Chelmsford Amateur Radio Society

Club Station
Call Sign
GOMWT

Issue Number 377

June 1997

THE JUNE MEETING

The Marconi College, Arbour Lane, will be the venue to see the latest products of members being entered in this years competition.

The Chapman Brothers, Andrew and Christopher have volunteered their services as judges and depending on the number of entries will award prizes of £10, £7 and £5 to the chosen 1st 2nd and 3rd winners respectively; as in previous years there is also a prize of £5 for any first time winner. To add interest, competitors will be asked to give a short talk on their entry and for the benefit of the judges and the subsequent Newsletter report, please provide a short written description of the entry, together with your name and callsign. Envelopes (as illustrated) and award certificates are in preparation, so we can look forward to an interesting evening, which begins at 7.30pm.

DATES FOR YOUR DIARY

1

June. WATERS & STANTON OPEN DAY (Sunday 10am). 3 June. CLUB MEETING - Constructors' Competition.

21 June. RSGB HQ SATURDAY OPENING- 10am to 4pm.

1 July. CLUB MEETING - Jim Bacon, G3YLA (Anglia TV).

DF NEWS

Three events are scheduled for June; on Sunday 8th a RSGB Qualifying event at Torbay, on Friday 13th a Chelmsford evening event at Tiptree Heath and on Sunday 29th RSGB Qualifying event at Maidenhead Thicket NGR, 855 816.

MEMBERS NEWS

With regret we sadly report the passing of Pippa Heap, wife of Harry, G5HF at the end of April. On behalf of all Society members a message of sympathy was sent to the family and many Amateurs attended the funeral at Broomfield Church.

This month the Society is pleased to welcome Jason Pavia, G7RBR, who joined at the last Club Meeting.

Congratulations to Andrew Chapman, G7TKK and his wife on the safe arrival of a baby daughter.

Ela, G6HKM has worked her 120th country on six metres, completing with SUIER near Cairo on the first day of operation in that country.

COMMITTEE MEETING

The next Committee meeting will be held in Telford Lodge at 7.30pm on Wednesday 11th June, you are welcome to join us.

LAST MONTHS MEETING - Colin, GOTRM

Ken Jones, G3RRN started his excellent presentation on Marconi Short Wave Beam Stations by giving us a few words about himself. He apologised for his lack of technical know how saying he was not an engineer and only had a limited knowledge of radio theory. He showed throughout the evening however that his knowledge is not that limited. Licensed in 1963, his interest in radio has spanned some fifty years, first becoming interested at the age of ten when he was given a book on the subject.

He is very interested in industrial archaeology and has spent many hours at Tetney Beam Station near Grimsby, as well as many other Beam Stations sites. Last April, Ken assisted the Lincoln Short Wave Club in setting up a station at Tetney using the callsign GB70GBH, to commemorate the 70th Anniversary of the inauguration of the Empire Beam Service to Australia (the original station callsign being GBH).

Kens' first slide was of Princess Elettra and her Son taken at the recent 100 years celebrations, where he met them both. Marconi's yacht Elletra was amongst the first few slides.

He described an early station that had been built at Clifden in southern Ireland during 1906/7 and showed what now remains of the original buildings. In 1922 the station was blown up during political troubles and had never been rebuilt by the Marconi Company. The capacitor building housed a massive array of metal plates suspended vertically, the total capacity being 1.8uf The generating plant housed in an adjoining engine house produced some 300kw direct current at a maximum potential of 20,000 Volts. The DC was used to charge banks of secondary storage cells each of 40 ampere-hour capacity used to give a potential of I2,000 volts. As a result the station could operate for some 16 hours out of the 24 without using the Main Generator, this being driven by steam turbines fed from peat-fired boilers. An identical station was built at Glace Bay in Canada to form the other end of a transatlantic link, these stations were in operation for many years albeit with numerous modifications.

Ken then went on tell us about Caernarvon in South Wales, built about 1918 initially with spark transmitters and a antenna system beaming to Australia. It was in 1921 that the famous Marconi engineer H.J.Round updated the station, when he designed and supervised the building of 100kw transmitter containing some 54 valves giving direct communication with Sydney (a Club member commented that he had visited the station in 1931 when it was still up and running).

The later beam antennas for these stations were enormous structures some 300ft high and in some cases 130011 wide depending on the frequency of operation. The lattice masts used to support these antennas were some twelve feet square and each weighed fifty tons, supported on very large concrete blocks. For maintenance purposes a ladder extended right to the top of these towers and added to that a small trolley was able to run along the length of each catenary allowing someone to travel between the tops of the 30011 towers checking the cables.

Great care was taken during construction to ensure the antennas were at exactly at right angles to the shortest great circle distance to their allotted destinations. The antennas consisted of multiple radiating elements, adjusted to resonate at half the desired wavelength, with a reflecting curtain of wires a set distance behind them. This reflecting curtain consisting of twice as many wires as there were elements. The precise arrangement of elements and reflectors varied according to which circuit it was to be used on; for example for Canada two frequencies were used, for day and night time operation; this required two sets of elements appropriately tuned and suspended in line with each. For Australia however, only one frequency was required, but two identical sets of elements arranged back-to-back with a reflecting curtain in between them. In this way using switching, one curtain beamed West using the long path in the morning and the other beaming East in the evening. The designers aimed to achieve a narrow beamwidth and some 15° was obtained, well below the target of 30° set by them.

These beam arrays were designed by another famous Marconi engineer, C.S.Franklin; he introduced a phasing coil between each half wave section to bring the antenna into phase, overcoming the natural tendency of a half wave vertical antenna to give maximum radiation of 45°. (continued over)

The coils were later replaced with a series of non-radiating zig-zag wires to create a **phase reversing** arrangement. All the wires in the system were kept taught by a system of counter-weights to compensate for wind pressure and to reduce the stress on the support masts.

Feeding the antennas in phase also required careful consideration, Franklin designed a concentric feeder run which initially branched symmetrically into two separate feeders; each of these then branched into a further two and so on until each vertical element was fed. It was important that the length of feeder to each element was the same in every case; 2.25" copper tubing was used as the inner conductor, eventually reducing to 1 .75" nearer the antenna and to matching auto-transformers. Ken calculated the feeder impedance to be in the region of 75 ohms and showed a slide indicating, at certain points in the feeder runs, matching elements installed to keep it constant. This type of feeder is still in use today and can have an overall diameter of 12" or more. Ken's various slides illustrated all these designs including the concrete foundations for the masts, which exist to this day and Ken explained that as part of his archaeology at Tetney he had made an excavation on one of these bases buried many feet down in the ground.

We saw pictures taken at Tetney around 1928 showing five masts supporting two different frequency arrays for India set at 90°, and three masts supporting a single frequency array for Australia set at 76° as required by the Great Circle route. All the original buildings still exist and follow the usual pattern with buildings to house the transmitters and generators adjacent to each other but not mechanically joined to reduce vibrations.

The Tetney station differed to other stations regarding power as it was able to use a 6.6kV supply from the local power station at Grimsby. The buildings are now used as a wood machining factory and many of the original features still exist. During one of his visits to Tetney, Ken met Harry Wolfe who had been involved in dismantling the towers in 1940 and was able to supply Ken with many interesting photographs taken at the time; the dismantled towers were taken to Dorchester and Somerton and re-used. Visitors are generally welcome to look round the remaining buildings.

Bodmin Station was featured and mention was made of the three cylinder Rushton and Hornsby diesel generators which were made in Lincoln and were used in many stations. The generators produced 400v @ 300a DC to drive alternators for the HT and other supplies via huge banks of rectifiers.

Ken went on to explain more about the valve transmitters. There were three main parts, the frequency generator, the drivers and the final amplifier. Cooling was carried out using forced air as well as paraffin circulating in copper tube jackets surrounding the valves. Triodes in push-pull configuration were used for the driver stages and for the final amplifiers or magnifiers as they were called then. Telegraph keying was by an absorber stage which consisted of many high wattage air cooled resistors and a number of Triodes. High speed relays were arranged to key the main absorber stage via the Triodes, allowing HT to the drivers during key-down and dumping the voltage into the resistors during key up.

A slide showing the front panels of one such transmitter brought back many memories to quite a few of the audience, either because they had actually built very similar or later models or because they had operated or maintained them during their working lives. (Mention SWB8 and some peoples eyes will glaze over). Part of one still exists at the Science Museum.

Some transmitters had two push-pull oscillator panels installed for use say to India enabling night and day frequencies and others only one oscillator for use to Australia. Dorchester for example had seven transmitters for circuits to the U.S.A., SAmerica and the Far East. This station was initially owned and run by the Marconi Co. The receiving station paired with Dorchester was fifty miles away at Somerton in Somerset. This station had directional aerials and eight receivers. G.A.Mathieu was responsible for the design of the valve receivers and because of oscillator drift in the transmitters, the tuned stages were 10kHz wide in order to minimise continual re-tuning. Many patents were granted to Marconi engineers for their ideas and innovations in transmitters, receivers and antennas.

There was a further receiving station at Bridgewater to receive signals from Canada or South Africa again with the high towers. On the question of frequencies there was usually some 80kHz between receive and transmit.

Another Marconi engineer E.T.Fisk went to Australia to set up the other end of the link at Ballon. The station there followed the same pattern as others and operated for many years. A small town grew up in the vicinity and is now called Fiskville after E.T.Fisk who went on to become managing director of Amalgamated Wireless Australasia Ltd. Ken would much appreciate any further information on any aspect of the Australian stations.

A slide showing the Australian station at Rockbank just outside Melbourne still working in 1937 but eventually closed in the 1960s.

It was used to receive from the USA, Canada and the UK, again using two oscillator panels for day and night frequencies. The station was used in a film sometime ago about spurious Morse signals coming from an unknown source after a nuclear explosion.

The mode used for these early transmitters was high speed Morse sent by machine using a pre-punched paper tape. At the receiving end Morse was received on a machine called an Undulator which produced an alternating ink line on paper tape which corresponded to the incoming Morse signals. (Equipment of this type was on display at our meeting last July).

Ken's presentation ended with many questions from the floor, all answered with the **same enthusiasm that had been the** pattern for the evening. Those present enjoyed a most enlightening talk and some were prompted to continue researching the history of Beam Stations. Many thanks to Ken for all his hard work.

GALLOPING GOLF TROLLEYS - Peter GOKSJ

Roy, GOKSV, and his wife had two lady friends who dressed alike, did everything together, and played golf together and they bought two identical electrically powered golf trolleys called 'MAX'.

Briefly these trolleys were lightweight (French) design powered by two six volt dry **accumulators and speed controlled** by a 10K pot connected to a PCB about 3"x4" driving the motor.

One intriguing point about the design is that there is no on/off switch, just an indent on the 10K pot just after the slowest position.

These ladies having parked their trolleys at the 19th hole duly attended to whatever lady golfers do in these circumstances and to and behold MrMurphy came into play. One of the trolleys decided to set off! On enquiry, it was discovered that 'MAX' were notorious for this problem. So this is how Roy acquired these two trolleys completely free of charge. Roy found that one trolley appeared to work normally, the other however set off at full speed whenever the batteries were connected. Roy made enquiries about a repair with a trolley repairer near Billericay and was told "we have a lot of these, we don't know what to do with them, but we have a Marconi employee looking at the problem". Like a fool most pseudo experts are I offered to look into the problem. Now the interesting part (for me): The PCB from the offending trolley was removed and it was found to have 4 chips and a large FET from which all ident markings had been removed. The only obvious thing to be seen was that the FET appeared externally to have been overheated (there was no heat sink). I then drew out the circuit in an attempt to decide what did what and to try to determine from the chips their connections. By meticulously searching the pin out diagrams in the Maplin catalogue I was able to guess what they were. At the same time I was able to deduce from the circuit diagram which chip controlled the speed. This chip was double op-amp (8 pin). From an elderly `scope I found that the first op-amp produced a triangle wave form which was fed to the control pot. The control pot on the trolley selected the height of the cut off up the triangle to determine the length of pulse sent to the output (motor driver) FET. The second op-amp sent that decision to the output FET. A 35 Amp FET was chosen from the Maplin catalogue, duly fitted this **time with a small heat sink and all** went well ... for a time but MrMurphy reappeared, and the trolley set-off on its own yet again!...

A second removal of the board determined that the dual op-amp had failed, there being no pulses. After a chat with Dick, G3WHR, who told me that the input of a FET was effectively capacitive, I again searched the Maplin catalogue and found a dual op-amp with the required pin-outs where it claimed that it could feed an infinite input capacitance. In silence I said eureka, promptly bought one and fitted it to **the** PCB. In the course of time the second board was modified.

What do the other three chips do? they appear to function as warning of overload (stall condition) and low battery warnings and drive a small beeper.

I can claim that electronically Roy's trolleys are still in working order. There have of course been other mechanical problems - since there was no reverse, the chassis was reversible - and to accommodate this there was a multi-pin plug and a pin broke off causing much searching. Know anyone with a MAX trolley with failed electronics? It can be repaired at a significant charge for club funds of course. Hopefully you don't.

73 from Roy & Ela Martyr,
G3PMX & G6HKM
(01245)360545
(0385)546963
1, High Houses,
Mashbury Road,
Great Waltham,
CHELMSFORD,
Essex, CM3 1EL.
E-mail Roy_Martyr@compuserve.com

Deadline for the next NewsLetter is Saturday 21st June