

The newsletter of the
Crystal Palace Radio & Electronics Club

Affiliated to the Radio Society of Great Britain
Established January 1956

Meetings are held on the first Friday of each month.
The room opens at 7:30pm for an 8pm start at:
All Saints Parish Church,
Beulah Hill, London, SE19 3LG
(opposite the junction with Grange Road).
Visitors are always welcome.

Web sites: Club Admin: <http://cprec.btck.co.uk/>
Club Technical: <http://cprec.btck.co.uk/OurTechnicalSite>
Email: crystalpalaceradio.club@gmail.com
Club Net: Each Wednesday at 20:00 on FM on 145.525MHz (S21) ± QRM
Twitter @BobFBurns or www.twitter.com/bobfburns

Next meeting: Friday 3rd August 2018

Summer Social

In this issue: *Future Meetings & Events, Recent Event News, Faster than the..... by 'Theorist', Technical Snippets, Members News, Miscellaneous, Noticeboard, Diary of External Events, News from other Clubs, Local Training Courses and Club Contact Information.*

See page 8 for club contact information

Dear Reader

Future Club Meetings and Events

- 03 Aug 18 M Summer Social
18 Aug 18 E Angels One Five at the David Lean Cinema
07 Sep 18 M Introduction to Electronics - Power Supplies by Bob G300U
05 Oct 18 M Practical Session - Building a compact VHF Aerial
02 Nov 18 M Network Radio by Martin Butler M1MRB
07 Dec 18 M Christmas Social
04 Jan 19 M Video Evening
01 Feb 19 M Annual General Meeting

C = Contest, CM = Committee meeting, E = External event, M = club meeting, R = Rally, T = Training course, V = Visit.

03 Aug 2018 - Summer Social

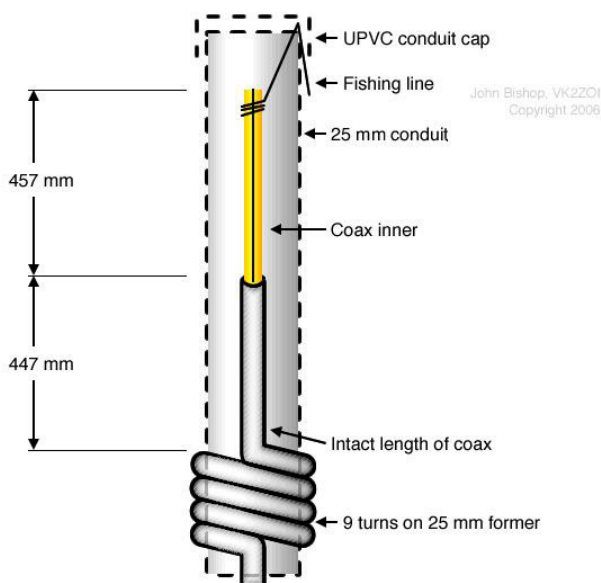
This meeting will be our summer social at which there will be a buffet, tea and coffee etc. Members are asked to contribute sufficient food for themselves and any accompanying guests to the shared buffet.

If we have time we will activate the club radio station for which early assistance would be appreciated in assembling the aerial and electronic equipment before the meeting gets underway.

Recent Event News

06 Jul 2018 - Compact HF and VHF Aerials - Bob G300U and Damien 2E0EU1

a) The evening commenced with a talk by Damien on the Flower Pot aerial which is a light weight single band vertical VHF aerial. It is constructed using a length of one inch (25mm) diameter kitchen waste pipe and a length of 50ohm coaxial cable with a flexible inner conductor and



an outer braiding without any surrounding foil. The latter is important because the coax cable makes a sharp turn when entering and leaving the pipe which may break the foil.

The diagram shows the general construction details for a 144MHz version of this aerial. For more information visit the designer's web site at:

<http://vk2zoi.com/articles/half-wave-flower-pot/>

This aerial will feature in a practical construction meeting in October this year - see Members News later in this newsletter.

You can add an extra band to this aerial, say 432MHz, by including a half wave foil resonator on the outside of the plastic tube centred on the point where the coaxial cable braiding ends.

b) The evening continued with a talk on Compact HF aerials. This commenced by looking at standard HF aerials like long wires, dipoles, ground planes and a loop and then moved on to consider how these could be reduced in size to fit small suburban gardens or flats with no garden but just a balcony. Loading coils may be used to shorten the basic resonator or to reach a lower frequency band and resonant traps may be used to add extra bands.

A clothes line aerial was shown which has a quarter wave of wire wound onto a short length of rope or plastic clothes line. The result is similar to a helical whip and can be adjusted for resonance on the desired band.

Faster than the... by 'Theorist'

A science fiction story I read in my youth started with a detective looking at a window. The glass in the window was a special 'slowglass' which meant that light took 20 years to pass through it. A murder had been committed 20 years earlier near the window so that by looking at it now (i.e. two decades later) the detective could see the murder and see who the murderer was, and if he had arrested the right man at the time. That is how I remember it anyway.

If you look online at a Table of Physical Constants (and do pay special attention to the word 'constant') you will find that the speed of light in a vacuum is defined as being precisely 299,792,458 m/s, a value to which I will assign the customary symbol c . There is no error in this figure; it is exact because the metre has now been defined as the distance light travels in $1/c$ seconds. The metre is no longer a truly fundamental unit as it is defined in terms of something else, and any error is now loaded in the measurement of the metre rather than in the measurement of the speed of light. As you know, all electromagnetic radiation (EMR) travels at this speed including radio, x-rays, infrared and ultraviolet light, as well as visible light. Visible light does slow down when passing through materials such as glass or water, and EMR in general will be slowed down by different materials. You will also have heard that 'nothing travels faster than the speed of light'. Clarification is needed, as always. The statement really means that information cannot be sent faster than this speed, and/or that nothing can go past you greater than this speed.

Edwin Hubble showed that the universe is expanding and that more distant galaxies are receding from us faster than nearer galaxies. Indeed astronomers use the red shift in the spectrum of light from distant galaxies to work out how far away they are. If the universe is infinite, as the evidence now suggests [1], then there comes a point

where the distant galaxies would be receding from us faster than c , but the light from them would never reach us as it can only travel at c . What we can actually see (ie get EMR from) is therefore known as the observable universe to distinguish it from the bits we can't, and will never see.

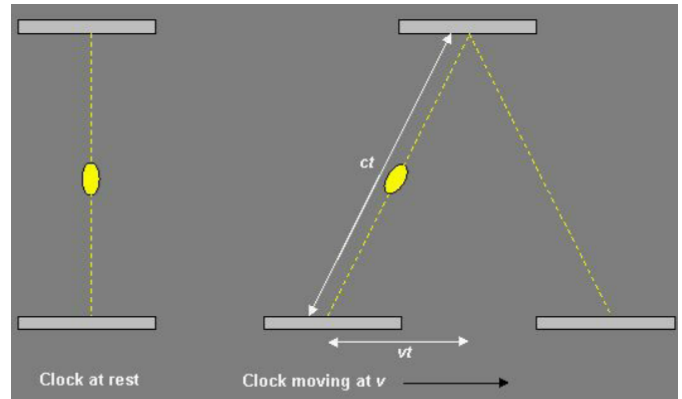
The way to think of this is to consider a bread dough with some raisins in it that represent galaxies. As the dough expands the raisins become separated, but those that are initially close together move apart less quickly than those which are initially far apart. In this analogy the dough represents space itself, and indeed in the standard cosmological model the expansion of the universe is an *expansion of space*: more space is being created with time and the galaxies are carried along with it like the raisins in the rising dough. But locally nothing can go past you faster than c and you cannot send a message to anybody faster than c .

You might be wondering why you can't simply keep accelerating something until it is travelling faster than c . The reason is that as things go faster they increase in mass. This effect is imperceptible at low speeds, but as things go faster the effect becomes more and more pronounced. In the LHC protons can be accelerated to $0.999\,999\,991\,c$, or about only 3 m/s less than c ! At this speed their mass is about 7,000 times as great as when they are at rest, and more and more energy would be needed to accelerate them that little bit more [2]. You can never get to c as an infinite amount of energy would be needed to do so.

If you think about it though it though there is something else that is rather odd. Suppose you were in space and a small spaceship was travelling towards you at half the speed of light with its headlights switched on. What speed would you measure the light coming from the spaceship when it reached you? Think about a cyclist cycling directly towards you at 10mph who throws something forward at you with a speed relative to him of 7mph. You would see the thrown object coming towards you at 17mph. So what speed would you measure the light coming from the spaceship, given that a man on the spaceship would measure the light from his headlights as c ? Would it be $1.5\,c$, even though this is faster than the speed of light? The answer is that both you and anybody in the spaceship would both measure the same speed, namely c . There is no explanation for this. It is the way the universe is set up. If you could explain it you would become world famous. The fact is that the speed of light really is a universal constant which is independent of the motion of the emitting body. When you measure the speed of light you always get c [3]. What would be different is that you would see the light from the spaceship as blue-shifted because of the Doppler effect, in other words at a higher frequency than spaceship-man would measure.

What it also means is that time goes slower the faster you travel, as is easily(?) demonstrated by considering something called a light clock. In this hypothetical device two horizontal mirrors are placed almost exactly 30 cm apart and a photon is allowed to bounce up and down between the mirrors. Each circuit or 'tick' from bottom to top and back again will take the photon 1 ns. Now imagine that a man on a spaceship whizzes past you at a

speed approaching c , and that both you and he have a light clock. The photons in both clocks will travel at c and will therefore cover the same distance in a given amount of time, since c never varies. But if you look at the diagram you can see that when both clocks have completed one tick the photon in the moving clock (on the right) has travelled further, meaning that it took longer to complete the tick than the stationary clock on the left. Time is therefore going slower for the spaceship man than it is for you!



Slowglass was a nice idea and obviously does not exist. However there is something called a Bose-Einstein condensate, which is a peculiar state of matter as exhibited by (e.g.) a supercooled (170 nano-Kelvin or so) extremely low density gas. It was first achieved in 1995 although predicted in 1924 by Bose and Einstein. Light was predicted to travel extremely slowly through such a gas and in 1999 a physicist called Lene Hau was able to slow light to a mere 17 m/s in such a condensate. In 2001 she actually managed to stop light completely though briefly.

- [1] I really really don't like the idea of an infinite universe. Really.
- [2] This precise way of looking at things is no longer in favour for various reasons but can be found in the older textbooks of my generation
- [3] Actually there is a very slight twist here which is that c is affected by gravity very slightly

Members News

a) Aerial mast Maintenance: Your scribe needs to carry out some maintenance on his 25+ year old mast and would appreciate some assistance for two or three hours while the weather is good. A minimum of five people are required to take the mast down, do the work and re-erect it. Volunteers please?

b) 18th November: please put this date in your diary as we have booked two tables at the CATS Bazaar in Coulsdon and will require help from members to assist with talking to visitors and sales. This should be a well attended event as the Autumn Kempton Park rally has been cancelled this year.

c) Member's projects - are there any? Outside of the committee there seems to be little project activity advised or talked about by members. If you have something of interest please send it in to the newsletter editor.

d) Flower Pot Aerial: If you would like to construct and take away the Flower Pot aerial presented by Damien at the last meeting please let a member of the committee know so that adequate materials can be provided for the construction meeting in October 2018. Damien will advise on costs before the event but it should only be a few pounds as the materials are few and fairly basic.

Technical Snippets

a) Filters: Last month's newsletter discussed some possible HF receiver designs and first and second intermediate frequency (IF) options including upconversion architectures whenre the first IF is above 30MHz.

Roofing filters for up-conversion receivers or transceivers are sometimes available at rallies or on eBay but choice is limited and the supply is not predictable so making your own may become a necessity. Here the ladder filter is one of the easiest formats to implement.

First you will need to decide on the range of modulation modes to process which will determine the maximum bandwidth of the roofing filter. The following table shows the most common modes of operation and their respective bandwidths.

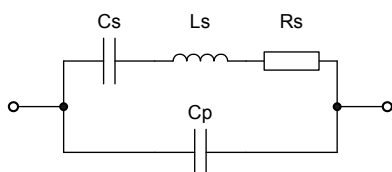
Signal Type	Max Bandwidth
25KHz channelised FM	15KHz
20KHz channelised FM	12KHz
12.5KHz channelised FM	12.5KHz
AM	6KHz
SSB	2.5KHz

CW and most data modes require much lower bandwidths, typically 200Hz or less.

Ladder filters are relatively easy to design and construct as long as you can first measure the crystal characteristics and calculate the internal crystal parameters. Two design sites have been provided, both showing how to measure the crystal and calculate the internal parameters.

A single roofing filter in a receiver must have sufficient bandwidth to pass the widest possible required signal as shown below:

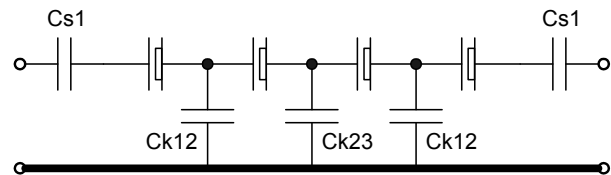
The drawing on the right shows the equivalent circuit of a fundamental mode quartz crystal or ceramic resonator - overtone resonances have been omitted. Cs is the motional capacitor, Ls is the motional inductor and Rs is the equivalent series loss resistance. Cp is the parallel capacitance caused by the surface metalising and holder strays. The overall result provides two resonant frequencies, a low impedance



series resonance and a high impedance parallel resonance.

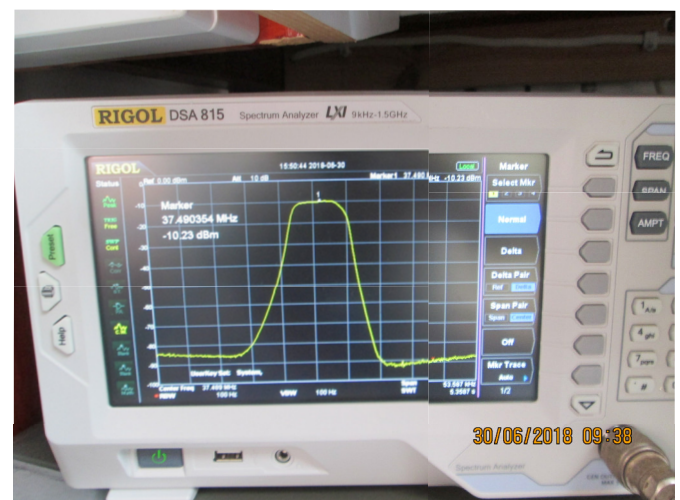
If you compare the internal electronic equivalent circuit of a fundamental mode crystal and a third overtone crystal of the same frequency the motional capacitor (Cs) in the overtone crystal is much smaller. This results in the maximum possible bandwidth for a ladder filter based on third overtone crystals being much smaller than one based on fundamental mode crystals of the same frequency. For the same reason, overtone crystals also have a much smaller pulling range than a fundamental mode crystal of the same frequency.

An example of a simple four section ladder filter:



There is a comparative table in the Crystals for Filters page in the Crystals and Filters Menu on the Technical web site where the last two entries compare a 37.5MHz fundamental crystal with a 40MHz third overtone crystal.

Last month I located a source of 37.5MHz fundamental mode crystals and purchased twenty for a filter investigation. Using these I designed and constructed a 'dead bug' prototype eight pole roofing filter at 37.5MHz with a passband width of 15KHz, a 6/60dB shape factor of 2:1 and a minimum stopband attenuation of -65dB. A 7.5KHz wide eight section roofing filter has also been designed and constructed in a similar manner for which a frequency response plot is shown below - the vertical axis is 10dB per division. The -3dB bandwidth is 8KHz and with improved grounding on the test jig the stopband is at least 73dB below the filter passband.



These crystals were specified as 20ppm (parts per million) and almost certainly intended for oscillator applications as there are a number of spurious responses on the high side that would be unacceptable in filter applications. However, as the spurii are not exactly the same frequency in each

crystal, they get attenuated with sufficient sections in the filter.

I determined that a minimum of six sections is required to ensure that the spurious responses are at or below the stop band response of each filter but the width of the filter at the -20dB and -40dB frequencies will be wider than the eight section version. You can see from the photo below that the low frequency edge of the filter response falls more slowly than the high frequency edge which is normal for a ladder filter.

Higher performance receivers make use of multiple roofing filters with different bandwidths to minimise the number of signals that are passed on to subsequent stages prior to the mode filters. For example, at least six SSB signals and many more CW signals will fit inside the passband of a 15KHz FM filter.

Since the low frequency edge of a ladder filter is closely related to the series resonant frequency of the crystals, two different bandwidth filters using the same crystals will have different centre frequencies. This can be corrected in the filter with the lowest centre frequency by adding small capacitors in series with each crystal to raise the centre frequency to that of the other filter. You may find that this modification has a small effect on the overall bandwidth due to changing the coupling between each section. To model this change you can use the AADE Filter Design or LT Spice packages, both free.

A PCB layout has now been designed and made with measured performance very close to the theoretical model. The 15KHz wide filter shows an actual bandwidth of 15.5KHz, a centre frequency of 37.495MHz and a stop band of -73dB. Ripple is about 1dB which is good considering the use of unmatched crystals. A 7.5KHz wide filter has been constructed with a characteristic impedance of 68ohms. The measured bandwidth was 6.8KHz which may be due to using randomly selected unmatched crystals but this can be corrected by increasing the design bandwidth to 8.3KHz.

A 3KHz wide filter has been calculated with a characteristic impedance of around 20 ohms but not constructed. The insertion loss may be somewhat higher than in the wider bandwidth filters.

If you would like to try designing your own filters then look at one of the following web sites:

Web based calculator:

<http://www.giangrandi.ch/electronics/crystalfilters/xtalfilters.shtml>

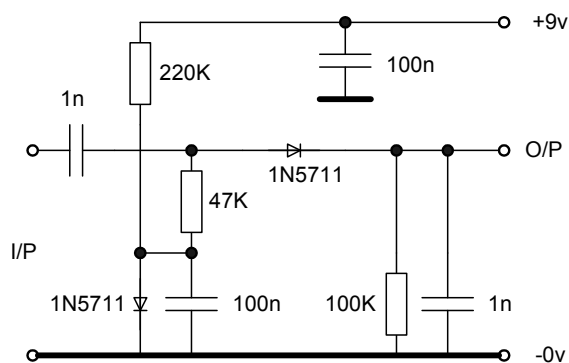
Downloadable Windows executable program:

http://warc.org.uk/?page_id=387

Both calculators will allow you to design simple and more complex Butterworth and Chebychev filters and the latter one has additional functions including one for designing matching sections to and from 50ohms so is somewhat more useful. In each case you will have to measure the crystal parameters by following the relevant instructions.

b) Detectors: Silicon diode detectors have severe non-linearity at very low signal levels and a relatively high threshold of conduction - typically 650mV. Germanium diodes have a much lower threshold of conduction, typically 100-150mV, but they are not stable with temperature. The Schottky diode sits between the previous two types of diode with a conduction threshold of about 400mV and good temperature stability.

You can significantly improve the low signal level distortion, but not remove it entirely, by forward biasing the detector diode as shown in the following



circuit. To achieve good temperature stability the forward bias should be derived from another diode of the same type.

Using two Schottky diodes in this manner gives a detector that has relatively low distortion down to about 100mV peak to peak (pk-pk) signal input level and a minimum discernable output level of about 3mV pk-pk. The DC supply should be well decoupled.

The 1N5711 is a typical low cost Schottky detector diode which may be used as a detector or mixer from LF to UHF.

c) Guitar Pickups - our Treasurer Ian writes: 'First of all, I'm not a guitarist but I am a musician. My first experience of an electric guitar was, why does the volume control affect the tone?'

Well, let's consider the Dynamics of a pickup, it wants movement of a magnetic field that will induce a voltage. Hence the output, alas this is a voltage with very little current. Most musicians know little about this might I add. So the impedance of the signal is quite high.

Next thing I learnt was that because of this most guitars have a problem with potentiometers i.e. the signal is of such a high impedance it seems that the impedance of the amplifier will affect the signal.

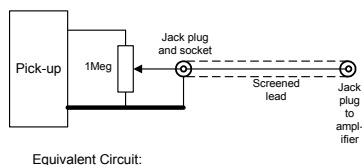
So I thought about a high impedance buffer/mixer to overcome these anomalies, I know it's been done before but I settled on an FET cos of its almost infinite input impedance and researched a few designs and I wanted it to be small, so I kinda designed it around 3 volts i.e. A 2032 button cell.

It worked. I also introduced a piezoelectric pickup to the bridge with a 1meg resistor that also worked.

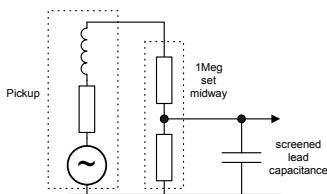
Now to my main point: guitar pickups can't deliver much current so it affects the tonal qualities. When

it's wired in conjunction with a potentiometer (variable resistance) the capacitance of the connecting lead must be taken into account. A high impedance signal with the variable resistance set to say midway will result in some loss of the higher frequency audio signals.

The diagram to the right shows a typical guitar wiring diagram, ignoring any tone controls, and its equivalent circuit.

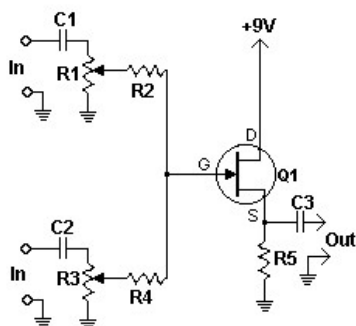


Equivalent Circuit:



If we assume the 1Meg level control is set midway then the resistance of each half will be 500K. When the reactance of the cable falls below 500K at an audio frequency then the circuit attenuation starts to become significant.

To get round this problem a buffer or mixer with a high input impedance and low output impedance is required. I selected the circuit to the right but running it on a much lower supply voltage of 3v from a 2032 button cell.'



Miscellaneous

a) The American Radio History website houses a vast collection of scanned printed information of the history of radio in the States including Broadcasting, Technical, Music, Early Radio and Station Lists. Well worth a visit.

<https://www.americanradiohistory.com/>

b) The 'Angels One Five' film is being shown at the David Lean Cinema, Croydon Clocktower, Katherine Street, CR9 1ET on Saturday 18th August at 14:30. This Top Ten 1952 Battle of Britain film, presented by the Kenley Revival Project, was commended for the accuracy of its portrayal of RAF tactics.

A number of functioning Hawker Hurricane aircraft were used and some shooting took place at Kenley Aerodrome.

Tickets are £5 per person but do book early via <http://www.davidleancinema.org.uk/> in case it sells out before the day.

c) RAF 100 Celebration - Cathy and I visited this event in London which featured a range of display aircraft from 1918 to date and an exhibition enclosure with a range of active and passive displays.

Aircraft on display ranged from a WW One biplane, a WW Two Spitfire to the latest heavy lift helicopter and jet fighters.

Pictured below are an early biplane and the Douglas Dakota which was used extensively in the Berlin

Airlift in 1948/49 and a number are still in commercial use today.



d) Donation of Books: A member of the family of a local silent key amateur contacted me and very kindly donated a collection of technical books at the last meeting. I am pleased to report that 90% of these have gone to new homes with small donations to club funds. Included were some mid WWI - WWII RSGB documents.

Three small books on TV Servicing and a valve data book remain if anyone would like them.

Notice Board – Wanted and For Sale

The Notice Board is for all club members to use so if you have one or more items that you wish to buy or sell then please send in the details. Some of the current list of items may be viewed at:

<http://cprec.btck.co.uk/SaleofClubEquipment>

All excl P&P.

For Sale

a) Remaining items donated for club use or club funds by two Norbury residents:

- Four text books: 'HF Communications - A Systems Approach' by Nicholas Maslin, 'Communications Systems' by Simon Haykin, 'Telecommunications Engineering' by Dunlop & Smith, 'Introductory Topics in Electronics and Telecommunications - Modulation' by F R Connor. £1 each.

- Gould Digital dual beam 20MHz storage scope type 4035 with manual on CD, working, £30 ono.

Offers to our Chairman Damien on 07900 242541 or email [Gorby928\(at\)gmail.com](mailto:Gorby928(at)gmail.com).

CPREC has a large bank of fundamental and overtone quartz crystals, from 1.0 – 99.91MHz. The list, which is on the club website as a downloadable PDF file, has recently been updated with new frequencies and case classifications and sorted in frequency order. Prices are £1 each to club members and £2 each to non members, excluding P&P.

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G300U

Diary of External Events

29 Jul - Chippenham & DARC Rally, Electronics Fair & Car Boot Sale

Kington Langley Village Hall & fields, Church Road, Kington Langley SN15 5NJ. Opens 10am (disabled 9am), entry £2, car boot sale, catering, flea market, SIGs, talk-in, trade stands. Contact Brian Tanner, G6HUI on 0772 224 2741 or rally@g3vre.org.uk

19 Aug - The RATS (Rugby Amateur Radio Society) Rally

Princethorpe College, Princethorpe, Rugby CV23 9PY. Open 10am to 4pm (8.30am for vendors). Entry £3, car boot sale and catering on site. Tony, G0OLS, 0775 968 4411, rally@rugbyats.co.uk or www.rugbyats.co.uk

28 - 29 Sep - National Hamfest

Newark & Nottinghamshire Showground, Lincoln Road, Winthorpe, Newark, Nottinghamshire NG24 2NY. Brought to you by the RSGB in association with the Lincoln Short Wave Club. Free car parking, disabled facilities, trade stands, Bring & Buy, car boot area, flea market, SIGs and RSGB bookstall. Representatives from the RSGB Services and committees. Morse proficiency tests, on-site catering outlets and a seating area. Information from www.nationalhamfest.org.uk

12-14 Oct - RSGB Convention

Kent's Hill Park Training and Conference Centre, Swallow House, Timbold Drive, Kent's Hill Park, Milton Keynes, Buckinghamshire MK7 6BZ. The Convention programme of lectures for all interests will be available on the website. Principal sponsor Martin Lynch & Sons. www.rsgbevents.org.

18 Nov - 41st CATS Bazaar

Oasis Academy Coulsdon, Homefield Rd, CR5 1ES Coulsdon. £1.50 entry and plenty of free parking! Applications from traders, clubs and private sellers most welcome. Contact bazaar@catsradio.org or ring Andy G0KZT on 07729 866600.

News from other Clubs

Club Secretaries – please ensure that your future meeting details are present in your newsletters, on your websites or sent to our newsletter editor Bob G300U. Palace Pulse is published about ten days before our club meeting which is on the first Friday of each month and

closes for editorial contributions a few days before publication. Due to differing publication dates and short lead times it is getting increasingly difficult to include other clubs' events although we will endeavor to do so if advised in time.

Readers - If you plan to visit one of these club meetings please check with the club concerned in case of any last minute changes.

Bredhurst Receiving and Transmitting society

Meet on Thursday night from 8:30pm at the Parkwood Community Centre, Long Catlis Road, Rainham, Kent, ME8 9PN. Contact secretary@brats-qth.org or <http://www.brats-qth.org/brats/>

Bromley & District Amateur Radio Society

Meets at 19:30 on the third Tuesday of each month at the Victory Social Club, Kechill Gardens, Hayes, Bromley, BR2 7NH. Contact Andy G4WGZ on 01689 878089 or enquiries@bdars.co.uk. Web: www.bdars.co.uk
21 Aug Operating and Social
18 Sep Aerials by G4WGZ

Chelmsford Amateur Radio Society (CARS)

19:30 on the first Tuesday of each month at Oaklands Museum, Moulsham Street, Chelmsford, Essex, CM2 9AQ. Contact: [secretary\(at\)g0mwt.org.uk](mailto:secretary(at)g0mwt.org.uk) Web: www.g0mwt.org.uk
07 Aug Constructors Competition
04 Sep 999 Emergency Communications - G3ZPS

Coulsdon Amateur Transmitting Society (CATS)

8:15pm on 2nd Monday each month. Contact: Andy Briers G0KZT on 07729 866600 or [secretary\(at\)catsradio.org](mailto:secretary(at)catsradio.org). Web site: <http://www.catsradio.org/>
13 Aug CATS BBQ @ G4CDY QTHR

Crawley Amateur Radio Club (CARC)

Every Wednesday 20:00 – 22:00, every Sunday 11:00 – 13:00. Formal events are on the fourth Wednesday of the month, 7-30pm for 8pm. Phil M0TZZ on 07557 735265 or [secretary\(at\)carc.org.uk](mailto:secretary(at)carc.org.uk) or Web: <http://www.carc.org.uk/>
25 Jul QE2 Communications by Duncan Brooker
26 Sep Surplus Equipment Sale

Cray Valley Radio Society (CVRS)

Meets at 8pm on the 1st and 3rd Thursday of each month at 1st Royal Eltham Scouts HQ, Rear of 61 - 71 Southend Crescent, Eltham, London, SE9 2SD. Contact: Richard on [secretary\[at\]cvrs.org](mailto:secretary[at]cvrs.org). Web www.cvrs.org
28 Jul Annual BBQ + G1RCV activity in IOTA contest
02 Aug Dxing for Beginners by Fred G3SVK
16 Aug Beginners guide to Raspberry Pi for Amateur Radio – Pete M0PSX

Dorking & District Radio Society

Meetings at 7.45pm. Contact: David Browning (M6DJB) at [djb.abraxas\(at\)btinternet.com](mailto:djb.abraxas(at)btinternet.com). Web site: <http://www.ddrs.org.uk>
17 Aug Summer Social
25 Sep Small transmitting loops by Prof. Mike Underhill G3LHZ
23 Oct Practical evening - Making antenna traps by Tom Ellinor G4DFA
27 Nov AGM & RSGB Video

Echelford Amateur Radio Society

Meetings on 2nd and 4th Thursdays of each month at the Weybridge Vandals Rugby Football Club. Enquiries to John at jho_g4gsc(at)btinternet.com or 01784 451898. Web site: <http://www.qsl.net/g3ues/index.htm>
1-2 Sep High Power Field Day

Hastings Electronics & Radio Club

Meetings held at the Taplin Centre, Upper Maze Hill, St Leonards on sea, TN38 0LQ, 7pm for 7:30 on the fourth Wednesday of each month. Information from Gordon Sweet M3YXH on 01424 431909, email: sionet3344(at)hotmail.co.uk
Web: <http://herc-hastings.org.uk/>
25 Jul Bring & Buy Sale
22 Aug Construction Contest
26 Sep Photos Presentation by Alan Harding

Hereford Amateur Radio Society

Meets on the first Friday of each month at Hill House, Newton, Nr Leominster, HR6 0PF. Contact: enquiries@herefordradioclub.uk or <http://herefordradioclub.uk/>

Horsham Amateur Radio Club

meets on the first Thursday of each month at the Guide Hall, 20 Denne Road, Horsham, West Sussex, RH12 1JF. NRQ TQ172304 at 20.00hrs local time. Contact Alister Watt G3ZBU at g3zbu@hotmail.com or <http://www.harc.org.uk/>
02 Aug Photo Quiz, Andrew M0GJH
16 Aug Social - The Royal Oak - Wineham

Mid-Sussex Amateur Radio Society (MSARS)

Meet most Fridays in the Millfield Suite, Cyprus Hall, Burgess Hill, RH15 8DX from 7.30pm till 10.00. Contact

Stella on 01273 844511, M6ZRJ(at)msars.org.uk or www.msars.org.uk
27 Jul Foxhunt 3
31 Aug Foxhunt 4
14 Sep EGM

South East Essex Amateur Radio Society (SEARS)

Contact Mark Callow 2E0RMT on 07842 336444 or secretary@southessex-ars.co.uk or <http://www.southessex-ars.co.uk/>
Meetings: 7pm 2nd Tuesday each month at The White House, Kiln Road, Benfleet, Essex, SS7 1BU.
19 Aug Special Event - Museums on the Air, Bay Museum Canvey
09 Oct Andy Tyler G1GKN - Ex military radios in Amateur Radio

Surrey Radio Contact Club (SRCC)

7.30 for 7.45pm on 1st. and 3rd. Mondays every Month. Contact John Kennedy G3MCX on 020 8688 3322 or secretary@g3src.org.uk. Web: <http://g3src.org.uk/>
06 Aug Shgort talks by Quin G3WRR, John G8IYS, Ray G4FFY
03 Sep Echo Satellites by George Emsden M0TPH

Sutton & Cheam Radio Society

8pm on 3rd Thursday every month. Contact John Puttock G0BWV on 020 8644 9945 or email info@scrs.org.uk
Web: <http://scrs.org.uk/>. SCRS run a practical group most Monday evenings at the Bandstead Scout Hut.
16 Aug SOTA for Beginners – Richard Perzyna – G8ITB

Please replace the (at) with @ when using any email addresses shown in this newsletter.

Crystal Palace Radio & Electronics Club is a member of the South East Tutors training group.

Local Training Courses

Licence Level	Dates	Location	Club Provider	Format	Further details
Advanced	22 Jul - 9 Sep	Bromley BR2 7NH	Bromley	5 days (Sun)	www.bdars.org
Foundation	07 - 21 Oct	Bromley BR2 7NH	Bromley & District ARS	2 days (Sun)	www.bdars.org
Intermediate	03 - 25 Nov	Eltham, SE9 2SD	Cray Valley RS	3 days (Sat)	www.cvrs.org
Foundation	02 - 09 Feb 2019	Eltham, SE9 2SD	Cray Valley RS	2 days (Sat)	www.cvrs.org
Intermediate	17 Feb - 17 Mar 2019	Bromley BR2 7NH	Bromley & District ARS	3 days (Sun)	www.bdars.org
	= course commenced				

CPREC Committee Information

Officers:		
Chairman:	Secretary:	Treasurer:
Damien Nolan 2E0EUI	Alan O'Donovan G8NKM	Ian Skeggs M6FZC
E: crystalpalaceradio.club@gmail.com	E: crystalpalaceradio.club@gmail.com	E: crystalpalaceradio.club@gmail.com
Committee Members:		
Bob Burns G30OU	Newsletter Editor	T: 01737 552170 E: g30ou@aol.com
Nick Stapley		