CCITT SGXV
Working Party XV/1
Experts Group for ATM Video Coding

Document AVC-318R
July 10, 1992

SOURCE : CHAIRMAN OF THE EXPERTS GROUP FOR ATM VIDEO CODING
TITLE : REPORT OF THE SEVENTH MEETING IN NEW JERSEY AND RIO DE JANEIRO (July 1-10, 1992) - PART II
Purpose: Report

PART II JOINT SESSIONS

Contents

1. Introduction

Joint sessions with ISO/IEC JTC1/SC29/WG11 (MPEG) were held in Rio de Janeiro at the kind invitation of ABNT (Associacao Brasileira de Normas Tecnicas) during 6-10 July 1992. At the opening session on 6 July, Mr. Raul Colcher, Chairman of the Brazilian JTC1 Committee, welcomed the CCITT Experts Group. The Experts Group appreciated the support and hospitality of the hosting organization.

A list of documents considered during the joint sessions is attached to this report as Annex 1.

2. REQUIREMENTS sub-group (by S. Okubo)

2.1 General

The REQUIREMENTS Group met as follows during the week:

Mon (6 July)	evening	joint with VIDEO
Tue (7 July)	morning	joint with VIDEO
Tue (7 July)	morning	joint with SYSTEM
Tue (7 July)	afternoon	independent
Wed (8 July)	afternoon	independent
Wed (8 July)	afternoon	joint with AUDIO
Thu (9 July)	morning	independent
Thu (9 July)	afternoon	independent
Fri (10 July)	morning	joint with VIDEO

The major tasks were to finalize the "guide for video work" and to formulate requirements listing for system and audio.

2.2 Documentation

REQUIREMENTS group reviewed the following contributions:

223	US NB	USNB resolution for consideration by ISO/IEC JTC1/SC29 Working Group 11
234	ANSI	MPEG Lossless compression
235	AUS NB	Comments to Haifa resolutions
237	UNINFO	Opinions on questions contained in ISO/IEC JTC1/SC29/WG11 N0201
247	CCITT/J	H.261 compatibility requirements
263	Sugiyama	Consideration about multi picture formats
264	Hidaka	Study about the compatibility toward to MPEG3
280	ITSCJ	Resolutions of Japanese National Body
294	CCIR	Appointment of a Special Rapporteur on Study Groups 10, 11 and CMTT applications requirements for digital source
295	Convenor	Generic audiovisual coding - A proposal for international multi-organisation collaboration
302	SC29	Project description format
316	CCIR	Establishment of Task Group 11/4 on Harmonisation of HDTV standards between broadcast and non-broadcast applications and its first meeting to be held in Washington, D.C. (October 1992)
318	Bourguignat	User requirements for secondary distribution
320	CMTT	Liaison letter from CMTT/2-SRG to ISO/IEC JTC1/SC29/WG11 (MPEG)
321	CMTT	Report of the activities of the group of experts assisting the special rapporteur
322	ANSI	Comments on MPEG-2 Video requirements
327	Curet et al.	Addition of conditional access to the MPEG System layer
328	Ziegler	Stereoscopic imaging - Work done within COST 230 and RACE DISTIMA
338	ANSI	MPEG 2 project description
347	BSI	UK National Body Comment on the 18th ISO/IEC JTC1/SC29/WG11 meeting resolutions (Haifa Meeting)
348	BSI	UK National Body Comment on the MPEG Requirements documents
376	SF NB	Comments to Resolutions of Haifa meeting
385	DIN	Comments to the resolutions of the Haifa meeting
386	AFNOR	French contribution on SC29/WG11 Work
387	KBS	Opinions on some resolutions of ISO/IEC JTC1/SC29/WG11 Haifa meeting of March 1992
392	Kunt	Letter to Convenor
393	Hepper	Application profile for hierarchical TV/HDTV broadcasting
407	CCIR	Statement concerning user requirements for source coding and multiplexing for broadcasting applications

2.3 Lossless video coding

In the joint discussion with VIDEO group, the following clarifications were made (see the VIDEO report for more details):

- Lossless coding in the sense of reversible coding can not be provided by the current algorithm.
- Very high quality in the sense of near lossless coding should be

provided by the current algorithm.

2.4 Removal of "about 10 Mbit/s" upper bound from the MPEG-2 title

The REQUIREMENTS Group discussed the subject and related matters in the afternoon of July 7. These discussions were based on the discussions during the joint VIDEO/REQUIREMENTS sessions in the evening of July 6 and the morning of July 7. Items of the members concern were;

- Implications of removal on requirements of MPEG-2
- Question of adding HDTV as a specific requirement
- Impact of the removal on the time schedule

After extensive discussion, the REQUIREMENTS Group concluded as follows,

1) The current upper bound of "around 10 Mbit/s" should be removed from the title and the requirements listing (MPEG92/229,230) for the following reasons;

a. It provides for CCIR-601 but precludes coding of several formats with much higher resolutions.

b. Even CCIR-601 formats may require higher bit rates than 10 Mbit/s to achieve very high quality.

c. MPEG-1 supports a wide range of bit rates, this standard will also support a wide range of bit rates.

2) MPEG-2 should provide sufficient hooks in the syntax for extension to higher formats such as EDTV, HDTV and SDTV; e.g. identification of these formats, possibility of use of dedicated tables for each format.

3) The current time schedule agreed to in Haifa must remain unchanged.

4) For coding of HDTV, a new work item should be established and definition of requirements should be initiated. The following functionalities of hierarchical coding have been identified as essential for HDTV broadcasting by several contributions;

a. Graceful degradation according to received signal strength,
b. Upward/downward compatibility with conventional TV.

Note - The first sentence was reworded at the plenary on Wednesday as follows; "For coding of HDTV, using the hooks defined in 4), additional work is needed with corresponding requirements and schedule."

2.5 Guide for the video work - revision of MPEG92/230 (AVC-259)

At the start of the discussion, the meeting clarified the purpose of the two documents (the video requirements listing in MPEG92/229 and the guide for the video work in MPEG92/230) as follows;

- MPEG92/230 should describe normative parts of the requirements so that the standard development can be checked against this document.
- MPEG92/229 should describe informative parts of the requirements. The title should be modified to reflect this clarification.

Historically, the guide for the video work has been extracted from the

general requirements listing. Since it is urgent to provide a crisp description on what are required for the video standard, however, the meeting did best efforts to complete this document during the week. By studying carefully item by item and considering comments from National Bodies and other organizations/individuals, the meeting produced a "Rio version" of the guide for the video work.

This revised version was reviewed and agreed to at the joint meeting with VIDEO in the Friday morning. The content of this document will be used as yardsticks when the video specifications are frozen in March 1993.

2.6 Information on requirements for MPEG-2 video
- revision of MPEG92/229 (AVC-258)

The meeting reviewed this document to reflect several comments from National Bodies and other organizations/individuals and to make alignments with the above mentioned guide for the video work. Rio version was produced as the outcome of this work. Due to the lack of time, however, the meeting felt it necessary to make further editorial improvements. This will be finished by the next meeting by an adhoc group which also takes care of the integration of requirements for System, Video and Audio.

2.7 Requirements for MPEG-2 System

REQUIREMENTS group assisted SYSTEM group to formulate requirements for the current phase of work on such items as multiple program or component multiplexing, error resilience. See the SYSTEM report for more details.

2.8 Requirements for MPEG-2 Audio

REQUIREMENTS group assisted AUDIO group to formulate requirements for the current phase of work. See the AUDIO report for more details.

2.10 Adhoc group for requirements listing

Toward producing an integrated requirements listing document for System, Video and Audio, editorial work is continued till the next meeting in November by the adhoc group.

2.11 Response to National Body position papers

Based on the study during the week, REQUIREMENTS Group drafted the responses to US, UK and German National Bodies for approval of the Plenary.

2.12 Recommendations of the group

As conclusion of the one week discussion, the following Recommendations were drafted for consideration of the Plenary;

1) The guide for video as revised in MPEG92/230 (revised on July 10, 1992) should be applied to the work of video coding standard development.

2) Integration of the requirements listing for system, video and audio should be worked out by an adhoc group before the next meeting, based on the achievements obtained during this meeting.

3) WG11 should produce an MPEG-2 project description according to the format proposed in MPEG92/338.

4) Upper bound of "about 10 Mbit/s" in the MPEG-2 title should be removed. MPEG-2 should provide means for extension to higher resolution formats than CCIR-601.

5) The current time schedule agreed to in Haifa should remain unchanged.

6) MPEG-2 should not seek to provide for lossless coding in the sense of reversible coding, but it should provide for very high quality (near lossless) by selecting parameters.

3. TESTS sub-group (by S. Okubo)

Based on the work of the adhoc group which had been established at the Haifa meeting, the following sequences were selected;

Title	Length	Source	Remarks
Fountain and Rainbow (CG)	5 sec	T. Hidaka	Computer graphics
Marbles	5 sec	T. Hidaka	Stress material
Bus Crossing Columbus Circle	5 sec	VIACOM	CCD shutter 1/250
Carousel	5 sec	VIACOM	Beta SP 2/250
Confetti	4 sec	VIACOM	Composite
Ballet	5 sec	Hughes (Kodak)	Component

It is noted that the following sequences had already been selected at Haifa;

Title	Length	Source	Remarks
Football	5 sec	CCIR Library	New portion
Cheer Leader	5 sec	CCIR Library	Quick motion
Bicycle	5 sec	CCIR Library	Quick motion
Prl Car	5 sec	J. Morris	Stress material
Hockey	5 sec	B. Haskell	Quick motion

New test sequences will be distributed by Exabyte tapes through the three regional coordinators; N. Wells (Europe), D. Mead (North America) and J. Yonemitsu (Far East).

Chair of TEST sub-group, Mr. Hidaka, will prepare a letter to copyright holders of these test sequences asking permission for MPEG members to use those materials for their internal research work in support of the current phase of standardization work.

4. VIDEO sub-group (by G. Bjoentegaard)

4.1 General

The VIDEO group met as a whole group, jointly with REQUIREMENTS, SYSTEMS and IMPLEMENTATION as well as in subgroups. Brief reports from the subgroups are given below with special emphasis on the items of interest for CCITT.

4.2 Prediction modes

In this group both coding structure (frame based, field based) and prediction modes were dealt with. The pure field structure was removed from the TM. The frame based frame and field coding remain and they should satisfy the needs both from compatibility and low delay point. Some new prediction modes that could be of interest specially for low delay was included as core experiments (SVMC, DUAL').

4.3 Compatibility

Extended core experiments were proposed. Some of them intend to cross check the merits of different techniques. Core experiments were also defined for compatibility with H.261 and higher formats (e.g. HDTV). A modification of the syntax to use field structure for compatibility was made in the TM.

4.4 Cell loss

Although not stated in the requirements, the group expressed interest in checking cell loss performance for high loss rates (up to 10E-2). The core experiments defined in TD6 from CCITT were adopted.

4.5 Quantization

Core experiments were defined to perform test of the following items:

- Weighting matrices.
- Scanning of coefficients.
- Quantization (e.g. increase upper limit of reconstructed coefficients from 256 to 2000).
- Other transforms than 2D DCT. 8*1 DCT and NTC (Non Transform Coding) will be examined.

4.6 Scalability

The following items will be addressed in core experiments:

- Pyramid/subband approach.
- Coefficient scanning.
- Interlace/interlace extraction problems.
- Drift corrections.

4.7 Adhoc groups

To perform work in all these areas until the next meeting the following adhoc groups were formed:

Editorial	A. Koster
Prediction	H. Watanabe
Scalability	E. Viscito
Compatibility	A. Puri
Quantization	N. Wells
ATM and error resilience	M. Biggar
Low delay	T. Yukitake

5. SYSTEMS sub-group (by B.G. Haskell)

The SYSTEMS Committee of MPEG has shrunk considerably in size as the topics

for discussion become more general. This should change as specific implementational aspects of the various applications begin to be studied.

The current list of MPEG2 Systems Requirements includes...

1) Scalability of Audio and Video
2) Robustness to bit errors and cell loss
3) MPEG1/H.261 backward compatibility
4) Trick modes for VCRs
5) Multichannel Audio/Language
6) Multiprogram with Adaptive Multiplexing
7) Switching Bitstreams, such as Channel Hopping
8) Indication Signals for Stream Inter-Relationships
9) Encryption/Scrambling, such as Conditional Access
10) Editing of Distribution Format
11) Broadcast Applications

All were discussed to some extent. However, more time was spent on items 5, 8, 9 and 11. Some preliminary arrangements for language specification were spelled out. Contributions were studied for various levels of conditional access, which are also being studied by the CCITT. Special broadcast requirements were discussed, and an ad hoc Committee on Broadcast Requirements was formed with B.G. Haskell as chair.

6. IMPLEMENTATION STUDIES sub-group (by D.G. Morrison)

6.1 General

The group met several times during the week. The participants at the first session were:

Cliff Reader, Cypress Semiconductor
Kwok Chau, LSI Logic
Marco Gandini, CSELT
Doug Bailey, Integrated Systems Technology
Jim Williams, Hughes
John Gooding, Inmos/SGS Thomson
Colin Smith, Pioneer Digital Design
Sam Narasimhan, Institute of Microelectronics, Singapore
Eiichi Kowashi, Intel
Toshio Nagata, Texas Instruments
Ben Yung, Apple Computer
Elio Pithon Saryo Fo., IPgD-Telebras
Sergio Csnesiu Collocci, CpgD-Telebras
Geoff Morrison, BT Labs (chair)

6.2 Discussion

1) We discussed document MPEG92/350 which investigated the hardware complexity of various predictors. This prompted recommendations 1 and 2 about FAMC.

2) In the context of predictors, the idea of downloadable predictors as proposed in MPEG92/285 did not find favour mainly because of the possible large RAM overhead for the decoder's table. Recommendation 3 expressed our preference that this should not be added to the Test Model.

3) Document MPEG92/388 considered the implementation aspects of a Modified Universal Variable Length Coder. Some participants were of the opinion that a simpler implementation could be possible. Recommendation 4 reflected this.

4) Some implementation problems are eased when the number of coded bits per block is not unduly high. In recommendation 5 we requested experiments to see the affect of setting maximum numbers of 256 and 512.

5) Recommendation 6 was prompted by the desire to be able to find picture start codes directly in the System multiplex.

6) Some implementers favoured simplification of the TM syntax. Recommendations 7, 8 and 9 requested the video group to investigate the affect on coding performance of removal of MBA and CBP and a having a new VLC for coefficients.

7) We held a joint meeting with proponents of scalability in the frequency domain. This led to recommendations 10 and 11. We also held a joint meeting with proponents of scalability and compatibility in the spatial domain. We decided to establish an ad-hoc group to study further hierarchical schemes using frequency and spatial domain methods (recommendation 12).

8) We participated in a joint meeting with Systems and Video on the subject of multiplexing strategy for layered coding. We expressed a small but positive preference for such multiplexing to be performed at the System level and not as part of the video multiplex.

9) We decided not to meet again before the London meeting in November.

6.3 Recommendations of IMPLEMENTATION STUDIES Group, Angra dos Reis

1) FAMC B predictions using average mode should be removed from the TM.

2) FAMC weighting factors should be multiples of 1/8.

3) Downloadable predictors should not be added to the TM.

4) The MUVLC warrants further complexity study. (The coder may be less complex than suggested in MPEG 92/388).

5) Core experiments are requested to assess the affect of restricting the maximum number of bits per block to 256 and 512. In these experiments trailing coefficients should be forced to zero and these modified values used in reconstructing predictions.

6) For video editing it is desirable that picture start codes can be detected directly in the System byte stream. This is facilitated by these codes not being interrupted by System headers. We request the SYSTEMS group to propose mechanisms to achieve this with the intention of making it a normative requirement.

7) We support the non-use of skipped macroblocks in the TM. We would support the deletion of MBA. At the beginning of slices the horizontal position should be indicated. Experiments are requested.

8) We request the VIDEO Group to perform core experiments to test the

effect of deletion of CBP from the TM.

9) The VIDEO group should re-examine the coefficient VLC table with a view to simplification eg removal of the two stage escape mechanism and the first/next coefficient mechanism.

10) Scalability in frequency domain. We note that the schemes under investigation by the VIDEO group range from those which are only marginally more complex than non-scalable to those which are significantly more complex (more memory, more memory bandwidth, more quantisation and transform computations.) We expect that only those schemes which are competitive with simulcast have a chance of being incorporated in the standard. We request the VIDEO group to identify these and provide clear information on them. (MPEG 92/288 is a good example). This information is requested by 14 Aug 92.

11) We confirm that bi-linear interpolation using multiples of 1/8 to effect higher precision motion vectors in lower layers using half pel resolution vectors from a higher layer does not add significant complexity.

12) We recommend the establishment of an ad-hoc group on implementation aspects of scalability and compatibility.

7. Meeting on very low bitrate audio-visual video coding study (by G. Eude)

A group chaired by Mr K. O' Connor met to have a preliminary discussion about audio-visual coding at very low bitrate (about 10 kbit/s) and to draft the ad-hoc group mandate. More than 25 people, many from the CCITT EG, attended this meeting.

On the basis of the US National Body contribution (MPEG92/233), audio-video coding techniques and possible applications were reviewed. Two target dates for this study have been mentioned, near-term solution (~2 years) and long-term solution (~5 years). The study should be subdivided into video compression algorithm, audio compression algorithm, system multiplex specifications, requirements and implementations. During the discussion, some participants mentioned the fact that the standardization of audio-visual terminals for communications is relevant to CCITT.

In conclusion, the mandate of the ad-hoc group on very low bitrate audio-visual coding study is "to perform a study to produce a new project (NP)" by November 92 (London meeting). CCITT EG members were invited to join this group on a individual basis.

END

Annex to AVC-318R

List of documents for the Rio de Janeiro joint sessions

Note: * indicates that the content of the document is also covered by AVC-numbered document.

MPEG92/		
233	ANSI	Contribution on very-low bitrate audiovisual coding
234	ANSI	MPEG Lossless compression
235	AUS NB	Comments to Haifa resolutions
236	ITSCJ	Resolutions of the Japanese National Body
237	UNINFO	Opinions on questions contained in ISO/IEC JTC1/SC29/WG11 N0201
238	IPQ	Video coding at 10 kbit/s and applications
239	Kirby	Cooperation CCIR-ISO/MPEG-Audio
240*	CCITT SGXV	Liaison statement to ISO/IEC JTC1/SC29
241	Chinen et al.	Field/Frame DCT coding and Zigzag/Vertical scanning
242	Kameyama	Some Modification of Rate Control of TM1
243	Kameyama	Simulation Results
244	Iwahashi et al.	Tape Demonstration of Frequency Scaling Decoder
245	HITACHI	Simulation results on TM1 core experiment
246	Nakajima	Simulation results of TM1 core experiment
247*	CCITT/J	H.261 compatibility requirements
248*	CCITT/J	Scene change handling in low delay mode
249*	Yukitake	Simplification of FAMC
250*	Yukitake	The comparison of numbers of operations between adaptive field/frame and simplified FAMC
251*	Japan MPEG	The estimation of coding and decoding delay and number of required field memorys for predictions in TM1
252	Takahashi	Proposal of Global Motion Compensation
253	Takahashi	Scalability achieved in Decoder
254	Noguchi et al.	Comparison between FAMC and frame/field/dual-field prediction
255	Fukuhara et al.	Improvement of Dual field prediction and its coding gain
256	BTA	Results on Basic Duality Subjective assessment for conventional Television Secondary Distribution
257*	Ueno et al.	Simulation result on compatibility
258	Odaka	Comparison among three prediction structures in TM1
259	Odaka et al.	Improvement of dual field prediction method in TM1
260	Sugiyama	Results of TM1 core Experiments
261	Sugiyama	Proposal for core Experiments
262	Sugiyama	Results and Proposal for low delay coding
263	Sugiyama	Consideration about multi picture formats
264	Hidaka	Study about the compatibility toward to MPEG3
265	Matsuda	Comparison between prediction schemes
266	Nagata et al.	Comparison of Field-Time Adjusted MC and Frame Field Adaptive MC
267*	Nogaki	Studies on Low Delay Coding
268	Nogaki	Comparison between FAMC and Frame/Field MC
269	Hanamura	Result of SNR scalability experiment
270	Sato et al.	Simulation results of TM1:Frame/Field structure coding
271	Okazaki et al.	Simplification of TM1:Frame/Field structure coding
272	Kato et al.	Comparison of Frame_structure/Field_structure/ Pure_field coding in TM1

273	Suzuki et al.	Proposal of Adaptive Frame/Field structure for core experiments
274	Okazaki et al.	Simulation results of Quantization
275	Kato et al.	Proposal of Adaptive DCT/NTC coding
276	Okazaki et al.	Simulation results of Input Format
277	Obikane et al.	Results of Scalability experiments
278	Japan MPEG	Prediction and Motion Compensation in TM1
279	Japan MPEG	Summary of TM1 Core Experiments in Japan
280	ITSCJ	Resolutions of Japanese National Body
281	Nocture	Results on TM1 from the VADIS European collaboration
282*	PTT Research	TM1 experiments
283	Nokia	Comparison of prediction modes
284	UH/FI	Experiments with TM1
285*	Bjoentegaard	Flexible encoder defined predictions
286	Corset	Evaluation of new prediction modes
287	Siemens	Experiment 1 of the scalability annex of TM1
288	DTB	Multiple loop decoder for TM1 scalable mode
289*	Schamel et al.	Frequency scanning with MUVLC
290	LER	Frequency scanning with ACVLC
291*	BT	TM1 compatibility experiments
292*	PTT Research	TM1 hierarchical coding/compatibility vs simulcast
293	Koster	Improvement of TM1 syntax with respect to compatibility
294	CCIR	Appointment of a Special Rapporteur on Study Groups 10, 11 and CMTT applications requirements for digital source
295	Convenor	Generic audiovisual coding - A proposal for international multi-organisation collaboration
296	JTAG2	Minutes of the meeting of JTAG2, held in Geneva, 1992-06-02/04
297	JTC1	Summary of voting on document JTC1 N1779, revised title, area of work and programme of work for ISO/IEC JTC1/SC29
298	Ainsworth	Report of the ISO/IEC JTC1/SWG-P ad hoc group on teleconferencing/electronic messaging
299	SC29	Resolutions adopted during the second plenary of ISO/IEC JTC1/SC29 in Haifa, Israel, 1992 March 30, 31 and April 1
300	SC29	Proposal for a workshop on Multimedia/Hypermedia standardisation
301	SC29	Letters concerning ISO/IEC DIS 11172-1
302	SC29	Project description format
303	Gonzales	Ad-hoc group on experiments with the scalability requirements
304	Puri	Ad-hoc group on experiments with the compatibility requirements
305	Wells	Ad-hoc group on quantisation experiments
306	Haskell	Ad-hoc group on conformance testing for CD11172
307	Reader	Ad-hoc group on CD editing
308	Hidaka	Ad-hoc group on MPEG-2 video test sequences
309	Morrison	Ad-hoc group on implementation considerations of TM1
310	Pan	Ad-hoc group on audio software simulation
311	Koster	Ad-hoc group on Test Model editing and Core experiments
312*	PTT Research	Error sensitivity of the TM1 syntax
313*	PTT Research	TM1 pyramid coding for the scalability requirements

314*	PTT Research	ATM cell loss experiments with TM1
315	DSM/Chair	Sub Group Chairman's report for DSM Sub Group
316	CCIR	Establishment of Task Group 11/4 on Harmonisation of HDTV standards between broadcast and non-broadcast applications and its first meeting to be held in Washington, D.C. (October 1992)
317	Sebestyen	Status of work in CCITT SG VIII with regards to JPEG, JBIG, MPEG
318	Bourguignat	User requirements for secondary distribution
319	CCIR	Tentative schedule of preparation of recommendations considered in WPs and TGs
320	CMTT	Liaison letter from CMTT/2-SRG to ISO/IEC JTC1/SC29/WG11 (MPEG)
321	CMTT	Report of the activities of the group of experts assisting the special rapporteur
322	ANSI	Comments on MPEG-2 Video requirements
323*	CCITT/AUS	Cell loss characteristics for statistically multiplexed video sources
324*	CCITT/AUS	The ATM adaptation layer for video services in the B-ISDN
325*	CCITT/AUS	Adapting MPEG 1 video for ATM transmission
326*	CCITT/AUS	Proposal for cell loss core experiments on layered and non-layered coders
327	Curet et al.	Addition of conditional access to the MPEG System layer
328	Ziegler	Stereoscopic imaging - Work done within COST 230 and RACE DISTIMA
329	Chiang	Results of compatibility experiments of MPEG1 field coding in a 3-layer structure
330	Yu	Allowing reverse order of field coding in field-structured frame-sequences
331	Savatier	CD 11172 rev 2, Video: Comments and clarifications
332	Savatier	Syntax modifications for the coded block pattern in 4:2:2 sequences
333	Savatier	Alternate search method for FAMC motion vectors
334	Savatier	Field reordering in pure-field- sequences for FAMC prediction
335	Savatier	Simulation results on prediction modes and Field/Frame DCT coding
336	Savatier	Simplification of the coding of Field-based MV in Test Model
337*	Bjoentegaard	Simulations with field coding and M=1 for low delay
338	ANSI	MPEG 2 project description
339	Holtzman	Amplitude Scalability experiments
340*	Aravind et al.	Modifications to TM1 to suit Broadcast Applications
341	Aravind et al.	Report on core experiments on temporal prediction modes
342*	CCITT/J	Cell loss compensation scheme
343*	DSRC	VBR MPEG bit-rate characteristics
344*	DSRC	Error concealment for MPEG Video over ATM
345*	CCITT/J	Comparison of prediction methods of the low delay mode of TM1
346	Sugiyama	Call for participation in audio bitstream exchange
347	BSI	UK National Body Comment on the 18th ISO/IEC JTC1/SC29/WG11 meeting resolutions (Haifa Meeting)
348	BSI	UK National Body Comment on the MPEG Requirements documents
349*	Okubo	Third progress report

350	Fauthier et al.	Implementation study of motion compensation modes in TM1
351	Zdepsky et al.	AD-HDTV: Hardware verification of MPEG-1 syntax at HDTV bit-rates
352	Zdepsky et al.	An MPEG Video user data and its syntax
353	Joseph et al.	Priority syntax for 2-tier MPEG transport
354	Puri et al.	Revised Specifications for Compatibility Experiments
355	Puri et al.	Revised Specifications for Hybrid Scalability Experiments
356	Puri et al.	Increasing Efficiency in Frequency Scalability
357	Puri	Framework for Improving Quantization Options
358	Puri	Report on coordination of North American Experiments
359*	Bellcore	Low-Delay Coding Experiments
360	Wong	Non-compatible vs Simulcast vs Compatible Experiment G.3
361	Viscito et al.	Proposal for new Huffman codes in frequency scalability syntax
362	Gonzales et al	Experiments and proposal for field extensions to frequency scalability syntax
363	Viscito et al.	Description and Results of Experiments on scalability
364	Alves et al.	MPEG indication functions
365*	Bellcore	Non-compatible vs Simulcast vs Compatible
366	Morris	Response to WG11 question on very low bit-rate audio-visual coding
367	Yonemitsu	MPEG 1 video compliance and the patent issue
368	Kogure et al.	Adaptive DCT/Non-DCT Core Experiment
369	Kogure et al.	A proposal of chrominance coding method for the adaptive frame/field algorithm of the MPEG Test Model
370	Kogure et al.	Simulation results for TM (adaptive frame/field)
371	Kogure et al.	Compatible coding for multichannel audio
372	Schroder	Letter to Prof. Noll
373	Sugiyama et al	Proposal of audio bitstream exchange
374	Sugiyama et al	MPEG/Audio compliance testing
375	Yamada	MPEG2 TM1 comments
376	SF NB	Comments to Resolutions of Haifa meeting
377	SC24	Excerpts from CD 12087-1
378	SC24	Excerpts from CD 12087-3
379	Convenor	E-mail addresses
380	Fritsch	Use of the MPEG/Audio simulation software
381	Puri et al.	MC prediction options in field-structure pictures
382*	Bjoentegaard	Simulation with field coding and M=1 for low delay
383	Johnson et al.	Results on frequency scalability core experiments
384	Sikora et al.	Proposal for frequency scalability experiments
385	DIN	Comments to the resolutions of the Haifa meeting
386	AFNOR	French contribution on SC29/WG11 Work
387	KBS	Opinions on some resolutions of ISO/IEC JTC1/SC29/WG11 Haifa meeting of March 1992
388	Selinger	Implementation study of a MUVLD
389	Convenor	Draft letter to companies having provided patent statements
390	Sebestyen	Letter to Convenor
391	Knoll	Experiments MPEG2-TM1 and UVLC
392	SNV	Letter to Convenor
393	Bosch et al.	Application profile for hierarchical TV/HDTV broadcasting

394	Liu et al.	Experiments on frequency pyramid coding and scan order of DCT
395	ITTF	Excerpts from DIS 11172
396*	AT&T	Timing recovery for variable bit-rate video on ATM networks
397*	CCITT EG	Low delay mode
398*	CCITT EG	Cell loss resilience: issues and core experiments
399*	CCITT EG	An experiment to investigate H.261 compatibility and to help determine the most suitable compatible prediction method
400	AUS NB	Invitation to 21st WG11 meeting
401	Schamel et al.	Description of encoder with frequency based scalability for broadcast applications with heterogeneous receivers
402	Stoll	Intention to contribute a low bitrate audio coding system to ISO/IEC JTC1/SC29/WG11 Audio, Phase 2
403	v. d. Kerkhof	Intention to contribute a low bitrate audio coding system to ISO/IEC JTC1/SC29/WG11 Audio, Phase 2
404	Holtzman	BUS: Demonstration employing new test footage
405	CCIR	Draft New Recommendation: Multi-channel stereophonic system with and without accompanying picture
406	Savatier	FAMC prediction in pure-field sequences
407	CCIR SG11	Statement concerning user requirements for source coding and multiplexing for broadcast applications
408	Savatier	Extend escape range to 12 bits and intra DC precision to 9 bits
409	USA NB	Contribution on MPEG/Audio standard
410	Editing gr.	Delta for TM-2
411	Chiariglione	Meeting notice of ad-hoc group on Video Test Model

END