# TECH NEWS

by Rodger J. Ross

# A NEW METHOD FOR RECORDING TELEVISION PROGRAMS ON BLACK AND WHITE FILM

One of the most important advantages of videotape, we are told, is that it can be erased and reused many times. It turns out in practice that there is a considerable reluctance to erase original recordings of television programs, and in many broadcasting stations, huge videotape collections have accumulated. The big reels of 2-in. videotape take up a great deal of storage space, and the value of the tape itself in storage can easily add up to hundreds of thousands of dollars.

At Nippon EVR Ltd. in Hiroshima, Japan, the possibilities for storing color television programs on black-and-white film, using the elctronic video recording (EVR) process have been investigated. A paper in the January 1978 issue of SMPTE Journal gives a detailed account of the work that has been done there.

The EVR process, developed by Dr. Peter Goldmark at CBS Laboratories, Stanford, Conn., was announced in 1970, with much fanfare, as the answer to the economical mass production of prerecorded programs for playback into television receivers. It was said at the time to be truly a visual counterpart of the long-playing phonograph record. Plagued by technical problems, EVR was abandoned two or three years later, but now the process is being revived in Japan for a different purpose – the permanent preservation of color television programs, as an alternative to the storage of videotape recordings.

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The EVR process was described by Dr. Goldmark in a paper in the August 1970 issue of SMPTE Journal. The recorded programs were stored on a special photographic base 8.75 mm. wide, in cartridges 7 ins. in diameter and half an inch thick, with a running time of 25 mins. in an optical/electronic player giving an RF signal output. The intention was to mass-produce the cartridges from film masters made in an electron beam recorder at a central processing station. Each frame in the film consisted of two separate images, side by side across the width, one half being a black-and-white picture representing the luminance portion of the video signal, while the other half of the frame contained the color information in non-recognizable coded form.

In the more recent paper from Nippon EVR Ltd. the authors assess the various methods that have been used to record television programs.

Two-inch videotape has the advantage that the color signals are recorded with high fidelity and color films can be transferred easily to the tape through a telecine machine. But videotape is bulky in storage and access is not easy.

Color motion picture film has the advantage that many original programs are in this internationally compatible form, but the transfer of color television signals from videotape to film at high fidelity is difficult and costly.

At one time kinescope recording was used extensively in television production centres, but adequate resolution, tonal scale and signal-to-noise ratio were difficult to maintain, due both to the color film itself and the transfer process. Besides, there is the inherent problem with color film that it tends to fade and deteriorate in storage.

The Image Transform system, in which the R, G and B signals are recorded on three black-and-white films is also mentioned in the paper. This method gives permanence, but the separation masters are bulky and the process is too expensive for general use.

The EVR process, suitably modified and improved, has been found by Nippon EVR Ltd. to give excellent results. A chart accompanying the paper compares the performance of seven different video recording methods, in nine different parameters. The modified system that has been developed by Nippon EVR Ltd. has been rated "good" in seven respects, and fair in only one. A high fidelity playback system to recover the color video signals at high fidelity still has to be developed.

The material for making the master negative has a silver halide emulsion and an electro-conductive carbon backing. The print film, also with a silver emulsion, has magnetic stripes on both edges, with a row of narrow perforations in the centre of the film between each pair of images, called cync windows. The picture (luminance) half of each frame is 3.125 by 2.335mm. in size, considerably smaller than the picture frames in Super 8 film.

This experimental work showed that the process gives adequate resolution and frequency response for recording and regenerating color television signals without sacrificing signal-to-noise if the EVR player could reproduce the recorded signals on the film. Work is proceeding at NHK Research Laboratories in Tokyo on the design of a laser flying spot scanner for 8.75 mm. black-and-white film, utilizing a He-Ne laser and rotating mirror. That work is also directed towards preserving color television signals on film, but

the system being used is different than EVR. Other investigators in Japan have been testing an EVR player with linear array senors in an optical system, as reported during a national conference of the Institute of Television Engineers in Japan.

In the EVR system the film is driven continuously by a capstan, giving much better wear resistance than conventional intermittent film driving methods. Improvements in EVR players include electronic anti-jitter and anti-weave circuits. Coded images printed on the film enable servo-control mechanisms in the player to reduce vertical jitter to a virtually imperceptible level. Weave caused by errors in film slitting and the player transport mechanism can be eliminated in a similar manner from an anti-weave code printed on the film.

In the early days of television broadcasting, when all programs were in monochrome, millions of feet of black-and-white film were used to make kinescope recordings. In spite of the most strenuous efforts to improve the process, kinescope recording gave results that were far from satisfactory. But it was not until the invention of videotape that an alternative recording method became available. The improvement was so great that the playback of even the earliest videotape recordings could scarcely be distinguished from the original television camera pictures. Almost at once, kinescope recording was abandoned.

But then there began to be a demand for copies on film of videotape recordings, and the old kinescope recording process was revived – but now updated to record the pictures on color film. Still the old problems that plagued the black-and-white process from the beginning had not been eliminated. John Lowry, who had worked at CBC in Toronto in various capacities, set out to develop a greatly improved film recording process known as Image Transform. The main purpose was to produce motion pictures of large screen theatrical quality from videotape recordings.

The Image Transfer process has been highly successful for the purpose intended, but it is quite costly, and not readily adaptable for general use as a storage medium for television programs.

Over the years since television broadcasting started, some people in the industry have been insisting that it should be possible to develop a film recording process that would give pictures and sound in playback equal to 2-in. quadruplex videotape recordings. A successful black-and-white film recording process on 8.75mm. film would, at one stroke, release millions of feet of valuable videotape for re-use; provide a universally interchangeable recording medium, and make available a low cost, compact and permanent means for storing television programs.

(John Lowry was awarded the Agfa-Gevaert gold medal at the recent SMPTE technical conference in Los Angeles for significant improvements at the interface between motion picture film and television imaging systems.) □