Advanced Television Committee
Planning Subcommittee WP-3
Spectrum Utilization Working Group
Attendance (By Affiliation)

Name	Affiliation	Mtg: 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
Sheau Ng	David Sarnoff Research Center																											x																	
Ted Wagner	David Sarnoff Research Center						x	x	x						x					x																									
Richard Iredale	Del Ray Group													x																														
Richard E. Shrum	Department of State														x																													
Harley Radin	Direct Broadcast Satellite Corp.		x					x	x	x	x										x																		x	x		x		
George Hanover	EIA			x		x		x	x		x		x	x								x		x								x								x				
Eb Tingley	EIA											x																																
Tom Friel	EIA/CEG																	x																										
Tom Mock	EIA/CEG				x											x		x							x																		
Ken Dunmore	Economists Inc.													x																														
Steve Wildman	Economists Inc.													x																														
Linda Dubroof	FCC																									x																		
Bob Eckert	FCC									x		x	x	x	x		x					x	x		x	x		x		x	x	x	x		x	x	x	x	x		x		x	x	x	x
Bruce Franca	FCC						x	x				x													x										x										
Gordon Godfrey	FCC																																		x	x	x			x	x		x	x	x
Gina Harrison	FCC																																											x	
Ray Laforge	FCC																x										x	x																	
Steve Selwyn	FCC	x	x	x	x	x	x		x	x	x						x																												
David Siddall	FCC						x	x							x			x																											
Rodney Small	FCC			x	x		x		x	x																																		
Tom Stanley	FCC						x																																						
Alan Stillwell	FCC																																		x	x	x		x		x			x		x
David Workman	FCC									x																																			
Hector Davis	FCC Laboratory																																		x										
William Hassinger	FCC MMB				x					x				x																														
James McNally	FCC MMB/EPB		x																																									
Paul Marrangoni	FCC OET																											x																
Marty Liebman	FCC PRB			x																																								
Tom Ramstack	FCC Week Publication																							x																				
Bern Kobb	Federal Communications Tech News							x	x																			x																
James G. Ennis	Fletcher, Heald & Hildreth	x						x	x		x								x								x	x				x				x							
Anne Goodwin	Fletcher, Heald & Hildreth														x					x																								
Frank Jazzo	Fletcher, Heald & Hildreth			x	x	x	x	x				x	x	x				x		x	x	x	x	x		x	x			x	x			x	x								
Bud Klueck	Fletcher, Heald & Hildreth															x	x																											

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Tim Schnacke	Fletcher, Heald & Hildreth																																				x								
Jennifer Clayborne	GAO														x																													
Karen Brown	GAO/IMTEC																										x																	
David L. Hanna	GTE Telops			x																																								
Herb Schubarth	Gannett								x																																			
Robert Rast	General Instrument																																		x				x					
Jeff Krauss	General Instrument Consultant																																x	x	x	x		x	x	x	x	x	x	x	x
Christina Black	George Washington University		x	x	x		x	x	x	x																																		
Joe Gianguinto	Group W	x	x	x	x	x		x	x	x		x		x	x		x	x	x	x		x	x	x	x	x	x	x	x		x												
Alton Stalker	Group W		x	x		x		x		x	x	x	x	x																														
John Watson	Group W						x																				x					x	x	x			x							
Chris Ehrenberd	HBO				x	x	x									x																												
Alison Purcell	HBO							x																																				
David Gump	HDTV Data Corp.																					x		x		x																		
Ann Hagemann	HDTV International													x													x																	
John Huffman	HDTV Washington Resources																							x	x	x																		
William Byrnes	Haley, Bader & Potts																					x									e													
Dale Hatfield *	Hatfield Associates	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x		x	x	x		x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x		x	x
Carl Scarpa	Hitachi																																									x	x	x	x	x
Kei Yamashita	Hitachi																x																												
Rich Hindman	House Subcommittee on Telecom.					x																																							
Jayne Roads	Hughes Aircraft																				x	x	x																					
Don Jansky	Jansky Barmat Telecom, Inc./CBS	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x		x	x	x	x	x	x		x	x	x		x	x	x	x	x	x	x		x	x	x	x	x		x
Robert A. O'Connor	Jansky Barmat Telecom, Inc./CBS			x	x	x	x	x	x			x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Jules Cohen	Jules Cohen & Associates/MST			x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x		x	x	x	x	x	x		x		x	x	x		x	x	x	x	x	x		x	x
Bob Denny	Jules Cohen & Associates/MST	x	x	x	x	x	x	x	x	x	x																																		
Aileen Amarandos	Latham & Watkins							x	x																																			
Richard Solomon	MIT Media Lab					x																																						
Gregory DePriest	MST	x	x		x	x	x	x	x			x	x	x	x	x										x		x																
Victor Tawil	MST								x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x		x		x	x	x		x			x	x				x		
Thomas Pfaff	Medill News Service																							x																				
William M. Borman	Motorola	x	x		x	x	x	x			x	x	x		x		x	x				x								x	x										x	x		
Allen Davidson	Motorola																					x					x																	
Stuart Overby	Motorola	x	x	x	x		x	x	x	x	x		x																															

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Don Walker	Motorola		x	x	x		x		x	x		x	x	x			x	x	x	x	x	x	x		x	x	x		x				x									x	x		
Lynn Claudy	NAB																x	x					x	x	x	x	x		x		x	x	x		x		x		x		x	x			x
Ed Cohen	NAB																							x																						
Ralph Justus	NAB		x	x		x	x	x			x	x		x	x	x		x	x		x	x	x	x				x		x			x												
Tom Keller	NAB				x	x					x																							x											
Ken Skinner	NAPC																																				x	x	x	x						
Stan Baron	NBC																																							x						
Ronald Gnidziejko	NBC															x																														
Randy Hoffner	NBC																								x	x				x															
Louis Libin	NBC	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x		x	x		x	x	x	x		x	x
Martin Meaney	NBC	x	x	x	x	x	x	x	x		x	x	x	x	x		x						x																						
Burnett Sams	NBC																																x	x	x	x		x	x	x	x	x	x	x	x
Chuck Jackson	NERA																															x													
Keiichi Kubota	NHK																										x	x											x	x					
Martin Billips	NPR																																													
Karen Christensen	NPR			x		x																																							
David Cohen	NTIA		x					x	x																																				
Charles Mellone	NTIA/DOC						x																																						
W.E. Glenn	NYIT															x																														
A. James Ebel	Network Affiliats			x	x																																								
Harvey Arnold	North Carolina Public TV																																x	x	x	x			x				x		x
Frank Bugg	PBS				x	x	x	x		x	x				x																														
John Ernandez	PBS																																													x
James Kutzner	PBS																															x	x	x	x	x	x	x	x	x	x	x				
Louise Lynch	PBS		x	x																																									
Barbara Wellbery	PBS				x																																								
Atsushi Yamakita	PBS																																						x	x	x		x	x	x	
William Zou	PBS																																						x							
Saeed Mirzad	Pacific Bell	x		x																																									
Celia Nogales	Pacific Telesis																	x																												
Robert A. Peloso	Panasonic ATVL																																					x	x	x	x	x	x	x		
Larry Phillips	Panasonic ATVL																																			x	x									
Judson Hoffman	Panasonic Technologies			x	x		x	x	x				x	x				x																												
Aldo G. Cugnini	Philips Labs																										x																			

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Wayne Johnson	Philips Labs													x																																
Robert Mcfarlane	Philips Labs														x												x																		
Rupert Stow	RSA																																												x
Ed Reinhardt	SBCA				x						x		x	x																															
Kevin Fisher	Smith & Powstenko																																		x	x	x	x	x	x	x	x		x	
Howard Whitcomb	Tandy Electronics																																									x			
Lawrence Lockwood	TeleResources		x	x																																								
Rick G. Gould	Telecom Systems																		x																										
Kathy Dale	Televisa			x																																								
Joe Donahue	Thompson C.E.																										*					x												
Max Muterspaugh	Thompson C.E.															x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x		x	x
Randy Oster	U S WEST Advanced Technologies													x	x										x	x		x	x			x												
Paul Beeman	Viacom Networks								x	x	x	x																																
Lex Felker	Wiley, Rein & Fielding																									x																		
Dick Wiley	Wiley, Rein & Fielding	x																																										
Richard Citta	Zenith																																								x			
Pieter Fockeus	Zenith																																							x				
Wayne C. Luplow	Zenith														x																													
Jouke Rypkema	Zenith	x	x	x		x	x	x			x	x	x	x		x	x	x	x	x	x			x	x		x	x	x	x	x		x	x	x	x	x	x	x	x		x	x	x
Steve Crowley	du Triel, Lundin & Rockley																																										x	x
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Totals: 156 Indiv. & 80 Entities Participating		20	24	31	30	28	30	31	31	26	25	25	20	33	25	22	21	21	17	14	15	21	17	22	18	23	20	28	17	18	20	16	25	19	23	17	26	19	19	24	26	20	24	17	19	23

* Chairman

WHITE PAPER

On the Issue of

BROADCAST SUPPORT SPECTRUM IN THE CONTEXT OF THE ADVANCED TELEVISION SERVICE

Prepared By

Chairman, Working Party 3
of the
Planning Subcommittee
of the
Advisory Committee on Advanced Television Service

February 22, 1992

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I. BACKGROUND AND INTRODUCTION

The Spectrum Utilization and Alternatives Working Party (Working Party 3) of the Planning Committee of the Federal Communications Commission's Advisory Committee on Advanced Television Service was given primary responsibility for addressing spectrum related issues raised by the planned introduction of the Advanced Television Service (ATS). Very early in its deliberations, Working Party 3 recognized that there were critical radio spectrum issues beyond those associated with the actual over-the-air delivery of an advanced television signal from the transmitter to the consumer's receiver. In particular, it was recognized that, even if a sufficient number of advanced television signals could be accommodated within existing VHF/UHF television allocations, the deployment of the advanced television service could put significant pressure on Studio-to-Transmitter Links and other auxiliary links that are critical to today's television industry.

As a consequence of this recognition, Working Party 3 created a specialist group (Specialist Group 3) and charged it with the responsibility of examining the capacity of existing broadcast auxiliary spectrum to accommodate the increased requirements of the proposed ATS. In carrying out this responsibility, Specialist Group 3 has carried out a number of studies of its own as well as and taken note of, and analyzed, related studies conducted by other groups. The results of these studies and analyses have been reported on a regular basis to Working Party 3's parent subcommittee and, thence, via the Advisory Committee, to the Federal Communications Commission (FCC or "the Commission"). Stated succinctly,

these studies and analyses have concluded that there are significant levels of congestion with existing levels of usage in the broadcast auxiliary bands in the major television markets; moreover, it has been concluded that the congestion would be seriously exacerbated by the additional spectrum requirements associated with Advanced Television (ATV) systems.

Despite these concerns, the Commission, in its Notice of Proposed Rulemaking of October 24, 1991, ruled that no additional spectrum should be made available for auxiliary broadcast use. This decision was apparently taken in the belief that ATV licensees will be able to accommodate the added requirements of the Advanced Television Service by utilizing digital compression and other techniques to expand the use of existing broadcast auxiliary spectrum and/or by utilizing non-radiating fiber optic links to augment or replace such systems. However, Specialist Group 3 and Working Party 3 have taken explicit account of these alternatives and have concluded that it is unlikely that compression techniques and fiber optic systems will be able to accommodate the additional demand in the larger broadcast markets. Moreover, it is the Working Party's considered opinion that dictating additional sharing in already congested bands (or forcing the use of uneconomic fiber optic facilities) could (a) impede the implementation of the Advanced Television Service and (b) disrupt existing television operations (e.g., Electronic News Gathering -- ENG) in the United States.

Because of its concern that the Advisory Committee and the Commission may not fully appreciate the critical nature of auxi-

liary broadcast spectrum issues, the Chairman of Working Party 3 has assembled this White Paper on the subject. By and large, it does not present any new material. Rather, it summarizes and hopefully makes more accessible the results of the Working Party's efforts in this less visible but critical area of the Advisory Committee's deliberations.

The balance of the report is divided into three sections. Section II, which follows, briefly discusses the pivotal role that auxiliary broadcast spectrum plays in the delivery of existing television broadcast services and will, by necessity, play in the delivery of advanced television services. Section III presents, in a condensed form, the results of the studies and analyses that have been conducted of existing congestion in the broadcast auxiliary bands. Section IV summarizes the conclusions and recommendations that the Working Party has reached as a result of its work.

II. THE CRITICAL ROLE OF SUPPORT SPECTRUM TO THE ADVANCED TELEVISION SERVICE

In its First Interim Report in the Spring of 1988, Working Party 3 identified typical uses of support spectrum by broadcasters and hence those that could be impacted by the increased requirements of an ATS. These uses were grouped into three broad categories: (1) network origination, (2) affiliate, network and other feeds, and (3) station feeds. The first category, network origination, includes entrance links between a studio and the main origination terminal (e.g., satellite uplink/downlink facilities), distribution links between the main origination terminal and network affiliates, and contribution links between various program

sources and the main origination terminal. The second category, affiliate, network and other feeds, includes links between Electronic News Gathering or Satellite News Gathering vehicles and a studio. The former may include active or passive repeaters and the latter, of course, includes satellite relay. Wireless microphones for television audio are also included in this category. The third category, station feeds, includes satellite entrance links (SELs) and studio-to-transmitter links (STLs).

Subsequently, the Commission's Tentative Decision referred to these activities and requested further comments and alternative suggestions for accommodating the increased demands within existing bands. Specialist Group 3 of Working Party 3 continued its studies and focused its attention on two distinct segments of broadcast support services: the contribution segment which is the portion that delivers signals to the studio, and the distribution segment which delivers the signal from the studio to the broadcast transmitter.

An example drawn from the contribution segment is the use of the Local Television Transmission Service (LTTS) under Part 21 of the Commission's rules. In this service, temporary fixed microwave links are used to provide video signal transmission from events where adequate coaxial or fiber optic cable facilities are not available. Such occurrences may be periodic and of limited duration (e.g., an annual golf tournament), or they may be one-time events such as a political convention or a special news event such as a natural or man-made disaster. An example drawn from the dis-

tribution segment is the use of Television Broadcast Auxiliary Service spectrum under Part 74 of the Commission's rules. This service, among other things, provides for permanent links between a studio and a transmitter site (STL) in the typical situation where the studio and transmitter are not collocated and where adequate alternative non-radiating systems are either unavailable or uneconomic.

Based upon these studies, it became increasingly apparent that the television industry was vitally dependent upon the broadcast support spectrum for the delivery of modern television services in the public interest. That is, it became evident that the delivery of advanced television services to the public depended not just on finding sufficient spectrum to deliver ATV signals from the transmitter site to the consumer, but also on finding efficient and effective means of providing the contribution and distribution segments as well.

III. SPECTRUM CONGESTION IN EXISTING BANDS USED FOR BROADCAST SUPPORT SERVICES

By the time of its Second Interim Report, the Working Party had concluded that many of these broadcast support services could be impacted in a significant way by the ATS, depending on the type of ATV system selected and its implementation. Consequently, the Specialist Group, in conjunction with the National Association of Broadcasters, initiated two surveys of broadcast engineers and frequency coordinators in order to more completely assess existing congestion in the band used by broadcasters for STLs, ENG, and Inter-City Relays (ICRs). The issue of how existing spectrum usage

would be impacted by the emergence of ATV systems was specifically assessed. The results of the surveys were presented in the Working Party's Third Interim Report. In brief, these surveys of engineers and coordinators in the top 50 television markets revealed significant levels of congestion with existing usage, and indicated that the congestion could be seriously exacerbated by additional spectrum requirements associated with ATV systems.

The surveys revealed that microwave channels are used to the fullest extent, with the likelihood of additional capacity within the current structure being almost nil. For example, in Los Angeles there are 15 television transmitters atop Mt. Wilson, each with at least two microwave circuits between the studio and the site -- one STL and one transmitter-to-studio link (TSL). These microwave circuits are directed to the same general area limiting the use of antenna discrimination to permit frequency reuse. In addition, most of the stations are heavily committed to ENG operations. Such operations involve the use of one or more microwave transmitters (and associated channels) on the ENG vehicle and typically several microwave channels from repeater locations to Mt. Wilson. Generally, several repeater sites are required because of the mountainous terrain and the wide area served by the Los Angeles stations. ENG activity tends to originate from a common location, e.g., a major news event, thereby compounding the interference problem.

Moreover, because an unobstructed transmission path from the remote site to the ENG receiver often cannot be found, the 2 GHz

band, because of its reflective propagation characteristics, is regarded by broadcasters as being best suited for ENG operations. Broadcasters frequently "bounce" the 2 GHz signal off available solid surfaces, such as buildings, in order to obtain a transmission path to the receiver. The success of this technique is less sensitive to the scattering produced by the roughness of the reflector at 2 GHz than at higher frequencies. In addition, the increased path length incurred with this approach makes use of spectrum above 13 GHz less suitable because of rain attenuation and other factors. There are also large numbers of Cable Television Relay Service (CARS) systems in the Los Angeles area. These systems share the same frequencies used by the television broadcasters, thereby further compounding the problem.

More specifically, the Working Party reached the following findings based upon the surveys:

1. The 2, 7 and 13 GHz bands used for STL, ENG and ICR functions are congested.

2. Many of the respondents will be requesting more frequencies in these three bands.

3. Frequency coordinators reported the 2 and 7 GHz bands to be most heavily used with the 2 GHz band representing the most severe coordination problem.

4. The congestion/coordination problems are compounded by sharing within some bands, e.g., the 13 GHz CARS band.

In its Fourth Interim Report, Working Party 3 continued its analysis and identified and discussed in detail the following critical issues relating to broadcast auxiliary spectrum:

- STL and other auxiliary spectrum circuits are critical to broadcasters, and their need will likely expand for ATV.

- An ATV station must be able to operate independently of the NTSC station, including STL's, TSL's and other auxiliary circuits.

- The location where an ATV signal will be encoded will determine some auxiliary spectrum needs.

- Program contribution circuits Inter-City Relay, Satellite Entrance Links, and Transmitter-Studio Links (ICR, SEL, and TSL) generally require better performance than the STL.

- NTSC to ATV upconversion and ATV to NTSC downconversion will take place either at the studio or at the transmitter, and during the transition period it will be necessary to translate from one format to another.

- A new STL will be needed if the ATV transmitter is not co-sited with the existing NTSC transmitter.

- In the long term, digital compression techniques may have a major impact on the design of the next generation of broadcast auxiliary circuits. While digital modulation is less susceptible to interference than analog modulation, the use of high performance multi-phase digital modulation may actually require more protection.

Between the release of the Working Party's Fourth and Fifth Interim Reports, the Commission, as noted in the introduction above, issued a Notice of Proposed Rulemaking (NPRM) in which it tentatively concluded that no additional spectrum should be made available for broadcast auxiliary use. Instead, the Commission indicated that it believed that digital compression techniques, increased utilization of higher frequency bands, and the use of fiber optic systems would be adequate to provide the needed additional capacity associated with the introduction of the ATS. More specifically, the Commission's Notice suggests the possibility of some separate programming being authorized under the "simulcasting" definition and indicates that the two signals, ATV and NTSC, might be transmitted in the same microwave channel from the studio to

transmitter using a "lossless" compression technique. However, in its Fifth Interim Report, Working Party 3 noted that footnote 33 of the NPRM refers to one study which predicts stations in the top 10 markets will build an ATV facility in the first year of the transition to an advanced television service. It seems probable that others within the top 30 would follow shortly thereafter. At this time, it is not known whether the lossless compression techniques suggested by the Commission will ever be technically viable. Perhaps more to the point, within this relatively short time frame, Working Party 3 strongly believes it is highly unlikely that compression techniques will advance sufficiently to accommodate the additional demands on STLs created by the introduction of ATV systems.

With respect to the use of existing spectrum higher in frequency, the aforementioned survey did show much less congestion in the auxiliary bands at 18 GHz and above. However, since the average STL path length is over 14 miles, these frequencies, in general, would not be suitable for STL use.

With respect to optical fiber cable systems, their use may, indeed, be possible in certain circumstances. Moreover, telecommunication companies are rapidly expanding their fiber networks. Television transmitter locations, however, are frequently on remote mountain tops or antenna farm areas that are unlikely to be passed by these networks. Although custom designed buried fiber to such sites is possible, the costs involved are usually prohibitive. Another high-quality circuit requirement is for satellite entrance

links (SELs), where studio and earth station are not collocated. Here again, such sites may be located in remote locations, not passed by fiber networks.

For news events, existing circuits would be available only in the most fortuitous circumstances where a fiber optic cable with idle capacity already exists at the venue, or where the predictability and demand for coverage has justified the installation of permanent circuits. Generally it is not feasible to extend fiber to a particular site for a single or occasional television broadcast. In addition, many building owners are demanding payment for the physical penetration of their properties with fiber cable and for running conduit inside the building. In short, in many locations, fiber facilities are not yet available on a wide enough basis nor economical to support the additional capacity requirements imposed by ATV broadcast auxiliary operations.

IV. CONCLUSIONS AND RECOMMENDATIONS

Based on the studies and analyses that it has conducted over the past four years, Working Group 3 believes that the following specific solutions should be considered when looking for methods to provide facilities for broadcast auxiliary operations with the advent of the ATS:

- Where possible, use fiber optic systems to replace or augment fixed microwave circuits.
- Employ improvements in equipment and operating techniques, including FM deviation optimization, larger and shrouded antennas, and lower noise figures for pre-amps and receivers.
- Consider better utilization of the currently allocated but lightly used 18, 23, 30 and 40 GHz bands.

- Consider the possible use of the 20/30 GHz bands for satellite service.

- As they become available, employ better digital compression techniques to reduce per-TV-signal bandwidth.

However, for the reasons described at the end of Section III, above, Working Party 3 believes that it will be many years before these techniques will be available on a ubiquitous and economical enough basis to meet the added requirements associated with the impending introduction of ATS. Therefore, the Working Party continues to believe that additional broadcast auxiliary spectrum will be needed in the major markets. More specifically, Working Party 3 has reached the following conclusions based upon its work to date:

1. The future ATV industry cannot function without adequate Broadcast Auxiliary Service spectrum.

2. It is recognized that, at least in the major markets, new and innovative spectrum solutions will be required to ensure adequate capacity for studio contribution and distribution functions.

3. The fact that different NTSC and ATV signals will be transmitted in many circuit segments will mean that additional Broadcast Auxiliary Service spectrum capacity will be required.

4. Pursuit of other Broadcast Auxiliary Service spectrum should be initiated at the present time.

5. The FCC should institute a dialogue with the NTIA to consider the availability of additional shared spectrum to accommodate these needs.

6. Needs of the new ATV service should be considered in the pending legislation that would transfer 200 MHz of government spectrum to the private sector.

7. The bands 4.40-4.99 GHz and 7.75-7.90 GHz are the best possibilities for providing additional ATV-Broadcast Auxiliary Service support spectrum on a shared government/non-government basis.

8. More efficient Broadcast Auxiliary Service frequency coordination and the use of Broadcast Auxiliary Service equipment (e.g., antennas) with higher efficiencies and accuracies should be encouraged.

9. Fiber optic technology will become increasingly important to the industry.

10. The FCC should be sensitive to the costs of fiber optic technology in its consideration of the suitability of that technology for satisfying the need for expanded BAS services.

11. "Lossless" or low-loss compression technology will be required for, at the least, interplant distribution in an ATV program production/broadcast system. Without it, television production cannot be conducted.

In summary, Working Group 3 strongly believes that consideration must be given to the need for auxiliary spectrum, at least during a transition period, primarily for STL and, perhaps, SEL use. Working Group 3 urges the Commission to consider this requirement and review the many microwave allocations in the 4 - 8 GHz band which might be reallocated on a shared basis to the auxiliary broadcast service during the transition period. The results of the Working Party's efforts to identify potential spectrum for this purpose are summarized in the Appendix. Although Working Party 3 of the Planning Subcommittee intends to pursue its own investigation as to the possibility of shared use of government spectrum in this band, the Commission's own initiative in this endeavor would, of course, be invaluable.

Finally, Working Party 3 feels compelled to emphasize in the strongest possible terms its belief that further sharing of any of the existing broadcast auxiliary spectrum could impede the implementation of ATV and disrupt current broadcast operations, including electronic news gathering. In short, frequency congestion in

the TV auxiliary bands is a major concern for broadcasters today, and congestion will likely intensify with the additional requirements imposed by advanced television.

APPENDIX
Possible New Auxiliary Spectrum For ATV

The Commission's original Notice of Inquiry in its proceeding dealing with the Advanced Television Service requested information on various bands that might be used for the new service. Working Party 3 has studied the bands in the range from 1 - 13 GHz. That work is briefly summarized in the following material:

1. 2.5 - 2.69 GHz Band

Allocated to ITFS/OFS/MDS/MMDS services and is used primarily in the major markets. Recent FCC actions, designed to foster MMDS development, make this band almost unusable for BAS.

2. 4.4 - 4.99 GHz Band

Allocated domestically to the government Fixed and Mobile Services, but currently set aside for high-powered military tropo-scatter systems. Most systems are warehoused. Peacetime use is for training in limited, remote geographic areas.

3. 7.5 - 7.9 GHz Band

Allocated domestically to the government Fixed Service only. Used by up to three agencies for non-military microwave relay systems of intermediate length. Usage is not known. Good possibility for shared use with BAS.

4. 12.2 - 12.7 GHz Band

Broadcast Satellite Service (BSS) downlink band. Service was authorized over eight years ago, there are many authorizations extant but there are currently no operating systems.

5. Other Spectrum Possibilities

The FCC has suggested several frequencies for possible use for a Digital Audio Broadcast (DAB) service, including 1493-1525 MHz, 2390-2450 MHz, and other bands. If these bands are not selected for DAB, this spectrum is a good candidate for use for broadcast support services. It is also noted that there are other ongoing studies of possible spectrum for DAB which could be suitable for broadcast support channels.

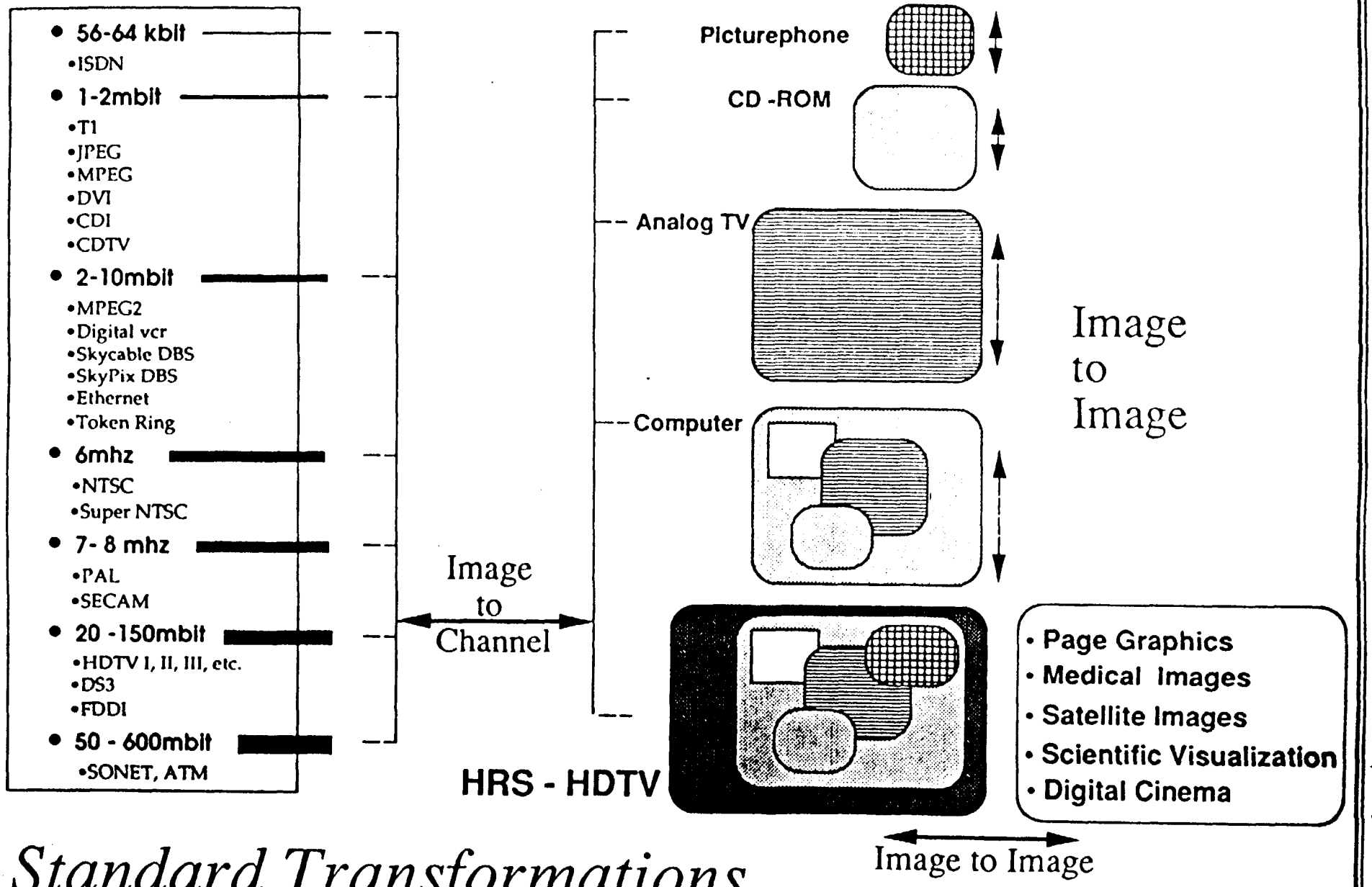
Advisory Committee on Advanced Television (ATV) Service

Planning Subcommittee -Working Party 4
Alternative Media Technology and Broadcast Interface

Working Group on Graphic Reference Models

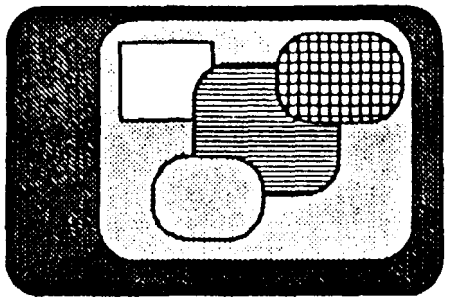
Interim Report
December 17, 1991

Mike Liebhold, Apple Computer, Chair
Richard Lau, Bellcore
Glenn Reitmeir, Sarnoff Labs
Virgil Conanan, HBO
Arpad Toth, Eastman Kodak
Tony Uytetnedale, Capitol Cities, ABC
Gary Demos, DemoGrafx
Robert Schunemann, DOD



Standard Transformations

Standard Reference Model for Interoperability



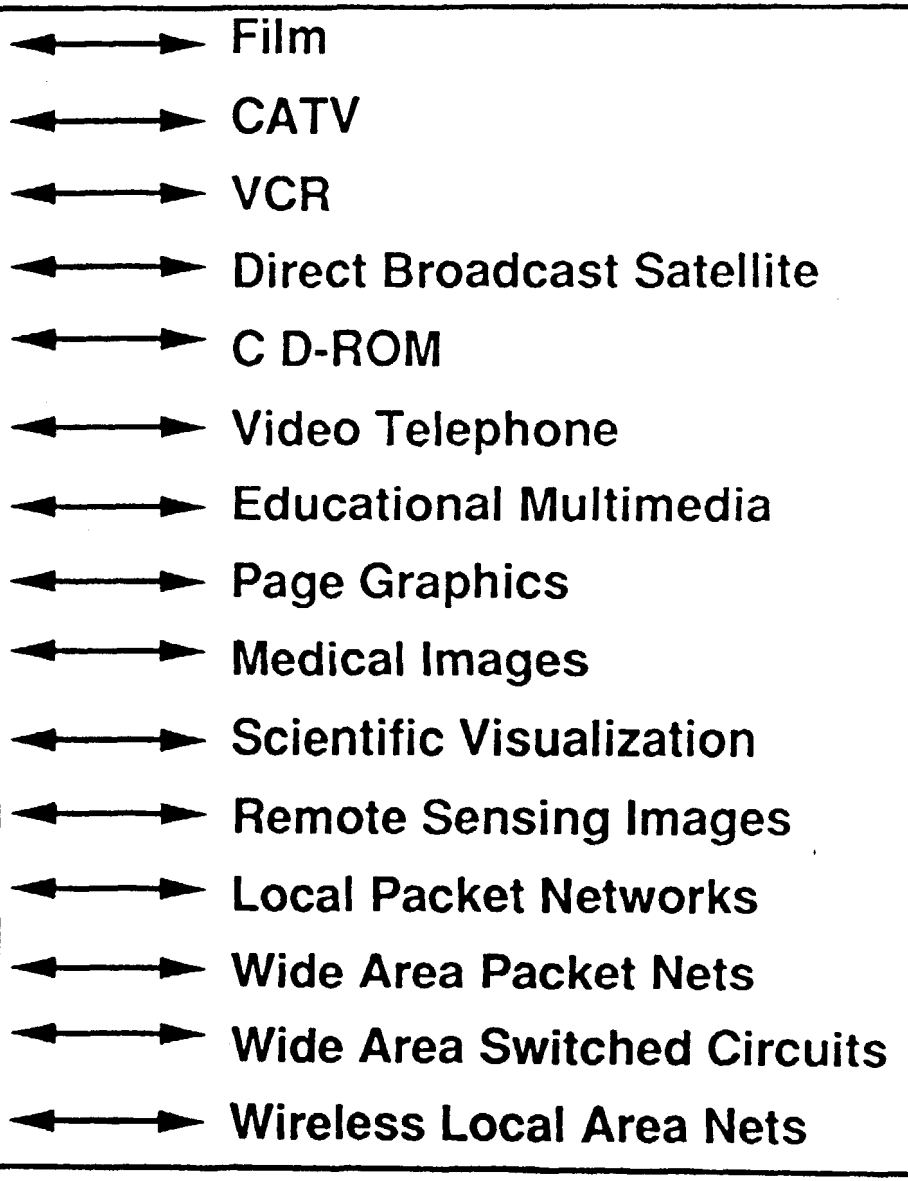
HDTV

Metrics for each Transformation

1. Cost
2. Complexity

Reference layers:
- Application
- Picture
- Compression
- Transmission

3. Quality



Metrics for Prioritization

1. Social Value
2. Economics
3. Timeline

FCC ACATS PS-WP/4 Proposed work plan for fy '92

A Data-Flow Model