TRIP REPORT

SEPTEMBER 13, 1961

SUBJECT: LAWRENCE TUBE COLOR DEMONSTRATION

PLACE: Paramount Building, Times Square, New York
Autometric Corporation, New York

ATTENDED: Paul Raibourn, President - Autometric Corporation
Robert Dressler, Executive Vice President-Autometric Corp.

G. Case - GE
E. Schilling - GE
T. Webb - GE

Distribution: V. Campbell—
G. Case
C. Dichter
W. Jones
B. Lees
R. Mooney
E. Schilling
D. Scott
P. Sullivan
P. Wargo
T. Webb

GENERAL

Mr. Raibourn introduced himself and Robert Dressler and indicated they had conducted a survey to determine the reasons RCA had been so unsuccessful in selling color. They regard poor monochrome reproduction and complexity of adjustment as being key deterrents. Price and size are considered secondary. Mr. Raibourn felt that one million sets ($500 - 700) could be sold if monochrome performance were improved.

The Lawrence tube development dates back to 1952 and the initial work by Chromatic Laboratories. The tube was transferred to Dumont in 1957 where work eliminated the internal sandwich, and vertical phosphor stripes were placed on the face of a cylindrical 22" tube. In 1960, the effort was transferred to Autometric. Both Litton and Fairchild Camera have military agreements with Paramount. No commercial agreements exist. A request for sample tubes was politely turned down until GE intentions are known. They do not particularly care to make the tube since they feel the industry has plenty of capacity.

Their effort (claim 30 people but not all full time) is aimed primarily at keeping the tube current, that is, in phase with competition and the passing years. A number of their people were recruited from Dumont.

We expressed interest in returning in several months when they expect to demonstrate a tube with 175 ft. lambert brightness and a contrast ratio of 100:1.

TUBE OPERATION

The Lawrence tube is a single gun, post acceleration device with vertical phosphor stripes and a color switching grille. Color selection is accomplished by applying the color subcarrier signal (3.58 mc) to the grille causing the post accelerated beam to bend between the grille and screen and hit the proper phosphor corresponding to the chroma information of the NTSC signal at the gun.

The grille wires are placed behind the red and blue phosphor stripes. The wires associated with the red phosphor stripes are brought out to one electrode and the blue to another. Between these electrodes and inside the tube, a coil is placed to resonate the grille capacity at 3.58 mc. A push-pull amplifier drives the tank circuit. The beam is deflected from green to red or blue depending upon the polarities. At zero and 180° phase of subcarrier, the beam is undeflected and therefore is post focused on the green stripe.

TUBE OPERATION (Continued)

The electron optics of the tube differ from tubes made five years ago. The electron beam is deflected at 20 kv and then post decelerated and then post focused back to 20 kv. Higher resolution is claimed along with minimum effects due to magnetic fields.

TUBE DEMONSTRATION

The demonstration was conducted at Autometric Corporation, where facilities for test signals, color bars, slides and movies were available. A Zenith monochrome set and RCA aperture mask set were on hand for comparative purposes. The Lawrence tube was mounted in a test set.

The tube demonstrated had the following characteristics:

Diagonal:	22" round corners
Deflection:	90°
Face:	Cylindrical
Length:	18"
Deflection Voltage:	20 kv
Screen Voltage:	20 kv
Internal Structure:	Grille having 56 wires per inch along with damper bar and beam shield.
Phosphor Stripes:	Vertical and of variable width but of approximately 9 mils.
Screen Area:	250 square inches although face allows for 280 square inches. Aspect ratio approximately 3:4.
Brightness:	Crayon Boy 85 ft. lb. at average beam current of 230 microamps.
Weight:	35 pounds

A series of NTSC slides were viewed with the Lawrence tube running approximately 2.5 times brighter than the RCA tube. No ultra-vision was used. George, Ted, and I felt that resolution and contrast was better on the aperture mask tube although the wedges on the resolution chart seemed to be of comparable quality. They claimed a contrast of 30:1. Generally speaking, the performance was pleasing although the tube had phosphor contamination, grille screen misalignment, anode button charging, and fair color fields. Monochrome reproduction was only fair although this was meant to be one of their strong points. Grey scale appeared good but poor screening affected the picture. Moiré was not recognized as such, but the 3.58 carrier frequency was quite evident.

As part of the demonstration, the tube was removed from the set and realigned in 2½ minutes. This is always impressive compared to the lengthy RCA alignment procedure. A color centering magnet and Z-axis coil to correct for grille-screen rotation goes with the tube.

TUBE DEMONSTRATION (Continued)

Haze caused by secondary electrons was not evident although they claimed coatings were not being used. One engineer mentioned control of aluminum thickness as the reason for this improvement.

TUBE PROCESSING

The tube structure is basically identical to that of the GE Post Acceleration tube and hence the manufacturing problems similar. Perhaps most significant, they mentioned a modified screening procedure which utilizes electron exposures to provide latent images. Final phosphor deposition is done with a light source flooding the face panel. This technique was not described in detail and some question exists as to the mechanics of the process. The use of electron exposure techniques has, however, minimized their problems to the extent that they do not use interchangeable grilles. One's first reaction is that electron exposures can only be utilized for limited production, but this should be carefully considered since grilles are easily made if interchangeability is not required. Although they currently use color glass, they further feel monochrome glass can be used with electron exposure techniques. (GE holds patents as a result of their electron exposure work.)

Other processing areas were briefly discussed with no apparent novelties. They exhaust long and hard to obtain good life, minimize grille distortion, and avoid glass breakage.

TUBE COST

We inquired as to their estimates on cost but did not get a direct answer. Mr. Raibourn felt that a monochrome bulb price was applicable in addition to about $15.00 of internal parts including shrinkage. Except for the bulb, this corresponds to our estimate made on PA tubes in 1957. We feel that tubes of this type would be as expensive as the Aperture Mask.

RECOMMENDATIONS

It is recommended that a second contact be made with these people to obtain further details on the tube and evaluate the performance of the 25 kv - 175 ft. lb. tube. This brightness along with the versatility in deflection angle represents definite product advantages. Manufacturability and high cathode loading (single gun requires time sharing and high peak currents) are two factors which need further study.

G. Case E. F. Schilling T. Webb

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