

March 17, 1994

To other Grand Alliance speakers at NAB:

I am attaching copies of my slides for presentation on Sunday. In addition, I have listed six questions that might be asked relative to formats, and they are attached, along with some possible answers.

I will be staying at the Stardust Hotel, 3000 Las Vegas Blvd., Tel. (702) 732-6111, from Friday evening until Monday morning. I have an 11:25 AM flight time for departure on Monday.

A handwritten signature in black ink, appearing to read "Bob".

Bob Keeler

HDTV Video Formats

Presented by Robert Keeler

March 20, 1994

HDTV FORMATS

- **Baseline formats**
- **Rationale for selected formats**
- **59.94 Hz and 60.0 Hz rates**
- **Migration to progressive-scan 1080-line format**
- **Film modes**
- **Multiple formats in receivers**
- **Summary**

HDTV Formats

- **Two line structures: 720 lines and 1080 lines**
 - **16:9 aspect ratio**
 - **Square pixels**
 - **24 Hz, 30 Hz, 60 Hz frame/field rates**

720-Line Formats

- **720 lines by 1280 pixels per line, active image**
- **Progressive scan for 24 Hz and 30 Hz film modes**
- **Progressive scan for 60 Hz video**

1080-Line Formats

- **1080 lines by 1920 pixels per line, active image**
- **Progressive scan for 24 Hz and 30 Hz film modes**
- **Interlaced scan for 60 Hz field rate**

Grand Alliance Video Scanning Formats

Interface Format Specifications

Active Lines	Active Pels/Line	Total Lines	Total Pels/Line	Pro/Int	Frame Rate (Hz)	Pel Clock (MHz)
720	1280	787.5	1600	1:1	59.94/60.0	75.52/75.60
1080	1920	1125	2200	2:1	29.97/30.0	74.18/74.25

Encoder Format For Transmission

Active Lines	Active Pixels/Line	Rate (Hz)	Pro/Int
720	1280	59.94/60.0	1:1
		23.98/24.0	1:1
		29.97/30.0	1:1
1080	1920	59.94/60.0	2:1
		23.98/24.0	1:1
		29.97/30.0	1:1

Rationale for HDTV Formats

- **Excellent quality for wide range of material**
- **Consistent with 6 MHz broadcast TV channel**
- **Satisfy needs for:**
 - **Broadcast and cable**
 - **Telecommunications**
 - **Computer and multimedia**

Support NTSC-related Frame Rates

- **59.94 Hz, as well as 60.0 Hz**
- **23.98 Hz as well as 24.0 Hz**
- **29.97 Hz as well as 30.0 Hz**

1080-Line Progressive Format

- **Not currently feasible at 60 Hz frame rate**
 - **Compression limit within 6 MHz channel**

- **Migration based on enhancement of original formats**
 - **Assures Compatibility**
 - **Pre-migration receivers ignore enhancements**

Film Modes - 24 Hz and 30 Hz

- **Film an important source for HDTV**
- **Film capture intrinsically representable in progressive scan formats**
- **Film modes (24 Hz and 30 Hz) have pixel rates that are 40% and 50% respectively of the 60 Hz frame rate progressive scan image sequences**
- **Virtually artifact-free compression and decompression of film material**
- **Modes will be automatically identified within production environment and at receivers**

Multiple-Format Receivers

- **Processing sized for maximum size and maximum rate formats**
- **Assume all received formats converted to single "native" display format**
 - **Unlikely to use "multi-sync" displays for consumer television**

Format Summary

- **Small set of formats addresses needs of HDTV users**
- **Superb pictures at HDTV viewing distance**
- **Ample scope for service providers to select formats matched to applications**