



## Chelmsford Amateur Radio Society

Established 1936

Affiliated to the RSGB  
President: Harry Heap G5HF  
Secretary: Martyn M3VAM

Club Call Sign: G0MWT  
Chairman: John Bowen G8DET  
Treasurer: Brian Thwaites G3CVI

Newsletter No 486

Web Address: [www.g0mwt.org.uk](http://www.g0mwt.org.uk)

August 2006

### **This Month's Meeting - Tuesday, 1<sup>st</sup> August. 7.30pm at the MASC. Table Top Sale organised by Colin, G0TRM**

Are you looking for a new rig or is it an antenna tuner you're after? Perhaps you have too many rigs already and want to make some more room in the shack. Now is your opportunity, as it is time for our usual August Tabletop sale. What better chance to make a clean start, get rid of all that stuff you have not used for years, and make someone happy - Your partner for instance! If you have something to sell, book a table in advance by calling Colin G0TRM (01245 223835). Not much to sell, then why not share a table. There is no table fee for Club members but 10% of any proceeds would be appreciated for Club funds.

Although now in semi-retirement, we hope once again to have Mike Wheaton G4ZPE, (Zipy to his friends) from Waters and Stanton. If the past is anything to go by, he will bring along a good selection of interesting items from various sources and again as in past years will be donating a very worthwhile prize for our raffle.

Not buying or selling then; come along and get up-to-date on the latest news or ask someone for help on your latest interest.

### **Dates for Your Diary**

Sunday 30 <sup>th</sup> July	Colchester Rally
Sat 5 <sup>th</sup> August	European H.F. Championship SSB/CW Contest
5 <sup>th</sup> , 6 <sup>th</sup> & 20 <sup>th</sup> August	VHF Contests
6 <sup>th</sup> August	RSGB 2 <sup>nd</sup> RoPoCo/CW Contest
Wed 9 <sup>th</sup> August	CARS Committee Meeting - Danbury Village Hall at 7.30pm - All invited.
Monday 21 <sup>st</sup> August	<b>The End of BR68</b> , as its Replacement start to be shipped – See Inside!!!

### **Sandford Mill - Open Afternoons in August & CARS there on the 6<sup>th</sup> & 20<sup>th</sup>.**

The Science & Industry Museum is open to the public each Sunday afternoon in August from 2 to 5pm. It is FREE entrance & parking. CARS will have a full station running on the 6<sup>th</sup> & the 20<sup>th</sup> of August. The Friends of the Museum will ensure there are "Things to press, poke, step on and even look at". All ages are catered for. There will be refreshments available.

CARS require YOU to attend to Operate, Log or simply Host. There is plenty to amuse the YL while you are "on station". Please see Brian at the August Meeting or contact him at [g3cvi@g0mwt.org.uk](mailto:g3cvi@g0mwt.org.uk) or phone him on 01245 471919.

### **Net Controllers: September: Denis, M0FHA and Ron, M3CAM.**

Our grateful thanks to Denis, M0FHA and Joy for posting this Newsletter. Could it have gone by E-Mail?

Please keep our Membership Secretary, informed of any changes to your callsign or E-Mail addresses, etc.

For further details contact our Programme Secretary: Martyn M3VAM on 01245-469008 or look on the CARS Web Site.

Club Nets: Tuesdays 8-30pm: (2nd) 145.375 : (3rd) 1.947 : (4th) 1.947 : (5th) 145.375. All +/- QRM.

## Software Defined Radios

By Murray Niman, G6JYB

### Report By Christopher Chapman G0IPU

Murray started his talk by outlining the state of the technology at present and that he would limit the talk to receivers rather than transmitters. The latter could form the basis of another talk later. Describing the equipment he had brought along for demonstration purposes later on, which consisted of two laptop computers and radio related attachments. One was of a more commercial nature but the more relevant one was a Softrock SDR 40 kit on a 1GHz laptop.

### What's SDR all about?

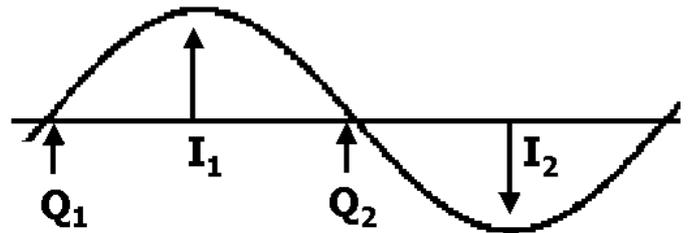
So what is SDR? This is where the computer has taken over and replaced most of the usual analogue functions of the radio. Audio stages, modulation and first up conversions of the radio are now on the computer / soundcard to recover or define the wanted envelope of the signal in the software or hardware. This is not to be confused with tone decoding type software like RTTY, PSK31 etc where DSP is used purely at the audio level - now the DSP is at the IF and Detector stage (RF stages). This means you can use software to replace many of the filters once in hardware, and now use software defined filters with 250 plus virtual taps (not possible in hardware with coils and capacitors). This makes for a very cost effective radio in hardware (around £18 if you import from USA, or £28 from W&S at present), as the software to drive it at present is free.

The modes we use can be controlled from the computer, making changing modes very easy. In addition there is the ability to see on the screen a panoramic view of the band spectrum in use making it easy to see where the activity is on the band (in the demo case, Softrock-40 model – 40m/7MHz). This could clearly be an asset for the contester in the future. Another advantage of less hardware in the front end and IF, is that there is less to go non-linear (within the 100dB range of the sound card) just a simple passive band pass filter, enabling in-band monitoring despite strong adjacent signal.

One key feature of SDR is the use of in-phase and quadrature (I/Q) detection which can be used to overcome interference issues resulting in better overall signal to noise ratios and dynamic range (around 100dB is achievable). As Soundcards have two channels, this enables each of these components (I&Q) to be compared allowing far better performance and functionality compared to traditional analogue AM/FM detectors. The I/Q channels must be as close to 90 degrees as possible in phasing, and can be adjusted either by the software or manually from within the software, giving as much as an extra 60dB's of image rejection. Murray then highlighted

that this reduction in discrete analogue componentry was very attractive to mobile phone makers who already have gone largely digital.

Murray using block diagram explained the hardware, showing the band definition filter, Local oscillator, Quadrature sampler, and two op-amps for the output to the soundcard. There were no RF amplifiers, pre amplifiers, IF amplifiers etc. In fact most of the components on the demo board were for the power supply, keeping the whole thing small.



### Quadrature Sampling

Murray then went on to explain the technique that is fundamental to the SDR system. An SDR system samples a waveform at four points per cycle to get pairs of I and Q components (remembering the 90 degree shift). Comparing I and Q in software it is possible to determine for instance whether the result is interference or whatever type of modulation you are receiving. The Softrock-40 samples at 4x the wanted frequency using a 28MHz (LO) that is divided twice to get 7MHz. The dividers have four outputs which drive CMOS sampling gates for the four signal states 0-90°, 90-180°, 180-270° and 270-360° all using simple 7400 TTL series chips. The new model Softrock (v7) simplifies the divider even further.

If this isn't familiar, remember that FM Stereo and Colour TV have been using I/Q signals with analogue detectors for decades.

### The Circuit Diagram

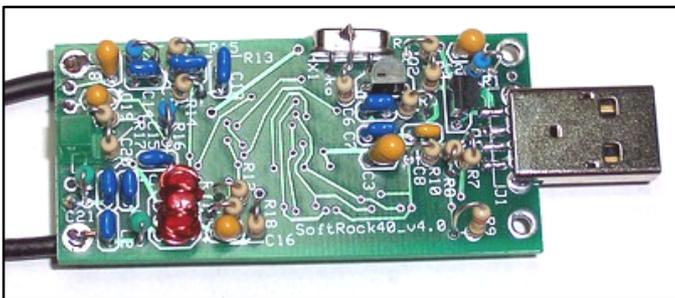
Murray then went on to with the aid of the circuit diagram pointing out the bandpass filter, hand-wound transformer for the phasing, and the point where the four sampled signals are combined down to the two outputs for the soundcard. Also present was the LO (28MHz) and the rest of the circuit is for cleaning the power supply from the USB connector. In concluding the diagram section Murray said that you could easily use the SoftRock-40 circuit diagram as a basis for your own design and off the shelf components. It should be possible to produce a bank of SDR receivers to cover your bands of interest. The kit had taken a few hours to solder together with a fine tipped iron

## Soundcard Issues

Ordinary Soundcards vary but will be good enough for this type of application. The integrated one used in Murray's laptop whilst not the best on the market is more than capable (AC97). Some Soundblaster cards are better and there are more specialist ones which lower the noise floor down to -130dBm. A nice set of plots of soundcard performance was shown, courtesy of Duncan Munro's Website.

## Available Software

Murray explained that most of the software he was using was free to all and was 'open source'. The software for the FlexRadio SDR1000 can be downloaded for free for use on the Softrock kits, though obviously some functions may not work on the small kit. It is Windows 2000 / XP based and around 17Mb in size. As the software gets better, so your radio does too, without any hardware changes, unlike now where you have to get the next model of radio to get the latest developments. Some software is UK written by Duncan Munro M0K GK, and will work on Windows 98SE and is only a few megs in size making this an international affair. Your PC needs to be a 1GHz plus computer to cope with all the processing, and all background utility software ought to be disabled, or removed on slower PCs to minimise overheads - a dedicated SDR / Shack PC perhaps



## Amateur Commercial Equipment

The SDR1000, a full 100W HF transceiver launched about a year ago is equivalent in functionality to the FT9000 plus more and is around \$1000 in the USA (or £995 from W&S).

## SoftRock Kits

Murray went on to say thanks to the QRP Club in the USA kits have become available for home construction market. Various versions are available at present. The one Murray used was the original Softrock 40 model (now superseded). The Softrock web site has all the detail and circuit diagram, so you can make the thing from scratch. Whilst they are plugged into the USB port, this is used for the power supply only. All the rest is via the soundcard inputs. On later models the USB PSU has been replaced by a more standard method.

The more recent Softrock-5 & 6 models all similar in size and the latter model is a neat dual band model with a small jumper to select between the 7MHz and 14MHz Bands (W&S £29). The next generation Softrock-7 will be 28MHz. The latter or models adapted to 10.7MHz can be excellent as digital IFs for VHF-Microwave receivers.

## Questions

Murray then took questions from the floor and some read from those that could not be there for the talk.

**Q.** *How is the filtering carried out at RF, If the filtering is too wide, how do you stop cross modulation?*

**A.** Murray went on to say for instance if sampling 7MHz you must keep out 14Mhz, so the band pass filter will roll off at around 12Mhz avoiding the aliasing of the sampler. This will stop sampling at either the low or over sampling the high end.

**Q.** *Can you receive DRM on a SDR?*

**A.** At present there are DRM capabilities built into the SDR1000 software, so it should be possible when someone releases a software CODEC. However this may overload the PC processor time with the added workload.

## Live Demo

Murray's live demo was on the 7MHz Band. Talking us through the display screen (SDR1000 Software) and the various modes the unit would resolve which were all the standard modes to be found in a modern transceiver CW, AM, FM, USB, LSB, DSB, plus some more newer ones RTTY, PSK31 and DRM. Selectable filters for the modes above and also variable filters whose widths could all be seen on the central panoramic spectrum. Also catered for were spot frequency memories, AGC, Time UTC/Local and band plan relevant to the frequency band in use. Murray then showed the configuration screen including the 65 pole filter, Noise Blanker, and other DSP / audio settings. It was ever so clear and you would have thought it was a very expensive rig you were listing to. Murray switched between the filter setting and pointing out the not so good aspects of his basic soundcard, but still achieving 90dB image rejection.

Next we were shown the different types of displays that were available for the centre window, panoramic spectrum, waterfall, spectrum analyser, oscilloscope (one audio channel), XY oscilloscope. Another display screen showed the input to the soundcard with all the unwanted interference shown and would be what a standard receiver would resolve. But the DSP cleaned the output up tremendously showing the power of DSP at RF level.

## Commercial Equipment

Murray then displayed the professional side of the SDR – a Cognio SDR spectrum analyser card. This had a receive frequency range of 2.4-2.5GHz and 5-6GHz, all in the space of a standard slimline PCMCIA card that plugged into the side of a laptop PC. The screen was showing a trace for a movement alarm or microwave oven nearby, then a Bluetooth device somewhere in the room was activated and displayed on the screen. The analyser could automatically recognise the signal types and could decode the packet information, so it could identify WiFi signals, decoding their data without a user knowing. This is a useful and highly portable device for professionals and Ofcom and it vividly shows how insecure WiFi and other devices could be.

## The Future

This little SDR board sparked a lot of interest, and Murray had certainly given a very informative and detailed insight to the future of radio. Only time will tell where this will all end up. Perhaps we will in time see the end of the “Blackbox Radio”, and as with many things, the combination of all the shack into the PC based system (if we can keep the EMC issues to a minimum). Perhaps we will be able to record the entire spectrum (of the band in use) and browse it later – this will make contesting interesting – the one that got away, that DX we missed.

## Useful Links

SoftRock-40

<http://www.amqrp.org/kits/softrock40/>

Duncan Munro M0K GK

<http://www.duncanamps.co.uk/amateur/sdr/>

Flex Radio SDR-1000

<http://www.flex-radio.com/>

Yahoo Group Discussion Boards for hints and tips:-

<http://groups.yahoo.com/group/softrock40/>

<http://groups.yahoo.com/group/kgksdr/>

## **New Look BR68 Licence Book – Preview-1**

Murray concluded the evening with a short talk on the new look license book (BR68) that had been released that same day by Ofcom in draft form. Some of the changes are that 100% Log Keeping ceases to be a mandatory requirement, unless requested by a representative of Ofcom (for an interference investigation). It also sees the reintroduction of /A (for those at alternative/holiday home addresses, etc) and lifetime license duration (5 year confirmation renewal – free when done on the internet) to name but a few.

All in all a well attended informative evening,  
- Many Thanks Murray.

## **VoIP - Introduction**

VoIP or "Voice over the Internet Protocol" is a technology for transmitting telephone conversations over the Internet - it does not use the traditional telephone network, unlike low cost carriers that route calls indirectly. Using programmes such as Skype, MSN Messenger & Yahoo Messenger, voice data, like an audio or image file, can be broken up into little packets of data and sent over an IP Network. BT is planning to convert the whole telephone network to IP by 2012 and have called it 21st Century Network (21CN). As a side, the max speed a dial-up Internet connection will be is 28kb/s (down from 56Kb). One advantage of VoIP is that the telephone calls over the Internet between people using the same software do not usually incur a charge beyond what you pay for Internet access, in much the same way that you don't pay for sending individual e-mails over the Internet.

Some VoIP services like Vonage, Sipgate and BT Broadband Talk, will also allow you to make and receive calls to landlines. Some programmes (Skype) offer a call out service to landlines and mobiles all over the world at very cheap prices on a pay as you go arrangement. Some also offer a call in and voice mail service for a fixed annual cost.

VoIP is useful to everyone, but it really comes into it's own if you talk frequently to the same people. Students away at University, business and their suppliers or customers, parents of teenagers who seem to have a phone permanently stuck to their ear chatting to their friends could all benefit greatly from using VoIP.

## **What do I need to get going on VoIP?**

You must have broadband Internet and a Laptop or PC. Recently telephones with codecs have appeared as well as combined modem/router/talk boxes (like BT Talk & Vonage) together with a VoIP programme and some type of audio hardware to talk and listen through.

Some VoIP programmes can be downloaded for free off the Internet. Calls between people using the same programme are free and some offer calls to landlines and mobiles all over the world at greatly reduced costs compared to traditional phone calls. You cannot call people using different programmes. In July 2006 Blueyonder telephones cannot call BT Broadband Talk but BT can call Blueyonder. Therefore some people have two or even three VoIP programmes installed on their PC.

Among the most popular are

Skype: <http://www.skype.com>  
MSN Messenger: <http://www.messenger.msn.co.uk>  
Yahoo Messenger: <http://www.messenger.yahoo.com>  
VoipCheap: <http://www.voipcheap.co.uk>  
Vonage: <http://www.vonage.co.uk>  
BT: <http://www.bt.com>  
Sipgate; <http://www.sipgate.co.uk>  
Call18866: <http://www.call18866.co.uk>

The hardware for using VoIP could be as simple as the speakers and a microphone that plugs into your PC or a headset with a microphone for Skype. Alternatively, for the traditional telephone experience, you could use a telephone handset that plugs into your PC's USB port. Some of these are able to control the VoIP program through the handset. Cordless phones are also available. Many Bluetooth mobile phone headsets, combined with a compatible USB Bluetooth adaptor, are also suitable and provide a wireless hands-free alternative.

DECT Cordless VoIP Handsets operate in a similar manner to an USB Handset, in that the base station of the phone connects to your PC via a USB, but with the advantage of not being tied to the PC whilst using VoIP. Some VoIP DECT phones are designed to be connected to the landline at the same time, with the ability of making and receiving calls from both VoIP and landlines. Many are able to control the Skype or Sipgate programme from the handset. BT Broadband Talk recommends DECT Cordless phones as the VoIP circuit (if free) switches to the landline when a landline call rings.

### Problems

Many VoIP telephones may not connect to the 999 Emergency Services. The transmission level and frequency response is usually lower than a BT-to-BT landline call and sometimes there is quantisation noise in the background. However most audio untrained users find it acceptable. Again, sometimes the first time one dials a number it may not connect - usually on the second try okay.

The BT Modem/Router/Talk box Voyager 220V takes 14 Watts from the mains and gets pretty hot - so much so G8DET has provided tall standoff feet to improve the airflow. If the mains are switched off the BT box - the VoIP telephone does not work, unlike the Vonage, which is not mains fed.

Tesco provide a VoIP telephone for £14.99 while you can pay up to £60 for a complex Sipgate one. The BT Modem/Router/Talk box is free if you order it with BT Broadband over the Internet which costs £18/month + min of £2/month for Talk. If you use VoIP and would like to share your experiences: - *email it to:* [editor@g0mwt.org.uk](mailto:editor@g0mwt.org.uk)

**John G8DET.**

## August Contests by Steve G4ZUL

### European H.F. Championship SSB/CW

Saturday 5<sup>th</sup> August.  
Start: - 1200 UTC. Finish 2400 UTC  
Bands: 1.8, 3.5, 7, 14, 21 & 28 MHz.  
Exchange: RS (T) + Year first Licensed  
Further info from  
<http://www.lea.hamradio.si/~scc>

### VHF Contests

Saturday, 5<sup>th</sup> August. 144MHz Low Power Contest  
Start 1400 UTC. Finish 2000 UTC.  
Sections: SF, SO. (25 Watts max)

Sunday, 6<sup>th</sup> August. 432MHz Low Power Contest.  
Start: - 0800 UTC. Finish: - 1200 UTC.  
Sections: - SF, SO. (25 Watts max)

20<sup>th</sup> August. 70MHz Trophy Contest.  
Start: - 0900 UTC. Finish: - 1500 UTC.  
Sections: - SF, SO, M. (Special Rules M1)

Full rules from: - <http://www.blacksheep.org/vhfcc/>

VHF contests are listed in January Radcom, p33.  
For further information please email Steve G4ZUL - [contests2006@g0mwt.org.uk](mailto:contests2006@g0mwt.org.uk)

Tip: Enter 'sm3cer' into Google, and look on his website - it is very comprehensive.

## The End of BR68 – Preview-2

Changes to the amateur licence renewals come in on October 1st. Lobbying by CARS is cited by Ofcom, who have just announced a free concession to over 75s for postal applications! – online is free of course.

All variants of BR68 & its Notices will be replaced by a new document, likely to be called Ofw178 which will in places differ significantly from the July-4<sup>th</sup> draft shown at the July meeting. Murray, who has participated in this, reports that the revised version is now going thru the Ofcom lawyers in time to be issued to the first renewals on August 21<sup>st</sup>. Note that the new conditions will only apply to those who actually receive it personally. – it does not apply to all amateurs on Oct 1<sup>st</sup> – Much more on this next month

## Echo-Link - QSY

Clive G1EUC's 2m Echolink system has now moved to a clearer channel, on 144.8375MHz. Unattended operation under the new callsign of MB7IDA (Internet Danbury). Is expected to occur shortly.

Contributions are appreciated for the Newsletter. Cut-off date for the August N/L is Friday, 18<sup>th</sup> August.