

ENG I N F

July, 11 1987 AI~. 30

Sypher 3 and 4 enter service at TVC

Sypher suites 3 and 4 recently entered service at Television Centre. Located under TC1 in the area that previously housed the manual PBX, Sypher 3 is a replacement for Sypher 1, and Sypher 4 is a new facility. Each comprises a post-production sound control room, and a small sound studio. There are also two Sypher preparation rooms.

Sypher is an acronym for "SYnchronised Re-st Dub, IELical-scan and Eight track Recorder" and indicates that it is a sound-dubbing process in which a multi-track sound recorder (MSR) is synchronised to a non-broadcast HVTR. The procedure is to record the original master vtr sound-track on to track 3 of the MSR, and EBU time-code, for synchronisation purposes, on to track 8. This allows additional sound effects and music etc. to be mixed with the original sound track and re-recorded on to track 5 of the MSR. The additional sound may originate from tape or cartridge machines or gramophones but where the mix is too complex to handle in one pass an intermediate track-lay process is used to produce them 'a~ synchronous sources on tracks 1 - 4 of the MSR. In either case when the final mix has been

completed it is transferred back to the vtr in place of the original sound track.

Each control room is equipped with an SSL 5000 series computer-assisted desk; this offers thirty-six mono channels, six stereo channels, four stereo groups, and four VCA groups. The desk has the normal range of equalisers, filters, pre and after fade listens and pan controls. The SSL computer is used to store information about the settings of the faders and six

Continued at Back page

New radio mic

Design Group RF Section have produced a high power Band I radio microphone system comprising transmitter, receiver and ancillary units.

Following the Merriman report, the BBCIS Band I allocation was substantially reduced so it became necessary to replace existing wide-bandwidth radio microphone equipment with a new generation of equipment requiring much reduced RF spectrum per channel. The new equipment uses 15kHz peak FM deviation to achieve this and recovers the consequent loss of signal to noise ratio using companding techniques. Attention has also been paid to the transmitter output stage to enable several links to be used in close proximity without incurring intermodulation problems. Receivers may be used singly or in diversity pairs.

The full line-up of new generation equipment comprises 4W transmitter TM3P/9, receiver RC4P/10, Circular units FL2/29A and B, attenuator FL2/30, 2-way rack EP1P/60, 7-way rack EP1MP/61 (for receivers), head amplifier AM14/60, filters FL2/31 A and B, splitter FL6/37 and power supply PS4/50.



Sypher 3 control room

Novel waveform generator identifies sources.

producing equipment for UHF TV transmitter sites. The Transmitter Demodulator, 001 M/506 and Rebroadcast Receiver, RC5M/503 were designed to replace equipment installed when colour was first introduced around twenty years ago.

svr Video Systems Ltd have also taken a Licence for the Digital Stereo Sound with Terrestrial Television equipment, more commonly known as NICAM-728. This range of units, comprising a Coder, M:XIulator, Demodulator and Decoder, was designed as a prototype model by Research Department, in order to test various possible methods of broadcasting stereo sound with television: the current specification has been approved by the Government as the UK standard. However, following much interest from other broadcasting organisations world-wide, svr are now developing the equipment further, to a form more suited to regular use in an operational environment.

ENG Ident: London Airport

Design Group, Design & Equipment Department have recently supplied for the London Airport studio an ENG Video Waveform Generator, GE6S/558. When the studio is not in use, the generator is connected to line and produces a test waveform similar to the line-19 ITS upon which most waveform measurements can be made, but its novel feature is the identification waveform which it produces on alternate lines. This waveform is so designed that when viewed on a waveform monitor an easily identifiable display is produced, based on alphanumeric characters formed by the combination of suitably modulated subcarrier and luminance. For London Airport the letters 'LAP' have been used as seen in the illustration. Other generators have been supplied for ENG sites at Crystal Palace, Barbican and the Topical Production Support vehicle. Just characters, some inevitably more stylised than others, can be represented using this novel technique devised by Richard Hubbard of Video Section.

Licence Agreements.

Agreements on the following Licences for BBC-designed equipments have been reached.

A new burn and shading corrector, and an improved head-amplifier, have been developed for Rank-Cintel Mk III telecine machines. Known as FF...STIVAL, the PEe Head Amplifier, AM1/616 and Burn Processor Unit, UN26/604 are now available through Digi-Grade Systems Ltd of Farningham.

Continental Microwave Ltd of Luton, and svr Video Systems Ltd of Maldon are

Finally, Eddystone Radio Ltd of Birmingham are designing a range of modular r.f.i.-shielded enclosures, based on Design and Equipment Department IS CH1/86MK screened chassis. These modules, protected by patent, have become the standard method of packaging for r.f.-susceptible equipment, and Eddystone expect to develop these in a similar way to their ever-popular die-cast box.

Contact the D&ED Liaison Engineer, Peter Jefferson, on LBH 4345 if you would like further information.

Transmitter News.

The following transmitters have opened or changed since June:

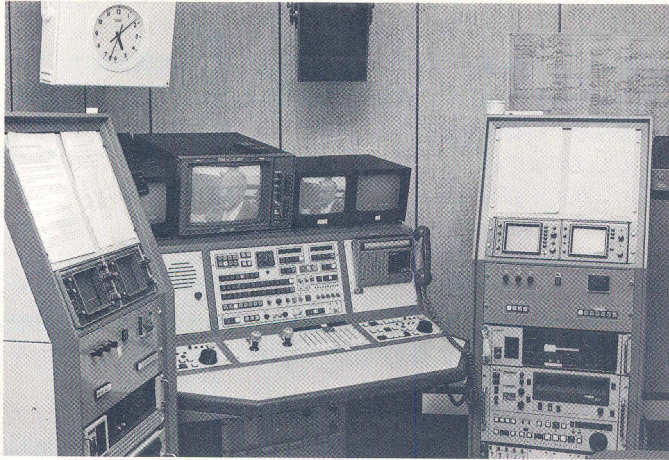
UHF Television

Bridge of Allan Burbage	Central Scotland Derbyshire
Byrness	Northumberland
Clachan High Keil	Argyllshire Argyllshire
Mottram stockport	Grtr. Manchester Grtr. Manchester
Tayvallich	Argyllshire

VHF Radio

Abergavenny Ballycastle	Gwent Cty Antrim
Pendle Forest	Lancs
Redruth	Cornwall

Manchester VT developments.



The Manchester VT control room

The first major redevelopment of Manchester's central video tape area since the present BH opened twelve years ago has recently been completed. One year of careful planning, followed by six months of site work, brought the new areas into service on schedule at the beginning of August. The objective of the redevelopment was to bring the facilities available up to the present day programme requirements, and recognise the change from 16MM film for news and current affairs to PSC and Jt' U-matic helical vtr. To achieve this, whilst maintaining Manchester's high programme output required the work to be carried out in two phases, concurrent with the construction of a temporary edit suite housed in a portable radio studio built within the vt OB garage. The technical equipment for the temporary facility, originally built for the 1986 Carmonweal th Games, was made available to Manchester by P.I.D.Tel. When the equipment left Manchester it found a new home in BH Plymouth.

Building work in the new area included replacing the computer floor, electrical installation, additional walls and decorative acoustic wall boarding. B.E.S.M., Bill Sanderson, redesigned the air conditioning to give a more positive extract from points of maximum static heat load and provide enough air movement at the operator positions for maximum comfort without draughts. This work has given the areas a much enhanced appearance and improved working environment. The space for two new vt areas, VI'3 and VI'4 was made possible by the removal of a life expired Rank Cintel MK 11 tk machine from an adjacent room. The whole area was then rearranged to form a vt complex equipped with two independent Jt' U-matic high band

transmission suites and three 1" C-format suites.

Each of the Jt' U-matic suites is equipped with two Sony BVU 800 vt machines and associated BVI 800 time-base correctors. The machines are linked to each other and the outside lines via a control and monitoring desk designed so that the whole suite can be operated by one person. Comprehensive control of the vtr's, sound, vision and the communications required for live transmissions is available from the desk position. A feature, incorporated at the suggestion of operations department is real time colour balancing. This was achieved by using a Cox 339 colour corrector unit adapted to preserve operational compatibility with Tariff 2, including the provision of lift and gain control on the z axis of the joysticks.

The U-matic vtr's can be remotely controlled using serial or parallel systems which ensure compatibility with all existing suites and mobile vt vehicles. The desks and control panels were custom designed by Manchester Tel.Rec. Services, in conjunction with operations department. The carcass was manufactured by Willsher & Quick, and the control panels by D & ED workshops.

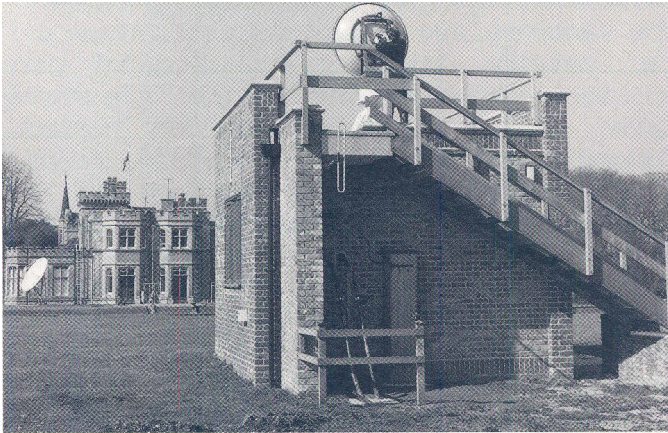
As an alternative facility, each Jt' U-matic suite is equipped for editing, either as a sample two-machine suite, or in conjunction with other 1" suites. This facility is enhanced by the inclusion of audio and vision mixers which can be operated together or independently.

All crews now have available by switch selection an electronic vt clock with line-up tone. Designed by Manchester Services, it is controlled by a small portable keyboard which can be plugged into the wallbox of any vt suite. Facilities are also provided via wallboxes for control of DVE and vision mixers. VIR serial bus access is available to allow simple plugging of external edit controllers.

The entire project was undertaken by local Tel.Rec. Services effort, led by John Smith assisted by John Pickering, Tony Bailey and Ian Jones. The wiring was undertaken by local wireman Robert Scott. Building, ventilation and electrical services work was planned by Manchester Building Engineering Services Department, under the leadership of Bill Sanderson, and carried out by contractors.

New antenna testing

f(l~i!i!y __,_"!t_>"~W .



The new antenna range at Kingswood

A new measurement range, specially designed for testing microwave antennas, has been installed recently at Kingswood Warren.

A measurement range was available at Kingswood Warren for operation up to **u.h.f.**, but no test facility was available within the BBC suitable for use at microwave frequencies. Therefore a new measurement range has been designed and commissioned to augment the existing one, extending the frequency range to beyond 18 GHz. Both ranges are now operated from a purpose-built building situated in the grounds of Kingswood Warren. The accompanying photograph shows the new range in action, with tests in progress on a new dish antenna for Television OB links.

There are established suppliers of equipment for antenna measurement, but their equipment is very costly and is tailored to the comprehensive systems that such firms supply. In this case individual items were procured from various alternative sources, and in some cases the equipment was tailored precisely to our needs. Much of the measurement hardware was built by Technical Services at Research Department. The engineer in charge of this project was Chris Gandy, a Senior Research Engineer in Transmitters and Propagation Section.

A wide range of antenna patterns is required for practical operations, from the narrow beam of a long distance communications link to the nearly omnidirectional patterns required in some Outside Broadcast operations. Amongst the many areas of research at Kingswood

Warren, there is a strong commitment to providing the service with specialist antenna designs to meet a wide range of requirements. This covers transmitting and receiving broadcast antennas, and communication antennas for both contribution and distribution of television and radio services. The 1.2 metre dual-band dish antenna for OB links, shown in the accompanying photograph is a typical example.

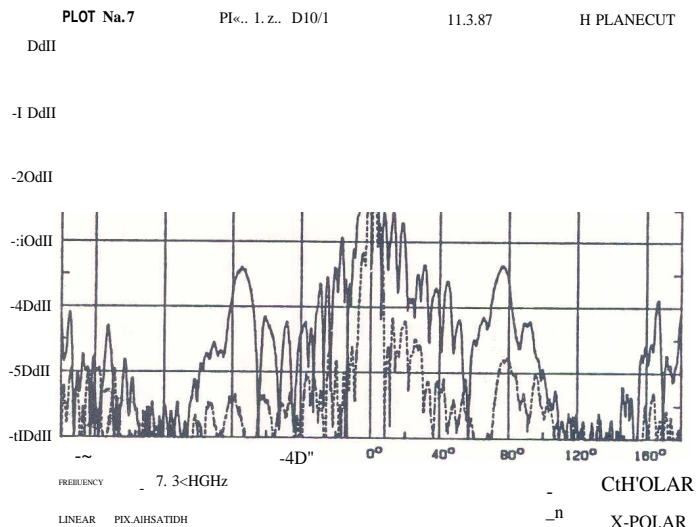
In order to assess commercial antennas and to develop designs to meet specific service requirements, it is necessary to have an effective antenna measurement range. Conventionally the pattern is measured by rotating the antenna under test about a vertical axis whilst it is receiving from, or transmitting to another antenna some distance away. The distance between the two antennas is important because it must be sufficient to simulate the conditions in which the antenna under test will ultimately be used; insufficient range length causes errors in the measured pattern. In this case at least 80m length was required and this dictated an outdoor range. It is equally important that the range should be clear of objects such as trees and buildings which could give rise to spurious reflected signals, or "clutter", which would effectively superimpose several radiation patterns on top of one another. This includes a contribution from the ground reflection and the only simple remedy is to elevate or slant the range above the ground.

Given these requirements the possible locations in the grounds of Kingswood Warren were soon whittled down to one; from the roof of the mansion, out over the croquet lawn to a spot in the grounds to the east of the mansion. The 100m path was surveyed at **s.h.f.** and was found to be sufficiently free from clutter provided that the remote site was elevated to at least 5m above ground level. After consideration of temporary structures and towers the decision was made to erect a proper brick building at this spot and to mount the antenna under test on its roof. The many advantages of a permanent building include the provision of decent laboratory facilities within the building, operator safety on the roof, and security for the very expensive equipment used in these measurements. The building takes

the form of a 4m cube with a wide external staircase leading to the roof.

One of the most critical items in the measurement system is the positioner for the antenna under test, which in this case is a remotely controlled turntable. This was required to support antennas as large as 1m in diameter and to provide an angular resolution of 0.2 degrees. None of the turntables in use at Research Department came anywhere near this specification and the cost of suitable equipment from one of the well known, industry standard manufacturers was immense. Fortunately, ERA Technology Ltd. was willing to develop a suitable turntable at a reasonable price, so an order was placed with this firm. The design includes a computer interface so the pattern measurement process can be controlled by a micro-computer. This offers great improvements in the speed of repetitive measurements and in the presentation of results, and allows a degree of post-processing which has hitherto not been possible. A typical result is the radiation pattern shown in the accompanying diagram: this took about two minutes to measure and plot, and the process was initiated simply by pressing a key. A BBC micro-computer is used and a comprehensive software package has been written at Research Department for this application.

For ergonomic reasons it was decided to operate the antenna under test as a receiving antenna (although the same patterns would be measured with it transmitting), and it is effectively illuminated by a distant source antenna,



about 1.5m above ground level, on the roof of the mansion. Access to this roof area is relatively difficult, so a switchable system of s.h.f. source antennas has been installed, and this can be controlled remotely by the micro-computer in the measurement building. All of the useful source polarisations are provided using very high quality corrugated horn antennas. Facilities have also been included for fitting alternative horns to cover other frequency bands (such as the 5.5 GHz and 7 GHz bands used by Television OB links)

The completed measurement range now provides a much needed facility for antenna research and development, for checking antennas that are in service and for verifying the performance of new antennas which are being considered for future use.

WARC plans HF broadcasting

Over six hundred and fifty delegates from 117 countries gathered under the auspices of the International Telecommunications Union (ITU), in Geneva in January earlier this year at the World Administrative Radio Conference (WARC) to plan the high-frequency bands allocated to broadcasting. Seven members of BBC staff from External Broadcasting and Research Department attended the conference, which followed from an earlier session in 1984. The earlier conference had asked the International Frequency Registration Board (IFRB) to devise a method by which the HF bands could be planned so that all Administrations had equal access across the "bands. Now that the dust has settled,

this article will look at the implications for the BBC on the decisions reached.

Background

Currently each Administration using the HF bands chooses its own frequencies to meet its broadcasting needs (see Eng Inf No 23, Winter 1985/86), and these are submitted to the IFRB on a seasonal basis. (For the uninitiated the ionosphere changes its reflective nature through the seasons, and sunspot cycle and affects the HF frequencies which can be used throughout the year). Any interference by one broadcaster to another is left to the individual Administrations to sort out.

Continued on page 6

HF WARC

continued from page 5

Many countries, particularly the emerging third world nations, felt that this had become a "first come, first served" system favouring established broadcasters such as the BBC.

The HFBC WARC in 1984 was therefore asked to determine the technical parameters to be used in planning the bands, and to devise a planning method. The 1987 HFBC WARC would then analyse the results of the planning system based on a set of broadcast requirements and determine a date for its implementation.

The test plans were published from July 1986 onwards, a total of six eventually being made available on microfiche or computer magnetic tape by the start of the second session (January 27 1987). An analysis by the BBC of these test plans, each of which required 15 MB of data storage, showed that if implemented, there would be a catastrophic impact on the audibility of BBC External Services. Only some 60% of the BBC HF broadcasting requirements were actually allocated a frequency. Even worse, only some 40% of our requirements were satisfied with the minimum acceptable quality level. A further shortcoming was the lack of continuity from hour-to-hour. For example a particular requirement could have a frequency for 30 minutes, no frequency for the next 30 minutes, and perhaps a totally different frequency for the next hour! The analysis of all these plans was a joint exercise by Bush House and Research Department using Transmission Planning Units VAX 11/750, and the results produced providing the main source of information for the IJII and Fm, not only of our own transmissions but for those of every other country.

This inability of the BBC to deliver its programmes to its massive audience worldwide under this planning system was unacceptable to both the BBC and the Foreign and Commonwealth Office (Fm) who actually fund External Services and prescribe the services to be broadcast.

The UK decided to send a very strong delegation to the Conference made up of representatives from the Fm, IJII and BBC. The IJII, as the 'UK Administration', would normally lead the UK delegation but, for this conference Sir John Graham, a retired high-level Ambassador to Nato, was appointed as leader.

Geoff Spells, Ian Davey and Brian Tait at a WARC technical committee meeting

The BBC team was led by Gerard Mansell, ex MDX Band ex-Deputy DG of the BBC. Others were John Corbett, CEXB; Dennis Thompson, HTPU; Ian Davey, SE(L&P), TPU; Geoff Spells SE(FM&RR), TPU; Brian Tait, Engineer, Research Department; Michael Harrison, Special Assistant to MDXB; and Cathy Tait, Secretary to CEXB.

'The Decisions reached

In the short term the decisions reached mean no immediate changes to the current system of broadcast frequency management at HF (ie Article 17 of the Radio Regs).

In the longer term, two recommendations may have an impact on the BBC External Services, although both will need to be ratified at a future conference.

It was recommended that the IFRB should, in the light of the agreed 1987 modifications and improvements to the planning method, revise their computerised planning system and test it prior to a further conference which would consider and ratify, if appropriate, the revised system. This new system would incorporate a planned spectrum alongside a 'free for all', the frequency spectrum for the former encompassing the 1979 extensions for HF Broadcasting, plus some of the existing spectrum operated under Article 17, as shown in fig 1.

Additionally another reallocation conference was requested in order to increase further the spectrum allocated exclusively to HF Broadcasting.

It was also recommended that HF broadcasting should move towards single side-band (SSB) transmissions, phasing out the existing double side-band (DSB) system by