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Contract No. W-7405-eng-48

SUMMARY OF RESEARCH PROGRESS MEETING OF SEPTEMBER 27, 1951

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November 14, 1951

Berkeley, California

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I. Color Television Tube Ernest O. Lawrence

Color pictures require three times the definition of black and white; that is, each primary color must have three times the definition. The definition is set by the spot size, hence the spot must be three times as small. Limitations also are set by the image object distance, space charge, etc. The solution therefore is to focus the spot at the screen rather than at the electron gun. The silk screen process is used to deposit quite easily parallel strips 2 mils wide and 2 mils apart of red, green, and blue phosphors on the glass screen of the tube. The order of the color strips are red-red, green, blue-blue, green, red-red, green, etc. One half inch in front of this screen is a very fine wire grid with wires running parallel to the phosphor strips and spaced between each double strip of red and each double strip of blue. After the screen is aluminized a potential difference of 9000 v is applied between the grid and the screen. This then sets up an electrostatic field with curved electric lines of force between each individual wire and the screen. When the electrons come in from the gun with 3000 v they are deflected by these lines of force and, more or less, focused into a mean path between the fields of two adjacent wires through to the screen. See Fig. 1. When the potential between each wire and the screen is equal, the path taken by the electrons is equidistant between the wires and is focused at a green phosphor

strip. By varying the electric fields, or potential difference of alternate wires and the screen, the electron path is then shifted toward the wire with the weaker field and consequently focused at an adjoining phosphor strip of red or of blue, whichever the case may be. Hence, the shift in color is accomplished by rapidly changing the potential of the wires during the time of each scanning of the picture by means of alternating the wire connections of the grid and varying the potential difference of each alternate wire. This shift in color requires only two mils of shift in space, hence there is no serious problem of accurate register. For black and white pictures one needs only to disconnect the grid and to add its voltage to that of the gun, a total of 12000 v.

The optics of the tube are fairly simple. See Figure 2. The tube is easy to build and can be quite easily adapted to the existing types of television. Many applications for color television are possible, especially in the military field; as for example, emphasizing with color a special line or a particular feature of a graph or chart during demonstration, instruction, etc.

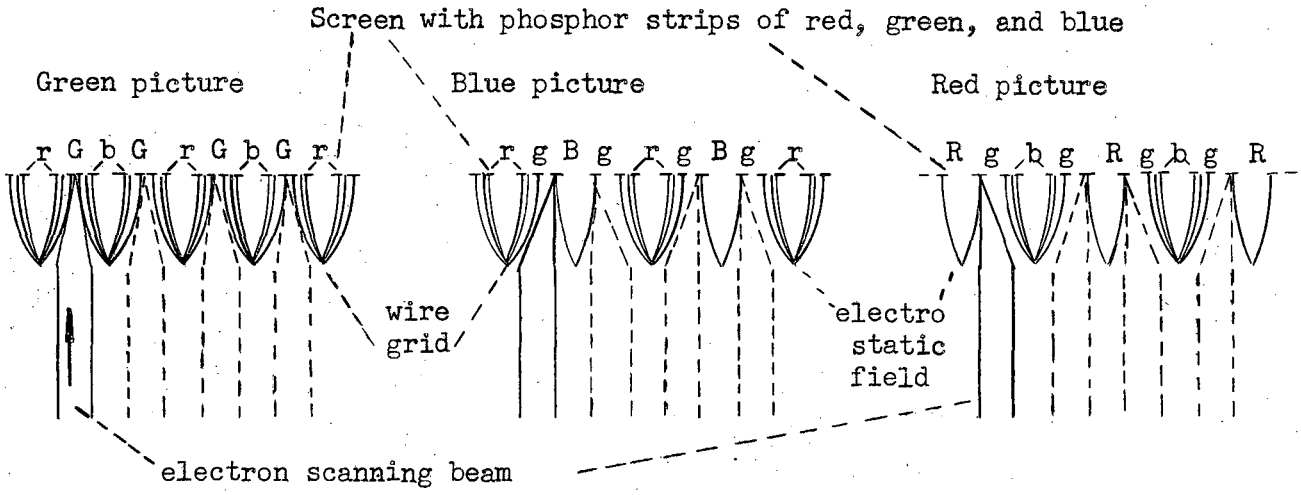
Screen with phosphor strips of red, green, and blue
Green picture
Blue picture
Red picture
r G b G r G b G r
r g B g r g B g r
R g b g R g b g R
wire grid
electro static field
electron scanning beam

Fig. 1

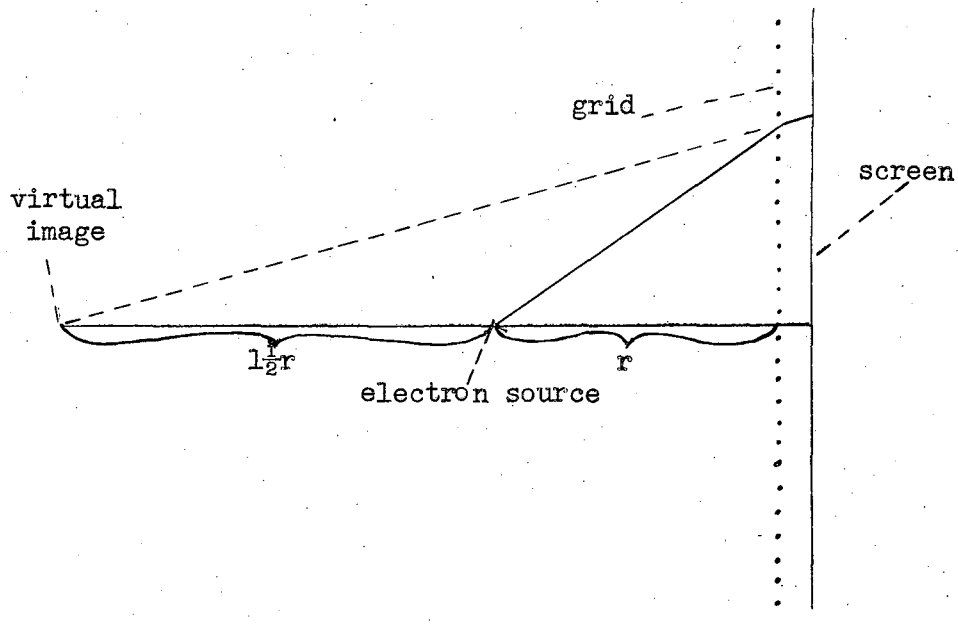
grid
screen
virtual image
1½r
r
electron source

Fig. 2

II. Report on the International Conference on Nuclear Physics at Chicago.

R. Jastrow.

There were about eight sessions on various nuclear topics as nuclear forces, photonuclear effects, neutron cross sections, mesons, etc. Fermi led off the first session on fundamental particles of which he listed 21 and among which conspicuous by its absence was the neutrino. He apparently believed in the latent hypothesis of the California Institute of Technology on V particles, where supposedly the decay particles consist of a nucleon and two π's. Too, there being only two charges one is able to see only two particles of the three as either π^- and $\pi+$ or π^- and p^+. This would account for the 2 types of V particles observed.

Luis Alvarez gave a report on recent work in nuclear physics at UCRL. Then Anderson presented his report on π^+ and π^- scattering cross sections measured at Chicago. He found that at 66 Mev the $\pi+$ cross section was 37 ± 8 mb, about three times that for π^- cross section. At about 66 Mev Anderson also found the differnece for scattering from $D_2O - H_2O$ for π^+ as $1 = 8$ for π^- as -3 ± 15.

Marshak reported on an experiment by Wilson and Perry on the amount of meson charge exchange scattering; as $\pi\pm + \ Be^9 \rightarrow \pi^0 + \ B^9$. There is an upper limit of 2 mb for charge exchange scattering of mesons. This experiment was done at 25 Mev, an energy at which the total scattering is probably of the order of a few millibarns.

Segrè reported on p,p and n,p scattering work at Berkeley. The English, Bickavance and Cassels, report a higher value of 4.8 ± 0.3 mb at angles of 90° to 35° and at 146 Mev. Their angular distribution shows quite a flat curve from 90° to 35° but at 25° it rises up to 5.5 mb.

Harwell also found some values similar to those from Berkeley for

the neutron cross section; e.g. especially Pb up to 90 or 100 Mev. However, beyond this energy level the Harwell cross section curve levelled off more gradually than the Berkeley curve. This was explained on the basis of hardening of the beam here in the transition region equivalent to 20 Mev. See Figure 3.

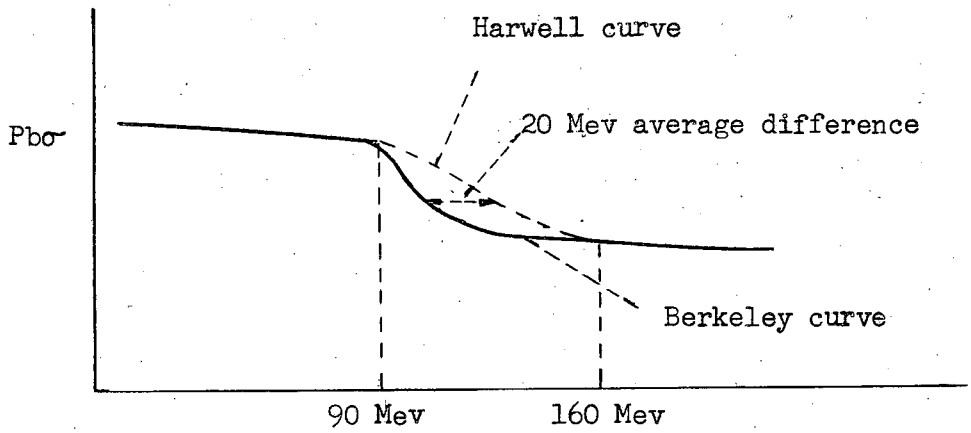

Fig. 3

Gamov, on cosmogony, gave a report about calculations on the abundance of the elements in the universe. Brown reported on geological estimates of the earth's age. Uncertainties arise from the difficulty in determining the percentage of that part of the Pb in the earth's crust which came originally from the center of the earth through volcanic action, earthquakes, etc. Hence, the measured Pb - U ratios may be altered by the fact that all the elements on the earth's crust are not of the same age. The deduction that uranium exists only in the earth's crust stems from the fact that ferric meteorites, presumably coming from the inner portions of spheres, do not contain uranium; whereas stoney ones, presumably coming from the surface, do. Also, the fact that the temperature in a mine does not get as hot when one goes down as expected from uniform uranium content, which tends to prove the absence of uranium toward the center of the earth. This uncertainty permits one only to

say that between two and ten billion years may be the possible estimates for the age of the earth. [Macmillan, Alvarez]

Salpeter reported on the relative importance of the proton cycle versus the carbon-nitrogen cycle in energy release of the stars. It was found that the proton cycle dominates when the hydrogen content is over 90%, and, is about the same when 50%. This condition of 90% hydrogen content is true in the surface layers of the sun, although as for its interior there is no way of telling.