Chelmsford Amateur Radio Society

Affiliated to the RSGB *Club Call Sign: G0MWT*
President: Harry Heap G5HF *Chairman: John Bowen G8DET*
Secretary: David Bradley M0BQC *Treasurer: Brian Thwaites G3CVI*

Web Address: www.g0mwt.org.uk

Newsletter No. 439 **August 2002**

The August Meeting.
The CARS Table Top Sale. Tuesday 6th. August, 7-30pm, MASC.

Established Members will know that this is one of our regular events usually held sometime in the summer. Last year it was September, but our Events Sub-Committee has decreed that this year it will be in August. Ours is not to reason why! This is an ideal opportunity to meet fellow Club Members!

The event is the brainchild of our affable Assistant Secretary Colin G0TRM. He's the chap who does such a wonderful job with our PA system. He has created a lot of advance publicity for the event and has invited one or two traders to attend; Waters & Stanton have accepted. The commercial terms are as follows; exclusive tables may be hired for £3, otherwise the Club takes 10% on all sales up to a maximum of £3. If that is not crystal clear Colin will explain it all on the night!

All amateurs are welcome to attend either as buyers or sellers or as window shoppers. Car parking and entrance is free but we do expect you to support our raffle. All good condition amateur, electronic, electrical, computer, audio, photographic and associated equipment may be offered for sale. But please, no kitchen sinks! If you would like any further information please give Colin a ring on 01245-223835 or email colinpage@ukgateway.net.

Ken G7RFT will be running the raffle this month. Your support is vital to maintain our solvency!

Dates For Your Diary.

Tuesday	August	6	CARS TableTop Sale, 7-30pm. MASC
Wed.	August	14	CARS Committee Meeting. Danbury Village Hall. 7-30pm

Amateur of the Year Award.

Please give your nominations for this prestigious award for a Member who you think has made a significant contribution to our activities during the past year. All you have to do is to write your name and that of the Member you are proposing on a piece of paper and hand it to any Committee Member. There's no need to give a reason for your proposal. Simple!

Foundation Courses.

The Club's dedicated team of instructors led by Clive Ward M0SIX and Chris Chapman G0IPU have been running a continuous series of Foundation Courses to help clear the backlog. They are taking a well deserved 3 week break during August before their next course which starts on August 29th. It will be held at Danbury Village Hall (there is plenty of parking nearly opposite, towards Chelmsford) and will run for 6 weeks between 7 and 9pm on Thursdays. If you know of any friends or work colleagues who would like to get into Amateur Radio let them know. Places on the course can be booked by contacting David Bradley M0BCQ Tel: 01245-602838 or E-mail: cars@g0mwt.org.uk

For those who cannot attend a Thursday evening course Charlie Davy 2E0PZT plans to hold a Saturday course during September. For further details contact Charlie on 01245-259951 or E-mail charlie.davy@btopenworld.com

The next Colchester Weekend Foundation course will be held on the 21st/22nd September. There are some spare places but don't hang about! To book a place ring Frank Howe G3FIJ on 01206-851189

CARS Publicity.

Murray G6JYB has produced a poster design to publicise CARS and the Foundation courses. If you would like a copy to put up at your work QTH, or anywhere else then see me, Trevor, at the next Club meeting or e-mail me at the address below. An electronic version (.ppt or .jpg) is also available. My address is m5aka@amsat.org

Last Month's Meeting. "From Rig to Radiator " by Brian G3CVI.

Brian prepared this talk to help explain some of the oft-confused and oft-forgotten details of transmitting. He had heard some amateurs saying, “What are these dB's all about. Why have we got to use them?” Answer: They’re in your licence.

The Dreaded dB's.

Initially “nepers” were used as a log unit when comparing power levels in transmission systems. Nepers are a log ratio on base ‘e’. They were inconvenient things to use and were replaced by the 'bel' (of the Alexander Graham variety!) which use logs to the base 10. But that unit was inconveniently large for comparing small changes and was replaced by the much more useful decibel or dB.

It should be noted that dBs are a log power ratio. They are not an absolute measure of anything. dB's are always relative. In the early days logs were calculated using log tables. These allowed you to do multiplication by adding the logs instead, and division by subtracting the logs. Slide rules were another form of log table. Of course, calculators have replaced the need for logs for many jobs.

If you have an amplifier that puts out twice as much power as you put in, the output is 3dB higher than the input. It has a gain of 3dB. On the other hand if you have a lossy cable that reduces the output by half it is said to have a 3dB loss.

dB's use base-10 logs. If a signal increases by 10 times, it increases by 10dB. If it increases 100 times, it increases 20dB. 1000 times is 30dB. 0dB indicates equal levels or no change. Values in between can be worked out on a calculator, or the graph that’s been fading on CVI’s shack wall for many years.

$$Power\ \ ratio\ \ in\ dB\ = 10 \times \log_{10}(power\ \ ratio)$$

Note that dB's must be a power ratio and are independent of impedance. .

dBW's and the Licence.

dB's can, however, be used to measure absolute power levels, **provided** you specify a reference power level. In the case of the Licence this is 1 watt. The term dBW simply means “decibels relative to 1 watt”. For example 26dBW is 400 times the power of 1W, or 400W. Note that 0dBW is not zero power, it is 1W.

To calculate power ratio from dB:

$$Power\ \ ratio\ = 10^{(Power\ \ ratio\ \ in\ \ dB/10)}$$

Transmitter Load Impedance.

Transceivers are designed to see desired output impedance. Usually this is marked on the equipment, and normally it is 50 ohms when connected to a load of 50 ohms the transmitter is working at its greatest efficiency.

If it is connected into a cable with an open circuit, or a short circuit at the end, it will not be at all happy! What happens is that power is reflected. Reflected power can be measured using a reflected power or SWR meter, a Thruline power meter, or the in-built indicators on many modern rigs. A suitable meter is an essential item in the shack. Brian showed a tiny low cost meter which performed just as well as the much more expensive Bird Thruline.

Reflected power meters can be connected at the output of the transceiver, or at the end of the feeder by the antenna during experiments and adjustments.

A transmitter with a poorly matched load will not deliver full power due to the internal limiting circuitry. Without this means of limitation it would probably become over stressed and damage itself. It is possible for standing waves on coax cables to overstress the dielectric and cause fires, so they are best avoided!

Modern transmitters are designed with directional couplers at the output to drive the meters and to allow the final stage transistors to be protected. Modern transmitters will typically work into a SWR of 2.5:1 or 3:1 but will not be as efficient as when they are working into a SWR of1.5:1 or less.

All amplifiers generate harmonics to some extent due to the non-linearity of transistors (and valves). Transmitters will therefore include a low-pass filter at the output to reduce the harmonics. External filters can also be fitted to reduce them further. If an external SWR measuring instrument is left permanently in circuit it should always be followed by a harmonic filter as the measuring circuit contains diodes which can also produce harmonics. Brian showed a unit from BNOS for 6m, and a home-built unit with an attenuation of 80dB

He also showed us a dummy load which he uses to set the transmitter to 50ohms before connecting the antenna.

Antenna System Tuning Unit (ASTU).

Antennas are designed to offer a good match at resonance. But at the ends of the band the match may not be acceptable.

Antenna tuning units are used between the transmitter and feeder to correct the resistive and reactive match presented by the antenna and feeder system to 50ohms to keep the transmitter happy. They cannot eliminate standing waves, which will increase the loss of the feeder. It will also not be able to correct very large mismatches without wasting a lot of power in the matching unit.

Antennas which require a different impedance to that required at the transceiver terminals may require the

use of an RF transformer or other matching arrangement. Balun type transformers are broadband but other methods using sections of cable or inductor and capacitor (LC) networks will only work on one band. Antennas that are balanced will require a balun transformer to connect them to an unbalanced line.

Feeder Loss.

Feeders will loose power due to the resistive losses in the cable. Shorter feeder cables are preferred as they have less loss. Losses are increased if standing waves are present due to mismatch. Also, every mismatch will have an associated loss, so ideally the antenna system should be matched throughout. 1dB lost here and 1dB lost there will add up, and you could find that the power actually radiated might be less than half of what your transceiver is capable of producing. With care, attention and regular maintenance, antenna system losses can be minimised.

Brian went on to describe the basic construction and operation of a wire doublet fed by open wire line.

Earths and Counterpoises.

Ideally a balanced antenna should be used. Balanced antennas don't have an earth. Balanced systems are not perfect and to ensure RF voltages are not present on the radio some kind of earth is desirable. Earths are just short thick connections to metal stakes driven in to the soil. Alternatively counterpoises can be used. These are wires or metal sheets with a high capacitance to earth and behave like an earth. They must be well insulated as they can carry high voltages. Earths and counterpoises must be connected to the ASTU, and not the transmitter, thus putting the system at the lowest possible RF potential.

An interesting Q&A session then followed after the refreshment break where antenna system queries were discussed. Thanks to Brian G3CVI for some excellent information, each aspect was suitably illustrated with well produced slides, which I'm sure was especially useful to our new licensees setting up their stations.

Report by Anthony M1FDE

"Rig to Radiator".....Some Further Thoughts by Brian G3CVI.

I was conscious of the fact that I left a few undotted I's and uncrossed T's during my recent chat so here are a couple of extras:-

I mentioned that you can achieve a good match from, say 50 ohms coax to 100 ohms by making up an electrical quarter wave of 75 ohms cable and placing it between the end of the 50 0hms line and the antenna. This uses the expression that links the Zo of the new bit to the Zi and Za by the square root formula viz.: Zo = sq.rt of Zi x Za....ie in the case mentioned Zi is 50 and Za is 100. Hence the new bit of Zo is sq.rt. of 5000 which is about 71 ohms. Now this must be AN ELECTRICAL quarter wave in length and is therefore 0.66 times the measured length because the velocity factor of the coaxial cables is close to 0.66 for all the common types. Thus for a twenty metre system the new bit would have to be 16.5 X 0.66 or about 10.9 feet in length. This is for an unbalanced to unbalanced system of course. If the antenna is balanced but possibly is a folded dipole then a balun is needed. This is essentially a way of getting the" soup up the spout" for the one band only. It has been tried at the third harmonic but not very successfully because the bands are not exactly in harmonic relationship to each other.

Since all amplifiers deliver harmonics to their loads I stated that some rigs quote the second harmonic as say, 40 dB down on the full 100w. Some modern ones are better WHEN NEW. But components may drift so we will take the 40 db as an example. This means, if you remember my chat about the dB, that 40 is 10 X the log of the power ratio hence the log is actually 4...really 4.0000 if we are fussy about the further places. The number whose log is 4 is 10000. Now one ten thousandth of 100w is better spoken of as 10 milliwatts. You may be forgiven for thinking "Oh! that ain't much"...But I can tell you that I had a small receiving valve (EF91) connected as an electron coupled oscillator with a measured output of 9 milliwatts and I used to work all over Europe on CW on 40m. So be warned if you are on 20m and running the full zizz of your rig.... You will most likely be readable on 10m as a rough modulated signal....and not just down the street!

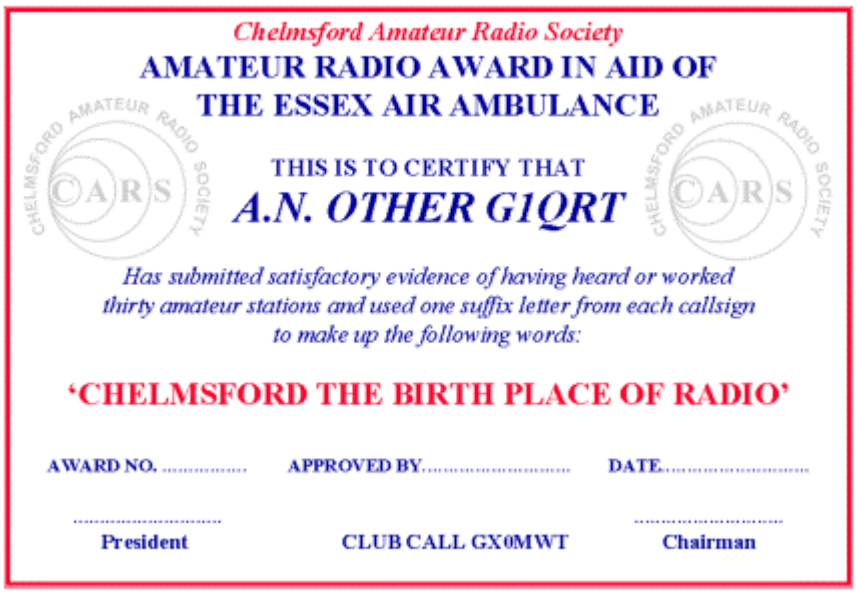
My last offering was the use of open wire feeders and I illustrated how it derives from two identical antennae placed so close that the radiation from the vertical bits cancels. I also suggested that the "top" or radiating wires were of any convenient length providing they are equal. If you choose to cut them at a resonant length, say as half wave on 40m you get a low impedance at the central feed point but after that it will be high impedance with very high voltages developed...sufficient to burn out the central insulator. The trick is to choose lengths "midway" between the current minima so that these voltages on the harmonic bands are away from the maximum values which can occur. Likewise the open wire feeder is part of the resonant length as I showed so it must be taken into account when designing such an antenna. It will cover almost any band available to us. I even had my antenna working on 6m when it became a bi-directional beam with a superb gain end-on both ways. But that is stretching things a bit far I admit. Even if you can only get a top of 50 feet up in the air.... try it because it is so easy...as easy as falling off a.....

I hope you enjoyed my chat; I tried to get a lifetime study into an hour but it can't be done.
If it started some debate I am happy.....73..... I will listen for you on the bands. Brian G3CVI

This is the first time that CARS has ever sponsored an award. It has been iniated and organised by Martyn M3VAM/ G1EFL who deserves our congratulations for his efforts in publicising Chelmsford and CARS and which also raises money for a worthy cause. Incidentally black & white doesn't do enough justice to the certificate!

Congratulations Martyn for promoting . . .

THE CHELMSFORD AWARD.



This award is sponsored by The Chelmsford Amateur Radio Society and is issued to commemorate the Centenary of Marconi's 1st Trans-Atlantic Radio Transmission on the 12th of December, 1901. MARCONI'S first radio factory for design and production of equipment was in CHELMSFORD, England.

To obtain this Award, use any one letter from the suffix of a callsign of a station worked or heard to spell:-

CHELMSFORD THE BIRTHPLACE OF RADIO.

Only one Callsign shall be used per letter, a total of 30 callsigns will be required. One Callsign used shall be from a station located in the Chelmsford, UK, Postal District. The Chelmsford Postcode is CM. For example:-
The "R" from G1QRT could be used to represent the "R" in RADIO.

Any bands or modes or a mix will be eligible, no repeater contacts. All QSO's shall be on or after 12th December 2001. No QSLs are required, a log extract certified by another amateur will be accepted. The Award costs 10 IRC or $10 or £6 Sterling only. Cheques can be made payable to "The Chelmsford Amateur Radio Society".

For every Award issued a donation will be made to "Essex Air Ambulance" which is an emergency helicopter completely funded by Sponsorship and fund raising events.

Send ALL applications to:-
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Deadline for the September N/L is Wed. 14th. August.