

ELECTROSTATIC PHOTOGRAPHY AS A MEANS TO OBTAIN
MAGNETIC RECORDS OF SPARK CHAMBER PICTURES

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(presented by J.P. Stroot)

Electrostatic photography is proposed as a method for fast processing of spark chamber pictures. The eventual use of magnetic powder for the development should provide a means for fast access to the actual information contained in the photographed events.

Electrostatic photography^{*)} is also known under the trade name of xerography. It is a process based on the production of a latent electrostatic image by light falling on a uniformly pre-charged conductor layer (usually amorphous selenium). Development to yield a visible image is done by projection of charged powder particles on the electrostatic image. The powder image can be transferred from the photoconductor surface to another surface like paper and fixed by various methods, one of them being the heat treatment of thermoplastic material associated with the powder. By a proper choice of the sign of charge carried over by the powder, either positive or negative image is obtained.

Nothing should prevent the use of magnetic but highly insulating powder as a developing agent. After having passed through a magnetizing stage, the pictures would appear as a series of black spots and stripes which can be detected by a magnetic tape reader.

The advantages of the xerographic method are :

- a) the suppression of the servitudes of film and delayed processing;
- b) it nevertheless gives a permanent record on a cheap substrate. Light density is also reproduced. Resolution is a question of powder particles' size; apparently it does not depend on the photoconductor.

*) See, for example, C.J. Claus, "Advance in Xerography 1959-62", Photogr. Sci. Eng. 7, 5 (1963).

- c) The photo-sensitive layer is not consumable, it can eventually be deposited on a continuously running belt.
- d) Associated with magnetic powder, xerography gives a means to use magnetic analysis. The photos can be scanned line by line being passed in front of fixed multiple magnetic heads. A suitably chosen combination of these can readily give orthogonal co-ordinates that are sent to a computer on-line or stored on magnetic tape. On-line analysis is possible. The speed of processing can at least be 20 cm/sec. A picture can be taken at every PS pulse. For simple events, decoding of multi-triggered pictures during one accelerator burst could be envisaged.

The main questions are :

- a) the actual possibility of using magnetic powders in xerography;
- b) the sensitivity of xerographic layers.

Contacts have recently been made with the experts from the Rank Xerox company. No definite answer has been obtained yet, but the first comments are encouraging. Sensitivity is about 10-20 ASA. If, as we expect for a photoelectric process, no reduction of sensitivity occurs in connection with the very short duration of the spark, it should be sufficient for our purpose.

If it works, this method would satisfy the requirements of fast scanning and continuous real time control of an experiment and yet present the advantages of visualisation and permanent record of film spark chambers.

DISCUSSION

ANDERSON: I didn't quite understand how much of this is still conjecture and how much has been done by way of experimental trial.

STROOT: As I told you, this was purely an idea and consideration about its feasibility. This is conjecture but we thought that as this was an informal meeting on film-less spark chambers, it would be the right time to present it to people and discuss about it.

FESSEL: I simply want to point out that there is commercially available, at least in America, apparatus to read such photographs. It is the same apparatus that is used to read magnetic numbers on bank cheques.

STROOT: Yes, as a matter of fact, this induced us to develop the proposed system to allow direct analysis.

ZACHAROV: Since the vidicon system also uses a photoconductive layer for storing the visual image as a charge pattern and since with this signal essentially you can do more conveniently anything that you claim you do with xerography, you can certainly store all the images as a permanent record on a magnetic tape and you can process the information much more readily. I am not clear what specific advantages you claim xerography will have over using a signal generating device.

STROOT: Well I am glad to hear that vidicon systems are so much more convenient then, we will see.

WISKOTT: Will you state more clearly the advantages of the xerographic system over the vidicon system? Could you say also something about the comparison between film and the xerographic paper? I have the idea that xerographic paper is much less easy to store and to handle than 35 mm perforated film.

STROOT: No that is not true because, as you have heard, the resolution which you can have with xerography is quite high and you can certainly have a substantial reduction in size. It is certainly not a definite point but with xerography you have, as we said, this easy access fast processing and then you have the permanent record, that is what I said to Zacharov.

ROBERTS: The difference between film and xerography seems to me might give a closer approach to on-line operation.

PIZER: Accepting the fact that you use xerography where do you see the particular advantage in the magnetic pick-up over an optical pick-up? After all, one could use many photo diodes or many magnetic heads. Why do you particularly want to use a magnetic pick-up?

STROOT: We can see advantages in using the magnetic recording heads. In fact you just move some sheets of paper in front of a fixed analysing head and this is certainly easy to do. You do not have the problem of a flying spot, etc., which is certainly very interesting, but we wanted to try this method.

PIZER: But you could have photo diodes.

STROOT: Yes you can have many things. This is just a proposal.

CHARPAK: To answer Zacharov's question about what would be the relative advantage over vidicon systems, I think one should say the following: in this method, if it is going to work and if it is feasible, you have the information in a visible form, it seems that storing the thing on magnetic tape is very good, but if you have the picture you can make a prescanning by eye, that is an important feature. This was in fact the main feature that attracted us. With the vidicon method you do not keep permanently a picture of the event, while here with xerography all your events are printed. It seems that in some cases it is a great advantage.

STROOT: May I repeat exactly what I said in my conclusion ? This method, if it works, can provide fast access. One has on-line control of one's experiment and keeps the advantage of classical film spark chambers which is visualization and a permanent record.

ROBERTS: Opinions on this are not likely to be swayed by argument so let us not make the discussion much longer.

ZACHAROV: I would just like to point out that any signal generating device can first of all be used to store the information permanently on magnetic tape or directly in the computer if you like. At the same time it can be used to regenerate the display to be used for scanning.