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TRIP REPORT #2

April 18, 1962

Subject: Lawrence Tube Color Demonstration

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

Attended: P. Raibourn, President - Autometric Corporation
R. Dressler, Executive Vice President - Autometric Corporation

P. Humeniuk, Mgr. Engineering, Television Receiver Dept., General Electric Company
D. Garrett, Mgr. Advanced Development, Television Receiver Dept., General Electric Company
Dr. P. Wargo, Mgr. Engineering, Cathode Ray Tube Dept., General Electric Company
E. Schilling, Mgr. Device Development, Cathode Ray Tube Dept., General Electric Company

GENERAL

During the demonstration, Mr. Dressler announced Autometric's decision to drop the Lawrence Tube (single gun switching tube) in favor of the three gun Lawrence tube because of its potential brightness. They estimate 350-450 foot lamberts on high light brightness using the new RCA red phosphor and beams from three guns. This approach is identical to the G.E post acceleration tube where color selection is determined by the angular entrance of the beam into the post acceleration field. The electron optics differs on the two tubes however. In the PA tube the electron gun was run at 6 KV to allow for minimum sweep requirements. Resolution and current are limited. Autometric's approach is to deflect at 20 KV, then post decelerate in the funnel and then post accelerate back to 24 KV. They claim higher resolution, higher operating currents and minimized effects due to magnetic fields. They are currently building samples of these high brightness tubes.

They also disclosed that Sony had signed a license (does not include Canada and U.S.) to manufacture Lawrence tubes for portable sets. An 8" tube size is under consideration.

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

TUBE DEMONSTRATION (cont'd)

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. We felt that resolution and constrast 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. Moire 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. 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. Reduction in raster size did indicate background haze however.

SLIDE DEMONSTRATION

At the Paramount Building, Mr. Dressler reviewed a series of projected colored slides under varied ambient conditions demonstrating the need for higher brightness in direct sun light. They also demonstrated a lenticulated screen which appeared to have a great resistance to ambient conditions. They would not disclose the nature of the screen on the mechanism but indicated that the idea could be incorporated into a finished tube. These demonstrations were apparently responsible for the change in direction from one gun to three guns.

TUBE PROCESSING

The tube structure is basically identical to that of the G.E 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. (G.E 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.

Screening Procedure for Grilled Tubes

(i.e. Lawrence Tube or G.E Post Acceleration Tube)

1. Mix carbon powder with Kodak Photo Resist
2. Coat panel with mixture
3. Electron expose thru non-interchangeable grille three stripes. Stripes exposed differentially
4. Remove assembly from electron exposure machine
5. Strip green stripe position using trichlorethylene
6. Coat panel with green phosphor slurry (PVA)
7. Expose panel with light from face of tube. Carbon acts as light shield
8. Wash

9. Strip blue stripe position using trichlorethyline and additive (unknown)

10. Coat panel with blue phosphor slurry (PVA)

11. Expose panel with light from face of tube

12. Wash

13. Repeat cycle for remaining stripe

RECOMMENDATIONS

It is recommended that a third contact be made with these people to review the performance of the 350-450 ft. lb. tube. In the meantime, consideration should be given to the manufacturing problems and cost potential of the tube. It is further recommended that Marketing consider the customer's need for a 400 ft. lb. tube.

E F Schilling

EFS:vc
5/3/62

E. F. Schilling
Manager
Advanced Device Development