz ATU, as used at G3ZMF

**See Yer !
Mad Frank G3ZMF**

Other Club News & Contact Information

BROMLEY & DISTRICT ARS

Website: www.bdars.org.uk

Email: bdars-news@talk21.com

Meetings: 3rd Tuesday of every month at Victory Social Club, Kechill Gardens, Hayes, Kent, 19:30 for 20:00.

CPREC (CRYSTAL PALACE)

Website: www.gsl.net/g3oou/ or

<http://www.g3oou.co.uk/>

Club Net: Wednesdays 20:00 on 145.525 MHz

Meetings: 1st Friday at All Saints Church Parish Rooms, Beulah Hill at 19:30

Jun 5th: The History of Audio Recording by Jon Weller G0GNA

CRAWLEY ARC

Website: www.carc.org.uk

Club Nets: Tuesdays 20:00 on 145.550 MHz and Fridays 19:00 on 1.970 MHz

Meetings: Every Wednesday at Hut 18, Tilgate Forest Recreational Centre, Tilgate Forest, Crawley from 19:30, and Sundays, 10:30 to 13.00.

Jun – TBA

Jul 2nd – ‘The Goubau Line’ – Mike Underhill G3LHZ

CRAY VALLEY RS

Website: www.cvr.rs

Contact: Richard Perzyna, G8ITB (see website)

Club Nets: Wednesdays 21:00 on 145.500/QSY and 22:00 on 3.720 ± QRM, and Sundays 11:00 on 3.720 ± QRM

Meetings: 1st and 3rd Thursdays at Progress Hall, Admiral Seymour Road, Eltham, SE9 1SL.

DORKING & District RS

Website: <http://www.ddrs.org.uk>

Email: ddrs.secretary@yahoo.co.uk

Contact: David Smith, M0SXD, 07808579501

Club Nets: Sunday 08:15 on 3.770 MHz & 20:30 on 144.775 MHz

Meetings: Friends Meeting House, Butterhill, South Street Dorking at 19:30.

23rd Jun – ‘Using the IBP and RSGB Board Consultation’ - Leslie Butterfields G0CIB

28th Jul - South Downs evening

HORSHAM ARC

Website: www.harc.org.uk

Club Nets: Saturdays 21:30 on 144.725MHz and Sundays 10:00 on 3.722 MHz

Meetings: 1st Thursday at The Guide Hall, Denne Road, Horsham, Sussex

4th Jun - TBA

2nd Jul - Bring Show and Tell

30th Jul - Fox Hunt

6th Aug - The Origins of Solar activity & its effects on the near earth environment - Len Culhane

MID SUSSEX ARS

Website: www.msars.org.uk

Club Nets: Sundays 08:00 on 3.740 MHz and at 11:00 on 145.350 MHz, Wednesdays 20:00 on 145.350 MHz and Daily 13:30 on 21.330 MHz

Meetings: Every Friday at Cyprus Hall, Cyprus Road, Burgess Hill, West Sussex for 19:45

REIGATE ATS

Website: www.gsl.net/rats

Email: rats@gsl.net

Club Nets: Thursdays 20:00 on 145.500 MHz and Sundays 20:00 on 3.740 – 3.760 MHz

Meetings: 3rd Thursday at RNIB, Redhill College, Philanthropic Road, Redhill for 19:30

SRCC

Website: www.g3src.org.uk

Contact: Ray Howells G4FFY 020 8644 7589

Club Nets: Sunday 09:30 on 1905 kHz

Daily natter channel – 144.215 MHz at 19.30.

Meetings: 1st & 3rd Mondays at Trinity School, Shirley Park, Croydon CR9 7AT 19:45 for 20:00

6th Jul - Summer BBQ at G4CCY/G4DDY's

3th Aug – Meccano with Alan Burman

SUTTON & CHEAM RS

Website: www.scrs.org.uk

Contact: John Puttock G0 BWV 020 8644 9945

Club Nets: Monday 20.00 on 145.500 MHz

Saturday 11.00 on 145.500 MHz

Meetings: 3rd Thursday at Sutton United Football Club, The Borough Sports Ground, Gander Green Lane, Sutton. 19:30 for 20:00

18th Jun – ‘Frequency Standards’ by Mike O’Beirne, G8MOB

16th Jul – ‘GB3NS Repeater’ - tbc

20th Aug – ‘Military Man-Machine Interfaces’ by Peter Skinner G7MLJ (tbc)

WIMBLEDON & DISTRICT ARS

Website: www.gx3wim.org.uk

Club Net: Mondays 20:45 on 145.500 MHz

Meetings: 2nd & last Friday of each month at Martin Way Methodist Church, Buckleigh Avenue, Merton Park SW20. 19:30 for 20:00

12th Jun - Commercial Satellite Communications G1SHV

26th Jun - Construction Evening

10th Jul Guest Speaker TBA

31st Jul to 9th Aug - Summer Camp

28th Aug - Fox Hunt

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