

TRIP REPORT

MOTOROLA - CHICAGO

23" - 92° Rectangular AM Tube

September 11, 1961

MOTOROLA PERSONNEL CONTACTED:

Messrs: Ed Taylor - Executive Vice President - Motorola
Dick O'Fallon - Manager-Components Engineering
Merl Armstrong
Bob Hanson - Advanced Development
Karl Horn - Chief Engineer
Ted Herkis - Vice President - Market Research

GE PERSONNEL:

Messrs: V. C. Campbell
G. L. Case
M. B. Lees

Distribution: G. Case
V. Campbell-
C. Dichter
W. Jones
B. Lees (3)
E. Schilling
D. Scott
P. Wargo
P. Sullivan
R. Mooney

GENERAL COMMENTS

The purpose of this visit was to review the status of the recently announced 23" - 92° aperture mask color tube. During our initial discussions with Mr. Horn, he reviewed the commercial considerations which led to this development. Motorola feels that it is essential, if the color television business is to accelerate its growth curve, that a 90° set with the rectangular picture aspect the same as the current 19" - 23" monochrome line be made available. They feel that styling, rather than price or reliability (which they consider to be satisfactory on the RCA set) is responsible for the currently unacceptable growth rate.

Since such a tube was not available in the industry, they had proceeded on their own (with the assistance of National Video Corporation) to fabricate a prototype from currently available parts; i.e. a 23" monochrome bulb, a C. B. S. aperture mask master and a RCA gun. In consequence of the limitations imposed by the lack of suitable parts, designs, etc., the prototype displayed relatively poor color and monochrome pictures; however, it was adequate to fill its intended purpose and apparently was enthusiastically received by their commercial people, distributors, etc. The styling permitted by such a tube was quite impressive, as compared to the cabinetry, etc. required by the 70° RCA round tube; the model displayed utilized a 20" deep cabinet with a 5" pot, although changes in basing would reduce this latter dimension by 1 - 1½".

COMMENTS RE TUBE DESIGN

Before such a product could be introduced, extensive design effort would be required, primarily in the following areas:

1. Yoke design and its match to the face plate.
2. Bulb design and tooling, with the possible applicability of regular TV glass.
3. Mask and frame design, including mechanical supporting means.
4. Electron gun design, probably some modification of the RCA gun.
5. Optical design of the screen geometry, and its match to the aperture mask and gun.

COMMENTS RE TUBE DESIGN (Continued)

In each of the above areas, there is considerable background available because of the similarity of this tube to the RCA round and the CBS rectangular 70° tubes, but there is little of this background within CRTD and a considerable penetration in each area would be required before a suitable design could be realized. There should be little doubt but that RCA is well along the road toward this objective and there was some indication at Motorola that Rauland had put considerable effort (\$50,000 per month for the last five years) into the development of some such product.

There is no apparent reason that, assuming the above problems are satisfactorily resolved, the picture quality, light output, etc. of this tube would not be competitive with the current RCA product; by the same token, there is no reason that it would be any better and hence the premium put on styling potential would be the only reason for its development. The slight gain in picture size (approximately 20 sq. in.) was not considered significant.

COMMENTS RE MANUFACTURABILITY

The problems inherent in the rectangular tube include all of those present in the manufacture of a round tube with the additional limitations imposed by the rectangular shape. For example, the exhaust rate would undoubtedly be somewhat slower than the 5-hour cycle currently utilized by RCA, because of the thermal expansion limitations of the rectangular structure; and the design of the ovens would be more critical.

The processing of screens, aluminum films, etc. would not represent additional problems, but again there is little knowledge or background within CRTD in these areas.

Manufacturing cost was estimated to be approximately \$10.00 higher than the round 70° tube.

COMMENTS RE MONOCHROME, COMPONENTS, ETC.

The quality control, quality approval, etc. procedures, facilities, and techniques available and utilized at Motorola were most impressive. Environmental testing of receiver and all components is utilized extensively. Receivers and tubes must operate at high line voltage (135 volts) in a temperature cycling range from 140°C. (95% RH.) down to -40°C. for 2000 hours without any failures. Picture tubes were reported to stand up satisfactorily under these conditions.

COMMENTS RE MONOCHROME, COMPONENTS, ETC. (Continued)

Positive grid slumping is used by Motorola as one criteria for evaluating picture tubes and this led to a discussion of cathode alloys. Mr. O'Fallon reviewed his opinion of the 220, 225, 330 and A31 (N96) alloys. He reported that the N96 alloy was the most stable and had the best long-life potential. It passed the high line voltage life test satisfactorily and because of it, lack of sublimation, was preferred over the 330 alloy which introduced circuit design limitations if the high line voltage life test was to be passed. The 330 alloy, although satisfactory, has considerable sublimation.

RCA recently sampled them with tubes having the Motorola "blue" color -- these tubes had 22 mil grid #1 apertures (which RCA did not recommend for life) and exhibited the best spot size of any tube they had tested to date.

Mr. O'Fallon said that there was little design engineering effort forthcoming from National Video. We were left with the impression that they would welcome a vendor with an adequate engineering program; however, they would continue to look to National Video as a major source of tubes.

COMMENTS RE ASSEMBLY OF PROTOTYPE TUBE

The following notes pertain to the Motorola tube as displayed and in most cases would not be pertinent to a longer-range program:

1. Because of the lack of suitable glass, the face and funnel parts were obtained by cutting a 23" H.W. monochrome bulb inside of the face panel (to obtain the funnel) and marrying with a new panel. Both pieces were ground and lapped to provide suitable fritting surfaces.
2. Screens were applied using the CBS system (settling in Kasil; coating with photoresist; exposing, developing, and polishing). The photoresist was "Unicote", a commercial photolitho compound.
3. Coating, fritting, bakeout, exhaust, etc. were carried out by National Video. The frit was Kunble CV137, which required one hour at 420°C. to complete devitrification.

Because of inadequate oven control and uniformity, they were forced to use this low setting frit, and still had difficulty with excessive bulb sagging.

COMMENTS WITH RESPECT TO COMMERCIAL ASPECTS

Color Market Data

It appears that Motorola has conveniently developed two market forecast approaches to color television, pessimistic projections based on RCA and blue sky projections based on Motorola color tube.

		<u>RCA Brand</u>	<u>RCA Private Brand</u>	<u>Total Color Sets</u>
RCA type set	1960 (Actual)	80,000	27,000	107,000
RCA type set	1961 (Estimated)			130,000
Motorola type set	1962 (Projected)			250,000
	1963 (Projected)			500,000

Ted Herkis was very bearish on color under the current situation and supplied the 1960 figure of 107,000 as known actual. He could see very little improvement in 1961 estimated color sales because of the very small amount of "added value" available to the consumer now as opposed to 1956. RCA was given full credit for having made substantial reliability improvements and removing the mental picture of the need of "an engineer being shipped with every color set" from the public's mind.

Ed Taylor stepped in with Motorola's color growth predictions based on tube samples being supplied Motorola in the second quarter of 1962 and production in the third and fourth quarters of the Motorola Color Tube with the total reason for growth being improved styling.

Color Television Plans

Motorola professes to be actively planning for production release in mid 1962 and conveniently demonstrated their chassis development work during a tour of facilities. How this is to be accomplished without a commitment by a tube company yet is intriguing.

In discussing Motorola's release of color tube information to industry, Ed Taylor stated that if a tube manufacturer does not join up soon, Motorola will be forced to release the details of the product breakthrough to the public in a series of advertisements in the consumer press. Motorola did not deny that their current program can only have a detrimental effect on the RCA type color set boom.

Color Television Plans (Continued)

It was evident that Motorola has no interest in further color tube product development work but Dick O'Fallon is continuing some experimental work toward a real improvement in brightness. The work to date has cost considerably more than initially anticipated.

Motorola Position

Where is the alert, forward looking tube company ready to take advantage of this golden opportunity? Come one, come all!

Motorola saw no specific need of a dual source requirement and this is important in respect to the relationships of National Video and Motorola. Patentwise, there are no inventions in the current device and Motorola will release all information to potential suppliers, probably including any further improvements through current programs; circuit developments, however, are proprietary.

National Video

Considerable time was spent by Motorola in reviewing the excellent processing contribution of National Video to the project, but stressing the lack of engineering capability which eliminates National Video as a satisfactory product development group.

Rauland

It was indicated that Rauland is very interested in the tube and there may be a very close identification of Rauland's color development program and Motorola's work.

Pricing

It was stated that the color set market being aimed at is the \$100.00 maximum. The discussion of a profit margin that might be expected on the tube must have touched a sore point because it touched off a 15 minute monologue by Karl Horn on how an adequate profit can be achieved.

MB Lee
J. I. Case
V. C. Campbell