ITU-T Telecommunication Standardization Sector
Study Group 15
Experts Group for Video Coding and Systems
in ATM and Other Network Environments

Document AVC-599R
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Source: RAPPORTEUR (Sakae OKUBO)
Title: REPORT OF THE FOURTEENTH EXPERTS GROUP MEETING IN DAEJEON AND SEOUL (October 27 - November 5, 1993) - Part III
Purpose: Report

Part I General (see AVC-598R)
Part II Sole sessions in Daejeon (see AVC-598R)
Part III Joint sessions in Seoul

Part III Joint sessions in Seoul

Contents

A. Introduction

The joint sessions with MPEG were held at Sheraton Walker Hill Hotel in Seoul during 1-5 November 1993 at the kind invitation of KBS. At the opening session on 1 November, Prof. Jae-Kyoon Kim, KAIST, made a welcoming address on behalf of the hosting organization.

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.

B. REQUIREMENTS sub-group (by Sakae OKUBO)

B1. Introduction

The Requirements sub-group met every day from 1-5 November 1993 under chairmanship of Mr. Sakae Okubo and co-chairmanship of Mr. Ken McCann. The work programme for the week was as follows:

Monday: Meeting of Ad-hoc group established at the plenary. All available input documents were reviewed briefly and a list of discussion items was drawn up.

Tuesday: Ordinary sub-group meeting started. There was a joint meeting with Video and Implementation sub-groups to identify the items needing advice of the two sub-groups. Consensus was reached on the discussion items and time schedule during the week. National Body position papers were reviewed.

Wednesday: There was a joint meeting with Test and Video sub-groups to exchange views on the priorities of the various video performance verification tests. Consensus was reached on most of the CD related discussion items. Editing of Chapter 8 and Annex E was carried out. Updated Video draft was reviewed jointly with Video.

Thursday: Comparison between the requirements and Video and Audio achievements was reviewed. Responses to National Body papers were agreed. Framework for verification test was discussed.

Friday: Consensus was reached on the verification test framework consulting with Video. Comparison between the requirements and Systems achievements was reviewed. Extension procedures for Profile and Level were discussed.

B2. Input Documents Considered

WG11 N0535	Convenor	Report of the 24th meeting in Brussels
MPEG93/855	Hitachi	Constraints on bits/macroblock and bits/slice to facilitate implementation and enhance interoperability
MPEG93/848	Italian NB	Contribution to the 25th WG11 meeting
MPEG93/856	US NB	Contribution on Profiles and Levels
MPEG93/860	US NB	Contribution on MPEG-2 interoperability
MPEG93/886	Schaefer	Statement of HDTVT to MPEG
MPEG93/897	DIN	Position of the German National Body on the resolutions of the 23rd and 24th WG11 meetings
MPEG93/906	Sezan	Report of Ad-hoc group on applications and testing of 10 bits and 4:2:2 extension
MPEG93/907	Okubo	Report of Ad-hoc Group on Editing Profiles and Levels part of Video WD
MPEG93/969	NNI	NNI resolutions for ISO/IEC JTC1/SC29/WG11
MPEG93/970	DISC	UK NB recommendation to the 25th meeting of SC29/WG11

B3. Discussion on Profile/Level

B3.1 Profile/Level structure [848-Italy, 856-US, 897-Germany, 969-Netherlands, 970-UK]

1) Not more than 11 conformance points in the CD?
2) 4P x 4L, 5P x 4L, 4P x 4L x 3C?

The views expressed are summarized as follows;

Item	D	GB	I	J*	NL	USA
No more than 11 conformance points	11	11	11	11	11	>11
4P x 4L	no	yes	yes	no	yes	no
5P x 4L	yes	no	no	yes		yes
4P x 4L x 3C	no	no	no	yes		**yes**
Addition of conformance points in the future	yes	yes	yes	yes		yes
Not necessarily onion ringed Profile/Level	yes	(yes) **	(yes) **	yes		yes

* Not documented, but expressed verbally by the delegation.
** implicit in the document

We agreed to keep the current 11 conformance points for the CD, but to split the current Main Plus Profile into two to make the specifications strict to the definition of profile, which is based on coding tools to be used.

High Level		√			√
High-1440 Level		√		√	√
Main Level	√	√	√		√
Low Level		√	√		
	Simple Profile	Main Profile	SNR Scalable Profile	Spatially Scalable Profile	High Profile

We considered the USA proposal to apply the 3D structure for our purpose and renewed the recognition that the Profile/Level is of multidimensional nature. We reached the above compromise solution maintaining the 2D model due to the facts that;

- more dimensions than three would be needed to accurately model the subsets; e.g. 8/10 bit accuracy, B-frames, DP,
- total number of possible conformance points would be increased to 48 including some impractical Profile/Level/Chroma format combinations,
- whatever structure we may adopt, the compatibility between decoders and bitstreams should be tabulated as in Table D-30 for precise specifications to cope with either hierarchical or non-hierarchical subsets.

3) Naming?

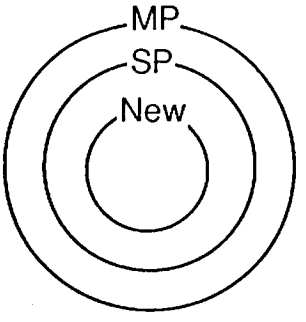
Profile naming is modified as follows;

- Simple and Main Profile are kept intact.
- Main+ is split into SNR Scalable Profile (SNRP), Spatially Scalable Profile (SSP).
- Next Profile is renamed as High Profile (HP) in line with other functionality oriented naming for Profile.

B3.2 Compatibility for bitstreams of a conformance point to be added in the future [§5.3 2)/907 - AHG]

1) How to encode **profile_level_id**?
2) Required resource indications in the bitstream?

Our guideline for the definition of Profile and Level is to make it hierarchical as far as practical and the current conformance points are in line with this. However, we can foresee a possibility that we may define a new subset of the standard which is inside an existing subset. In this case the existing decoder may not accept the newly defined subset bitstream due to the new value of **profile_and_level_indication**.



One agreed solution to ease the problem is;

- to assign the value in order of hierarchy so that the existing decoders can identify decodability of future bitstreams,
- to use the escape bit = 1 for encoding non-hierarchical Profiles and Levels.

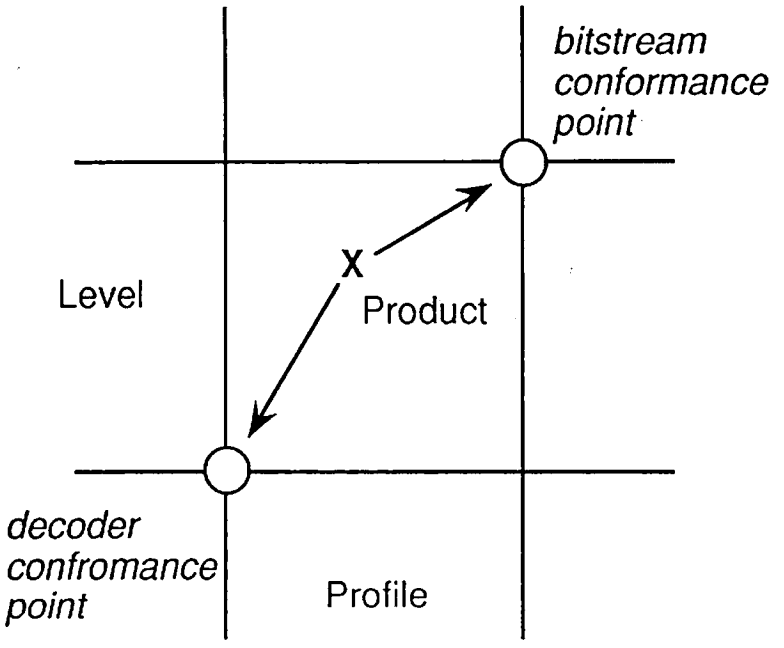
For example, suppose Intra only profile was introduced in the future. If its Profile id value is set to 110 or higher, then Simple (101), Main (100), SNR Scalable (011), Spatially Scalable (010) and Next (001) can be programmed to identify the decodability even at this moment. This is workable as far as hierarchy is maintained.

In order to cope with more general cases which arise in the future, we agreed to prepare for introduction of optional indications in the video bitstream to make the bitstream self describing. We propose to define a sequence extension code specifically reserved for this indication purpose. Its content should be defined at the time when new conformance points are added. The CD should include this place holder together with specification that the decoders conforming to the current version of the standard should be able to ignore this reserved extension until its syntax contents are defined.

B3.3 Products (decoder or bitstream) which lies between defined conformance points in the Profile/Level space [860-US]

1) What conformance point it can claim?
2) More conformance points we should define?

We recognize the purpose of defining conformance points in form of Profile/Level is to facilitate bitstream interchange among different applications. Though the standardization body encourages to produce decoders and bitstreams corresponding to those defined conformance points, actual products may be mapped into an intermediate point in the Profile/Level space as illustrated in the figure below.



To help to make this situation clearer, we propose to modify the first sentence of Chapter 8/WD as follows;

from

Profiles and levels provide a means of defining subsets of the ISO/IEC xxxxx syntax and semantics and thereby the required decoder capabilities.

to

Profiles and levels provide a means of defining subsets of the ISO/IEC xxxxx syntax and semantics and thereby the decoder capabilities required to decode a particular bitstream."

This matter of product compliance with the standard should be fully addressed in Part 4.

B4. Elaboration of the Video draft

B4.1 Temporal scalability in Spatially Scalable + and High Profiles?
[D.7/WD, 897-Germany]

Since applications which would use this tool is not clearly visible at the moment, we agreed to handle it as a tool which may be included in a future profile.

B4.2 Flexibility in sampling density; number of macroblocks bounded? [907-AHG]

At the joint consideration of IMPLEMENTATION, VIDEO and REQUIREMENTS, this matter was left to the discretion of REQUIREMENTS. Since we do not identify strong needs for this extended flexibility in the decoder, we agreed to keep the current specification.

B4.3 H.261 compatibility in Next [897-Germany]

According to the following decision in Brussels;

"The video syntax contains tools that are needed to implement H.261 compatibility that ITU may need for possible future use, however, this is currently not supported by any profile (§10.1/N0535)"

we agreed to move relevant description from normative Chapter 8 to informative Annex D.

B4.4 **frame_rate_extension** semantics

This syntactic element was defined at this meeting. We discussed how this is to be specified in Profile and Level. Considering

- that its use in MP@ML is not appropriate since the specifications frozen in Sydney are affected,
- that its use is accompanied by implementation cost,

we agreed not to use this element in any of five Profiles at the joint consideration of REQUIREMENTS and VIDEO.

B4.5 Naming for scalable layers

Consultation with VIDEO, we use the following naming for consistency;

first layer with **layer_id** = 0 base layer
second layer with **layer_id** = 1 enhancement layer 1
second layer with **layer_id** = 2 enhancement layer 2

B4.6 Representation of VBV buffer size specification [§3.9/Brussels Report]

In consultation with IMPLEMENTATION, the value is represented in unit of 1024 bits rounded up to a nearest integer.

B4.7 Another restriction to number of bits/macroblock, slice? [855-Hitachi]

No restriction was adopted in the normative part of Video CD, but the informative part states that a normative limit will be included in the Conformance Part of the standard. This decision, however, did not affect the Profile and Level specification.

B4.8 Representation of the bound for ratio of bitrate to picture rate [§3.9/Brussels Report]

In consultation with IMPLEMENTATION, unit of 1k (1000) bits is used; e.g. for MP@ML 15 000 000 / 23.976 = 625625.625... is rounded to 626k.

B4.9 Table numbers in D.7 be adjusted in the order of reference

This editorial improvement was acted.

B4.10 Handling of D-pictures [907-AHG]

Based on the agreement in Brussels and confirmation at the joint IMPLEMENTATION, REQUIREMENTS and VIDEO meeting on Tuesday, we included relevant specification in Chapter 8.

B4.11 Vector range for dual-prime [907-AHG]

This was sorted out in VIDEO, but did not affect the specification of Profile and Level.

B4.12 Vertical vector range for high resolution pictures [907-AHG]

At the joint consideration of IMPLEMENTATION, VIDEO and REQUIREMENTS, we agreed to apply the current [-128:+127.5] specification to all Profiles and Levels.

B4.13 Quantizer matrix loading is Level independent ? [907-AHG]

We confirmed that the quantizer matrix loading is Profile dependent but Level independent, and reflected this in Annex E.

B4.14 Simplification of the tables in D.7? [907-AHG]

For completeness and due to informational nature of Chapter D.7, we decided to keep the current full description.

B4.15 Completion of Chap 8 and Annex E

Mr. J. Williams and Mr. C. Birch volunteered to edit Chapters 8 and Annex E by incorporating the above agreements. The outcome was reviewed by REQUIREMENTS and VIDEO on Wednesday.

B5. Work plan for verification test requirements [§3.12/Brussels Report]

1) What should be tested for Profile/Level other than MP@ML?
2) Volunteers for Stages 3, 4

We made a framework as documented in WG11 N0605. Comments on the test items and indication of commitments are requested.

B6. Comparison between CD 13818 and the requirements

After review of Systems, Video and Audio in each sub-group together with REQUIREMENTS, an integrated document has been produced as WG11 N0606. Respective parts were kindly drafted by Mr. C. Holborow, Mr. T. Sikora and Mr. I. Rabowsky.

B7. Procedures to add conformance points through the amendment [856-US, 897-Germany]

It has been agreed that amendments should be used to introduce new Profiles and Levels of MPEG-2. We made a preliminary analysis for possible methods, and listed the following guidelines;

- Amendments should be timely but not too frequent - 1 to 2 yeas?
- New Profiles and Levels should follow the "onion ring" structure already established wherever practical. It is recognised that this may not always be the case.
- Wherever practical, new profiles and levels should be chosen to serve a cluster of applications and so encourage the interworking between applications.

This matter will be further studied through correspondence in an adhoc group chaired by S. Okubo.

B8. Profiles for Systems [897-Germany, 969-NL]

1) All decoders should be able to decode both PS and TS?
2) Other subsets?
3) Work method toward DIS

Since this study need involvement of Systems experts, it will be further studied through correspondence in an adhoc group chaired by K. McCann.

B9. Responses to National Body papers

We reviewed a drat response produced by Mr. J. Williams on those items of our responsibility (see §3, §4, §7, §8 above) and forwarded this to the plenary.

C. VIDEO sub-group (by Kiyoshi SAKAI)

C1. Introduction

The video sub-group met for five days and discussed issues for finalizing the video WD. The discussion centered upon the report from the ad-hoc group on video bitstream verification. The meeting clarified the ambiguities remained from the 4th Video WD and fixed any other inadequacies.

C2. Verification of the tools

According to the agreement made in the Brussels meeting, the tools unsucessfully verified by bitstream exchange are not included in the CD, the video group examined the work done by the ad-hoc group. The group approved all the tools which are included in the currently defined profiles, however, some tools seemed to be not yet fully tested. The video group decided to continue the work on bitstream exchange based on the final WD, especially focusing on the scalable syntaxes. Related to this issue, there was an opinion that the precise verification of scalable schemes was only possible in the form of system bitstream.

C3. Picture skipping ("big picture" issue)

There were extensive discussions on this issue together with scalable schemes. Main discussion in the video group was how to realize a loosely-coupled scalable system (spatial scalability) with skipped pictures in the base layer. However, there was an input from the systems group not in favor of supporting skipped pictures even in the main profile. The video group thoroughly reviewed the encoder/decoder operation in the presence of skipped pictures including non-scalable scheme.

1) Non-scalable scheme

The video group clarified the operation of vbv_buffer together with STD_buffer in the system layer to support picture skipping and this case was agreed to be supported in both video and systems group.

2) Scalable scheme

The following three alternative solutions were discussed to cope with the "big picture":

i) Allow picture skipping by ensuring end-to-end timing relation between pictures in respective layers.

ii) Allow picture skipping, but cut the link between layers when picture skipping occurred in the lower layer.

iii) Not allow picture skipping, but emulate picture skipping by using dummy pictures which consist of skipped MBs.

The proposed method from ITU-T/EG(solution 1, MPEG93/966) was recognized as a possible solution. However, there was a strong opinion that the solution is not fully investigated nor proved and may not always work well, for example, when re-multiplexing is done in-between encoder and decoder. As a result of extensive discussions, the group decided not to allow picture skipping in any scalable schemes in the WD.

C4. VBR operation

The proposal from ITU-T/EG(MPEG93/965) which pointed out the inadequacy of **vbv_delay** definition for VBR operation was accepted and the definition was kept as it had been before the Brussels meeting (shall be set as "FFFF" in case of VBR). However, as for **bit_rate** definition, the video chairman required to utilize the field to have some regulation for VBR-coded bitstreams. The revised definition after the discussion is as follows:

If the bit-stream is a variable bit-rate stream, the STD specifications in ISO/IEC 13818-1 supersede the VBV, and the bit-rate specified here is used to dimension the transport stream STD (2.4.2 in ISO/IEC 13818-1).

The bit-stream is a variable rate bit-stream if and only if the vbv_delay field has the value 0xFFFF.

Given the value encoded in the bit-rate field, the bit-stream shall be generated so that the video encoding and the worst case multiplex jitter do not cause STD buffer overflow or underflow.

According to the above definition, an encoder which wishes to generate a VBR bitstream conforming to MP@ML may set :

vbv_delay: FFFF
bit_rate: 15[Mbps]
STD_buffer_size: **vbv_buffer_size**+4[ms]*15[Mbps]

where the value for vbv_buffer_size is encoder's choice.

C5. Chroma format

The discussion point was which of the two commonalities 4:2:2/4:2:0 or MPEG-1/MPEG-2 should be taken. As a result of the discussion, the group chose the former concept. This means that a decoder has to switch the chroma processing method between MPEG-1 mode and MPEG-2 mode to precisely reproduce the chroma posision.

D. IMPLEMENTATION STUDY sub-group (by Geoff MORRISON)

There was no dedicated meeting of this sub-group in Seoul. The sub-group, however, assisted in determining the following items in the joint meeting with Requirements and Video (see Requirements sub-group report);

- representation of VBV buffer size specification,
- representation of the bound for ratio of bitrate to picture rate,
- vertical vector range for high resolution pictures.

E. SYSTEMS sub-group (by Stuart DUNSTAN)

E1. Introduction

The MPEG-2 Systems Working Draft ISO/IEC JTC1/SC29/WGll N0601 was submitted to the closing MPEG plenary in Seoul for consideration as a Committee Draft. The document dated 04 Nov 1993 was accompanied by a delta document "N0601 Corrigendum 1".

E2. SG15 EG issues

A presentation of the SG15 EG discussions in Daejeon was made on Friday morning, after more immediate issues affecting the Working Draft (WD) were resolved.

E2.1. Use of PES

MPEG 93/968 [1] raised ambiguities in the Brussels WD with respect to the use of the PES stream as an interface point. The revised WD text largely corrects this. Specifically:

- section 0.4 has been revised. The final paragraph states "The PES stream is a logical construct that may be useful within implementations of this standard; however it is not defined as a stream for interchange and interoperability".
- in section 0.10 reference to the PES stream has been removed.
- section 2.4.5 an STD is defined for a PES stream. It is the same as the STD for the Program Stream.

There was a general feeling in the meeting that no conformance point would be defined for the PES stream. However it was felt that this did not prohibit a user from using a PES stream if desired.

It was pointed out that the Program Stream may be used in a similar manner to the way in which it was anticipated the PES stream might be used.

There were a number of computer manufacturer representatives in the meeting who also expressed interest in using the PES stream. Concern was also expressed that the driving force behind MPEG-2 Systems has been the broadcast application; the suitability of MPEG-2 for computer environments was questioned, since the quality demands may be less e.g STD clock accuracy.

These issues are to be addressed in an ad-hoc group titled "Ad-hoc group on Network Applications" (see below).

E2.2. Timing

It was generally agreed that ATM cell jitter removal is an AAL function; the AAL should have mechanisms to bound the jitter on user data. It was suggested that SCR (or PCR) fields could be carried in AAL fields. Meeting participants were encouraged to quantify timing issues, and solutions to deal with jitter removal, in their particular application.

E3. Program Specific Information

Major work was done to the tables that make up the Program Specific Information (PSI) in the Transport Stream (TS). A common syntax was applied to the leading fields of these tables so that common decoding mechanisms could be applied. An informative annex describes the PSI structure.

An attempt was made to apply this common syntax to the equivalent table in the Program Stream (PS), the Program Stream Map. However since the PS does not allow start code emulation, the common syntax could not be applied. Start code emulation is allowed in the TS.

E4. Digital Storage Media Control Command (DSM CC)

References to DSM CC can be found in Part 1 of the CD as follows:

- Annex A is a normative annex describing DSM CC
- in the PES header there are optional fields which describe the mode of operation of the DSM e.g fast forward, slow motion etc
- in Table 2-10 a stream_id value has been allocated to identify PES packets carrying DSM CC.

E5. Locking of audio and video sample clocks in TS

In the TS the audio sampling rate and the video picture rate have defined and fixed relationships to the system clock frequency, for one particular program. The justification for this is as follows:

- decoder design is simplified. Where the audio sampling clock and the video picture rate are not locked then individual elementary stream clock synchronisation, using PTSs, is required. Where locking is used synchronisation for the whole program can be done on the basis of PCRs.
- all known MPEG1 bit streams have a fixed relationship between audio sampling rate and video picture rates.

In section 2.4.10 "Constrained System Parameter Stream" an allowed set of ratios are defined.

E6. Skipped Pictures

There was some opposition to allowing skipped pictures, since this is the one and only condition which violates the TS and PS STD timing models. However picture skipping was agreed to and reference is made to it in the sections describing the STD for each stream.

E7. Transport Stream System Target Decoder

The TS STD was considerably revised. The time at which a transport packet is removed from the transport buffer is defined in terms of a latency.

An informative annex on the MPEG-2 systems timing model is included in the CD.

E8. Response to Requirements Group

It was the feeling of the meeting that the initial list of requirements set by the Requirements Group had been more than adequately met. A response document was written.

E9. General

The WD underwent considerable re organisation and editing. A quick look at the document reveals that further editing will be necessary.

E10. Ad hoc groups

The following ad hoc groups were formed to continue work towards the Paris meeting:

- Ad-hoc group on Bit Stream verification - chairman: Tony Wasilewski
- Ad-hoc group on Conformance Testing - chairman: Jan van der Meer
- Ad-hoc group on Network Applications - chairman: Stuart Dunstan

References

[1] ISO/IEC MPEG 93/968, "Use of Packetised Elementary Streams as an interface point", TD 11 (Daejeon), ITU-T SG15 Experts Group for Video Coding and Systems in ATM and Other Network Environments.

END

Annex to AVC-599R

List of Documents for the Joint Sessions in Seoul (1-5 November 1993)

MPEG 93/???	Source	Title
846	ISO	Managing the information explosion - 24th World Standards Day, 14/10/93
847	Portuguese NB	Input of the Portoguese National Body to the 25th meeting
848	Italian NB	Contribution to the 25th WG11 meeting
849	CCETT-CSELT	Needs for standardised access to navigation services
850	M.A.Smith	Letter to Convenor
851		
852	T. Hidaka	The handling of Post filter for MPEG-2 Verification Test
853	T. Hidaka	Schedule of Next MPEG-2 Verification Test
854	D. Nasse	Comments on NO545 (and associated doc.) proposal for picture quality assessment
855	Hitachi	Constraints on bits/macroblocks and bits/ slice to facilitate implementation and enhance interoperability
856	USNB	NB Contribution on profiles and levels
857	USNB	NB Contribution on DSM-CC
858	USNB	NB Contribution on MPEG-4
859	USNB	NB Contribution on MPEG-2 Audio
860	USNB	NB Contribution on interoperability
861	SC29 Secretariat	Calling notice and draft agenda, the joint meeting of JTC1/SC24/WG7 and JTC1/SC29/WGs on Image Processing and Interchange (IPI), 1993-11-04, Seoul
862	N. Hirose	Liaison representative from SC 24 to the SC29/WG meetings, 93-11-01/05 Seoul
863	ITU	Availability of the reference implementation of the ISO/IEC 11172-3 algorithm and of objective evaluation tools
864	ITU	Liaison to convenor of ISO/IEC JTC1/SC29/WG11 (for action) and JTC1/SC29 (for info)
865	ITU	Liaison to convenor of ISO/IEC JTC1/SC29/WG11 and SC29
866	Chair of WP1/15	Guidance to the Rapporteur for the study of video coding and systems in ATM and other network environments
867	ITU	Liaison from WP 15/1 to ISO/IEC JTCI/SC29 WG11(for information) on Very Low Bitrate Videophone
868	WP 1/15	Draft standard H.AGG for Synchronised Channel Aggregation
869	SC29 Secretariat	Summary of Voting on ISO/IEC JTC 1/SC29 N428 Draft New Work Item Proposal Low Bitrate Audio Coding
870	SC29 Secretariat	Summary of Voting on ISO/IEC JTC 1/SC29 N427 Registration of ISO/IEC CD Information technology Generic coding of moving pictures and associated audio- Part3:Audio
871	SC29 Secretariat	Summary of Voting on ISO/IEC JTC 1/SC 29 N426: Registration of ISO/IEC CD Information technology- Generic coding of moving pictures and associated audio- Part 2:Video
872	SC29 Secretariat	Summary of Voting on ISO/IEC JTC 1/SC 29 N425: Registration of ISO/IEC CD:Information technology- Generic coding of moving pictures and associated audio- Part1:Systems
873	SC29 Secretariat	Summary of Voting on ISO/IEC JTC 1/SC 29 N424: Proposed Modifications to the ISO/IEC JTC1/SC29 Programme of work Subdivision of the project, JTC 1.29.05.02, Information technology-Generic coding of moving pictures and associated audio information

MPEG 93/???	Source	Title
874	SC29 Secretariat	Summary of Voting on ISO/IEC JTC 1/SC 29 N423:Registration of ISO/IEC CD 11172-4: Information Technology-Coding of moving pictures and associated audio for digital storage media at up to about 1,5 Mbits/s-Part4:Conformance Testing
875	VLBV94	7-8 April 1994 - University of Essex - Second call for papers
876	N. Hirose	New Work Item Proposal to JTC 1
877	F. Bigi	ISO/IEC JTC 1/SC29 and its WPs
878	M.A.Smith	ISO/IEC patent rules
879	ITU	Liaison to JTC 1/SC 29/WG 11
880	S.Okubo	Report of the Thirteenth experts group meeting in Brussels (2-10/9/93) Part I-II
881	UNINFO & SC29 Secretariat	Registration of the MPEG-2 CD
882	C. FrÉzal	MPEG2 Systems Ad-Hoc group
883	Israeli N.B.	MPEGII conformance testing
884	Nilsson et al	Proposal for modified syntax, semantics and decoding process for spatial scalability
885	Nilsson et al	Clarification for the use of VBV for low delay applications
886	R.Schafer et al.	Statement of HDTVT to MPEG
887	J.Stampleman	System Registration Descriptor
888	Edit. group	Video Working Draft
889	Sarginson et al.	Definition of 'null' transport packets
890	Sarginson et al	Revised for 'transport error indicator' semantics
891	NRL	User address indication within Segment Header
892	Sugiyama	Change of 4:2:0 Chroma Position
893	Sugiyama	Extension of Sample Aspect Ratio
894	J. Shin et al.	Very low bitrate video coding by Dynamic Motion Analysis
895	Y.Yamada	Flexibility of Pack-header and System-header lengths in PS
896	Y.Yamada	MPEG-2 system bitstream exchange report
897	DIN	Position of the German National Body on the resolutions of the 23th and 24th WG11 meeting
898	Japan	Comments on vbv_ delay description in variable bitrate operation
899	AT&T	More issues in SNR-Scalability
900	Challapali, etc	An MPEG-2 Profile for the U.S. HDTV Standard
901	Reader	Report of Ad hoc group on MPEG-4
902	Stoll	Report of Ad hoc group on ATM transmission of audio-coded signals
903	Pan	Report of Ad hoc group on audio software simulation
904	Fuchs	Report of Ad hoc group on formal listening tests
905	van de Kerkhof	Report of Ad-hoc group on Audio Working Draft
906	Sezan	Report of Ad-hoc group on applications and testing of 10 bits and 4:2:2 extension
907	Okubo	Report of Ad-hoc group on editing profiles and levels part of video WD
908	Fogg	Report of Ad-hoc group on video conformance testing
909	Savatier	Report of Ad-hoc group on video bitstream verification
910	Wise	Report of Ad-hoc group on Video WD editing
911	Fogg	Report of Ad-hoc group on Video Technical report
912	Hidaka	Report of Ad-hoc group on MPEG-2 Verification Tests
913	Wallace	Report of Ad-hoc Group on technical support of IPR
914	Kogure	Report of Ad-hoc group on DSM CC
915	van der Meer	Report of Ad-hoc group on Systems WD
916	Logston	Report of Ad-hoc group to exchange systems bitstreams

MPEG 93/???	Source	Title
917	T.I.Cho	Verifications on DSMCC syntax and semantics
918	J.Morris	Contribution on Program Stream Directory
919	U.Riemann	Priority Descriptor for MPEG-2 Systems Working Draft
920	C. Herpel	Bitstream exchange results
921	P. Decotignie	Some comments about to the Systems Working Draft
922	Sikora	Special issue of image communication on Audio in Visual Communications
923	Judice	Special issue of image communication on compression algorithms for software decoding
924	J.Zdepski	Flexible sample aspect ratio table
925	P.Moroney	MPEG-2 Systems Working Draft Clarifications & Changes
926	van der Waal	Current and future standardization of high-quality digital audio coding in MPEG
927	T. Savatier	Proposal for specification of Aspect Ratios (for Pel, Image and Display)
928	J. Mitchell	Call for authors to write books on standards and contribute chapters on advanced topics
929	AFNOR	Call for contributions and demonstrations
930	ITU-T	Guidance to the Rapporteur for the study of video coding and systems in ATM and other network environments
931	S.Dunstan	ATM network adaptation performance parameters
932	A.J.Wasilewski	Informative annex for MPEG-2 transport stream program specific information
933	A.J.Wasilewski	Enhancements to the MPEG-2 Program association table (PSI)
934	B. Ward	Discussion on Deinterlacing for Spatial Scalability
935	B. Eifrig	Additional Issues in Spatial Scalability
936	T. Kogure	Method to incorporate the DSMCC into Systems WD
937	T.Kogure	Open issues of DSMCC
938	T.Kogure	MPEG-2 DSM CC Specification (5th draft)
939	I.Shah	I-slice indicator
940	AT&T	Modification to VBV for VBR in WD is incorrect
941	ETRI	Low rate video coding using 3-D Segmention with two change detection masks
942	Y.Itoh	Comments on WD, SNR scalability related issue (Draft)
943	A.Katsumata	MPEG-2 performance at high level (Draft)
944	M.Biggar	Revised video error resilience text-Section D.3 of Working Draft
945	Motorola	Enhanced Procedure for MPEG-4 requirement analysis
946	Motorola	MPEG-4 Requirements and vision
947	D. Curet	Constraints over system, audio and video clocks in transport streams
948	D. Curet	Descriptor syntax and slice management
949	D. Curet	Some editorial and semantical questions on the MPEG2 systems W.D.
950	ITU-R	Liaison statements from TG11
951	D. Curet	Support of indicators for data group start and end in the MPEG2 transport multiplex
952	CCETT-BBC	Support for transport packet repetition
953	M.GErard	Prediction verification
954	R.Schaphorst	Guidance for the work of the rapporteur for the videophone (Very Low Bitrate) Part of Question 2/15
955	De Lameillieure	Results of the cascade coding of "Horse Riding"
956	M. Perkins	Comments on clock recovery in the presence of Jitter
957	van der Meer	Comments on the MPEG-2 Systems Working Draft

MPEG 93/???	Source	Title
958	ITU-T/Japan	Cell loss correction method for MPEG-2 system streams transmission
959	van de Kerkhof	Definition of matrix procedure for Dolby Prologic compatibility
960	E.Schroder	Integer representation of SQRT (2) and its inverse
961	D. Burt	Start code conflicts and resynchronization in PSI data
962	AFNOR	Inconsistency in informative annex of video WD
963	van der Meer	Request for an MPEG-audio based surround sound demo
964	CCETT	Corrections and proposed rewriting of WD
965	ITU-T	Decoding start-up algorithm for VBR coded bitstream
966	ITU-T	Spatial scalability when the base layer includes picture skipping
967	Tiernan et al.	MPEG-2 Systems- An analysis of clock recovery at the transport destination site
968	ITU-T	Use of packetised elementary stream as an interface point
969	NNI	NNI resolutions for ISO/IEC JTC1/SC29/WG11
970	DISC	UK NB recommendation to the 25th meeting of SC29/WG11
971	Convenor	Papers of the very low bitrate audio-visual coding in Seoul
972	Forshay	Dolby AC-3 Multi-channel Digital Audio Compression System Algorithm Description
973	Tominaga	Announcement of MPEG-4 Workshop ; Workshop on Mobile Multimedia Communications (MoMuC-1)
974	Morrison	Skipped pictures and spatial scalability
975	DSM group	MPEG-2 DSM-CC specification
976	Convenor	Report to SC29
977	Fuchs	Modified time schedule for listening tests

WG11 N0???	Date	Source	Title
582	93/11	Convenor	Resolutions of the Seoul meeting
583	93/11	Convenor	Report of the Seoul meeting
584	93/11	Convenor	Guidelines for ad-hoc groups
585	93/11	Convenor	Disposition of comments on registration of CD 11172-4
586	93/11	Convenor	Disposition of comments on registration of CD 13818-1
587	93/11	Convenor	Disposition of comments on registration of CD 13818-2
588	93/11	Convenor	Disposition of comments on registration of CD 13818-3
589	93/11	Convenor	Disposition of comments on draft low bitrate audio coding NP
590	93/11	Convenor	List of MPEG-1 patent holders with indication of which part(s) of IS 11172 their statements refer to
591	93/11	Morris	Final text of CD 11172-4 for 3-month letter ballot
592	93/11	Convenor	List of companies having provided patent statements for MPEG-2
593	93/11	Convenor	Editorial group on final text of CD 13818
594	93/11	Convenor	Ad-hoc group on Formal Listening Tests
595	93/11	Convenor	Response to the National Bodies of D, F, GB, I, IL, NL, P and USA
596	93/11	Convenor	Five-year meeting schedule
597	93/11	Convenor	WG11 workplan
598	93/11	Convenor	MPEG-2 detailed workplan
599	93/11	Convenor	MPEG-4 detailed workplan
600	93/11	Convenor	Report to SC29
601	93/11	Convenor	CD 13818-1 Generic coding of moving pictures and associated audio - Part 1 Systems
602	93/11	Convenor	CD 13818-2 Generic coding of moving pictures and associated audio - Part 2 Video
603	93/11	Convenor	CD 13818-3 Generic coding of moving pictures and associated audio - Part 3 Audio
604	93/11	UNINFO	Registration of the MPEG-2 CD
605	93/11	Okubo	Verification test items and plan
606	93/11	Okubo	Support of MPEG-2 Requirements by the MPEG-2 CD
607	93/11	Convenor	MPEG-2 project description
608	93/11	Convenor	List of patents declared by their holders to be necessary to implement 11172
609	93/11	Convenor	Ad-hoc group on MPEG-2 video verification test
610	93/11	Hidaka	Test items for MPEG-2 verification test
611	93/11	Hidaka	Participant form in MPEG-2 Spatially Scalable profile at H1440 level picture quality verification test(50Hz)
612	93/11	Hidaka	Participant form in MPEG-2 MP@HL picture quality verification test(60Hz)
613	93/11	Hidaka	Participant form in MPEG-2 SNR scalable @ ML verification test
614	93/11	Hidaka	Participant form in MPEG-2 HP @ ML picture quality verification test
615	93/11	Reader	Report of Ad hoc group on MPEG-4
616	93/11	Stoll	Report of Ad hoc group on ATM transmission of audio-coded signals
617	93/11	Pan	Report of Ad hoc group on audio software simulation
618	93/11	Fuchs	Report of Ad hoc group on formal listening tests
619	93/11	van de Kerkhof	Report of Ad hoc group on audio Working Draft

WG11 N0???	Date	Source	Title
620	93/11	Sezan	Report of Ad-hoc group on applications and testing of 10 bits and 4:2:2 extension
621	93/11	Okubo	Report of Ad-hoc group on editing profiles and levels part of video WD
622	93/11	Fogg	Report of Ad-hoc group on video conformance testing
623	93/11	Savatier	Report of Ad-hoc group on video bitstream verification
624	93/11	Wise	Report of Ad-hoc group on Video WD editing
625	93/11	Fogg	Report of Ad-hoc group Video Technical report
626	93/11	Hidaka	Report of Ad-hoc group on MPEG-2 Verification Tests
627	93/11	Wallace	Report of Ad-hoc group on technical support of IPR
628	93/11	Kogure	Report of Ad-hoc group on DSM CC
629	93/11	van der Meer	Report of Ad-hoc group on Systems WD
630	93/11	Logston	Report of Ad-hoc group to exchange systems bitstreams
631	93/11	Hidaka	Workplan for MPEG-2 video verification test other than MP@ML
632	93/11	Convenor	Ad-hoc group on MPEG-2 Audio verification test
633	93/11	Convenor	Terms of reference
634	93/11	Audio Group	Modified workplan of formal subjective tests of MPEG-2 including two non-backwards compatible audio codec
635	93/11	Convenor	Ad-hoc group on Video bitstream verification
636	93/11	Convenor	Ah-hoc group on 10 bits Video
637	93/11	Convenor	Ad-hoc group on Video Conformance Testing
638	93/11	Convenor	Ad-hoc group on Video Technical Report
639	93/11	Convenor	Liaison letter to Mr. Yamashita, Chair ITU-T WP 15/1
640	93/11	Convenor	Liaison letter to ITU-T SG15 WP15/2
641	93/11	Convenor	Liaison letter to ITU-R Task Group 11/4
642	93/11	Convenor	Ad-hoc group on ATM transmission of audio coded signals
643	93/11	Convenor	Ad-hoc group on Audio software simulation
644	93/11	Convenor	Ad-hoc group on Audio Conformance testing
645	93/11	Convenor	Ad-hoc group on conditional workplan and conditional requirements for MPEG-2 NBC Audio Coding
646	93/11	Convenor	Ad-hoc group on the additional work of DSM CC
647	93/11	Convenor	Ad-hoc group on procedure for introducing new Profiles and Levels
648	93/11	Convenor	Ad-hoc group on requirements for syntax restrictions of MPEG-2 Systems
649	93/11	Convenor	Ad-hoc group on Systems bitstream verification
650	93/11	Convenor	Ad-hoc group on Systems Conformance Testing
651	93/11	Convenor	Ad-hoc group on MPEG-2 Systems network applications
652	93/11	Convenor	Ad-hoc group on MPEG-4 transmission media characteristics
653	93/11	Convenor	Ad-hoc group to draft an outline for the MPEG-4 Requirements document
654	93/11	Convenor	Ad-hoc group for MPEG-4 Syntax
655	93/11	AOE group	MPEG-4 Applications and Application parameters
656	93/11	AOE group	MPEG-4 categories of requirements
657	93/11	AOE group	MPEG-4 structure for development of requirements
658	93/11	AOE group	Proposed change to NP for Very Low Bitrate AudioVisual coding
659	93/11	Fogg-Pan	Proposed Draft Technical Report on software for IS 11172
660	93/11	Audio group	Conditional Workplan on development of MPEG-2 Audio NBC profile
661	93/11	Req. Group	Agreements of the Seoul meeting
662	93/11	DSM group	Future DSM-CC activity

WG11 N0???	Date	Source	Title
663	93/11	Convenor	MPEG-4 Project description
664	93/11	Convenor	MPEG-1 Project description
665	93/11	Convenor	Document List