Comments on Laurence C. Gooddy's "A Time-Weighted Graticule for the 2*T* Sine-Squared Pulse"

By HANS SCHMID

In the above paper published in the *Journal* in June 1976 (pages 397 to 400), L. C. Gooddy proposes that the familiar *K*-factor graticule for the 2*T* pulse shape (K_{2T}) be changed to a *P*-factor graticule. In the conclusion of his paper, Gooddy states that "Using the latest information on time weighting for the 525-line NTSC television system . . . a straight-line graticule for the 2*T* pulse can be defined with dimensions significantly different from the scaled version of the British graticule" and ". . . the departure is significant enough to warrant the consideration of this proposal as a North American standard." Figure 1 shows the two graticules superimposed together with a distorted 2*T* pulse, so that the reader can form an opinion about this proposal. The reader will note that the differences between both graticules are on the order of an oscilloscope trace thickness (noise-free at that). I do not consider these differences significant enough from a practical point of view to warrant the creation of double standards.

Incidentally, the 2*T* pulse shape graticule (whether *P*- or *K*-factor) is unnecessary for overshoots (as seen in Fig. 1) or undershoots, because the respective pulse-to-bar ratios for the 2*T* pulse are more effective. There remains only 2*T* pulse ringing as the reason for the graticule, but a ringing 2*T* pulse indicates a malfunction so severe that it is immaterial whether, for example, the ringing has a *P*-factor of 1.6% or a *K*-factor of 2%. So why have a 2*T* pulse graticule at all?

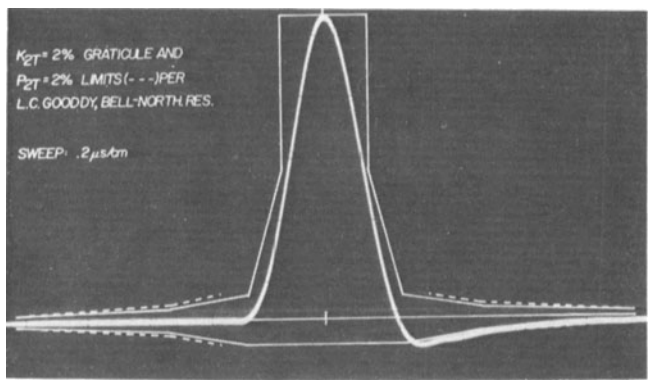

Fig. 1. Comparison of graticules for standard 2*T* *K*-factor and proposed 2*T* *P*-factor.

Letter submitted on 17 February 1977 by Hans Schmid (address given above).

Rebuttal to the Above Letter

By LAURENCE C. GOODDY

The following points are made for the adoption of a *'P'* Graticule and for the use of a 2*T* Pulse, in regard to Mr. Schmid's comments.

Trace Thickness

For a given reference distortion, e.g. 2%, the difference between the *P* and *K* graticules is about 1.4 IRE scale units maximum (i.e. from 6.6 IRE to 8 IRE at the point of maximum difference). This is an increase of 21% in the graticule dimension at a most critical point, a result which is not insignificant. In regard to trace thickness, this involves an error in performance estimation which is statistically based on the graticule dimension. If the graticule dimension is increased by a given amount, the effect of trace thickness will be shifted to the new dimension and statistically the increased tolerance will be realized. Taking Mr. Schmid's argument one step further, it could be argued that a tolerance based on subjective measurements should be increased to account for trace thickness and perhaps even noise. Such arguments are not valid because trace thickness effects on the waveform distortion are taken into consideration when the distortion is evaluated.

Necessity of 2T Pulse Shape Measurements

Mr. Schmid's arguments that ringing preceding or following a 2*T* pulse should not occur are based on the assumption that the circuit which generates such ringing must contain unwanted deviations in gain and delay vs frequency response or even cutoff characteristics below 4.0 MHz. As a broadcaster dealing with circuits with relatively wideband characteristics, this is a valid conclusion. The major portion of video transmission circuits do not, however, exhibit wideband characteristics. Satellite and terrestrial microwave circuits are not unrestricted in bandwidth

Letter submitted on 31 May 1977 by Laurence C. Gooddy, Bell-Northern Research, P.O. Box 3511, Station "C", Ottawa, Canada K1Y 4H7.

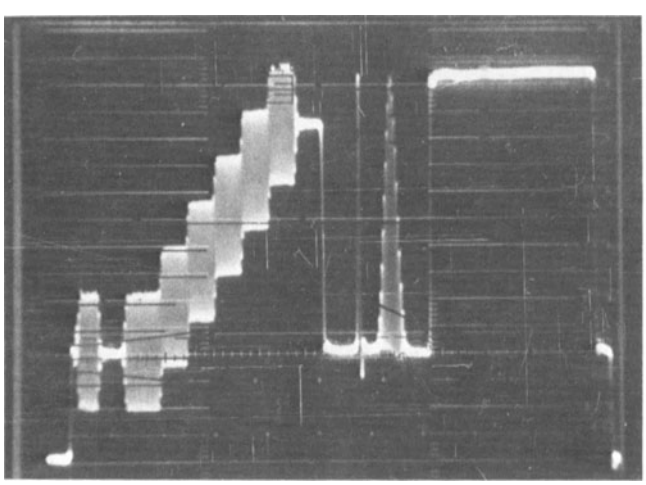

Fig. 1. Composite Signal No. 1, based on original Satellite Technical and Operational Committee — Television (STOC-TV) format according to CCIR provisions. (See C. A. Siocos' paper on STOC-TV Guidelines for Waveform Graticules, *Journal*, Nov. 1976.)

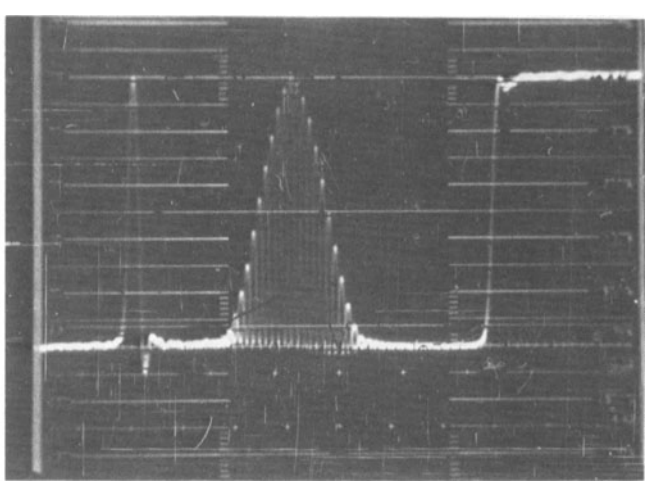

Fig. 2. Time expansion of the three signals of interest (central part of the waveform of Fig. 1), showing 2T pulse, 12½*T* modulated pulse, and leading edge of line bar or *T* step. Note ringing on the trailing edge of the 2*T* pulse and on the leading edge at the top of the *T* step signal.

and often produce gain and delay distortions below and beyond 4.0 MHz. In such cases it is necessary to employ a signal which has limited spectra to ensure that the distortion below 4.0 MHz (i.e. the most critical band for the video signal) meets requirements which are much more stringent than those above 4.0 MHz. The $2T$ pulse in conjunction with the T step accomplishes this requirement very well.

As far as ringing on the $2T$ pulse is concerned, this is quite likely to occur on microwave radio systems as a result of effects other than low-frequency cutoff. For example, in long microwave radio systems, very many echoes are generated in the frequency-modulated path by transmission lines (cable and waveguide). The result of these echoes is a random deviation in pulse skirt response which appears as a distorted ring. The effects of this distortion on signal components below 4.0 MHz must be controlled to relatively small magnitudes. The same effects will appear on the T step but may be augmented by cutoff effects acting on the higher spectral components present in this signal. It is therefore not possible to differentiate, with the T step alone, between the effects of echoes which affect the whole signal spectrum and cutoff effects which affect only the T step. Because such distortions in the lower part of the frequency spectrum are more objectionable than are the high-frequency cutoff effects, they should be controlled more tightly — which means that it is necessary to employ both test signals.

A further argument against the use of a T step alone is illustrated by Mr. Schmid's example regarding the T step graticule. The ultimate size of a T step graticule will be determined by the allowable magnitude of high-frequency distortions which cause ringing or overshoot close to the transition. When considering distortions caused by low-frequency gain and delay deviation (i.e. short-term smearing or exponential overshoots), the allowable magnitudes of the T step are much smaller. There is therefore a basic discrepancy between low-frequency and high-frequency effects in terms of the allowable distortions which prevents the exclusive use of the T step as an indicator of short-time distortion. This fact is well illustrated by Mr. Schmid's example which opposes the argument he presents when circuits with band limitations below 8.0 MHz are considered.

It is also possible that certain forms of distortion are indicated much more readily by the $2T$ pulse than by a T step. Such a case is illustrated in Figs. 1 and 2 showing waveforms for a working television network over a distance of about 2000 miles (3230 km).

Report on the SMPTE Chicago Meeting

30 April 1977

By HOWARD R. HOYT

A day-long program for Chicago SMPTE members was held on 30 April 1977, at the Marriott O'Hare Hotel. Four SMPTE Governors (John Ehrenberg, Chicago; William Smith, Detroit; Frank McGeary, Memphis; and Irwin Young, New York) were among the 172 persons registered for the meeting, as was Ed Blasko, Chicago Section Chairman.

The meeting began with *The Ark,* a film made by Howard Whalen, Film Group I of Michigan, Inc. It is an environmental film which concluded that "the cloud of foul air hanging over us is nothing but human greed."

The opening remarks to the session were made by SMPTE President William Hedden. The first speaker was Edward Wicinski, Calvin Communications, Inc., Kansas City, Mo., on the topic, "16mm vs Super 8 — Victories and Defeats." He discussed the unique characteristics and production requirements of each gauge.

The 21st Olympiad in Montreal made vast use of radio and television services. Marius Morais, Director of Engineering and Technical Services of ORTO, described the complexities of providing the means, facilities, and materials required to cater to the various needs of broadcasters who were covering the 21 Olympic sports in various locations in and around Montreal.

Film examples accompanied Ira Tiffen's presentation of "Creating Special Effects and Visual Styles Through the Use of On-Camera Filters." Mr. Tiffen, Tiffen Manufacturing Corp., Roslyn Heights, N.Y., described the following filters: fog, double fog, diffusion, half diffusion, split field, color gradation, sky control, and variburst.

Submitted on 31 May 1977 by Howard R. Hoyt, 401 W. Webster, Chicago, IL 60614.

Irwin Young, DuArt Film Laboratories, Inc., New York City, answered the question, "How Good is a 35mm Blow-Up From 16mm Type 7247 Color Negative?" He summarized the discussion and film comparisons by suggesting that because of the smaller area of the 16mm format no forced processing or gimmickry is possible and that more talent and care are needed to shoot 16mm than 35mm film.

Howard Shephard, Central Dynamics, Ltd., Montreal, Canada, briefly reviewed the history of videotape switchers and mixers as an introduction to his topic, "Applying the New C. D. 480 Switcher in Video Production and Post Productions." The 480 production switcher incorporates the three switchers (title, chroma key, and background) currently available and allows a greater variety of combinations.

Pete Comandini, Image Transform, Inc., North Hollywood, Calif., described the video processing necessary to remove television defects prior to making good broadcast tapes into acceptable theater film. Technical limitations of the NTSC make it unlikely that television tape will replace film in the near future.

The topic presented by Charles Nairn, Comtech, Detroit, Mich., was "How to Handle Those Curves Hollywood Throws at Us — The Academy Curve from a Contemporary Perspective." The curve he referred to was the audio response curve for sound film. He discussed the criteria for setting up the "Hollywood curve."

Randall Fox, I.R.D. Mechanalysis, Columbus, Oh., described his experience of attempting to produce seven inexpensive industrial training films with the use of super 8 which was then blown up to 16mm. It was concluded that though the cost of super-8 film and equipment is less, the release prints of super 8 cost more and in the end, producing 16mm originally may not be more costly.

Three entertaining short films were shown following lunch: *Solo,* made by Pyramid Films; a BBC spoof, *Spaghetti Tree;* and a comedy entitled, *Krasner Norman: Beloved Husband of Irma.*

The meeting had 22 film industry sponsors who underwrote the cost of the meeting. Their support was a factor in making this an outstanding program.

Irwin Young, Du Art Film Labs, addressing the meeting.