Trip to U.S.A. and Canada, 20th September to 2nd October 1967

Report by D.E.

The conclusions I drew from my visit to the U.S.A. and Canada in general are:

1. As judged in control rooms, picture quality variations are very much the same as here and it is still a major problem to maintain quality in changing from one camera to another, or from one picture course to another.

2. Distance has not much effect on the problem: material coming in from Los Angeles varied no more than material produced from the studio in New York.

3. From my observations I rated NBC well ahead of ABC, and ABC better than CBS. NBC's expertise in colour operation merits, I think, further study. A very important factor stressed by NBC and ABC was that the main lighting in a colour studio must not be dimmed, but its intensity must be regulated by changing the lamps or by putting attenuation in the light path. Dimmers are permitted for general background lighting cycloramas.

4. There is very great confusion on setting up colour monitors and on setting up colour cameras. Objective measuring methods are not used and the process becomes an art, which seems to be better understood at NBC than elsewhere.

5. Overall performance is very much worsened by the fact that there is such a variation in receivers, both in the characteristics of the tubes used and in the way the receivers are set up. There have been several changes in tube phosphors already and more changes are envisaged, particularly now in better greens. Standards for transmission must take account of these possible future changes.

6. There is considerable interest in miniature cameras and in portable tape recorders. Each of the three networks is doing its own.

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I.E.E.E. International Broadcast Symposium, Washington, 21st-23rd September

This was attended by about 250 engineers of whom the greater part represented the operational side of the smaller companies. Representation of the big networks was very thin, possibly due to the S.M.P.T.E. being held simultaneously in Chicago. The "International" element seemed to be one or two from Canada and myself. The papers on the whole were good, if utilitarian, but there were some of direct interest to us. Copies of these are available *, and the others I have arranged to obtain:

1. Gamma Correction in Live Color TV Cameras - J.F.Wiggin, General Electric Co.

   This was useful, pointed out the value of DC component and argued that overall gamma ought to be somewhat greater than 1.0 - suggested that this would go some way to make up for loss of three dimension of TV pictures.

2. A Simplified Approach to Color Pulse Distribution - Malcolm Albaum ABC

This was a very interesting paper and dealt particularly well with the effect and measurement of imperfect pairing in both the camera and the monitor. It considered the effect additively and dealt with a method of measurement suggested by Sheeter of NBC. It consists of observing a bright spot of light transversing vertically and at such a distance that the image is less than the width of the line. Suggested that interlace measurement, as well as being made a normal maintenance, should also be a periodical maintenance test. Suggested that as a working rule about 30% - 40% imperfect pairing was acceptable. The question arises as to whether it is desirable to measure this effect or to rely on observation.

*3. Correction of Hue and Saturation Errors in TV Tape Recording - J. R. West

This dealt chiefly with the RCA Colour Amplitude and Velocity error corrector. It sounded interesting.

*4. Correlation between TV Transmitter Performance Measurements and Picture Quality - T. M. Gluyas and W. L. Behrend, RCA

This was a good paper and sets out requirements and tests for the maintenance of uniform picture quality - deals with addition and cancellation of errors - points out that standards not yet perfect and more or less agreed for transmitter, but there are virtually no standards for receivers and that these ought to be established and accepted.(This point about the lack of standards for setting up cameras, monitors and receivers occurred repeatedly during my visit.) The paper also sets out requirement for test instruments.

*5. Planning 13GHz TV Relay Systems - J.B.Bullock and E.J.Forbes

This seemed a very good working paper and contains a lot of information on the use of 13GHz. I was told that the British Post Office is carrying out a rain survey in Bedfordshire to ascertain the non-uniformity of rainfall and whether rain attenuation can be reduced by space diversity reception.

I had discussion with a number of people on points of interest as follows:

VHF Circular Polarisation

Some people - almost all people who had already done it - spoke very warmly of the value of this. Others were more dubious, but all agreed that car reception was improved and some said fringe area reception was better. I had one ride in a car listening to a circularly polarised transmission and it was certainly good. Bartlett of NAB summed it up for me by saying that if he were building a new transmitter it would, without doubt, have circular polarisation, but if he had an existing station he would do it only if it did not cost too much and was not too difficult to do.

G.E. Polar Diagram Calculating Service

G.E. demonstrated this. The current amplitude phase of each of any number (I suppose within reason) of elements is fed into the machine together with information on dimension and spacing. The answer comes back in Cartesian or polar co-ordinates, as chosen, at 5° intervals over the range -180° to $+ 180^{\circ}$. In addition, a particular section can be explored down to 0.5° intervals. Samples of the computation are available. The service costs a monthly subscription of $100 plus 4 cents a second for computer time used. The above calculation takes 25 seconds of computer time in 6 second bits on a shared basis and about 4 minutes to print out. A complete polar diagram is therefore available in about 5 minutes and costs $1. One of the available samples was done specially for me. Vertical polar diagrams can also be done. I was told that the F.C.C. have their own machine which does their work and Martin told me they do all their aerial computation on it. I think we ought to consider whether we could set up an arrangement to do this.

Satellites for Programme Distribution

At the I.E.E.E. Banquet in Washington, Mr. David Acheson (son of Dean Acheson) and Vice-President, Communications Satellite Corporation (COMSAT) said most positively that he was opposed to the use of satellites for what he called "dedicated" services, i.e. exclusive services such as broadcasting, and that economies of cost and of frequency availability made it necessary to use satellites as common carriers for all services.

Colour Generally

There was general complaint about variation in colour quality between sources in a network and between cameras in a show and particularly between one channel and another. Those people running local stations told me that they did not operate their station to give what they thought was the best colour, but to match as best they could the incoming network picture. Throughout the Conference there was little talk of the superiority of this or that camera or telecine, but constant reference to setting up problems, receiver variations, etc.

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NEW YORK

A. Colour as seen and discussed at CBS

Very variable over about the same range as our own transmission set up of monitors, and receivers very variable - particularly the white balance. General tendency was to make this too blue. Results of observations set out in appendix, but in general the results are not as good as they ought to be, but generally better than L.N.L.U.

General Developments

1. Great pressure for development of a light-weight camera which could be used for O.Bs. but also as the foundation of a new studio camera. Philips are doing something on this. Ampex are also producing a camera. Saxe will speak to Davies of Ampex.

2. G.E. also about to produce something, possibly for next year's N.A.B.

3. Considerable re-thinking of studio requirements with thought towards a much simpler layout, perhaps with only one or two cameras, simple lighting and building, little air conditioning as light switched on for short period only - production handled in short fragments, direct with artists, perhaps complete in two to three days for a play with no external rehearsal or learning lines. Trial of these principles could be difficult in the U.S.A. Would like to know whether the BBC would co-operate.

4. Field trials of EBR(ECF) now about to start in March next. Saxe not awfully keen, but determined to try. Possibly full trials next autumn. So far EBR runs at only half real time, but Goldmark is to rebuild within two years so that machine will run at real time.

5. Americans to consider BBC development of equipment and submitted revised form of agreement.

6. Would like to develop with BBC an editing, identification and storage device for magnetic recordings.

7. Would like to see method of setting up colour monitors, but no confidence in Colorgard and think Quinn device too complicated. At present they said they use a black-and-white tube as reference white, but not much evidence of this. They buy selected colour and monochrome tubes for monitors.

8. Colour temperature set up of 9000° C gives poor pictures.

9. Considerable argument takes place about colour quality, but the senior people seemed prepared to accept as satisfactory, pictures which I thought rather poor.

10. At CBS Laboratories their portable camera is making very good progress and seems a very attractive device. It will use G.E. hybrid plumbicon. It weighs 20lbs while the back part weighs 40lbs and will operate for two hours on a set of batteries. It will work with a Canon 6:1 zoom lens with aperture off 2.0. It will operate by radio on 950 MHz or over a cable up to 3000 ft long in which case power can be fed down the cable on a constant current system. Alternatively, the camera and the back part can be separated by 100 ft of cable. The cost of the complete outfit, camera, feed encoders, oscilloscopes, etc., in lots of 6 is $164,000 each.

11. SEC Camera - CBS Laboratories are doing considerable work on this. Neither NBC nor ABC would admit to more than taking an interest. The CBS unit was away in use at a hospital, but we saw a tube and some modules of the camera. The tube is small, not much bigger than a vidicon, but is very expensive; $10,000 for a broadcast quality tube. CBS say that they have not seen a broadcast quality tube and have paid only $2,500 for the tubes they have, which they say, apart from a few blemishes, are satisfactory. The tube is very fragile and can be burnt out by a very small static charge. The tube will give a satisfactory picture down to 2ft candles and, with a "Light Intensifier" costing $2,500, down to 1/10ft candles.

At the present time, because of the cost and fragility of the tube, they use on Field Sequential at 180 frames per second connecting to NTSC with a disc switched display of 3 black-and-white pictures using plumbicon pick-up tubes. The camera unit weighs 10lbs. CBS Laboratories will develop this equipment for closed circuit work, but there seems some doubt as to whether it will be used for normal broadcasting.

B. Colour as seen and discussed at ABC

Barnathen said that the TK 41 was the best camera as far as picture quality was concerned. It would deal with widely varying light values and had no lag troubles. It was used for the Akron Golf Match. It was, however, too heavy and they would not buy any more. He thought they would buy either PC 70 or GE 250 with probability that they would buy PC 70 for general use and GE 250 for News. They had had a lot of trouble with a Marconi camera. Barnathen said he wished he had seen an EMI.

Colour generally at ABC was appreciably better than at CBS. Points of interest were:

1. A "Colour Captain" in the central room controls all colour pictures and adjusts iris, pedestal and separate gains on red, green and blue.

2. No dimmers are used on the mains illuminators, but are used on background shots. Light intensity was said to be 250 ft candles. Noise was grade 2.

3. Equipment, coders, sync pulse, generators, etc., are very miniaturized.

4. Barnathen would like a quote from the BBC for carrying out conversion of 625/525 pictures for him.

5. He would like BBC co-operation in trying to reduce the size of camera cables.

6. They have a joint development arrangement with Ampex for a small camera. The arrangement appears to be the same as for the slow-motion device - Ampex not free to offer to others for one year.

C. Colour as seen and discussed at NBC

NBC picture quality was very good indeed and as seen on two shows being recorded and other shows being played back was ahead of ABC, and far ahead of CBS. (A 10-minute sample of one of the shows is being sent to me.) This may be due in part to the cameras used, but is very largely due, I think, to operational skill and expertise by NBC. The cameras used are almost all TK 41's and the pictures commented on used these cameras. They have also a few TK 43's, but no TK 42's. For replacement they are now free to go away from RCA if they wish. They are impressed with the PC 70 and interested in the EMI.

Points of interest are:

1. Final colour balance is done on one of the actors - they took about ten minutes to do this in "The Doctors" and looked at a girl in two different lighting conditions.

2. The monitors are lined up by eye by a very experienced man and a very close balance is obtained between the "Preview" and "Transmission" monitors.

3. In the line-up and balancing period there was constant exchange between the lighting men and the man at the control desk.

4. No dimmers are used, but if necessary lighting intensity is adjusted by inserting pieces of a kind of plastic mesh. The light was rather flat with 350 ft candles and an opening of F8 - F11. Noise was grade 2-3. It was said that it took two hours to light the studio. The colour temperature of the lamps was said to be 3300°K - 3500°K. This was done in the morning. Rehearsals started at 12.00 and the final take, which is now taped but which will be live, began at 15.00. The whole show was completed in one day.

5. RCA are developing a portable camera using E.S. focussing vidicons, type 8134. The camera will be radio linked back to reserving point on 950 MHz. From the central point to the camera 13 GHz, with a steered 2 ft disk, is used to carry control and sync signals and instructions to the cameraman. The camera as a whole looked very unweildy and not as attractive as the CBS device.

D. Colour as seen and discussed at CBC

I was at CBC only over the weekend and there were no colour productions that I could see live. I was told, however, by independent viewers, that CBC colour was appreciably better than U.S.A. colour. I saw shows on two colour receivers, but both of them were very badly out in colour balance. From what I could see, however, the noise level was low, there was no lag at all and no fringing. CBC expressed themselves as very satisfied with the TK 42 and not too worried by its size. They also had a good opinion of the GE 250. They had not been very impressed with the Marconi Mark VII, chiefly on account of reliability troubles which had prevented them from making a reliable assessment. They were interested in the EMI.

Points of interest:

1. CBC do not use Colorgard nor the Quinn device. This latter is not yet in production and they seemed lukewarm about it.

2. CBC have doubts about whether they will be allowed to use satellites for broadcasting, but are pressing their proposals and putting forward costs. This possibility is, however, a separate item in their budget proposals which are now on a five-year basis.

General Impressions of Colour

1. It is widespread and varied from very good to very poor indeed. The faults are poor and changing colour values. Sometimes there is some head banding, but less than I expected.

2. NBC is well ahead and one could learn from their production techniques.

3. To get good colour reception over the frequency range 50 MHz to 950 MHz is very difficult. The tuning controls on the receiver I used were generally not good enough.

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RCA Laboratories, Princeton

The demonstrations and lectures were very well done. The latter being of a very broad nature dealing with the attitude of mind necessary for research and not with any particular way to do it. It was good common sense outlining the characteristics we would all recognise and wish to have.

Points of interest were:

1. For successful training, feedback is essential.

2. A successful executive must be able to design and specify his own O & M programme of work.

3. Electronics is any activity that can be better carried out by electronics than by other methods.

Copies of the paper will be available in due course.

The demonstration was very good indeed. I saw two kinds of them and could perhaps give details if anyone is interested in a particular one.

My general impressions are:

1. A great concentration on storage and delay, magnetically, with cyogenics and with major structure methods. There seemed to be a very great concentration on all this.

2. There is film evaporative and diffusion application to obtain various effects.

3. Photo devices in a considerable effort still seem to be going into the photocell camera; a unit with 180 x 180 elements in an area about 15mm signal was shown. It gives a rather poor picture, but a unit 360 x 360 elements is foreseen. At present the device is about 25 times down on the vidicon. Control of colour accuracy is said to be obtainable by the correct mix of cadmium, selenium, etc. in the evaporation process.

4. What we saw of solar cells was only the small part of the work going on that could be published. Even so, it was impressive. It was said that the old type of solar cell made up of individual elements cost £3,000 per 100 watt unit, but that the new type using a film method of construction will cost about one-tenth of this.

4. cont...

The new type cells will generate about 100 watts per sq. m. in space, and about 140 watts per sq. cm. on earth. For a reason that I could not understand, it was said that the space efficiency at about 10% is lower than the earth efficiency at 14%.

5. The radiation properties of gallium arsenide are being used for pulse-modulated and frequency-modulated transmission.

6. Speech analysis and synthesis to achieve recognisable speed quality with low bandwidth is clearly receiving considerable attention with a view to speech from the Moon or Mars. The signal resulting from speech analysis into 250 frequency or tone sounds is conveyed by a perforated tape carrying 23 bits per second to a reproducer which uses 250 tape reproducers, each having one continuous sound on it. The result was very intelligible, but was demonstrated only with a prepared recording.

7. Research on colour phosphors is now being directed to improve "green" and it is expected that an appreciable improvement will occur. It seems clear that the requirement for improved brightness will be dominant and that we have got to live with a continually changing characteristic of the display tube phosphors.

FCMcL/ET
12.10.67

Att:

APPENDIX

DATE		20.9.67			25.9.67	
PLACE		N.Y. Office	N.Y. Office	N.Y. Office	CBS	CBS
SHOW		You Don't Say	Dating Game	Secret Store	Live Show	Interview
NETWORK		NBC	ABC	CBS	CBS	CBS
VIEWED		Office	Office	Office	Studio	Control Room
LIGHT					250	250
CAMERA		TK41	GE 250	PC 70	PC 70	PC 70
FIDELITY	Best	2	2	3	2	2
	Worst	3	4	4	4	3
FRINGING	Best	2	3	3	2	2
	Worst	2	4	4	4	3
REGIST-RATION	Best	2	2	2	2	2
	Worst	2	2	2	2	2
LAG	Best	1-2	2	2	2	2
	Worst	1-2	2	4	2	3
NOISE	Best	2	2	2	2	2
	Worst	3	3	2	2	2
R or M*		R	R	R		M
OVERALL		2-3-4	2-3-4		2-4	2

*Receiver or Monitor

APPENDIX CONTINUED

DATE		25.9.67				
PLACE		CBS	CBS	CBS	CBS	CBS
SHOW		Ed Sullivan	Secret Store	Captain Kangaroo	Football	United Nations
NETWORK		CBS	CBS	CBS	CBS	CBS
VIEWED						
LIGHT						
CAMERA		Marconi	Philips PC 70	MWT	GE 250	Marconi
FIDELITY	Best	2	2	2	2	2
	Worst	4	4	3	3	3
FRINGING	Best	3	2	3	2	2
	Worst	4	3	4	4	3
REGIST-RATION	Best	3	2	2	2	
	Worst	4	2	2	4	
LAG	Best				2	
	Worst				2	
NOISE	Best					
	Worst					
R or M		R/M	R/M	R/M	M	M
OVERALL		3-4	3-4	3-4	2-3	2-3

APPENDIX CONTINUED

DATE		25.9.67				26.9.67
PLACE		CBS	CBS	CBS	CBS	ABC
SHOW		Ed Sullivan	Ed Sullivan	Cronkite	Love is a Many Splendoured Thing	Dating Game
NETWORK		CBS	CBS	CBS		ABC
VIEWED						
LIGHT						
CAMERA		Philips PC 70	Philips PC 70	Philips PC 70	Philips PC 70	PC 60
FIDELITY	Best	2	2	2	3	3-4
	Worst	2	3	2	4	2
FRINGING	Best	2	2	2	3	2
	Worst	3	3	3	3	2
REGIS-TRATION	Best	2	2	2	3	2
	Worst	4	2	2	3	2
LAG	Best		2	2	3	2
	Worst		2	2	3	2
NOISE	Best		2	2	2	
	Worst		2	2	2	
R or M		R	M	M	R	R/M
OVERALL			2-3	2-3	3-4	3

DATE		26.9.67		27.9.67			
PLACE		ABC	ABC	NBC	NBC	NBC	NBC
SHOW		It's Your Money	News	Various	Discus-sion	Discus-sion	The Doctors
NETWORK		ABC	ABC	NBC	NBC	NBC	NBC
VIEWED					Live	Recorded	Control Room
LIGHT					300	300	330
CAMERA		GE 250	PC 70	TK 41	TK 41	TK 41	TK 41
FIDELITY	Best	2-3	2	2	2	2	2
	Worst	3	2	4	2	3	2
FRINGING	Best	2	2	2	2	2	1
	Worst	3	3	3	2	2	1
REGIS-TRATION	Best	2	2	2	2	2	1
	Worst	2	2	2	2	2	1
LAG	Best	2	2	2	2	2	1
	Worst	2	3	2	2	2	1
NOISE	Best	2	2	3			3 very good pic-ture
	Worst	2	2	3			3
R or M		R/M	M	M	M	M	M
OVERALL		2-3	2-3	2-3-4	2	2-3	1-2

FCMcL/DA
12.10.67