

ENG INF

The Quarterly For BBC Engineering Staff

'Our Standards Are Highest'

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Major BBC Showing at IBC

The BBC will take an important place at the International Broadcasting Convention in Brighton this year.

No less than seventeen conference papers will be read by BBC engineers and there is to be a major exhibition stand to show off more than a dozen novel engineering developments from Research and Designs Department.

All the products on show can be licensed for manufacturing by private industry or have already been licensed and need to be shown off to potential overseas customers. At the moment product licences draw in some £65,000 a year but we aim to increase that as much as possible.

The equipment on the stand will include novel equipment from Research Department for electronic preparation of Television Graphics and ACE (Advanced Conversion Equipment), the first four-field digital standards converter and the first to be virtually transparent in operation.

Other developments on show will include NICAM, the digital sound distribution system, high-quality Band II

FM transmitter equipment and compact, microprocessor-controlled equipment that will generate television logos and captions.

There will also be a demonstration of processing audio signals using a COPAS (Computer Processing of Audio Signals) system in which spectrum shaping, compression, limiting and other audio processes are all controlled by a bit-slice microprocessor working on digital signals.

Outside the exhibition hall will be CMCCR 2, the BBC's new Colour Mobile Central Control Room. It has sides that expand to 4½ metres width, opening to give a spacious production unit that will handle 25 vision sources and includes a stack of 34 monitors.

"You may think it is strange that at a time when many things are being cut that we should initiate this engineering bulletin but for a very small cost every year it should be able to contribute considerably to keeping us all in touch with what is going on in BBC Engineering. Some of you may well be pleasantly surprised at the range of development that is going on in BBC Engineering now, today.

With technology developing as rapidly as it does today I am very proud to be able to boast that engineers in the BBC are not just following close behind the technological bandwagon but are amongst those who are in the front pulling it along.

But the cuts in our expenditure have been on all our minds over the last few months and the repercussions will continue to affect us for a long time. We have to give up 130 posts in the Engineering Division from a total staff of some 7,000. As well as the reduction in staff we are going to suffer much tighter budgetary control, but as engineers we are thoroughly used to the practice of tailoring our system to the budget that is available.



Bryce McCrirrick
Director of Engineering

Despite these cuts in effort and money our technical standards will not fall. As broadcasting engineers we will continue to lead the field in Research and Development and our operational standards will likewise continue to set and example to broadcasters the world over.

Some of the equipment that has recently gone in service shows just how BBC engineers are setting even higher standards. The new digital standards converter at Television Centre has proved so efficient that some people ask whether programmes have in fact
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405 Ends, Self-Help Begins

On May 20th, the Home Secretary announced the phased closure of the 405-line television service, authorisation for a further stage of relay station building and also signalled the start of a scheme for 'self-help transmitters'.

The closure of the 405-line transmitting stations will be spread over a period of five years between the beginning of 1982 and the end of 1986. The 39 BBC stations to be closed in 1982 are in areas where there is almost complete UHF coverage. The closure programme will be co-ordinated with the IBA so that transmitters in the same area will be closed at the same time. These are the key points from the announcement:

- Phase III, the next phase of UHF relay station building, will follow on after the present Phase II programme has been completed. With 200 Phase II stations still to be built at the rate of 70 stations a year, Phase III should begin during

1984. Service Planning Section at Research Department cannot yet anticipate the number of Phase III stations that will be required but feel it may be as many as 500. These will be built at the same rate of 70 a year.

- In the 'self-help' scheme, approval will be given to small remote communities to set up and run their own stations. Broadcasters will do the basic planning and will ensure that the transmitters are integrated into the network. Then when a station comes into operation the broadcasters will check that it is not causing interference to existing viewers in the area. When this has been done the Home Office will issue a licence for five years operation at a cost of around £100.

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Simple Self Help

Most of these stations are expected to use commercial yagi receiving and transmitting aeriels and commercial amplifiers. The amplifiers will be similar to those being used at present for wired distribution systems. The power of each station will obviously depend on the area it has to serve but will have to be carefully planned to avoid interaction with other stations on the same or adjacent channels. Split receive/transmit sites may be necessary in some cases. Most of the stations should be active deflectors which receive and transmit on the same channel but some stations may need to use transposers in order to avoid possible interference.

So far there have been about 40 requests to operate 'self-help' stations mainly from remote communities in Scotland. So, it is difficult to assess how many 'self-help' stations will be put in service but estimates vary from 200 to 500 stations.



A self-help system could be just as simple as this

405-line Stations closing during 1982

| | | | |
|--------------|-----------------|-----------------|--------------|
| Abergavenny | Cambridge | Hungerford | Okehampton |
| Aldeburgh | Campbeltown | Kendal | Oxford |
| Ayr | Canterbury | Kilkeel | Perth |
| Ballachulish | Cardigan | Kinlochleven | Port Ellen |
| Ballycastle | Carmarthen | Llanelli | Scarborough |
| Bedford | Churchdown Hill | Maddybenny More | Scilly Isles |
| Belmont | Dundee Law | Marlborough | Sheffield |
| Bexhill | Ffestiniog | Newhaven | Swindon |
| Bodmin | Girvan | Northampton | Ventnor |
| Bude | Hereford | | |

Radio With Data As Well

Research Department is developing ways of sending extra, inaudible signals with radio broadcasts. Using these signals tuning could become automatic and the radio set of the future could have an electronic display indicating the name of the network, telling the time or giving the latest news headlines. There are two systems, one for VHF/FM and another for MF/LF radio. The MF/LF system is being pursued only by the BBC. It phase-modulates the radio carrier wave at 50 hertz using digital biphasic modulation. The data rate is 25 bits per second and experimental transmissions have already been broadcast from Droitwich, Radio 4.

JOIN IN THE EXPERIMENT

Subcarrier tests are already underway at Wrotham and Research Department want volunteers who will listen critically to VHF at home or in their cars and report their comments.

The VHF/FM system is capable of supporting a data rate of 1200 bits per second using a biphasic signalling rate of 2400 baud. The BBC has shown that these signals could be very effectively placed on a subcarrier of 57kHz. Test transmissions have been broadcast on Radio 4 and Radio London from Wrotham.

The VHF system can carry very much more data than the medium/long wave system and as well as international discussion on standards there will have to be considerable discussion with the receiver industry before the system could go into use.

Volunteers will have to complete a special form so if you can listen to Radio 4 from Wrotham and would like to join in the trials, telephone EID on BH 2921 for a form.

ABOUT 'ENG. INF'

You can call it what you like but if you want to use our name you should pronounce it 'Enj. Inff'. We are aiming at the technical people in the BBC and we hope it will give a wider view of what is going on in BBC Engineering.

We would welcome your views on this first edition and we will welcome contributions from you for future editions. If you are too busy to put pen to paper, then just ring BH (London) 5432/5433 and let us know what you have been doing.

We will sort out the protocol of ensuring that any stories we print have been checked with the right people so you can feel free to pick up the telephone anytime you like. It may be that some of your achievements deserve much wider coverage in magazines outside the BBC. We can see to that too if the story and the time are right.

This edition was edited and prepared by David Allonby, Gwyn Morgan, Lynne Prop and Amanda Tucker.

'Digital TK Within Five Years' - Says Sanders

'We can expect to see all-digital telecine machines on the market within the next five years but all-digital cameras will have to wait for the nineties', says Richard Sanders of Research Department in an SMPTE Conference paper.

His team have already developed an all-digital telecine which produces 'an exceptionally clear and uniform picture'. The sensor is a 1024 element linear array which scans the film image sequentially at 24 or 25 frames per

second to produce a single 625-line or 525-line sequential output which then is digitally stored. The information in the field store is reordered and read out to provide conventional 625/50 or 525/60 interlaced video.

Dark areas of the picture must be coded to 11-bit sample accuracy. The team have devised a practical alternative to a full 11-bit ADC by providing a second 8-bit ADC with its signal pre-amplified by a factor of 8. The second ADC contributes three additional bits when-

ever the signal falls below 12.5% of peak white.

But broadcast quality digital cameras will have to wait. Richard Sanders says, 'Lightweight camera heads using economical analogue LSI signal processing cannot be matched by digital circuits which need more space and consume a great deal more power. For example, to correct for element-to-element sensitivity variation in a sensor array would need a complete field-store for each sensor'.



Camera in Whispering Gallery



Dave Hunter on Camera 5 outside Buckingham P.

Major OB For Queen M



CMCR at Admiralty Arch

On Tuesday 15th July there was a Service of Thanksgiving at St. Pauls as part of the celebrations for the Queen Mother's 80th birthday. A major BBC TV outside broadcast using 24 television cameras followed the Royal procession from Buckingham Palace and covered the ceremony in the Cathedral.

Producer, Mike Lumley said, 'The Jubilee broadcasts in 1977 were our starting point in planning the OB. The requirements were very similar and once again we were able to give viewers a spectacular view of the nave from a camera at the apex of the dome'.

Overall direction for the broadcast centred on the BBC's Colour Mobile Central Control Room (CMCCR 1), a unit designed for use at major occasions

like this.

Frank Hughes, Assistant Head of Engineering Television OB's who co-ordinated the engineering planning said, 'The experience of the Jubilee broadcast in 1977 helped considerably in planning the coverage of this ceremonial programme. Apart from CMCCR 1 at St. Pauls from which the entire OB was directed, five other mobile control rooms at St. Pauls were used for operational cameras, radio-links and video-tape inserts. In the Cathedral additional lighting for television was set under the direction of Engineering Manager, John Wilson.'

There were two mobile control rooms along the processional route as well as a single camera installed high up

25 year old Wrotham gets Major Re-build



On 2 May 1980, the Wrotham VHF/FM transmitting station celebrated its 25th Anniversary. In 1966 it was the first station to go stereo and in 1972 the first to have a pcm link. Now it will be the first to be modernised.

Wrotham will get a new aerial and new transmitting equipment. The new aerial will introduce a vertical component into the transmission to improve reception on portable and car radios, which normally use vertical aerials.

The work should be finished by 1981.

Far left: Wrotham mast as now.

Near left: Ian Blanthorn, AEIC CP, and STM Derek Mann in Tx hall,



Palace



Links at New Zealand House



'Compact' links hut at NZ house

Mother's Thanksgiving

on top of New Zealand House. The first of these was one of the BBC's new Type 5 CMCR's equipped on this occasion with seven cameras. Three of these cameras covered the Royal Party as they prepared to leave Buckingham Palace, while the remaining four followed the start of the procession as it left the Palace and travelled along the Mall.

One advantage of the Type 5 units is that the cameras use tri-ax cables which are much smaller in diameter than the multi-core cables previously necessary. Tri-ax cables can more easily be pulled through the ducts under the road. Along the Mall and on Admiralty Arch four more cameras covered the procession on its way to the Cathedral.

The signals from the CMCR's at the Palace and Admiralty Arch were radio-linked to New Zealand House and from there they were fed on to St. Pauls.

At St. Pauls thirteen cameras covered the scene outside and inside the Cathedral. One of these on a building overlooking the West Door was linked by radio to its control van.

Six cameras were installed in the Nave and Chancel of the Cathedral, but the most spectacular shot of the Nave was provided by a camera mounted above a peep hole in the very top of the dome. This camera looked straight down onto the congregation 275 feet below. The same camera was also used outside on the Golden Gallery to give a bird's eye view along Ludgate Hill.



Peephole in the dome

New Continuity Suite in BH Basement

Radio has a new stereo continuity studio in the basement of Broadcasting House and Radio 3 are now in occupation. Continuity 'B8' has been installed in double quick time by S.C.P.D. They wanted the new suite in a hurry because they needed to release one of the six suites on the first floor for staff training.

Amongst the novel equipment that has gone into the studio are some modern voltage controlled amplifiers from the new Designs Department 'Maxicon' system and an all solid-state monitoring system that does away with the need for relays.

T.O., John Morgan, and Jeff Bottom, S.C.P.D. with installation team in B8.



More Legs for PCM

The BBC began stereo broadcasting using the Zenith - G.E. system in the mid-sixties on the Third Programme. Using analogue links the service was carried by Wrotham, Sutton Coldfield and Holme Moss. In 1972 the analogue links were replaced by links carrying the signal in PCM. Again Wrotham, Sutton Coldfield and Holme Moss were the first to be reached, but this time with three stereo channels. The PCM link system carries 13 separate sound channels six of which supply the three stereo services.

The extension of the PCM system to Kirk o'Shotts, Wenvoe and Divis left holes in the coverage in East Anglia, North and West Wales, South and South-West England, Northern Scotland and Londonderry. Some of these were filled by using analogue links: one link went from Wrotham to Tacolneston, another received Wenvoe and fed North Hessary Tor. In each one only two of the three services could be carried. Rowridge operated by direct pickup of Wrotham,

but with only two services.

This year extra legs are being added to the PCM distribution system. One leg goes via Peterborough to Tacolneston and will make the temporary Tacolneston feed redundant. Another goes down to Rowridge. The Scottish route is being extended to Meldrum this autumn and will reach Rosemarkie early next year.

Londonderry, the only vhf station in Northern Ireland not radiating stereo will receive its feed next year, but the western and northern parts of Scotland and the west and south of England will have to wait until 1984/5.

The PCM distribution system was extended to Peterborough on 11th July bringing another 125,000 people in the city of Peterborough within the reach of high-quality stereo radio. The BBC PCM network, now some 8 years old, is still unequalled anywhere else in the world.

Digits Catch On In Local Radio

Local Radio engineers are putting digital techniques to work for themselves and saving time and money as a result.

Des Richards, was with LR headquarters when he developed an automatic system for directing taped reports from London to specific local radio stations.

The taped reports are sent along the permanent Local Radio Distribution System and all reports are received at all stations, but not necessarily recorded. Previously, it was necessary to warn the individual stations that they would have to record specific items and they would have to start the recorder manually and listen out for the finish.

The digital system makes the process automatic. It sends a 64-bit signal along the music circuit at the start and finish of each item. The signal can convey up to 16 commands but at the moment it is simply used to switch-on and switch-off a tape machine at each station.

The signal is made up from an 8-bit framing code, followed by an 8-bit 'order' or command code followed by 48-bits which represent individual stations.

Each station is identified by a single pair of bits in a specific location in the 48-bit group. The state of each bit-pair indicates whether the station should obey the command or ignore it.

Code transmission units have been installed in Studio 3D and in the Parliamentary Unit in Bridge Street. Regular contributions from another

studio, 3G, follow a similar pattern each day so the appropriate code-groups are simply sent up the line from a conventional recording on a cartridge.

David Cox has solved a similar problem for Radio Solent. They have an unattended studio at the Portsmouth Guildhall which also acts as a common feed point for Post Office lines from the Anglican Cathedral, the Naval Dockyard, three OB local ends and the Chichester unattended studio. The lines feed into the Guildhall studio and from there they are switched, as need be, to a common music circuit between Portsmouth and the Radio Solent operations room. All the necessary switching at Portsmouth can now be done automatically from Southampton thanks to a digital signalling system.

The digital signals are sent along the two-wire control-line between Portsmouth and Southampton. The equipment at Southampton sends an 11-bit digital FSK code to Portsmouth which can represent up to 35 different commands. The data receiver at the Portsmouth end constantly monitors the line but is immune to the programme cueing and talk-back signals that share the same circuit.

Local Radio Goes Stereo

Radio Lincolnshire and Radio Norfolk, which come into service later this year, will be the first two BBC local radio stations to go stereo.



PCM coder in London Control Room

Energy - nearing

Energy savers ETD have bought a second-hand milk float to cut the petrol bills for carrying goods around the grounds. It won't help sleepy students though; there will be less noise now to wake them up in the mornings.

Radio Newcastle

Radio Newcastle is extending its coverage to offset the effects of the cut in Radio 4 local news bulletins later this year. Northern Northumberland and an area as far north as Berwick-on-Tweed would have lost all trace of local news when the VHF Radio 4 opt-outs were ended but now Radio Newcastle is going to cover the area when a new vhf channel 94.5MHz at the Chatton transmitting station goes into service in the Autumn of 1981.

Radio Leicester

Radio Leicester is being allowed to change its mf frequency from 1584kHz (189 metres) to 837kHz (358 metres). As about 25% of the receivers on the market are not able to tune to 1584kHz and as daytime propagation of this frequency meant that certain highly populated parts of the county, between Loughborough and Coalville, did not get an adequate service, the lower frequency should help them get a much bigger audience. However, because of the higher level of interference on 837kHz, coverage after dusk will be worse.

RD Ahead in Satellite Broadcasting

The urgent need to clarify the UK strategy on direct satellite broadcasting has increased the importance of some key experiments recently carried out by the BBC.

Research Department has been investigating the separate technologies of digital television and satellite broadcasting for several years. In addition to playing a leading part in the preparatory studies for the 1977 Geneva Broadcasting Conference (through Home Office and EBU study and planning groups) Research engineers conducted the first experiments in PAL television transmission by digital methods through an Intelsat satellite. In May 1976, in collaboration with the British Post Office they sent sound and television signals from Designs Department in London to the Post Office Goonhilly Downs earth station. There they were digitally encoded as a 60 Mbit/s package to include a television signal, six high-quality sound signals and error protection, and sent to the Indian Ocean satellite and back. In spite of the elevation of this satellite being low from Goonhilly, causing a poor signal-to-noise ratio and relatively high error rates due to atmospheric absorption, the system operated with complete success. The satellite transponder normally handles frequency-modulated analogue signals and it was possible to compare analogue and digital formats: the digital signal gave better overall results. It was the first time that the Post Office digital terminal equipment had handled actual television signals rather than laboratory test number sequences.

Then in February 1979 further

New HETD to Review Courses

Every BBC engineer and technical operator spends some time at Wood Norton and if the new Head, Dr. Alun Owen, has his way we could be paying more visits there. He believes that training is a vital element in the BBC's overall technical strategy and should be continuous throughout an individual's career. With this in mind he hopes to provide more courses for staff at all levels.

Dr. Owen, who took over from Harry Henderson as Head of Engineering Training Department on 21st April this year, has experience of other areas of the BBC. He joined the BBC in 1963 after getting a degree in Electronic Engineering at University College Bangor. He first went to Television Recording at TVC and later became an Education Engineer.

He left the BBC in 1965 to read for his doctorate at University College



2.4 metre
Multi-polarization
Receiving Dish at R.D.
for OTS

tests with the Post Office used the OTS satellite to transmit two independent television signals and six high-quality audio signals. The two television channels were transmitted with different polarisations but a common frequency. The test showed that the separation between the two channels was perfectly satisfactory for digital television transmissions. In collaboration with the French ground station at Bercany it was possible to trap about half a second of television signal in an earth satellite loop to demonstrate that the digital signal could be re-transmitted many times with no loss of quality.

More recent development work has used the OTS and an earth terminal at Research Department. We designed and built a solid-state preamplifier and receiver to operate with a 2.4 metre dish aerial. Experiments using this equipment have shown that it is possible to broadcast a frequency-modulated signal which comprises a PAL vision signal together

with two digitally-encoded sound signals, thus proving that either stereo sound or two separate sound channels could accompany the television signal in satellite broadcasting.

Work on satellite technology is still continuing at Research Department and now that our proposals for programming satellite tests have been announced by Robin Scott, D.M.D.Tel., the discussion on satellite broadcasting is gaining momentum. We have proposed that we should take up two of the five channels that are allocated for satellite broadcasting in Britain, one for Pay Television and the other for a service to provide the best programmes from BBC 1 and BBC 2. Satellite broadcasting would instantly provide a national service. Unlike a terrestrial network, a suitably-stationed satellite can 'see' almost every part of Britain and, therefore, satellite television could be made available to the whole population of Britain overnight.

Dr. Alun Owen the new HETD

Swansea. In 1969 he became an Automation Development Engineer with the British Steel Corporation. Then from 1970 to 1974 he worked in the Ministry of Defence and rose to the Rank of Lieutenant Commander R.N. From 1975 until he took up his new appointment he was Staff Tutor in Technology in the South West region of the Open University.

Dr. Owen says, 'I want to review the current statutory courses to make sure they are in line with today's needs in the output directorates and I would like to get recognition by the Technical Education Council for our A, B and C courses. ETD will certainly be facing up to the challenge of the new and changing Broadcast Technology and will continue to produce broadcasting staff that command respect the world over'.



We Deserve Reflected Glory – DE

been converted at all, and the lead we are taking in digital recording in radio has prompted at least one journalist to suggest that the record industry needs to look to its laurels because the BBC are yet again giving hi-fi enthusiasts the

kind of high quality sound reproduction that they cannot obtain from anywhere else.

The excellence of BBC engineers has contributed considerably to the respect that BBC programmes are

accorded in this country and overseas. And much of that respect is reflected on to everyone of us in BBC engineering. Wherever we work, we all contribute to that engineering excellence and we deserve the reflected glory.”

Bryce McCrirrick

UK Teletext Beats World Rivals

Speaking at the IEEE's Chicago Conference on Consumer Electronics on Wednesday 18th June, John Chambers, Head of Special Projects Section at Research Department, described how the British Teletext system can be extended through to broadcasting full-colour high-definition still-pictures as and when the cost of memory has fallen enough to let viewers afford the decoders of the future.

Chambers described enhancements to the present teletext transmission system including being able to underline words and change the colour of every letter in a word. This shows that British Teletext can handle 'parallel attributes' just as well as any other proposed text broadcasting systems.

He also described a way that allows teletext to specify codes for about 220 display characters as opposed to the existing 96. Then a common core alphabet of 200 characters, currently being discussed by the European Broadcasting Union, would be possible. The common core alphabet would allow Latin-alphabet based languages to be used with a common decoder. Languages could even be mixed within a page. Other alphabets could be described using separate data lines to tell the decoder how to draw characters that are not stored in its character-generator.

Chambers says, 'These proposals for enhancing British Teletext retain all the advantages of the fixed-format

pages and it would also receive pages which use the new characters and display features not available in the earlier decoders'.

Chambers also introduced some very new ideas in teletext broadcasting. Foreseeing a decoder with one megabyte of memory, he described how teletext could broadcast full-colour still pictures. The same memory could accommodate around one thousand teletext pages and a technique called 'Linked Pages' would give the viewer instant access to these pages at the touch of one button on a keypad. Once the viewer has chosen any particular page the decoder would automatically file away a set of related pages by obeying commands hidden in the transmission of the first page. When the viewer was ready to read one of the related or 'linked' pages there need be no waiting time because the page would already be stored in another part of the



U.K. Stand at Chicago - (Inset) Enhanced CEEFAX decoder's memory.

One other refinement described is a page-check word. A very short digital message enables the decoder to check positively and automatically whether a page has been correctly received. This would have applications to business computer systems and the like where perhaps several hundred pictures are to be stored automatically.

Most of the potential developments of teletext rely on the reduction in cost of digital storage. At the moment the teletext system offers a proven way to start teletext broadcasting as adoption in Australia, Austria, Belgium, West Germany, Netherlands and Sweden would suggest. Chamb. foresees a hierarchy of developments that can be introduced stage by stage as the market allows.

Chamber's ideas are published in BBC Research Report number 1980/4.

Components To Lead Digital Future

In April some 100 EBU engineers from 25 countries, met at the BBC in London. One of their main aims was to discuss future digital television technical standards. The initial recommendation to the CCIR, is that the digital video standard be based on coding the luminance and colour-difference components of the video signal separately rather than the composite signal. Further work will be needed on sampling rates before the standard can be finalised.

The meeting in London demonstrated one proposal of EBU specialist group VI-VID to the main EBU

Technical Committee. Howard Jones of Research Department is Chairman of the VI-VID group.

The demonstrations used a system known as '12:4:4', referring to the 12MHz sampling for the luminance signal (756 samples per TV line) and 4MHz sampling for the colour difference components, B-Y and R-Y.

The demonstrations showed that the 12:4:4 standard preserved the original RGB quality very well.

Operation with Colour Separation Overlay (CSO or chroma-key) were less successful. Broadcasters could like to

have a digital standard that will make it possible to do 'downstream' CSO as effectively as it can be done at the RGB source. There was a suspicion that some fundamental limitation associated with 4MHz sampling was being exposed and further work will be necessary.

Other demonstrations showed digital mixing and recording from digital 12:4:4 inputs were within the capabilities of present day signal processing and recording technology.

One significant aspect to the meeting was a visit by a party from the S.M.P.T.E.