MODIFICATION TO SATELLITE MODULATION

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The NCTA has recently completed extensive testing to determine the worst usable C/I ratio for cable television TVRO receivers. With the modulation techniques used in cable-oriented video services today, the acceptable limits appear to be 18 db. This paper proposes a possible modification to the modulation techniques which may improve the TVRO's tolerance to poor C/I ratios.

Thirty-six thousand (36,000) F9 modulation of microwave satellite carriers indicates the carrier is deviated by a number of things including video sync pulses, wideband video information, any number of subcarriers, and an energy dispersal waveform (EDW). This proposal concerns two of these: video sync pulses and EDW. After de-emphasis, video sync pulses cause approximately 2-3 MHz of deviation. During video, EDW normally causes 0.5 to 1 MHz of deviation.

This recommendation would require that a nationwide and joint-corporate venture of satellite operators and users "genlock" these two signals on all transponders as follows:

1. Each satellite uplink would require a full field frame storer as the last video device before the exciter. This frame storer would be genlocked to a given transponder (on the same satellite and polarity used by that uplink) by use of an additional downlink receiver.

2. One transponder on each polarity of each satellite would be designated as "satellite masters". These masters would be selected by their uplink's ability to receive and genlock to a signal from the transponder designated as an "arc master".

3. Each frame storer's vertical and horizontal phases would need to be adjused so that its downlink video sync would be in-phase with its master's downlink video sync.

4. Next, the 30 Hz dispersal waveforms would be sync'd with the video field.

Syncronizing the deviation of all transponders in this manner would result in fewer cases of two adjacent carriers occupying the same spectral segment simultaneously--a major cause of crosspole interference.

The first sign of crosspole interference is the appearance of sync bars on the screen. Genlocking the video's in this manner would make a given level of crosspole interference much more acceptable since the interfering sync bars would be off the screen and virtually invisible. However, it should be noted that this advantage is only realized if the interference is from the same satellite as the desired signal. Geometry, the velosity of radio waves, and the very short time of a horizontal scan line, make it impossible for satellites in different geometric positions to provide genlocked video to downlinks in different geographic locations on the earth.

However, the energy dispersal waveform is a much lower frequency; therefore, syncronization of adjacent satellites would be realized by downlinks everywhere.

The actual overall improvement of this system would depend on many things, including the receiver I.D. bandwidth and the type of detector used. Manufacturer engineers indicate that their detectors would perform somewhat better if the desired carriers were at the high end of its I.F. spectrum when the interfering carrier appeared at the low end. However, none could be certain to what degree the output would be improved.

Another advantage to the cable industry would be improvement in the intermodulation of their distribution systems. All their videos from a given satellite would be genlocked--something only the richest cablevisions have been able to afford to do themselves.