foreign competitors because of the size and wealth of the United States (and other English-speaking) markets.[6/] The larger potential revenues for video entertainment products in the United States mean that more creative inputs and larger budgets are devoted to United States-produced motion pictures and television programs. There are two reasons for this. First, increasing the quality of a motion picture or television program by increasing the amount spent to produce it tends to increase the demand for and hence the expected revenues from the production. The reason that popular Hollywood films have big budgets is that more expensive productions tend, on average, to be more attractive to audiences. That is, there is a positive expected relationship between the dollars spent on a program and the revenues to be derived from that program, irrespective of the size of the total market. The second basis for the American advantage in world video markets is the size and wealth of the world-wide English-speaking audience. The larger the potential market or revenues, the greater is the incentive for competitive producers to

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6/ See The Emperor's New Imperialism, The Economist (Dec. 20, 1986) at 14.

increase their investment in their programs in order to try to capture a greater share of those larger expected revenues.[7/]

American video products have larger budgets, and hence higher quality, and this contributes significantly to their dominance in the world trade in motion pictures and television programs.[8/] On the other hand, all other things equal, viewers have a natural preference to view video entertainment products in their native languages. American motion pictures and television programs are able to overcome this language barrier in foreign countries in part because of their larger budgets, which tend to give American motion pictures and television programs greater audience appeal.[9/]

7/ S. Wildman, ATV Standards and Trade in Recorded Video Entertainment, Airlie House, Airlie, VA (October 1986)These results are also derived in S. Wildman and S. Siwek, International Trade in Films and Television Programs, Appendix B (1988).

8/ See Id., Chapters 2, 3 for data showing U.S. dominance of trade in motion pictures and television programs.

9/ Data reported in Wildman and Siwek indicate average budgets for U.S.-made motion pictures were four to five times greater than average budgets of other major film-producing countries. Similar results for television programs are reported in Waterman, World

(Continued on Page 8)

A numerical example can help to illustrate the economic foundation of United States dominance of world trade in video entertainment products. Imagine that there are two countries, A and B. Country A has a population of one million; Country B has a population of ten million. The price of a theater ticket is the same $1 in each country. A very popular entertainment product in Country A, one that <u>everyone</u> in the country paid to see, could not have a budget over $1 million, because that is the limit of the available revenues. But comparably popular entertainment product in Country B could have a much larger budget (in this example, $10 million), simply because there are more people to see it and pay for it. Now suppose Country A and Country B are competing with each other in world markets for these products. Country B will generally have an advantage because its big budget products will tend to be more attractive to audiences in Country C, D and E than Country B's products. These effects do not depend on either country having a monopolist film producer, because

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9/ (Continued from Page 7)
<u>Television Trade: The Economic Effects of Privatization and New Technologies</u>, Telecommunications Policy (June 1988) at 141.

the benefits of a larger audience are felt even with a competitive industry.

The substantial foreign revenues earned by American motion pictures and television programs in turn have feedback effects on their quality. For example, foreign revenues for television programs accounted for $1.3 billion or 22% of the nearly $6 billion spent on United States-produced programs in 1988.[10/] Because United States television producers can anticipate receiving substantial foreign revenues from successful productions, they can invest more dollars in order to increase the audience appeal of their productions. United States viewers benefit from this competition because the budgets and quality of United States television programs are increased as a result. Indeed, because of the potential for foreign revenues, many productions are initially produced at a deficit in the United States market, a deficit which is recovered from foreign sales. American viewers benefit because the production values of the motion pictures and television programs they see are greater than they would be if producers' budgets were limited to domestic revenues.

10/ Television/Radio Age, 26 (Oct. 3, 1988).

If United States producers were denied or hampered in their ability to compete for these foreign revenues, the average quality of United States television programs would decline and marginal programs may be lost altogether, reducing the quality and diversity of United States-produced video entertainment products.

Potential Effects of HDTV Standards on Trade in Video Entertainment Products

The way in which HDTV standards are adopted throughout the world can adversely affect international trade in television programs and motion pictures.

With the advent of HDTV, the uniformity of electronic production standards becomes more important. To understand the potential problem, it is important to distinguish between production standards and transmission standards. HDTV production standards establish how and with what equipment HDTV programs are produced. HDTV transmission standards, on the other hand, determine the method by which HDTV programs are transmitted and received by viewers. HDTV transmission standards affect the design of television transmitters, cable, fiber optical equipment, VCRs and television sets. The two types of standards are related, as discussed below, in the sense that a particular

production format must be convertible to a particular transmission format. Currently, most United States exports of motion pictures and television programs are produced using 35mm film.[11/] It has become relatively easy and inexpensive to convert 35mm film to any existing conventional transmission standard for television broadcast, whether to the United States standard (called "NTSC") or to the various European standards (PAL or SECAM). Because 35mm film is the de facto world-wide production standard today, the existence of different electronic transmission standards worldwide has not seriously hindered trade in motion pictures and television programs.

The Development of Electronic Production Standards for Motion Pictures and Television Programs

The United States 1125/60 SMPTE 240M production

11/ Motion picture production may be impacted by HDTV because cost or other considerations may begin to change the medium in which films are made, with electronic cinematography becoming a viable option to 35mm film making. See Variety, 95 (Oct. 5, 1988). Currently 80-85% of all prime time programs are produced in 35mm film. See Television--The Challenge of the Future, Address by Joseph A. Flaherty to SMPTE Winter Conference (Feb. 7, 1987) at 4.

standard was approved in 1987 by the Society of Motion Picture and Television Engineers (SMPTE) and the Advanced Television Systems Committee (ATSC) after four years of study, analysis and modification. Several reasons led to their approval of the 1125/60 system as an American standard: First, its quality. The 1125/60 production system offered higher resolution, better color rendition, wider aspect ratio and stereophonic sound; in toto, the system produced pictures with over 1000 active scanning lines and a picture quality equivalent to 35mm film. The quality of the 1125/60 system made electronic cinematography a realistic alternative to 35mm film for movie makers. Second, its utility and efficiency. The 1125/60 production system is supported by a wide range of production equipment, including cameras and tape conversion and editing equipment. Utilizing this equipment may lead to significant economies in the production of movies and television. It has been estimated that producing a one hour television drama in HDTV can reduce production costs by 15% compared to 35mm film.[12/] Animation, computer

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12/ In Search For Visual Perfection, Budget Referees HD vs. Film Fight, Variety (Oct. 5, 1988) at 95. See also
(Continued on Page 13)

graphics, and many special effects are easier or in some cases only possible with HDTV video production.[13/] Lower cost HDTV production would be useful even without HDTV distribution because HDTV-produced programs can be converted easily to 35mm film for theatrical exhibition[14/] as well as to existing conventional (NTSC) videotape for television transmission.[15/] Thus, there has been considerable impetus to move to HDTV production even before HDTV distribution to viewers is possible. And third, its potential for world-wide usage. The 1125/60 production system is capable of down-conversion to all

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12/ (Continued from Page 12)
R. Stow, The Economics of High Definition Television Production, (Mar. 9, 1987).

13/ R. Stow, HDTV--Making It Happen, Paper delivered at Probe Research Inc. HDTV Symposium (Nov. 16, 1988) at 7.

14/ M. Sugimoto, The Technical Characteristics of HDTV, (Dec. 1986) at 3.

15/ J. Rossi, and R. McMann, The 1125 HDTV Production System and Its Relationship to NTSC and HDTV Broadcast Systems, (Jan. 13, 1988) at 3. In fact, conversion of HDTV programs produced with an 1125/60 production system for broadcast on conventional (NTSC) American television results in a higher quality product than if the program had been produced instead with 35mm film and converted to NTSC. See Stow, supra n.13 at 4. In addition, the cost of this conversion is low.

existing transmission systems (NTSC and PAL/Secam). In light of its quality and utility and the benefits of low-cost, flexible program interchange, there has been great expectation that the 1125/60 production standard might find world-wide acceptance.

A significant problem would occur, however, if different HDTV standards were adopted by our trading partners. As noted, United States standards organizations have adopted an 1125/60 production standard, and the United States government has proposed the 1125/60 standard as a world-wide production standard. So have Japan and Canada. Europe is considering the so-called "Eureka" 1250/50 HDTV standard. Program material produced with equipment built to the U.S. 1125/60 standard is not easily convertible to use on equipment built to the 1250/50 standard. Indeed, no one has yet attempted such conversions in either direction.

As noted above, the 1125/60 production standard was developed in part to facilitate conversion from HDTV to conventional transmission standards, but convertibility from a 60Hz HDTV standard to a 50Hz HDTV standard has not been proven practicable. That is, one can easily down-convert from 1125/60 to virtually any transmission standard, but not sideways, from one HDTV production standard to another. Based on the experience in converting

videotape from one conventional broadcast television standard to another, it is widely believed that converting HDTV programs from one production standard to another is likely to be very costly and to result in a degradation of picture quality.[16/]

If United States and European HDTV standards are not convertible, or convertible only at substantial cost or loss of quality, there could be serious repercussions for the United States video entertainment industry. In that event, the absence of a single world-wide HDTV production standard would reduce the level of foreign revenues that United States-produced motion pictures and television programs earn. The result will be a needless loss of trade opportunities. Equally serious will be the deterioration in the quality and diversity of programs viewed by United

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16/ See High-Definition Television, Memorandum of the Public Broadcasting Corporations of the Federal Republic of Germany, (Jan. 13, 1988) at 8, 9. See also HDTV to HDTV Standards Conversion: A Prime Motive for a Single Production Standard, Sony Corp. of America HDTV Production Series No. 5 (Apr. 1988); Interview with H. Yushkiavitshus, Soviet Vice Chairman of Radio & Television, HDTV Newsletter (November/December 1988) ("I think this time [the problem of different national standards] is even worse because transcoding from one system to another system in high definition is expensive and you are losing quality.")

States consumers as budgets of United States productions are reduced because of the diminished ability of United States producers to obtain foreign revenues.

Conflicting HDTV production standards could thus raise the costs to United States producers competing abroad and impair the quality of their productions in foreign markets, thereby creating a non-tariff trade barrier. This is analogous to the foreign language handicap already affecting United States producers in non-English speaking countries. If the absence of a single world-wide production standard is similar in effect to language barriers, one can predict that sales of United States produced television programs and films could be substantially reduced relative to what they could be with readily-convertible standards.[17/]

Europe's Strategy to Use Production Standards as a Non-Tariff Trade Barrier

The European consumer electronics industry has been successful in the past in using standards to discourage

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17/ For example, United States produced films account for 90% of movie attendance in the U.K., but less than 50% in West Germany, France, and Italy. Wildman and Siwek, *supra* n.7, at 19.

imports of (mainly Japanese) television sets, largely because of patent control. For example, Telefunken, which had developed the PAL television system used in most of Europe, excluded Japanese large-screen television sets for several years because it controlled the patents on PAL. The French industry developed the SECAM standard for similar reasons.[18/] Today, Europeans see the opportunity to use HDTV standards not merely to protect the European consumer electronics industry from Japanese imports, but also to protest European "culture" and producers from American imports.[19/]

The French government has taken the lead in trying to discourage "cultural pollution," especially by English-language programming. One major manifestation of the European attempt to limit sales of American video products is the movement to impose minimum local content

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18/ See generally, Booz, Allen and Hamilton, "EEC Consumer Electronics--Industrial Policy: Final Report," Brussels: EEC Information Technologies Task Force, June 1985.

19/ This is symptomatic of a broader European strategy to use EEC standards as a non-tariff trade barrier. See "Obstacle Course - As EC Markets Unite, U. S. Exporters Face New Trade Barriers", Wall Street Journal, January 19, 1989 at A1.

requirements on European television broadcasts, and to reserve broadcast time for European productions.

There is evidence that the European community is adopting its separate "Eureka" 1250/50 standards for HDTV in part to protect its motion picture and program production industries from United States competition. For example, in a recent public letter to the EEC, French President Mitterrand suggests that the Eureka approach may help deal with "...the risks that European culture and industry will be exposed to if we fail to react to the current situation: Europe imports close to half of the cinema and television programmes it broadcasts. Out of each one hundred hours of programming acquired in Europe, only eight come from another European country. Europe exports also very little, since its programmes account for less than 15% of world exports. In order to address this "problem", President Mitterrand suggests the subsidization of European video producers and the imposition of foreign content restrictions on European television."[20/]

20/ Letter from President Mitterrand to EEC President Jacques Delors, October 7, 1988, as quoted in EUROPE Monday/Tuesday 10/11 October 1988 at 7.

There Is No Justification for Abandonment of U.S. Support for a Single World-Wide Production Standard

Some have argued that prospects for a uniform world-wide HDTV production standard are doomed because of the prospects for success of European protectionist efforts.[21/] This reflects a defeatist attitude not justified by developments to date.

An international production standard may be achieved through de facto acceptance by the preponderance of international producers and broadcast organizations or through formal acceptance through the CCIR or a combination of both. The increasing use of 1125/60 production equipment in the United States, Canadian and Japanese motion picture, television, and advertising communities evidence the very real possibility that the 1125/60 production system is already becoming an important de facto production standard.

The prospects for formal acceptance of the 1125/60 production standard by CCIR are quite real. The 1986 meeting of the CCIR deferred a decision on a single

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21/ NBC has embraced this position and has proposed a 1050/59.94 domestic production standard. "NBC Unveils new HDTV standard", Broadcasting (Oct. 17, 1988) at 31.

world-wide international standard until its next Plenary Assembly in 1990. In the interim, Soviet-sponsored international tests of the European and American HDTV production systems are scheduled to begin next month in Moscow. Those tests are motivated by the strong desire of the Soviet Union to see a single world-wide production standard.[22/] It is quite possible that selection by the Soviet Union of a particular production system as its standard will lead to similar decisions by the five Eastern European bloc countries. Should the Soviet Union select the same 1125/60 system approved by the United States, Canada and Japan, much of the third world may follow -- leaving the Western European administrations isolated and with little hope for world-wide economies of scale for European manufacturers. By the time of the next Extraordinary Meeting of CCIR Study Group 11 in May 1989 -- scheduled for the sole purpose of debating the merits of the United States/Canadian proposal versus that of the EEC -- preliminary results of the Soviet tests should be known.

The CCIR recommends, but does not "set", technical

22/ Interview with H. Yushkiavitshus, Soviet Vice Chairman of Radio & Television, HDTV Newsletter, November/December 1988 at 24.

standards for the international community. Its recommendations need not be unanimous; and, typically, some number of member nations dissent (take "reservations") from CCIR recommendations. Also, commonly, "reservations" of dissenting member nations are withdrawn over time as international consensus develops around a technical standard based on private sector acceptance of equipment built to a particular standard.

Should the twelve Western European nations take "reservations" to any CCIR recommendation of the US/Canadian 1125/60 production standard proposal, as is likely, but the remainder of the world's nations accept such a recommendation, Western Europe's "reservations" to the 1125/60 system, in time, may well be withdrawn.

The United States government has played, and continues to play, an important role in the fostering of a single world-wide production standard. At the Plenary Assembly of the CCIR in 1986 and continuing to date, the United States Department of State has strongly supported the 1125/60 HDTV production standard developed by the United States private sector. That support has had an important and positive impact in maintaining the momentum in world bodies for the development of a single world-wide production standard. The position of the Department of State has been based on

United States interests in promoting the ease of international program interchange and the free flow of electronic information world-wide.[23/]

For the reasons set forth in this report, CBS believes the position taken by the Department of State to be well-founded and deserving of the full support of the entire United States government. The abandonment of United States efforts to promote a single world-wide production standard will inevitably lead to various "electronic curtains" among nations which will be detrimental to our commercial interests in international program exchange and to our nation's interest in the free flow of information world-wide.

Conclusion

The United States should continue to press for a single

23/ Recently, the Department of Commerce issued a Notice of Inquiry seeking comment on whether the United States should continue its support of the 1125/60 production standard. For the reasons set forth in this report, CBS believes the United States should maintain its position of support. Indeed, in CBS's view, the DOC NOI suggests a division of opinion about the United States position which is detrimental to United States' interests and supportive of European efforts to fragment world standardization efforts.

world production standard. The 1125/60 standard is the most viable, suitable candidate: it is already in use; it is of high proven technical quality; and it will present no standards conversion problems for any of the proposed domestic HDTV transmission systems. If 1125/60 does prevail, the U. S. motion picture and television production industry will be able to continue to distribute their product freely in European markets with a resultant favorable effect not only on U. S. trade balances but on the quality and diversity of United States motion pictures and television programs.

CBS Inc.
February 1, 1989

ATTACHMENT B

Documents
CCIR Study Group
Period 1986-1990

Doc. IWP 11/6-2020
9 January 1989
Original: English

United States of America

RATIONALE FOR A SINGLE WORLD-WIDE HDTV STANDARD FOR THE STUDIO AND FOR INTERNATIONAL PROGRAM EXCHANGE

1.0 Introduction

One of the most important decisions taken at the 1986 CCIR Plenary in Dubrovnik was to adopt Resolution 96. This Resolution calls for the holding of an Extraordinary meeting to consider the adoption of a single world-wide HDTV standard for the studio and for international program exchange. The desirability of this objective was unanimously agreed. The rationale for such a standard, including a single frame rate, is discussed in this paper.

In this connection, Decision 74, setting the terms for this conference, noted that important progress on the basic parameters of a world-wide HDTV system was achieved and reported at the Interim Meeting of Study Group 11 in November 1987. The question is, has there been enough progress to establish a single world-wide production standard, and if so, what should it be?

Considerings (q) and (r) of Decision 74 describe the nature of this expected progress. They state:

> (q) that further significant progress is expected in this area in the coming year;
>
> (r) that the results of tests on the possible systems will be submitted by administrations prior to the extraordinary meeting in parallel with IWP and JIWP output documents, documents reporting technical and operational performance in applications including programme production recording on both tape and film large screen display, and conversion in both directions with current TV standards, and particularly the progress on the key sub-systems including:
>
> - a reference studio chain with digital and analogue processing and processes in tandem
> - the range of interface standards described in interim Report AU/11 including all of the transcoding and conversion processes
> - the emission chains for terrestrial and satellite broadcasting including the effects of propagation and interference

- integration of the HDTV receiver and display with existing and evolving television systems.

This report evaluates the status of progress in relation to these objectives.

2.0 HDTV Studio Standards

At this time, in accordance with the definition of HDTV, only two proposals have been made to the CCIR with respect to an HDTV standard. These are 1125/60 Hz and 1250/50 Hz. The first is the only standard which has reached a point of development where it was actually recommended to the Dubrovnik Plenary for adoption.

Report AZ/11 is a progress report on HDTV prepared at the Interim Meeting of Study Group 11. It is helpful to review sections 2.2 and 2.3 of the report and any related new material as a basis for evaluating the readiness of these standards to be put forth as the basis for a single world-wide production standard for HDTV.

2.1 Technical Parameters

2.1.1 1125/60 Hz

As documented in a number of publications, 1125/60 was chosen because (a) it has greater than 1000 active lines which is the minimum number of lines to avoid visual disturbance caused by the structure of the scanning lines at a viewing distance of three times picture height, and (b) 1125 has a simple relationship to the number of lines in conventional systems, 15/7 times 525 and 9/5 times 625.

The choice of 60 Hz, instead of 50 Hz, was based on studies of the relationship of field rate to (a) motion blur of the reported picture, (b) smoothness of motion, and (c) large area flicker. These qualities would improve with increased frame rate, but too high a rate would affect video compression.

In Report AZ/11, sections 2.2.2.1 through 2.2.2.6 set forth "a full set of relevant digital and analogue parameters for a single world-wide high definition television standard for programme production and for international programme exchange." These have been documented for scanning parameters, colorimetry, analogue representation, digital representation, and analogue synchronizing waveforms.

These parameters have already been recognized in the United States by two national/international standards setting organizations -- the Advanced Television Systems Committee (ATSC) and the Society of Motion Picture and Television Engineers (SMPTE) -- and are under consideration by the American National Standards Institute (ANSI).

2.1.2 1250/50 Hz

Section 2.3.2 of Report AZ/11 reports on studies which have been made in the framework of the Eureka EU 95 project which have led to a proposal for an HDTV standard. This proposed studio standard does not have a defined set of parameters analogous to those in sections 2.2.2.1-2.2.2.6. A summary of section 2.3.2 information on these parameters is provided below:

Scanning Parameters: An argument is presented that a 50 Hz standard will ease the tape-to-film transfer, that motion portrayal at such a field rate is satisfactory. It states that progressive scanning offers several advantages. However, other arguments are made that an interlaced approach is a much better use of bandwidth and that there is a substantial improvement in motion portrayal quality between 50 Hz and 60 Hz.

Colorimetry: Parameters are presently being studied by the EBU, but have not, as yet, been developed.

Analogue Representation: No information is available on this subject.

Digital Representation: Several suggestions are made with respect to luminance sampling frequency and color-difference sampling frequency.

2.2 Convertibility

As reported in section 2.2.4.1 of Report AZ/11, a standards converter from 1125/60/2:1 HDTV to existing 625/50 and 525/60 has been developed by NHK and has given satisfactory results. In addition section 2.2.4.2 states that converters from 1125/60/2:1 HDTV to PAL, SECAM, NTSC, and 24 frame film have been developed and are currently being used satisfactorily.

Alternatively, it states that converting 60 Hz HDTV to 625/50 requires an expensive standards converter, whereas 50 Hz HDTV needs a line rate converter which is significantly less expensive, and that a 50 Hz studio standard would ease the combination of film and HDTV production. However, none of these converters have been built or tested for a 50 Hz standard.

2.3 Frame Rate

There are three frame rates in use, each of which is involved in some way with the choice of a production standard. They are 25 (50 fields), 29.97 (59.94 fields), and 24 for 35 mm film.

Conversions from 1125/60 to 525/59.94 can be accomplished either through a record and playback process for the major portion of programs which are not real time or through the use of drop frame techniques now being developed.

On the other hand, 1250/50 Hz to other field rates has not been demonstrated.

2.4 Relationship with Emission Standards

As it is envisioned that there may be a number of emission formats for HDTV, it is desirable that a single world-wide production standard be established independently. As discussed above, the principal consideration is the reality of convertibility and the quality of this product after conversion. For example, the MUSE-E transmission system is not dependent on the 1125/60 production standard. It has been stated by many of the proponents of U.S. HDTV transmission systems, including those with field rates of 59.94 Hz, that it would be possible to use 1125/60 or other 60 (or 59.94) formats as a source.

2.5 Relationship with Recommendation 601

Recommendation 601 specifies a dual-mode standard for studio interface of digital television. This recommendation provided a method of digitizing analog signals of existing 625/50 and 525/60 systems. The goal of a single world-wide HDTV standard implies the need to establish parameters for a new studio interface standard that need not be bound by older systems. Also implied is the desirability of a single frame rate. In order to insure the highest possible quality in the studio, a single frame rate is imperative as conversion from one frame rate to another in the HDTV domain has not been satisfactorily demonstrated. Therefore, a world-wide HDTV standard based on Recommendation 601 cannot meet the most basic requirements of a single frame rate.

2.6 Equipment/Operation

Sections 2.2.6 and 2.2.7 of Report AZ/11 provide extensive evidence with respect to the development of equipment, the increasing use in actual production, and extensive experience with the use of the recommended 1125/60 production standard.

The Eureka EU95 demonstrations at Brighton in September 1988 provided a picture of the status of development of the 1250/50 Hz production standard mentioned in the interim reports. These demonstrations showed the development of some equipment, but not a complete set of studio equipment. Only a few hours of production material were demonstrated and thus there is not much operational experience.

2.7 Testing

Although a number of tests have been reported for the 1125/60 Hz standard, some no doubt have been carried out for the 1250/50 Hz standard, but they have not been broad-based comprehensive tests. Recently it has been reported that the U.S.S.R. will sponsor such tests under the supervision of the various International Broadcasting Unions. Progress toward the establishment of a single world-wide production standard could be advanced by the conduct of such tests.

3.0 Summary

This paper has summarized the available information documented within the CCIR with respect to candidates for a single world-wide production standard. Table 1 gives a summary of this information. Based on this information, the only standard which is in a position to be considered as a recommendation at this time is the one based on 1125/60 Hz.

TABLE 1

Characteristic	1125/60	1250/50
1. Technical Parameters	Established and developed	In theoretical and study stage
2. Relation to Emission	Demonstrated for different systems	No transmission demonstrations
3. Equipment	All equipment for complete studio being manufactured	Some prototype demonstrations
4. Operation	Many documented uses	Few exist
5. Tests	Many documented	None
6. Convertibilty	Demonstrated for film, 625/50,525/60	Film, not to other standards