

NOV 30 '88 16:58 MOFFET, LARSON &amp; JOHNSON, INC.

P.15

## ENGINEERING REPORT

## MOFFET, LARSON &amp; JOHNSON, INC.

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FALLS CHURCH, VA. 2204

ENGINEERING REPORT  
ON BEHALF OF  
TELE-COMMUNICATIONS, INC.

5) Proposed enhancements to the present 6 MHz NTSC system appear to provide features and quality which rival more bandwidth-intensive HDTV approaches. A properly-designed NTSC enhancement (EDTV) system should satisfy a substantial portion of the television viewing audience, stimulate purchase of EDTV software products and supporting consumer equipment, and provide valuable time to optimize digital HDTV (D-HDTV) as the next-generation video standard.

The Advisory Committee suggests that the ultimate quality for HDTV is

"an electronic image with a picture quality equivalent to 35mm film."<sup>14</sup>

The Committee goes on to state that

"...efforts should be focused on establishing, at least ultimately, an HDTV standard for terrestrial broadcasting", and "It seems likely that viewers will eventually demand this level of reception quality and that non-broadcast media will offer it".<sup>15</sup>

The Advisory Committee recognize that there are a number of proposed systems which provide substantial improvements to the present NTSC system, referred to as "Enhanced Definition Television (EDTV)". Noting that the ultimate test of the demand for HDTV will be determined in the marketplace, the Committee adds

"...one cannot foreclose the possibility that, as EDTV evolves toward HDTV, it may offer such significantly improved picture and audio quality that it will be accepted by the public as a competitive alternative to HDTV."

This, indeed, is the point of the several companies that are proposing enhancements to the NTSC system. Appendix A lists the known proponents of enhanced NTSC, along with the features or performance claimed for their system.

<sup>14</sup> Interim Report of the FCC Advisory Committee On Advance Television Service, R. E. Wiley, Chmn., June 16, 1988, pg. 5.

<sup>15</sup> Ibid., pg. 6.

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A study<sup>16</sup> comparing the public's perception of various video systems shows that substantial visual improvements can be made to NTSC television. In terms of "just noticeable differences" (JNDs), the number of picture defects noticed in comparison with a "perfect" image dropped from 110 JNDs for "NTSC Today" to 50 JNDs for "Full NTSC". This shows an improvement of more than two-to-one in picture defects if all of the picture resolution in NTSC was available. By comparison, the European MAC systems JNDs ranging from 40 down to 20, but require luminance bandwidths from 5.5 MHz to 11.5 MHz, respectively, compared to NTSC's 4 MHz luminance bandwidth. Various EDTV systems, discussed elsewhere herein, promise further improvements in perceived picture quality while maintaining NTSC receiver compatibility and the 6 MHz channel structure.

An EDTV system, once chosen, can be quickly implemented and can attain penetration into the market more quickly than an augmented HDTV system since EDTV requires no spectrum reallocation and is compatible with existing domestic NTSC receivers. The cost to implement EDTV transmission is lower in both production and transmission stages, furthering its adoption by program producers and broadcasters.

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16 Curtis R. Carlson and James R. Bergen, "Perception Considerations for High-Definition Television Systems", SMPTE Journal, December 1984, pp. 1121-1126.

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6) Video display devices, i.e., TV receivers, can be equipped at minimal cost with standard input/output ports to permit high-quality interconnection with RF tuners, VCRs, cable tuner/decoders. Such an interface will help avoid obsolescence of all parts of the consumer video system, especially the expensive large-screen displays. The study and consideration of this interface standard should be considered part of the overall ATIS proceeding.

The development OF ATV services and programming could be helpful by the adoption of an equipment interconnection standard. Such a standard, such as RGB or Y/C (luminance/chrominance channel) interconnection, can be established independent of the transmission or storage format.

A consumer video display system could be provided with a baseband input port that will accept video signals from a broadcast tuner, cable, DBS, VCR, video disc, etc., without excessive cost or retarding the development of ATV. This interoperability would be valuable to consumers, who purchase new video equipment one step at a time. It is unreasonable to introduce a ATV receiver that cannot use the consumer's other equipment to maximum advantage (such as the "Super-VHS" VCR format).

The Advisory Committee supports this position, noting:

"...the Committee believes that expeditious consideration should be given to the achievement of effective and inexpensive ATV interfaces between broadcast and non-broadcast media."<sup>17</sup>

Such interconnection standards already exist. Some new products have Y/C input and output ports, overcoming problems the "composite" NTSC system, but still compatible with NTSC. The Electronic Industries Association is working toward a universal standard referred to as "Multiport"<sup>18</sup>, and the European Economic Community has a "SCART" connector similar in function to the EIA Multiport to handle conventional and HDTV signals.

As part of this Proceeding, the Commission should require that all future HDTV devices (receivers) sold in the United States should have an input port that would allow the device to display programming available from any media.

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<sup>17</sup> Ibid, pg. 9.

<sup>18</sup> EIA "IS-15 Multiport Standard", minutes of a meeting by the Television Receiver Committee (R-4), Audio/Video Baseband Interface Working Group, February 17, 1988.

NOV 30 '88 17:07 MOFFET, LARSON & JOHNSON, INC.

P.1

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**CONCLUSION**

An Advanced Television System for the United States would be best served at present by a standard that enhances the present NTSC system. Prototype systems have been developed which show considerable improvements in picture quality, widened aspect ratio or other benefits. Adoption of such an enhancement system to NTSC represents the best combination of quality improvement and cost for consumers, program producers, and broadcasters alike.

A compatible enhancement system (EDTV) would serve as a welcome improvement to the television industry. Looking toward the future, it is highly likely that digital high-definition television will develop, higher in quality than any of the proposed systems now under consideration and that a broadcast transmission standard for digital high definition TV should be actively supported. EDTV would serve as a highly satisfactory interim broadcast standard until the advent of a truly optimum system.

  
Charles G. Perry III

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The following table sets forth a brief description of known single-channel, 6 MHz, NTSC receiver-compatible systems providing enhanced-definition television (EDTV). These systems have the capability of providing wider aspect ratio, increased resolution, or reduced picture artifacts, or a combination of these and other features. This table is not intended to be a comprehensive list of all proposed systems, but an example of EDTV development.

6 MHz, NTSC-Compatible EDTV SystemsBroadcast TV Assoc. of Japan - "EDTV-1"

Aspect Ratio:	4:3
Scanning Lines:	525
Scanning Technique:	progressive scanning and conversion to interlace scanning for transmission
Field Frequency:	60 (59.94/s)
Audio System:	FM (standard NTSC)
Stage of Development:	experimental transmissions with prototypes

Del-Rey Group System - "HD-NTSC"

Aspect Ratio:	14:9
Scanning Lines:	828
Scanning Technique:	2:1 interlace, pseudo-progressive scanning
Field Frequency:	60 (59.94/s)
Audio System:	digital sound
Stage of Development:	successful computer simulation

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APPENDIX A (Continued)

6 MHz, NTSC-Compatible EDTV Systems

Faroudja Labs System - "SuperNTSC"

Aspect Ratio:	4:3
Scanning Lines:	1050 (transcoding to 525)
Scanning Technique:	2:1 interlace
Field Frequency:	60 (59.94/s)
Audio System:	digital sound
Stage of Development:	successful public demonstration of prototype systems

Japan Broadcasting Corp. - "MUSE-6"

Aspect Ratio:	16:9
Scanning Lines:	525
Scanning Technique:	2:1 interlace, pseudo-progressive scanning
Field Frequency:	60 (59.94/s)
Audio System:	NA
Stage of Development:	prototype testing in real time

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APPENDIX A (Continued)

6 MHz, NTSC-Compatible EDTV Systems

Production Service Inc. - "Genesys"

Aspect Ratio:	not specified
Scanning Lines:	1125
Scanning Technique:	not specified (proposes a conventional NTSC signal and 1,125/60 within same 6 MHz channel)
Field Frequency:	60 (59.94/s)
Audio System:	digital sound
Stage of Development:	public demonstration of portion of system

Matsushita System

Aspect Ratio:	4:3 or 16:9, depending on whether on not luminance bandwidth is improved
Scanning Lines:	525
Scanning Technique:	2:1 interlace
Field Frequency:	60 (59.94/s)
Audio System:	FM (conventional NTSC system)
Stage of Development:	computer simulations of moving images

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## APPENDIX A (Continued)

### 6 MHz, NTSC-Compatible EDTV Systems

#### RCA/NBC/Sarnoff Labs System - "ACTV-E"

Aspect Ratio:	5:3
Scanning Lines:	525 or 1050, depending on whether progressive scanning or interlace mode
Scanning Technique:	2:1 interlace for 1050 lines 1:1 progressive for 525 lines
Field Frequency:	60 (59.94/s)
Audio System:	digital sound
Stage of Development:	successful computer simulation; prototype hardware under development

**ATTACHMENT 2**

# *Super*NTSC™

## **Advanced Television Demonstration**

**Telecommunications and Finance Subcommittee  
United States House of Representatives  
Washington, D.C.**

**September 8, 1988**

**Faroudja Laboratories Inc.  
946 Benicia Avenue  
Sunnyvale, California 94086  
Telephone (408) 245-1492  
Facsimile (408) 245-3363**

# ***SuperNTSC***™

A Television Transmission and Reception System  
By Faroudja Laboratories, Inc.

- Provides 35mm Image Quality To The Viewer
- 1050 Lines – Renders Scanning Lines Invisible To The Viewer
- Eliminates NTSC Artifacts Such As Rainbow Patterns Or Wiggling And Crawling Movements
- Standalone ***SuperNTSC***™ Products Are Already Being Used In Existing Broadcast Facilities
- Prototype Now Available For Cable TV Field Test Prior To Final Product Development

# *SuperNTSC*™ BENEFITS

- **HIGH DEFINITION VIDEO**

35mm Picture Quality

- **FULL COMPATIBILITY**

Operates within all current broadcasting and cable television transmission systems in the USA and in over 30 NTSC countries in North America, Asia and Latin America.

(230 million TV sets. . .

60% of world units)

- **NO SPECTRUM WASTE**

Uses only a single 6 MHz transmission bandwidth with no separate augmentation channels required, as compared to several other systems being proposed.

- **NON-DISRUPTIVE HDTV INTRODUCTION**

Will improve reception of all regular TV sets. The consumer has the option of buying a regular set or a *SuperNTSC*™ set for dramatic improvement.

# ACKNOWLEDGMENTS

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**DISNEY STUDIOS**

**DOLBY LABORATORIES, INC.**

**LUCASFILM**

**MODERN VIDEO FILM**

**PARAMOUNT PICTURES**

**TWENTIETH CENTURY FOX**

**WARNER BROTHERS STUDIO**

**KRON-TV**

– Yves Faroudja