V. Campbell

RESEARCH LABORATORY TRIP REPORT - 2/25/59

P Humeniuk
GA Schupp
WE Good

A discussion took place between the above and Dr. P. E. Pashler, Dr. W. E. Glenn and C. Fick concerning the development schedule of the Glenn Color TV projection tube. This is the pumped tube which we expect to use for our evaluation of the capabilities of this system. The primary point of discussion was to determine the most judicious time for transfer of the tube to TVRD. Our original schedule had called for a February 1959 transfer date. Drs. Glenn and Pashler felt that the situation is such that several months work will be required at the Research Laboratory before the performance of the tube will be adequate for us to make quantitative measurements. They were particularly concerned about the decay times of the different colors as written on the oil. We had hopes that a series of qualitative measurements of flat color fields, etc., at the Research Laboratory,,for judging whether the performance was adequate would be sufficient. However, Dr. Glenn stated that he would not be able to judge adequate performance without working with a color picture. We had also hoped that we would not be required to put a color picture on the projector until enough quantitative measurements had been made so we could produce a picture more in line with the capabilities of the system.

They proposed the following program:

Month of March 1959 - Write on oil and debugging of electrical and mechanical troubles.
" " April " - Work on oils using the tube as a tool for evaluation.
" " May " - Electron optics and light optics.
" " June " - Primary color tests with color pictures.
July 1 " - Tube will be moved to Syracuse for quantitative measurements providing its performance is adequate as judged by RL, CRT and TVRD.

There was complete agreement on the fact that the tube should be working before it leaves the Research Laboratory. There was not a full appreciation at the Research Laboratory of the fact that we had scheduled the evaluation of this system tightly into our plans and that we were anxious to "take it over" at the earliest possible moment. There was not a full appreciation of TVRD of the magnitude of some of the basic problems of the system that still remain to be solved.

It was agreed that TVRD would continue to supply all of the electronic equipment and as much of the optical equipment as required for these tests. This would include a chassis at an early date that would take appropriate color signals from a color television receiver and convert them into ones which would drive this tube. It was pointed out by Dr. Good that while this will give a color picture to work with, that no one should conclude that it will be a good color picture or demonstrate the full potential of the system. Two reasons were given -- one because it is "off-the-air" and the other is that we do not know precisely what types of signals are required by the tube.

Attached are objective and plan sheets that were prepared at TVRD. These will be modified in line with the arrangements made above. Our completion date for Phase I will now be more like Dec. 1959 rather than Aug. 1959.

Dr. Pashler pointed out that the following problems (for a sealed-off tube) will still be with us after Phase I is completed. He listed several paths for solution to each.

1. Vacuum maintenance.
   a. Reduction of beam voltage.
   b. More stable oils.
   c. Titanium getter.

2. Cathode life.
   a. Metal cathode.
   b. Other cathodes.

3. Oils
   a. Some new oils are more resistant to bombardment.
   b. Further experiments for better understanding.

4. Oil replenishment.
   a. Rotating disc.
   b. Electrostatic pumping.
   c. Distillation.

5. Light sources.
   a. Incandescent, inefficient but may be possible with new developments.
   b. Arc sources - efficient, long life but expensive.
      The ideal light source needs to be developed.

6. Costing.
   True evaluation of costs cannot be made until the above problems are solved.

Dr. Tieman showed us his new negative resistance tunnel diodes in various circuits and provided us with one sample.

Dr. Williams pointed out that their main activity in electroluminescence is a search for a more efficient method of excitation. Most of the inefficiency of this type of light source is in the excitation rather than the emission.

Dr. Cusano demonstrated his UV light amplifier.

W. E. Good
Advanced Development Engineering
Television Receiver Department

WEG:REL
2/27/59
cc: T True
H Vanderlaan
M Graser
V Campbell - #6
P Sullivan - #6
C Ellis - #7
Dr. P Pashler - Res. Lab. - Sch'dy.
Att.

Objective 2

Advanced Development Project

Projection Color Television

Objective:

To develop a new product.

Goal:

To develop a color television receiver which meets the market objective of cost and performance.

Plan and Schedule:

Evaluate the potential performance and cost of the Glenn color television projection system by study and by developing a working model.

This project covers phase I of three phases:

Phase I: Technical evaluation of the potential performance and cost of the Glenn projection color TV system.

Phase II: Design criteria and product evaluation.

Phase III: Product design.

Phase I is scheduled to take from 8 to 12 months. It will consist of establishing the requirements of such a system and determining both theoretically and experimentally whether these requirements can be met.

Time Schedule:

(1) Sept. 1958 to Feb. 1959 - Assist CRT with the design and the physical and electrical equipment needed for the development of the pumped tube. Determine the optics, lamp and screen needed for the evaluation set up. Develop and build appropriate power, sweep and signal circuitry for evaluation of the system using the pumped tube.

(2) Feb. 1959 - Delivery of pumped tube to TVRD by CRT.

(3) Feb. to April 1959 - Setting up and debugging of the overall system.

(4) April to June 1959 - Measuring and evaluating the performance of the system.

(5) July - August 1959 - Report covering performance, preliminary design criteria and potential cost of the required components.

9/26/58

GLENN PROJECTION COLOR TV (Phase I)

1. Purpose: To determine the potential performance and level of picture quality that can be obtained with Glenn's oil film projection system. Evaluate the cost and problems encountered.

2. Plan:

(A) Design, construction and debugging of a pumped tube by CRT, RL and TVRD at the Research Laboratory.

(B) Qualitative measurements at the Research Laboratory to insure that all aspects of the tube are functioning properly - i.e., flat color fields - B to G hue change, transfer characteristics and efficiency.

(C) Quantitative measurements at TVRD of the following:

(1) Color, saturation and hue, transfer characteristics, efficiency, white and grey scale, cross modulation, etc.

(2) Use these data to determine if modifications are needed in the system.

(3) Design modulator to translate R G & B into proper signals for tube.

(D) Make color pictures from scanner signals at R G B and then off the air. Use bright light source and optimum Schlieren system. Evaluate.

Plan Details

(A) Tube to be constructed for Glenn's orthogonal system, i.e., red primary intensity varied by velocity modulation on the horizontal sweep, and the blue-green variable primary hue selected by beam splitting in the vertical; blue-green intensity modulated by HF spot wobbulation in the vertical direction.

(B) Qualitative measurements to be made in the Research Laboratory.

After determining that the spot size and splitting characteristics are suitable, the following measurements should be made:

(1) Color: - Blue to Green flat fields using varuable DC on the beam splitter. Hue change to be determined visually using small screen and single slit optics with filter or dichroic mirror. Saturation to be judged visually. Red flat field by using 10 mc synchronized sine wave for velocity modulation on H deflection plates. Single slit optics with red filter or dichroic mirror. Saturation and hue to be judged visually.

(2) Transfer Characteristics:

Blue-Green amplitude signal vs. brightness. 45 mc signal to be applied to V plates and varied manually. Brightness to be evaluated visually or with a light meter.

Red signal vs. brightness. Both 10 mc and 45 mc signals to be

used to judge the overall effect of the 10 mc velocity modulation and then the effect of the 45 mc wobbulation. Brightness to be evaluated visually or with a light meter.

(3) Efficiency: -

Blue-Green and Red light conversion efficiency measurements can be made with the transfer characteristics set-up by use of a light meter.

Repeat the above measurements using Glenn's one kw Xenon source and multiple slits.

If the above measurements indicate that the system produces the anticipated effects to a degree which shows reasonable promise of making a successful system, then the unit should be transferred to TVRD in Syracuse for quantitative measurements, followed by the design and construction of the auxiliary equipment required to make a color picture both from a scanner at the R G B level and off the air.

If the measurements at the Research Laboratory show inadequate performance, then the responsible areas should be determined and corrected until the performance appears adequate on the qualitative basis.

(C) Quantitative measurements at TVRD.

(1) Blue-Green hue and saturation characteristic (spectroradiometer and single slit optics).

(2) Blue-Green transfer characteristic and efficiency (point by point measurement with light meter).

(3) Red hue and saturation (spectroradiometer and single slit optics).

(4) Red transfer characteristic and efficiency (point by point with light meter).

(5) White field and grey scale (manual control, visual and spectroradiometer).

(6) Cross-modulation between Blue-Green and Red evaluation.

(7) Contrast ratio.

(8) Definition.

If the quantitative measurements at Syracuse show required areas of improvement, these should be ironed out jointly with the Research Laboratory and CRT. A very close working arrangement between TVRD, CRT and RL is anticipated during this entire period.

(D) Color pictures and evaluation.

(1) Color bars (R G B modulator matrix to tube).

(2) Color picture from scanner via R G B matrix.

(3) Color picture from scanner via RF and NTSC demodulator.

(4) Color picture off air (RF, IF and NTSC demodulator).

(5) Evaluate performance by viewing tests.

(6) Evaluate stability factors (vertical sync, HV - sweeps, necessary correction voltages, etc.).

(7) Evaluate lamp, slits and optical requirements.

(8) Establish technical requirements for commercial color TV display.

(9) Arrive at preliminary cost of the above system.

(10) Decide whether to embark on Phase II.

W. E. Good
Advanced Development Engineering
Television Receiver Department

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