CCITT SGXV
Working Party XV/1
Experts Group for ATM Video Coding
(Rapporteur's Group on part of Q3/XV)

Document AVC-399R
November 6, 1992

SOURCE: CHAIRMAN OF THE EXPERTS GROUP FOR ATM VIDEO CODING
TITLE : REPORT OF THE NINTH MEETING IN IPSWICH AND LONDON (27 October - 6 November 1992) - PART 2
Purpose : Report

Part 2 Joint Sessions with MPEG

1. Introduction

Joint sessions with ISO/IEC JTC1/SC29/WG11 (MPEG) were held in London at the kind invitation of BSI (British Standards Institution) during 2-6 November 1992. 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 (K. McCann, S. Okubo)

2.1 General

The Requirements sub-group met every day during the November MPEG meeting, including joint meetings with the Systems and Implementation sub-groups. Sakae Okubo chaired the meeting on Monday and Tuesday, whilst Ken McCann acted as chairman from Wednesday to Friday.

The major tasks were the finalisation of the integrated "Information on Requirements" document, the production of a first draft of the normative "Guide for Systems" and the definition of a means of producing sub-sets of the MPEG-2 toolkit.

2.2 Documentation

The following contributions were reviewed:

Documents on Requirements Listing

92/674	Okubo	Report of Ad-hoc group for editing requirements document
92/674a	Okubo	Information on Requirements
92/740	CCIR SRG-UR	CCIR Comments on "Information on Requirements for MPEG-2 Video"
92/791	CCIR 11/4	Liaison Statements from TG11/4 to Requirement sub-group of MPEG
92/682	Erdem et al	10 bit/pixel source material option for MPEG-2
92/528	Futa	Requirements for the generic coding method of moving pictures from the perspective of cable television distribution in North America
92/714	Stevens	Contribution to MPEG Requirements and MPEG Video in the definition of MPEG-2 standard application profiles
92/725	SMPTE	SMPTE Header/descriptor Task force: Final Report

Documents on Profiles and the Core Profile

92/792	SC18/WG3	Document Application Profile Proforma and Notation Amendment (extract from N1779)

92/477	Reader	Contribution on MPEG 2 Video Requirements
92/476	USNB	Proposal for Reorganised Syntax for MPEG 2 Video
92/635	DIN	Interoperability, definition of 'maximum core' and extensions
92/569	NHK	Consideration on HDTV/CDTV Compatibility
92/563	Sugiyama	Proposal for the Common Core
92/759	Lippman et al	ATV Profile

2.3 Completion of the Requirements Information document

The participation of Dr Nishizawa and Mr Long of the CCIR Special Rapporteurs Group on User Requirements contributed to a better understanding of broadcaster's requirements and was greatly welcomed. The document on Information on Requirements for MPEG-2, MPEG92/674a, was revised in the light of comments from the CCIR SRG-UR, and other inputs.

It was noted that the CCIR are working on establishing a relationship between subjective quality, an objective measure of picture criticality and the probability of the occurrence of critical sequences. The offer from CCIR to collaborate in the MPEG subjective test and evaluation programme was welcomed.

The suggestion of accepting 10 bits/pixel input signals in Document 92/682 was sympathetically received, but this was noted to be a new requirement not contained in the normative video requirements document. Concern was expressed that adding this as an additional requirement would adversely affect the timescales of the video work.

2.4 Guide for Systems

A first draft of the normative "Guide for Systems" was agreed. The Guide will be frozen at the next MPEG meeting after receiving feedback for the Systems sub-group.

2.5 Definition of Profiles and Levels

2.5.1 ODA International Standardized Profile experience

Mr. Price, Convenor of SC18/WG3, kindly related the experience of SC18 with the development of International Standardized Profiles (ISPs) for ODA. The ISPs are developed by informal workshops but are then formally registered by JTC1 ballot. Three ISPs have been registered to date.

2.5.2 Use of Profiles and Level by MPEG

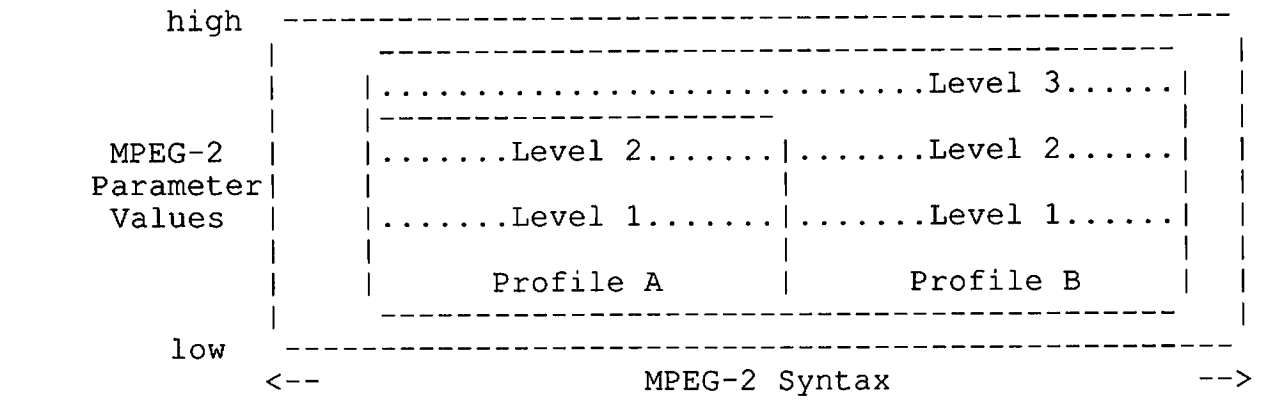
It was agreed that:

1) The concept of International Standardised Profiles (ISPs) should be used as a guideline for the definition of sub-sets of the MPEG-2 parameter values and syntax.
2) Profiles could be developed by MPEG or by other bodies, such as CCITT or CCIR. Plenary should be asked to consider whether it would be appropriate to ask ISO/IEC JTC1 to act as a registration authority.
3) Profiles may contain different levels, which are distinguished only by allowed ranges of parameter values. The number of levels should be kept as small as practical and, wherever practical, levels should be defined so that higher level conforming decoders can decode lower level bitstreams.
4) Wherever practical, the meaning of levels should be harmonised between different profiles.
5) Full compliance to the same level of the same profile by two codecs should be a sufficient guarantee of their ability to successfully decode each other's bitstreams.
6) MPEG profiles should be truly international in scope; national variants should not exist. Some equipment designed for regional subsets of a profile might be used in

practice (eg supporting of only 525 lines or only 625 lines) but such equipment could not be claimed to be fully compliant with the profile.

7) The number of profiles should be kept as small as practical. In particular, the development of profiles which are very similar, but not quite identical, should be discouraged.

An example of profiles with harmonised levels is shown below:



2.6 Core Profile

2.6.1 Guidelines for developing the Core Profile

It was agreed that MPEG should develop a particular profile called the Core, using the following guidelines:

1) The core profile should be suitable for use by the largest possible number of major MPEG-2 applications in terms of both functionality requirements and cost constraints.
2) The core profile should facilitate bitstream interchange between applications.
3) The core profile should not contain redundant algorithmic techniques. A single method of providing a particular functional element should be used wherever practical.

2.6.2 Key Functionalities of the Core Profile

The joint meeting with the Implementation sub-group provided some useful indications of the likely implementation costs of important potential features of the core. The precise definition of the Core Profile will require further work by the Requirements sub-group in consultation with the Implementation, Video, Audio and Systems sub-groups. Consensus has been reached on the following skeleton:

The Core will support functionalities of:

- Random Access (not necessarily at every frame)
- Editability (not necessarily at every frame)
- Robustness to bit errors and cell losses
- Video windowing (e.g. 4:3 from 16:9 pictures)
- Low delay (by simply turning off B frames)

The Core will not support functionalities of:

- Trick modes (other than those automatically supported by the basic syntax)
- Low delay (other than simply turning off B-frames)
- Scalability
- Compatibility

2.6.3 Core coding techniques

The Core will include:

- I, P and B frames
- 4:2:0 resolution video
- 8 bit pixels
- No more prediction modes than strictly necessary (e.g. Frame and Field/Frame only)
- Non 8x8 DCT only if necessary (and only on a MB by MB basis)
- No more scan modes than strictly necessary (e.g. zig-zag scan only)

The Core coding techniques will exclude:

- 4:2:2 or 4:4:4 resolution video
- 10 bit (or other non 8 bit) pixels
- Prediction modes whose necessity has not been demonstrated

2.6.4 Core Performance Level

- 720x480x29.97Hz and 720x576x25Hz
- Bitrate up to 15 Mbit/s
- Picture Quality close to Rec 601 source
- Negligible degradation after up to 3 cascaded encoders/decoders

2.7 Recommendations of the Requirements Sub-Group

The Requirements Group recommends:

1) That the concept of International Standardised Profiles should be used as a guideline for the definition of sub-sets of the MPEG-2 parameter values and syntax. Profiles are defined by functionality and coding techniques. Within profiles, the concept of levels is introduced. Levels are defined by performance constraints.

2) That WG11 should consider whether ISO/IEC JTC1 should act as a registration authority for such International Standardised Profiles, since they could be developed by other bodies (such as CCIR or CCITT).

3) That MPEG should develop a profile called "Core" which is suitable for use by the largest number of major applications in terms of both functionality requirements and cost constraints and is intended for bitstream interchange.

4) That WG11 endorse the consensus view of the Requirements sub-group on the skeleton of the Core Profile given in the Requirements meeting report. The precise definition will require further work by the Requirements sub-group in consultation with the Implementation, Video, Audio and Systems sub-groups.

5) The establishment of an ad-hoc group to further develop the draft Core Profile and consider profiles. MPEG members are encouraged to join the ad-hoc group and to provide information on intended applications to assist in the profile development.

6) That the MPEG syntax should not permit redundant algorithmic techniques.

7) That the Video, Audio and Systems sub-groups should study the integrated "Information on Requirements" document.

8) That the draft Guide for Systems should be studied by the Systems sub-group with the intention of issuing a frozen set of normative systems requirements during the next MPEG meeting.

9) MPEG members are encouraged to provide information on the systems requirements of practical applications of the MPEG-2 standard.

10) That in order to meet the goal of a technically frozen draft by the Sydney meeting, an MPEG meeting is held in January 1993. The Requirements sub-group further recommends that at least one joint Video-Requirements meeting is held during the January MPEG meeting.

11) That the Convenor conveys to CCIR the appreciation of the Requirements Group for the participation of two members of CCIR Special Rapporteurs Group on User Requirements in the London MPEG meeting.

3. TESTS sub-group (S. Okubo)

This sub-group decided to create procedures for and planning of subjective tests field trial for the purpose of showing the quality level of MPEG-2 standard to relevant organization including CCIR, EBU and SMPTE.

The following new test sequences were approved in addition to the current MPEG-2 official test sequences;

- Composite version of Mobile and Calendar in 625/50 and 525/60
- Stress materials proposed by General Instrument

Members are requested to provide HDTV test sequences for the purpose of MPEG-2 quality testing.

4. VIDEO sub-group (G. Bjoentegaard)

The video group met throughout the whole week. The work was done in plenary, in joint sessions with SYSTEMS and IMPLEMENTATION and in subgroups. The work was even done in "sub-sub" groups. This way of spreading out the work made it difficult to have an overview of what was going on at all times.

I followed the work in the video plenary as well as the subgroups on prediction and low delay. The report on the work in the other groups is based on the subgroup reports back to the video plenary. Special emphasis is tried given to areas of special interest for CCITT.

4.1 Joint meeting with SYSTEMS

The main issue was the impact of two - layer coding on systems.

4.2 Joint meeting with IMPLEMENTATION

The implementation group gave their reaction to the impact of various coding aspects. There was basically no strong objection to the coding items proposed from the VIDEO group.

4.3 Prediction

The intelligent prediction modes (SVMC and DUAL+) showed significant coding gain, especially for M=1 where the gain with these prediction modes was typically 1 dB. It was decided to continue tests for further simplification of intelligent prediction. As a result of this, SVMC and DUAL+ will be merged to one mode for the next core experiment.

Tests had been performed on prediction on 8*8 block bases. The results so far showed little improvement. Further experiments will take place up to the next meeting.

4.4 Low delay

The work concerning regular update is concluded. The recommendation is to use regular slice update. An additional option for picture skipping is included in the picture header. The coding performance for low delay depends basically on good prediction modes. This is taken care of in the prediction group.

Since the requirements concerning low delay seems to be fulfilled, it was not considered necessary to continue this work.

4.5 ATM - cell loss

The work in this group is basically based on the inputs from the CCITT experts group. The group considered the use of leaky prediction as a method for cell loss recovery.

4.6 Compatibility/spatial scalability

The work is in progress, but many items still remain unsolved. The main work items in this group are:

- Compatibility with MPEG1 as well as H.261.
- Fine tuning of spatio-temporal weights for optimum performance.
- "Interlace-interlace" compatibility.
- SNR scalability.

4.7 Frequency scalability.

Much work still remains before standardization. Some of the present work items in the group are:

- Reduction of drift problems in lower layers.
- Single loop/multi loop approach.

4.8 Quantization.

This group covers several items related to the coding procedure.

- An extra VLC for coefficient coding in INTRA frames have been adopted.
- Alternative scanning of transform coefficients have been considered.
- Increased precision of DC coefficients was considered. The group recommended the use of 9/10/11 bits for DC.
- Alternatives to 8*8 DCT were considered. 8*1 DCT and NTC-coding were two alternatives.
- An alternative exponential table for MQUANT was considered.

4.9 Ad hoc groups.

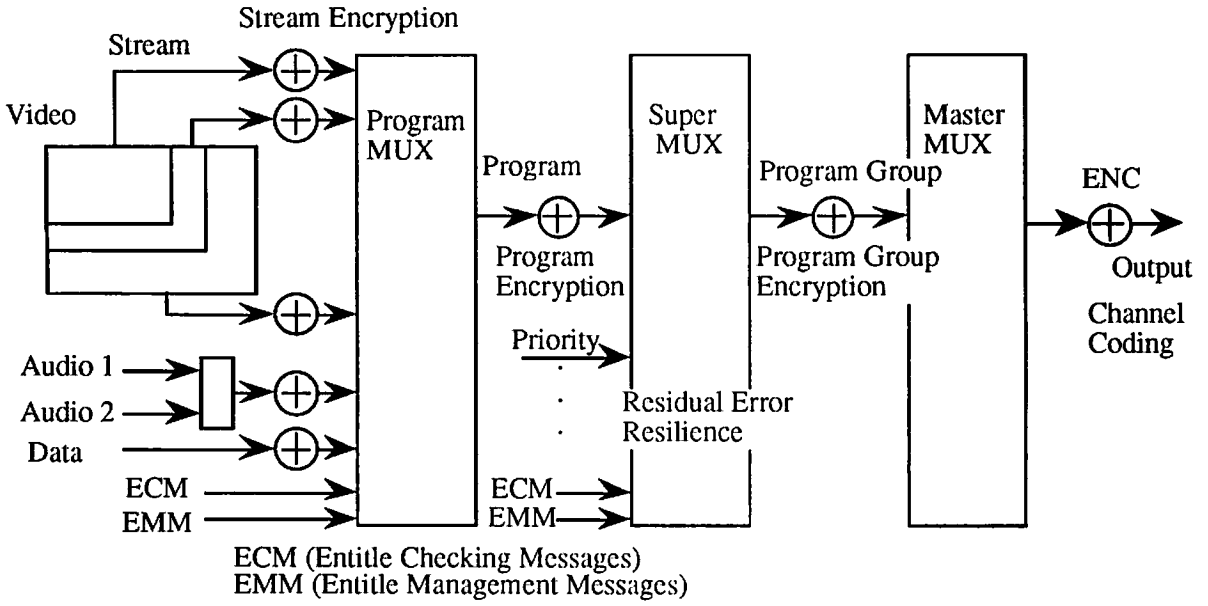
The following ad hoc groups were formed to perform experiments up to the next meeting.

Technical report (MPEG1)	A. Koster.
Comments on syntax matters	J. Yonemitsu.
Prediction	H. Watanabe.
Quantization and entropy coding	N. Wells.
Scalability	E. Viscito.
Compatibility	A. Puri.
ATM - cell loss	M. Biggar.
Comments to working draft	T. Kogure.

5. SYSTEM sub-group (B.G. Haskell, T. Tanaka)

The systems group approved the Compliance section for MPEG1 and continued discussion of the various requirements for broadcast applications. Participation was much larger in London than in Angra, mainly due to the broadcast interests.

They did not address ATM networks in particular, but instead focused the general broadcast problem. The following model has been made;



A program consists of multiple audiovisual elementary bit streams having a common timing clock, while a program group consists of multiple programs each of which has an independent timing clock. An adhoc group for "multiplexing for multiple programs" has been established to make further progress.

This sub-group also considered Directory for the program mux (MPEG92/672) and System ID extension.

The current Working Draft table is as follows;

Systems Working Draft Table of Contents

Symbols and Definitions
Method of Describing Bit Stream Syntax
requirements
1-Annex A (Informative) Program Multiplex and Coding Layer
1-Annex B (Informative) Super Multiplex and Coding Layer
1-Annex C (Informative) Master Multiplex and Coding Layer
1-Annex D (Informative) Conditional Access
1-Annex E (Informative) Support for Error Resilience
1-Annex F (Informative) Support for Graceful Degradation
1-Annex G (Informative) Glossary

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

6.1 The Quantisation Sub group at Tarrytown had asked for implementation views on several items.

6.1.1 VQ. Documents 92/708 and 92/737 reported on implementation aspects of the proposal made at Tarrytown. The vector search is very significant for encoders, approaching that of motion vector determination complexity. The look up tables at coder and decoder are significant. We made a recommendation stating these.

6.1.2 Alternative VLC for intra coefficients, quant <8.

We agreed that this incurred little complexity.

6.1.3 Range extension of coefficients.

We had been asked to comment on 10/11/12 bit coefficients. We were willing to accept any or all of these. If switchable, the indication should be at the picture header level.

6.1.4 MQUANT extension

There were two proposals. One was based on the step size being the sum of up to three consecutive powers of two while the other was a look up table with an approximately square law. We expressed a slight preference for the former because it was easier in some implementations and just the same in the others.

6.1.5 Zig-zag and vertical scan

We considered this to incur very small costs in decoders. For encoders, an a priori decision method had been proposed with adequate performance and the implementation burden of it was acceptable.

6.1.6 Non 8x8 DCT

We had insufficient information to assess the implications of using an 8H by 1V DCT. We requested fuller details.

6.1.7 Non transform coding

We assessed two proposals for non transform coding. Both use a form of DPCM.

One method has the same prediction value for all pels in a block. The differences are quantised with the existing quantiser and coded in the normal transform mode fashion but with a choice of two additional scan paths.

The other method uses DPCM from the previous pixel scanned along the zig-zag path and a square law quantisation of the prediction errors. This scheme was seen to have two

overheads. Firstly, the order of quantisation and block to zig-zag scan is reversed from the transform case. This is extra complication especially for encoders and decoders with dedicated hardware sub-units. Secondly, the non-linear quantiser, being in the DPCM feedback loop in the coder must be high speed.

Accordingly we were more favourably inclined towards the former method but reserved final judgment on whether either should be included. We requested that the Video group find a complete solution to those cases where transform coding does not work well.

6.2 Feedback from Video Group since Angra dos Reis

The Implementation Studies had requested the Video group to perform some experiments. Results were reported in a joint session of Video and Implementation in the afternoon of 4 November.

6.2.1 The effect of limiting the number of coefficient bits per macroblock to 256 or 512 were reported. At higher bit rates defects were clearly visible. These might be mitigated by more intelligent encoders which did more than just truncate excess coefficients. However, the Implementation group had asked for experiments with dumb encoding to assess what could be achieved without adding significantly to encoders.

The original motivation behind the request for the experiments was realised to be part of a more general concern reported below.

6.2.2 Macroblock address, skipped macroblocks, coded macroblock pattern and first coefficient trick.

Simulation results were reported that deletion of these had almost no effect on SNR and on the pictures when viewed. However, it was pointed out that the use of other pictures and lower bit rates would refute this. The Implementation group agreed that since the possible simplification of MPEG-2 only decoders was very small and that designs for chips able to decode both MPEG-1 and MPEG-2 would be made a little more complex we would accept the retention of these items in the syntax.

6.3 Issues arising at the London meeting

6.3.1 Motion Vector for intra blocks

ATM cell loss error concealment can be improved if motion vectors for intra blocks are made included in the coded bit stream. We concluded that:

There is trivial overhead on decoder implementations which choose not to implement this concealment technique. The impact on decoders which do use it depends on the decoder implementation but is considered modest.

For encoders the overhead can be trivial if they are permitted to always insert zero vectors. The next simplest is to insert the vector which may have been computed prior to the intra/inter decision. Insertion of the vector for the macroblock below is more difficult. However, this is not subject to standardisation.

6.3.2 10 bit pels

There was discussion on permitting 10 bit pels which might be useful for some very high quality applications. Our agreed view was that the extension to 10 bit pels has serious implications. All signal handling parts of the decoder and most of them in encoder need changes. (Motion vector determination at 8 bits might be adequate.) The major impacts are on the DCT/IDCT accuracy and the non-availability of 10 bit wide memories.

We agreed that it would not be commercially sensible to offer only 10 bit resolution MPEG chips. Thus 8 and 10 bit MPEG-2 would be different markets. Concerns were expressed that the market for 10 bits might be so small that it would only be addressed by costly professional offerings.

The concept was raised of a 10 bit MPEG-2 bitstream being decodable by an 8 bit MPEG-2 decoder. This is essentially SNR scalability.

6.3.3 Frequency scanning and MUVLC

This had been looked at previously at the Angra dos Reis meeting. Extended discussion at the London meeting revealed that the encoder might incur less of a memory penalty than the original proposers had thought but we concluded that a corresponding technique at the decoder was not possible. The temporary memory is one slice of coefficients. For a slice size set to one row of macroblocks across 601 images, the storage is of the order of 200 kbit which is too much for on-chip. Putting this off-chip incurs a very significant bus bandwidth penalty as every 12 bit coefficient is stored and fetched. This is roughly equivalent to another three prediction sources. We noted that using smaller slices reduces the memory size proportionally but leaves the bandwidth unchanged. We were of the opinion that the coding efficiency would deteriorate markedly if the slice size were reduced sufficiently to allow on-chip storage.

(The encoder simplification arises from having small caches which hold the numbers of zero coefficients. Non-zero coefficients are encoded as early as possible.)

We recommended that the video group make other proposals which we would then assess.

6.3.4 We discussed the overheads of scalable and compatible algorithms. We presented initial findings in a short session with the Requirements group. We had a short presentation on the transform domain scalability methods (single and multiple loop). We began to construct a table listing pertinent points of the transform and spatial split approaches.

6.3.5 It was pointed out that although some prediction modes such as dual field have a smaller storage requirement than modes using B frames, the memory bandwidth is unchanged. Device speed limitations may therefore mean that the required physical amount of memory is the same.

6.4 Restrictions on bit streams

We were informed of a difficulty that can arise in decoders when a very large number of MBA stuffing words are clumped together. Further discussion indicated that this is a specific case of a more general difficulty. When the bitstream contains extended periods of large macroblocks (many bits) the VLC decoding time for them can become a significant fraction of one picture time. Even though the following macroblocks may contain few bits (to satisfy the VBV) they may nevertheless require a large number of computations or memory accesses or both. To complete these before the end of the frame slot may require very high clock rates and peak memory bandwidths.

The difficulty was seen to be architecture dependent. Some of the participants had foreseen the matter and chosen their architectures to overcome it. However it was accepted that there may be an (unquantified) cost penalty to do this.

The issue is that of designing a decoder which can accommodate all possible MPEG bit streams which could be generated by valid pictures and syntax or designing a decoder which works on all or most of the bit streams which are likely to be generated in practice by real encoders from real pictures.

The company which had highlighted the specific MBA stuffing issue had also brought a proposal to limit the bit stream. This might place some burden on encoders but was thought (by the Implementation Studies participants) to have little or no effect on picture quality on real material.

We decided not to accept this hastily but agreed that the general problem identified has far reaching consequences. Therefore it was felt that an ad-hoc should be established to consider the matter to sufficient depth before reaching a decision.

6.5 At the request of the MPEG Convenor we discussed what rules if any should be applied to hardware demonstrations (not simulation results) given at MPEG meetings. A summary was presented at the closing plenary.

6.6 Need for January meeting

In the light of the need to close the restricted bit stream issue and the need to report on overall implementation aspects of the complete WD/TM it was agreed that the group should meet in January if the work was to remain in step with other MPEG groups towards the schedule. The anticipated duration required is 3 to 4 days.

END

List of documents for the London joint sessions

Note - See Annex 3 to AVC-355R for MPEG92/411 to 547.

MPEG92/		
548	Convenor	MPEG progress report
549	MacInnis et al.	Audio-visual multiplexing in MPEG
550	Koster	Video Test Model 2 Rev. 2
551	Chiariglione	Report of the Tarrytown meeting of the Video Test Model ad-hoc group
552	Dunstan	Tarrytown meeting report for ad-hoc group on ATM, Packet loss and general error resilience
553	Reader	MPEG meeting requirements
554	Conte	Preliminary contribution on MPEG-1 video encoder and decoder source code development
555	Katayama	Results on Quantization Experiments
556	Iwahashi	Motion Compensation Technique in Scaling Decoder for Drift Reduction
557	Kameyama	Core Experiment Results on L.10
558	Kameyama	Field Prediction with Frame Motion Vector
559	Nakajima	Results of prediction core experiments L-10 Special Prediction modes
560	Sugiyama	Results of Special Prediction Experiments
561	Sugiyama	Results of Leaky1 Prediction and 16x8MB Experiments
562	Sugiyama	Results of Non-8x8DCT and NTC Experiments
563	Sugiyama	Proposal for the Commomn Core
564	Sugiyama	Proposal of Pure Field Coding Especially for VCR Application
565	Odaka	Simulation results on TM2 prediction core experiment L.10
566	v. d. Kerkhof	Low sampling frequency extension to MPEG1 Audio
567	Nishikawa et al	Simulation results on TM2 core experiment (Vector Quantization)
568	Sugaya	Simulation results on VQ
569	NHK	Consideration on CDTV/HDTV compatibility
570	Nogaki	Experimental results on low delay coding and leaky prediction
571	Yagasaki et al	Modification of syntax for prediction
572	Yagasaki et al	Proposal of adaptive DCT/NTC coding
573	Yagasaki et al	Simulation results of 8x8 MC
574	Tahara et al	Results of core experiments (Drift correcting encoder on Frame/Field mode)
575	Nakajima	Prediction mode decision method among frame, field, and other modes
576	CCITT EG	Status report on ATM video coding standardization, issue 3
577	CCITT/J	Effect of pseudo-random signal insertion in leaky prediction
578	CCITT/J	Simulation results on H.261 compatibility and SCIF
579	CCITT/J	Structured packaging
580	CCITT/J	Spatial-domain compensation for cell loss
581	CCITT/J	Picture header of dropped pictures
582	CCITT/J	Comparison of picture dropping order
583	CCITT/J	Comparison of leaky prediction and intra slice on channel hopping
584	CCITT/J	HDTV coding by Test Model 2
585	CCITT/J	Undefined items in compatibility coding
586	CCITT/J	Simulation results on spatio-temporal weighting
587	CCITT/J	Re-synchronization by slice size reduction
588	CCITT/J	AT&T public switched telephone netwrotk videophone
589	CCITT/J	Multimedia multiplexing method of audiovisual communication
590	CCITT/AUS	Results on layered coder error resilience
591	Parke et al.	Spatio-temporal weighted compatible coding core experiment
592	Parke et al.	Layered coding cell loss experiment
593	PTT Research	Cell loss experiments in layered coding
594	Koster	Simulation results of spatial-temporal weighting
595	CCITT/N	Quality consideration on video coding algorithm for short term PSTN video telephone standardization
596	Poncin et al.	Core experiment on cell loss resilience by using frequency scanning
597	CCITT/F	Experiment on spatio-temporal weighted H.261/MPEG2 compatibility
598	AT&T	Correction: eliminating the limit cycle in leaky prediction
599	AT&T	Experimental Results With Leaky Prediction
600	Kogure et al.	MPEG2 preliminary working draft
601	AUS NB	Comments to ISO/IEC DIS 11172

602	B NB	Comments to ISO/IEC DIS 11172
603	BR NB	Comments to ISO/IEC DIS 11172
604	CDN NB	Comments to ISO/IEC DIS 11172
605	CH NB	Comments to ISO/IEC DIS 11172
606	CN NB	Comments to ISO/IEC DIS 11172
607	D NB	Comments to ISO/IEC DIS 11172
608	F NB	Comments to ISO/IEC DIS 11172
609	GB NB	Comments to ISO/IEC DIS 11172
610	I NB	Comments to ISO/IEC DIS 11172
611	IL NB	Comments to ISO/IEC DIS 11172
612	J NB	Comments to ISO/IEC DIS 11172
613	K NB	Comments to ISO/IEC DIS 11172
614	N NB	Comments to ISO/IEC DIS 11172
615	NL NB	Comments to ISO/IEC DIS 11172
616	P NB	Comments to ISO/IEC DIS 11172
617	RS NB	Comments to ISO/IEC DIS 11172
618	S NB	Comments to ISO/IEC DIS 11172
619	SF NB	Comments to ISO/IEC DIS 11172
620	USA NB	Comments to ISO/IEC DIS 11172
621	CCIR	Approval of 4 new and 2 revised CCIR questions and their assignment to SG9
622	CCIR	Report of the first meeting of working party 11E
623	CCIR	Report of the first meeting of working party 10-11R
624	CCIR	Approval of 3 draft new questions
625	CCIR	Approval of draft new question
626	CMTT	Liaison letter from CMTT/2-SRG to ISO/IEC JTC1/SC29/WG11 (MPEG)
627	JTC1	DIS ballot text of ISO\IEC DIS 11576 on registration of algorithms for lossless compression
628	JTC1	Title and area of work of SC24
629	TC1	Announcement of the formation of an ISO/IEC JTC1/SWG on Conformity Assessment
630	SC24	Prego framework - Initial draft
631	JPEG	Sponsored enhancement proposals for 10918 addendum
632	MHEG	MHEG model
633	Std Australia	Letter to Convenor
634	IBN	Letter to Convenor
635	DIN	Interoperability, definition of 'maximu core'and extensions
636	UNINFO	Italian comments on some WG11 resolutions at Angra dos Reis
637	UNINFO	Invitation to 21st ISO/IEC JTC1/SC29/WG11
638	SIS-ITS	Comments on new work item on very-low bitrate audio-visual coding
639	ANSI	US offer to host a meeting of JTC1/SC29/WG11 in New Yorl City, NY on July 1993
640	Convenor	MPEG project description
641	Iwadare et al.	Proposal for layer III audio bitstream exchange
642	Convenor	Report on the relations between patented items in 11172 and encoded bitstream
643	Kogure et al.	Low bitrate multi-channel audio /multilingual coding system
644	Kogure et al.	Simulation results of non-DCT methods
645	Kogure et al.	Simulation results of 8x8 Intra/Inter and 8x8 MC
646	SC24	Liaison statement to ISO\IEC JTC1/SC29
647	SC24	Liaison statement to ISO\IEC JTC1/SC29 on the PREMO project
648	Yundai	Simulation results of core experiment for scene change handling in low delay
649	Lam et al.	Channel change using leaky prediction
650	Teichner	Compatibility between chrominance formats 4:2:0, 4:2:2, 4:4:4
651	Parke et al.	Syntax for compatibility
652	Gaspar et al.	Remote control of networked databases
653	Juhola et al.	Results for Fi/Fr prediction core experiments
654	Nocture	SNR scalability
655	Nocture et al.	Core experiment Q3.2 on quantization (9 bit INTRA DC)
656	Nocture	Results from the VADIS European collaboration
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658	Koster et al.	Call for MPEG Video encoder and decoder source code development
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699	O'Connell	Project description for very-low bitrate Audio-visual coding
700	O'Connell	New work item proposal for very-low bitrate audio-visual coding
701	Puri et al.	Core Experiment Proposal on Improvements in spatio-temporal weighted Compatible Coding
702	Puri et al.	Report on Core Experiment on Interlace-Interlace Conversion
703	Puri et al.	Core Experiment Proposal on Quantization Improvements
704	Puri et al.	Core Experiment Proposal on VLC Adaptation
705	Wong et al.	Proposal for 16x8 Frame MC and quarter field-pel precision 16x8 Field MC
706	Puri et al.	Core Experiment Proposal on Cell Loss and Error Concealment in 2- layer Spatially Scalable Coding
707	Puri et al.	Core Experiment Proposal on Frequency Scalability with Adaptive Interlace Extraction and Drift Correction
708	Fautier et al.	Memory cost estimation of ATT and GI proposals
709	Curet et al.	Reflexions on three problems induced by conditional error mechanism on broadcast systems
710	Convenor	Twenty-first WG11 meeting notice
711	Alves et al.	Control and indication requirements for broadcast applications
712	Stoll	Low sampling frequency extension to DIS 11172-3
713	Savatier	Simulation results on vector quantization
714	Stevens	Application profile for desktop video conferencing
715	Stoll et al.	ISO 11172-3 compatible low bitrate multi-channel audio coding system
716	v. d. Kerkhof	Multichannel low bitrate audio coding system
717	Herpel	Discussion on scalability aspects
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720	EBU	EBU questionnaire on digital terrestrial television emission systems
721	Rault	Proposal for compatible multi-channel and multi-lingual audio coding
722	Schroder et al.	Compatible coding for multi-channel audio Compatible coding for multi-lingual audio channels
723	Brandenburg	Extension of DIS 11172-3 Layer III to multi-channel/multi-lingual audio Extension of DIS 11172-3 Layer III to lower audio sampling frequencies
724	Brandenburg	New project description for MPEG/Audio
725	SMPTE	Header/descriptor task force final report, January 3, 1992
726	AFNOR	Remarks from the French contributors to JTC1/SC29/WG11
727	Aravind	Quantizer matrices and other information in the picture layer
728	Viscito	Result of core experiment I.12 - Adaptive Inter-scale prediction
729	Schamel et al.	Results of frequency scanning (MUVLC) core experiment I8
730	Schamel et al.	Results of frequency scalability using the HIVITS structure (core experiment I2)
731	Schamel et al.	Results of interlaced-to-interlaced conversion (core experiment I1)
732	Schamel et al.	Hierarchical HDTV-TV coding using frequency scalability
733	Rault	Proposal for coding at low sampling frequency
734	Brandenburg	Draft requirements list for the Audio New Work Item Proposal
735	NNI	Comments to Angra dos Reis Resolutions
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744	Peterson et al.	Preliminary results of experiments with VQ
745	Wells et al.	Demonstration of TV and interlaced SIF compatibility
746	Wells et al.	Demonstration of HDTV and TV compatibility
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748	Convenor	Organisation of 20th MPEG
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751	CCITT EG	H.261 compatibility
752	ETRI	HDTV video coding using MPEG-2 - TM2
753	Vial	Syntax extension for frequency scanning using ACVLC
754	Wasilewski	Requirements and methods for high-level multiplexing of MPEG and other digital service bitstreams with universal transport layer
755	Telia	Statistics on bits per block in a TM2 frame structure
756	Paik et al.	Results of core experiments - Adaptive 8x8 motion compensation
757	Paik et al.	Results of core experiments - Adaptive 8x8 inter/intra
758	Wells	Conversion between interlaced picture formats
759	Lippman et al.	ATV profile
760	Yagasaki etal.	Macroblock stuffing problem for implementation
761	Hidaka	Status of MPEG-2 Test sequences
762	Knoll	MPEG2-TM2 bitstream
763	Paik	Description of proposed test sequence for core experiments
764	Paik	Combined core experiment of L.11 and L.12
765	CCIR	Multichannel sound systems with or without accompanying picture
766	Yung	Various opinions on patent language
767	Yung	Low-delay mode over LAN such as Ethernet in MPEG-4
768	Herpel	Frequency scalability core experiment
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771	Watanabe	Necessary change of TM2 from Frame\Field prediction ad-hoc group
772	SC24	Position on proposal for a workshop on Multimedia\Hypermedia Standardization
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775	JTC1	Table of replies to DIS 11172 ballot

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787	ad-hoc group	Disposition of comments for DIS 11172
788	Astarabadi	A guide to MPEG Auio Layer-III decoding process - Rev. 2
789	Cotton et al.	HDTV: a 140 Mbit/s codec for "contribution" quality coding
790	CCIR	Proposal for a draft new recommendation
791	CCIR	Liaison statement from TG11/4 to Requirement subgroup of MPEG
792	SC18	Excerpts from Document application profile proforma and notation amendment

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Experts Group for ATM Video Coding
(Rapporteur's group on part of Q.3/XV)

- AVC-399R Report of the Ipswich/London meeting: Part 2
- AVC-400 Test Model 3

Please note that the descriptions for "Compatibility and Spatial Scalability" will soon be amended by an delta document. I will distribute this additional document when it is made available. Sakae OKUBO

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