MARCONI RESEARCH CENTRE

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A HISTORICAL SURVEY OF THE MARCONI RESEARCH CENTRE

by

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ABSTRACT

A short summary of the principal technical activities of the Marconi Research Laboratories from the construction of the first building on the Great Baddow site in 1938 to the formation of GEC Research Limited in 1985.

KEYWORDS

History, Marconi Research, Great Baddow Laboratories.

Ed: An extract follows relating to the research on Television by the Marconi Company

3. THE RETURN TO PEACE

After the war ended the Service Units withdrew from the site, staff who had been seconded to work elsewhere e.g. at the Admiralty Signals Establishment or at TRE Malvern returned, and the Laboratories turned their attention to peacetime needs. The nature of the research did not however undergo a fundamental change.

3.1 Frequency Control

For example there was still a need for precise control of frequency of communication channels and work to overcome the long term drift of quartz crystals was continued. The problem was eventually overcome by packing the crystals in glass sealed units (a procedure which had begun in wartime) and later in TO5 cases, similar to those used for transistors. The frequency range over which crystals could be supplied was also extended from 1 kHz to 100 MHz, using flexural modes at the lower end and overtones at the upper, and frequency stability was improved by enclosing the crystals in ovens at precisely controlled temperatures. In Lea's frequency control team these developments were incorporated into frequency standards with drifts as low as a few parts in 10^{10} per month which could not be surpassed until the arrival of atomic standards. An example of an equipment resulting from this work was the TME2 Frequency Measuring Equipment (a successor to the wartime TME 1) used by the BBC at its Tatsfield monitoring station and by broadcasting administrations throughout the world.

In addition to the work on oscillators of the highest stability, demanding multiple ovens with temperature control of the crystal to a few millidegrees, research into temperature control of a lower order was aimed at the achievement of frequency stability of about 1 part in a million for communication requirements. In an oven designed by D.J. Fewings, working in a team controlled by Dr. G.L. Grisdale, he used the expansion of naphthalene at its melting temperature to activate a control switch to the heater.

Many thousands of these ovens were sold by the Specialised Components Division to customers, the majority of whom where outside the Marconi group. Another successful series of crystal oscillators used transistors as rapid-heating elements, and crystals in transistor cases, with the whole assembly being contained in an evacuated miniature valve envelope to provide mass-free thermal insulation.

3.2 Television Resumed

The initiative on television research and development had been lost to the United States during the war years but work was restarted in 1946 in a team strengthened by the recruitment as Chief Television Engineer of L.H. Bedford, who had been one of the leaders in radar development at Cossor's. An agreement with RCA enabled the team to obtain up to date information from which to advance their own work and by 1949 Bedford was able to demonstrate, to an audience at the Royal Society of Arts, pictures from an image orthicon camera which lost very little in either contrast or definition when the source of illumination was changed from a spotlight to a single candle. In the same year the Varsity Boat Race was for the first time televised from start to finish using a similar camera and the research team was able to turn its

thoughts to the problems involved in system improvements including the introduction of colour to the pictures.

The Marconi Company had not been involved in the manufacture of domestic radio receivers since 1929 when it sold its Marconiphone Company and the use of the copyright signature "G. Marconi" to RCA in an agreement which precluded its trading in domestic receivers for a period of 20 years. However in the late 1940's the Baddow Laboratories were given the task of designing a television receiver. This went into production at an English Electric factory at Liverpool and was marketed as the Model 1550. Some members of the team involved in its development were then transferred to radar display work and others to the problems of stable channelised aircraft transmitters and receivers.

In the meantime the studio research team was studying the problems involved in introducing higher resolution black and white systems (625 lines instead of 405) and colour. Under the direction of L.C. Jesty they made an experimental 2-tube colour camera which was used for demonstration purposes well before the decision was taken to standardise on the PAL system in the U.K., and assembled the necessary background technology to enable a development activity to be launched immediately the decision on the preferred system was known. In 1956 it was decided that system principles were sufficiently well established for the television activity to move out of the research domain and the team transferred to development activities at Chelmsford, dividing their interests between two divisions - Broadcasting and Closed Circuit Television.

3.3 Microwaves and Millimetric Waves

When the Laboratories were first formed a small team led by N.M. Rust was given the specific responsibility for exploring new ideas which could be used as the basis of patents, the Marconi Company from its inception having had a strong tradition for initiation and exploitation of patents. This team like others was engaged on activities specific to the war effort but as it ended began to study again how some of the ideas formulated could be used in peacetime. In the period 1946-47 J.F. Ramsay published in the Marconi Review a series of articles on Fourier Transforms in Aerial Theory which was widely used by antenna engineers throughout the world for many years, until the advent of digital computers made it possible to improve on the analytical design techniques which he employed.

Within Rust's team work also began on the possible uses of the upper end of the microwave frequency spectrum, one of the participants being P.S. Brandon - a future Chief of Research for the Marconi Company and later Professor of Electrical Engineering at Cambridge University. A magnetron to operate at about 40 GHz had been designed in the Services Electronics Research Laboratory at Baldock and was being further developed at Elliott Bros Ltd Borehamwood. Other components were designed at Baddow and used as a basis for system experiments. Very few of the components for the frequency band were readily available at this time and the Laboratories had to design and manufacture their own. In doing so they developed a number of relatively new techniques such as electroforming, and precision casting and machining and although the 40 GHz work was temporarily suspended in