EXHIBIT 6

CCITT SGXV
Working Party XV/1
Specialists Group on Coding for Visual Telephony

Document #317R
Jan. 29, 1988

SOURCE: CHAIRMAN OF THE SPECIALISTS GROUP ON CODING FOR VISUAL TELEPHONY
TITLE : REPORT OF THE ELEVENTH MEETING IN TOKYO (January 26-29, 1988)

CONTENTS

1. General
2. Documents for the Meeting
3. Tape Demonstrations
4. Report of Working Party XV/1 Meeting
5. Discussion on nx384 kbit/s Codec
6. Discussion on mx64 kbit/s Codec
7. Others
8. Future Meetings

1. General

The Specialists Group met in Tokyo, Japan, from January 26 to 29, 1988 at the kind invitation of NEC and FUJITSU. Mr. Yamashita, Vice-Chairman of Study Group XV, Chairman of Working Party XV/1 delivered a welcoming address, appreciating the activities of the Specialists Group and requesting further efforts to produce draft Recommendations for the nx384 kbit/s codec during this study period as well as those for the mx64 kbit/s codec at the earliest occasion.

The list of participants appears at the end of this report.

At the closing session, Mr. D.Lemay announced that he had replaced Mr. S. Sabri as core member of BNR. Furthermore, Chairman thanked the hosting organizations for the meeting facilities provided and the excellent operation of the meeting.

2. Documents for the Meeting (TD2)

For this meeting, 41 normal documents and 12 temporary documents have been available. Annex 1 shows the outline of each document.

3. Tape Demonstrations (TD3)

A number of tape demonstrations as listed in Annex 2 were presented during the meeting.

4. Report of Working Party XV/1 Meeting (#277)

Chairman reported the results of the Working Party XV/1 meeting held in November 1987, focusing on matters of direct concern to the Specialists Group. Mr. Yamashita supplemented this report by conveying the advice of Mr. Irmer, Director of CCITT, on the intellectual property related to CCITT Recommendations, that the "code of practice" published as Annex 3 of COM XV-R22 is a good practical guideline and Working Party as well as Specialists Group should rather concentrate on technical problems following this "code of practice".

EXHIBIT 29

5. Discussion on nx384 kbit/s Codec

5.1 Hardware Progress (#283, #290, #305, #315)

1) Progress of each hardware development

Japan: In the first project, whole coder and decoder are working. Parameter optimization and connection with DIS test signal generator were successfully carried out based on the initial compatibility check parameters. It will be transported soon to UK to check back-to-back compatibility. In the second project, the codec is working except video multiplex decoder which will be completed in one month. DIS test signal generator connection has been almost successful.

UK: Encoder is working since November 1987, decoder loop is working several months. Video multiplex decoder has just been constructed, and will expectedly be finished in one or two weeks. Connection with France through satellite was successful for frame structure and audio.

France: Encoder is working. Video multiplex decoder will be completed very soon. Connection with DIS test signal generator has successfully been carried out. For field trial with UK, see above. Optimization work will soon follow.

FRG/Netherlands: Encoder is working. All components for decoder have been assembled, and will be completed at the end of February. Connection with other European countries are intended after the completion.

2) Test signal generator

Some bugs were reported in Doc. #290, to which Doc. #315 responded that revised PROMs were designed correcting those bugs as well as supporting colored blocks and a detailed block. Mr. Schaphorst announced that new PROMs were handed to NEC at this meeting for testing before delivery to all other users. For the jerkiness observed in a Japanese demonstration in Red Bank, Doc. #290 reported that it was due to the decoder structure and the mechanism was clarified.

5.2 Transform (#281, #284, #314; TD 6)

Two documents, Doc. #281 and #284, were addressed to the approach of defining a baseline transform together with allowable mismatch error. Referring to Doc.#314, Mr. Haskell reported the eight proposals received in response to the request letter formulated at the Red Bank meeting (Annex 3 to Doc. #276R). The meeting reviewed these materials to find a solution for the transform part specification. During the discussion, the following observations were made for the baseline transform approach;

-Mismatch error and refresh rate need be checked on its bit rate dependency. Low bit rate operation such as 64kbit/s may or may not require smaller mismatch error.

-There is doubt for the use of random data to evaluate the mismatch error. Signal with low pass type amplitude distribution which is closer to picture signals may be better.

-Allowing flexibility is welcome to transform chip developers.

-If we lower the accuracy of the baseline transform, it becomes difficult to obtain the required mismatch error with implementation other than the baseline transform.

-Transform chips should not be designed only for the purpose of this Group. General purpose transform device should be used for nx384 codec. Industry standard is desirable.

-Encouraging manufacturers and IEEE (through Mr. M. Liou) to contribute to making industry standard may help us.

Taking these into account, Mr. Haskell coordinated a small group consisting of member from US and Japan to produce an action plan (TD6).

The meeting reviewed this plan and made some amendments. The outcome is contained in Annex 3.

5.3 Source coding (#285, #286)

5.3.1 Quantizers (#285)

Doc. #285 presented an optimization work on quantizers, investigating adaptive quantization for luminance and chrominance, number of quantizers, and non-linear quantizers for smaller step sizes to prevent overload. As a conclusion, a table of recommended quantizers were proposed. Corresponding work is requested of Flexible Hardware developing members to reach an agreement on the specification at the next meeting.

5.3.2 Loop filter (#286)

Doc. #286 provided information on the loop filter control. There was a question regarding the methods to reduce color dirty window; use of smaller step size quantizer for color vs use of filter for chrominance blocks. This matter awaits further experiments.

5.3.3 Others

The meeting was informed that the data on the adaptive zonal scanning scheme described in Doc. #260 and #275 had been found to require further examination.

5.4. Video multiplex coding

5.4.1 Block address coding (#291)

The block address coding method presented in Doc. #291 was agreed to be adopted in the final Recommendation, thus the block address code indicates absolute address value if the run is longer than a certain value. Specific code table is, however, for further study.

5.4.2 Macro block approach (#302, #310)

The macro block approach was simulated for 384 kbit/s with comparison to RM4, concluding that both were equivalent in performance. As this technique gives a chance to provide operation extended down to 64 kbit/s, it was proposed to be considered for inclusion in Recommendation H.12X. After some questions and answers, the meeting decided to get conclusion in the discussion of "Scope of Recommendation H.12X" (§5.7.2 of this report).

5.5 Transmission buffer (#287, #290, #292)

Compatibility problem inherent in different transmission buffer structure, pre-coding buffer or post-coding buffer, was recognized. A method described in Doc. #287 provides a solution, though it sacrifices constantness of buffering delay. Members are requested for further considerations so that we can decide on appropriate method(s) to ensure compatibility at the next meeting. Buffer size and how to specify average buffering delay also awaits decision, to which Doc. #287 gives a proposal.

5.6 Transmission coding

5.6.1 Available network for 384 kbit/s (#311)

It was pointed out that there is no immediate plan to provide H0 channel in some countries, thus we need some schemes to obtain TSSI for 6 x B channels at the terminal if a 384 kbit/s channel is required. Two solutions are listed in Doc. #311.

Members are requested to collect information on the availability of national/international networks, and to figure out the specification for our purpose. The meeting agreed to raise the problem to related CCITT Groups and seek their answers through Study Group XV.

5.6.2 Zero byte replacement (#289, #307)

Two documents were presented on the scheme proposed by AT&T at the Red Bank meeting (Doc. #252). During the discussion, the following comments were made;

- The reason of over specification in Doc. #289 is that characteristics of neighboring channels are not known.

-Even if this facility is defined as an option, every codec to be connected to north America is required to equip with this option. Solution in the network or gateway is preferable.

-Other transmission coding elements such as FEC and encryption are also related. Possible order of processing at the coder is encryption, zero-byte replacement and FEC, if parity bits of FEC do not affect violation of network restrictions.

Conclusion was not obtained at this meeting due to lack of sufficient knowledge. Correspondence work with Mr. Bryan was encouraged toward the next meeting.

5.3.3 Forward error correction (#288)

Doc. #288 provided a candidate of FEC, BCH(511,493) code, for inclusion in the final Recommendation for the case that it is found necessary, describing coding method, block length, error correcting capability and where to place parity bits. The meeting welcomed the offer of Mr. Ericsson that he is ready to give further information on the Reed-Solomon error correction code to the Group.

The meeting decided to await the experimental results on the error resilience approach, but in parallel to seek an appropriate method for Recommendation.

5.6.4 Transmission clock synchronization (#293)

A technique was presented to theoretically overcome the problems which arise from mixed synchronous and asynchronous environments when X.21 64 kbit/s interface is involved. Further study is required to formulate a specification on this aspect.

5.7 Draft Recommendations H.12x and H.13x

5.7.1 Action plan toward Blue Book (TD4; §2.1 2)/#277)

Chairman proposed an action plan (Annex 4) to obtain complete Recommendations H.12x and H.13x based on the advice of CCITT Secretariat. The meeting agreed to proceed according to this plan.

5.7.2 Scope of Recommendation (#295, #312; TD7)

A proposal was made in Doc. #295 and #312 that the Specialists Group should regard operation down to 64 kbit/s as an essential requirement when drafting Recommendation H.12x for the Blue Book. Considerations for this proposal were customer's need, service and equipment provider's concern and network availability. There was an extensive discussion on the following problems pointed out against this proposal;

-We should not overly restrict the future 64 kbit/s standards development by extending the scope of nx384 kbit/s codec Recommendation. Defining mx64 kbit/s codec based on nx384 kbit/s codec may not be optimal.

-Taking 64 kbit/s operation into account might defer finalization of Recommendations H.12x and H.13x.

-The mx64 codec is required to be low cost, the complexity brought by this proposal may not contribute to this target.

-Extension of nx384 kbit/s technique to 64 kbit/s equipment is manufacturer's choice, not the matter to be described in nx384 kbit/s Recommendation.

- Cost requirement.

Chairman prepared a draft summary of discussion (TD7). Based on this document, the meeting reached the following agreements;

1) nx384 Recommendation H.12x is put into Blue Book as much as possible, desirably 95%. Remaining part awaiting hardware experiments should be put into the accelerated procedure in Spring 1989.

2) Full specification of H.12y for mx64 should be sought toward summer 1990, through steps of "divergence", "convergence" and "verification and optimization". It is noted that outline Recommendation H.12y will be drafted in the next meeting to be annexed to the Question m/XV for the next study period.

3) Considering the concerns expressed in Doc. #295 that Recommendation H.12x should not prevent its expandability to bit rates lower than 384 kbit/s, some specification of current draft H.12x may be modified during 1988, provided that the Recommendation H.12x is completed in spring of 1989 through the accelerated procedure. For the time being the scope of H.12x

will remain as nx384 kbit/s but it is the opinion of 5 European countries that the scope should be extended to include lower bit rates than 384 kbit/s at point X in Fig. 1.

4) Specific items which have been identified to be requiring such considerations are as follows at the moment;

- Macro block approach in video multiplex,
- Transform specification if mismatch error is allowed.

If there are any other items, they should be identified at the next meeting.

Agreed time table for nx384 and mx64 is shown in Fig. 1.

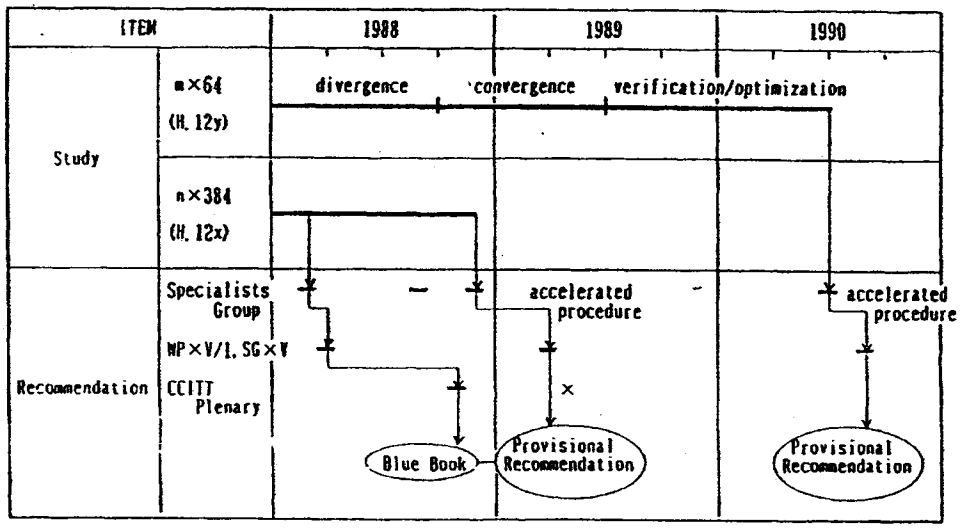


Fig. 1

5.7.3 Updating of H.12x and H.13x (#296, #306; TD 5, 11, 12)

Documents #296 and #306 were produced through correspondence work among the drafting group (See Annex 4 to Doc. #276R). After some questions and answers on these documents, the meeting requested Mr. Morrison to coordinate a small group, consisting of members from FRG, USA, France, Japan, Netherlands, UK and Sweden, for drafting a white contribution for Recommendations H.12x and H.13x. This small group was also charged to identify the points needing urgent study in order to complete these Recommendations.

The outcome is attached as Annexes 5 and 6. The white contribution will be submitted to CCITT Secretariat before February 10.

At the end of discussion, it was recognized that if some items remain under study at the next meeting, we would better to list up a limited number of

alternatives. The place where to record this information needs advice of CCITT Secretariat. Furthermore, presentation of nx384 kbit/s decoded images of some broadcasting TV scenes to CMTT was suggested by Mr. Zedler, because CMTT is interested in ENG through satellite channels.

5.7.4 Liaison with ISO (#282; TD 10)

ISO/TC97/SC2/WG8 which is standardizing still picture coding algorithm sent us a liaison statement to obtain commonalities in transform coding. After a short review of this statement, Mr. Haskell undertook to draft a reply to ISO. The agreed text is attached as Annex 7.

5.8 Intellectual property

5.8.1 Disclosed patent (#278)

A US patent of Compression Labs, Inc. which may be relevant to two-dimensional VLC was informed to the Group. Patent Licensing policy of the holding organization was also stated in Doc. #278.

5.8.2 Time of patent information disclosure (#313)

Statements collected according to the action point agreed at the Red Bank meeting (§4.8.1/Doc. #276R) was presented in Doc. #313. Seven organizations submitted by the time of this meeting. Other organizations were asked their positions at the meeting. It was found that most of all organizations were in the position that they could disclose patent information even before it enters the public domain with some provisos.

Organizations which could not prepare statement were requested to act according to the agreement at the Red Bank meeting. The meeting decided that we would take policy A (disclosure after entering the public domain) in Doc. #313 until all the statement are collected and otherwise agreed.

5.8.3 List of known patents (#304)

Updated version of TD 3(Red Bank) was distributed.

6. Discussion on mx64 kbit/s Codec

6.1 Frame structure (Attachment 2/#277, #280, #301)

Two documents related to draft Recommendation H.221 were introduced for comments, #280 on modification concerning BAS and parity bits interchanging, #301 on BAS value tables.

The meeting confirmed that the frame structure to be used in mx64 kbit/s codec conforms to recommendation H.221 and that outline of Recommendation H.12y to be annexed to Question m/XV of the next study period describes so.

6.2 Picture format (#279, #298; TD 8)

Doc. #279 presented Japanese views on various aspects relevant to the picture format problem, and proposed a variable format as conclusion. After questions and answers, the discussion focused on the need of multiple formats. Major considerations were;

- Long term target,
- Short/middle term requirements,
- Migratory way from short term to long term targets,
- Foreseeable performance,
- Trade-off between temporal and spatial resolution,
- Implementing cost, price required by customers,
- Applications (business, consumer, etc.).

As conclusion of this discussion, the meeting agreed on the following;

Considering that;

1) Realization of full CIF at mx64 kbit/s is the long term performance target,

2) Nevertheless full CIF operation is not envisaged easy to achieve at the nearest future with reasonable cost,

3) We are charged to provide timely standards to meet the short/middle term demand of ISDN users,

the meeting agreed;

1) To specify the following two formats (Note 1) in Recommendation H.12y.

a. Full CIF : 288lines x 360pels x 29.97Hz*
b. Format smaller than full CIF: 1/4 CIF,
144lines x 180pels x 29.97Hz* (Note 2),

* This temporal aspect is for further consideration.

and

2) To provide a mechanism to allow simple best interworking arrangement between the two formats in order to promote evolution toward the long term target. Interconnection between different formats is on the basis of format b.

Notes: 1. The United States expressed the view that they would like to consider the use of three formats for Recommendation H.12y.
2. Japan stated the need to confirm this point at the next national committee.

6.3 Source/video multiplex coding

6.3.1 Test sequences (#297)

Sequences "Claire" and "Salesman" have already been distributed, while "Blue Jacket" will soon be delivered by Japan.

Addition of "SWING" for interactive graphics was agreed as the fourth CCITT test sequence. Copies were distributed to US and Japan by Europe at this meeting.

6.3.2 Latest achievements (#294, #300, #309)

The following achievements were presented as information for the Specialists Group;

- Eyes, nose and mouth identification (#294),
- Motion compensated prediction with fractional-pel-accuracy (#300),
- Transmission of low pass image in pel domain, estimation of motion vector, transmission of motion field by transform coding, etc. (#309).

6.3.3 Macro block approach (#303, #308, #310)

Performance of the macro block approach at 64 kbit/s were reported in Doc. #303 and #308 to show rather good results by two laboratories. Use of escape code for shifting to ordinary block and other considerations to reduce overhead bits were also given in Doc. #310.

6.3.4 Algorithm study plan

Members are requested to make proposals to materialize three steps depicted in Fig. 1 of this report; divergence, convergence and verification/optimization. The questions are whether we should take the similar steps as those taken for nx384, in particular whether we should take "flexible hardware" or "flexible software" approach (see Doc. #169, §5 of Annex 9 to Doc. #181R).

6.4 Hardware (#299)

A DSP implementation example was presented in Doc. #299, where 8 DSP's coder and 4 DSP's decoder process CIF pictures with 8.33 Hz picture rate. It was also stressed in the presentation of this document that full CIF spatial resolution does not necessarily mean low temporal resolution.

7. Others (#316)

Information on a test tape intended for objective tests of the codec with waveform monitoring was provided.

8. Future Meetings

8.1 Specialists Group

- 12th meeting: March 22-25 in Netherlands, hosted by DNL.
- 13th meeting: September 6-9 in France.

It should be noted that a June meeting may be planned if necessary, according to the progress in the Hague meeting, where decision will be made.

8.2 Higher bodies

- Final Working Party XV/1 meeting: April 14, 15, 20 in Geneva.
- Final Study Group XV meeting: April 11, 21, 22 in Geneva.

Annexes

Annex 1: Documents for the Tokyo meeting
Annex 2: List of tape demonstrations
Annex 3: Action plan for transform specification
Annex 4: Action plan for nx384 kbit/s codec toward Blue Book
Annex 5: White contribution for draft Recommendations H.12x and H.13x
Annex 6: Items needing urgent study for H.12x
Annex 7: Reply to ISO/TC97/SC2/WG8

LIST OF PARTICIPANTS
(Tokyo; January 26-29, 1988)

Chairman	S. Okubo	- NTT, Japan
Core Members		
F. R. of Germany	J. Speidel	- PKI
	G. Zedler	- FTZ
Canada	D. Lemay	- BNR
USA	M. L. Liou	- BELLCORE (acting for H. Gharavi)
	B. G. Haskell	- AT&T Bell Laboratories
	R. A. Schaphorst	- DIS
France	G. Eude	- CNET
	J. Guichard	- CNET
Italy	L. Masera	- CSELT (acting for L. Chariglione)
Japan	Y. Hatori	- KDD
	N. Mukawa	- NTT
Korea	J.S. Lee	- ETRI
Norway	G. Bjoentegaard	- Norwegian Telecom
Netherlands	R. Plompen	- DNL
United Kingdom	R. Nicol	- BTRL
	N. Shilston	- GEC Video Systems
Sweden	H. Brusewitz	- Swedish Telecom Admin. (acting for P. Weiss)
Assisting Experts		
F. R. of Germany	W. Geuen	- FTZ-FI
USA	S. Ericsson	- PictureTel
	D. Hein	- CLI
	A. Ligtenberg	- AT&T Bell Laboratories
	L. Rennick	- CLI
France	J. David	- Alcatel CIT
Japan	Y. Kato	- NTT
	T. Koga	- NEC
	K. Matsuda	- FUJITSU
	T. Mochizuki	- NEC
	T. Murakami	- Mitsubishi Electric
	M. Ohta	- NEC
	M. Takizawa	- Hitachi
	M. Wada	- KDD
	M. Yamashita	- NTT
Korea	M.H. Lee	- ETRI
United Kingdom	D. G. Morrison	- BTRL

Annex 1 to Doc. #317R

DOCUMENTS FOR THE TOKYO MEETING

Normal Documents

#276R REPORT OF THE TENTH MEETING IN RED BANK (CHAIRMAN)

Points agreed upon and/or left for further study in the previous meeting are recorded to provide backgrounds for the discussion in this meeting.

#277 EXTRACT OF THE REPORT OF WORKING PARTY XV/1 MEETING (CHAIRMAN)

Agreements are extracted, which are directly concerned with the Specialists Group.

#278 CODING SYSTEM FOR REDUCING REDUNDANCY (COMPRESSION LABS)

A patent on a scheme of adaptive runlength coding for the most frequently generated word (0) informed as being relevant to the recommendation on nx384 kbit/s codec. Patent licensing policy of 'granting on a non-discriminatory basis on reasonable terms' is also stated.

#279 PROPOSAL OF mx64 kbit/s CODEC PICTURE FORMAT (JAPAN)

A variable picture format is proposed to meet various applications and also to allow for codec evolution with progress of coding techniques. The proposal is summarized as follows;

1) Aspect ratio of pel: that of CIF
2) Maximum format: CIF
3) Variable range: 32xk pels (k=5 to 11), 16xl lines (l=8 to 18), f/29.97 minimum coded frame interval (f=1 to 5-10).
4) Minimum capability is defined. All coders/decoders should handle formats not larger than their capabilities.
5) Format in a session is determined by negotiation.

#280 EMULATION OF FAS BY CERTAIN BAS CODES IN DRAFT H.221 (JAPAN)

It is indicated that emulation of FAS by certain BAS codes in draft Recommendation H.221 can be prevented by interchanging some bits of BAS and associated parity bits before transmission. Comments or suggestions are requested.

#281 INVERSE TRANSFORM CAPABILITY (COMPRESSION LABS, INC)

It is proposed to specify (a) a baseline transform as in Fig. 1, (b) the degree that the actual transform may deviate from the baseline transform and (c) the refresh cycle. Mismatch error (MME), which is defined as mean square error between the baseline IDCT and the actual IDCT for the input of perfectly DCTed coefficients for uniformly distributed uncorrelated 9 bit data, should be no greater than 0.02, while a block should be intraframe coded within the next 30 coded frame times after it has been interframe coded more than 30 times.

#282 LIAISON BETWEEN ISO/TC97/SC2/WG8 AND CCITT SGXV (ISO/TC97/SC2/WG8)

One of the candidates for coding algorithm for still pictures is ADCT. ISO requests us to consider such common parts as blocksize, scanning, quantization thresholding, Huffman code tables be harmonized with intra mode specification in our moving video algorithm.

#283 PROGRESS REPORT ON JAPANESE HARDWARE PROJECTS (NTT, KDD, NEC, FUJITSU)

Current statuses of the two projects are reported. In the first project, parameter optimization is being carried out, while hardware has been completed except video multiplex decoder in the second project.

#284 PRECISION FOR INVERSE DCT CALCULATION AND REFRESH CYCLE (NTT, KDD, NEC, FUJITSU)

Errors due to the mismatch between two IDCTs in coder and decoder are analyzed compared with the quantization error. Refresh cycle can be determined by the tolerable accumulation of the mismatch error to the quantization error. From the simulation result using the sequence 'Checked Jacket', it is concluded that mismatch error can not be subjectively detected if the accuracy is at least one bit higher than the specification in Doc. #222.

#285 QUANTIZING CHARACTERISTICS BASED ON INITIAL COMPATIBILITY CHECK PARAMETERS (NTT, KDD, NEC, FUJITSU)

Experimental results show the following;

1) Quantizing step size for chrominance should be smaller than that of luminance.
2) Eight quantizer sets consisting of 12 unit quantizers are sufficient for both luminance and chrominance.
3) Dynamic ranges of the smaller step size quantizers should be expanded to prevent overload distortion.

As a conclusion, quantizing characteristics are recommended as shown in Tables 3 and 4 of this document.

#286 FILTER IN THE CODING LOOP (NTT, KDD, NEC, FUJITSU)

Control methods of the loop filter (MC vector or side information) and the blocks to be filtered (luminance only or not) are compared on the flexible hardware. No significant difference in picture quality is reported.

#287 PROPOSAL AND CONSIDERATION OF BUFFER SIZE (NTT, KDD, NEC, FUJITSU)

Two control methods of the transmission buffer are discussed; constant delay method and variable delay method. According to considerations on picture quality for the picture after scene cut, delay time and its fluctuation, it is concluded as follows;

1) Coder buffer size: 128 Kbits.
2) Overall delay due to coder and decoder transmission buffers should be controlled so as not to exceed 132 ms when no picture dropping is activated.

#288 CONSIDERATIONS ON FORWARD ERROR CORRECTION (NTT, KDD, NEC, FUJITSU)

FEC is discussed concerning how to handle it in the Recommendation, possible codes and where to place the parity bits. The following specification is provided for discussion;

1) Handling in the Recommendation: Optional or mandatory according to the error resilience experiments.
2) Code: (511,493)BCH.
3) Parity bit transmission: independent framing.

#289 COMMENTS ON ZERO-BYTE REPLACEMENT (NTT, KDD, NEC, FUJITSU)

AT&T's proposal is discussed on error protection of flag bits, delay and flag bit transmission method. An alternative is provided for discussion; redundancy is added to the flag bit and they are allocated at the end of each sector.

#290 CONNECTION TEST RESULTS WITH TEST SIGNAL GENERATOR (NTT, KDD, NEC, FUJITSU)

Some bugs contained in the test signal generator are pointed out. Jerkiness observed on the sliding bar in Red Bank is also analyzed as being due to the decoder structure, suggesting a value of nominal + 1000ppm for the decoder clock frequency.

#291 IMPROVED ERROR TOLERANCE OF BLOCK ADDRESS CODING (UK, FRANCE, FRG, NETHERLANDS, ITALY, SWEDEN, NORWAY)

An idea to use absolute addressing for the case of run longer than a certain value is presented. This will improve error resilience without losing block address efficiency. It is proposed that this idea be considered for incorporation in the final Recommendation.

#292 A POTENTIAL PROBLEM WITH REDUCED PICTURE RATE CODERS (UK, FRANCE, FRG, NETHERLANDS, ITALY, SWEDEN, NORWAY)

Two transmission buffer schemes, pre-coding buffer and post-coding buffer, are discussed to have a potential compatibility problem in nx384 codecs as well as mx64 codecs. Mechanism is analyzed. It is proposed as a conclusion that this point be further studied for a solution in the final Recommendation.

#293 NETWORK SYNCHRONIZATION (UK, FRANCE)

Problems inherent in the mixed synchronous and asynchronous environments with X.21 port provided in the codec are analyzed to give the following solution;

1) The encoder clock frequency should adjust towards the receive frequency in the range of +/- 1ppm.
2) The encoder clock must not operate outside the nominal +/- 50ppm.
3) The receive port will accept and decode bit rates of the nominal +/- 50ppm.

It is proposed to check the practicality of the idea in field trials.

#294 FEATURE IDENTIFICATION IN FACIAL IMAGES (UK)

A technique known as 'back-tracking' is applied to identify significant

features in a typical head and shoulder videophone scene; eyes, nose and mouth. It is reported that the method presented here shows significant promise and has worked well on a section of 'Miss America'.

#295 SCOPE OF THE nx384 kbit/s RECOMMENDATION
(FRANCE, ITALY, NETHERLANDS, UK, FRG)

Considering the performance of the flexible hardware and simulation results, customer research within Europe and network capabilities, a proposal is made that the Specialists Group should regard operation down to 64 kbit/s as an essential requirement when drafting the Recommendation for the 'Blue Book'.

#296 SECOND DRAFT OF H.12x (DRAFTING GROUP)

Updated version reflecting the comments on the first draft distributed 24 November 1987.

#297 TEST SEQUENCE OF AN "INTERACTIVE GRAPHICS" (FRG)

A test sequence named SWING is proposed for interactive graphics, which consists of 375 CIF pictures.

#298 COMPARISON OF DIFFERENT PICTURES RESOLUTIONS CONCERNING THE TEST SEQUENCE "SWING" (FRG)

Three different spatial resolutions (CIF, 240 pels x 240 lines, 240 pels x 192 lines) for the first picture of SWING are demonstrated. The importance of relatively high spatial resolution concerning graphic application is stressed.

#299 AEG 64 kbit/s VIDEO CODEC WITH 8 DSP'S (FRG)

An hardware implemented with 8 DSP's for coding and 4 for decoding is reported, which processes CIF with 8.33 or 10 Hz. ADSP 2100 and MC68020 are used for DSP and microprocessor.

#300 MOTION-COMPENSATED PREDICTION WITH FRACTIONAL-PEL-ACCURACY (FRG)

Study results are reported on the effects of fractional-pel-accuracy of displacement estimation on the efficiency of a motion compensating predictor in conjunction with different spatial interpolation filters. "Critical accuracy" is concluded based on the prediction error as 1/4 pel for broadcasting signals and 1/2 for videophone signals. A separable interpolation filter which provides slightly better performance than the bilinear filter is also given.

#301 BAS VALUE TABLES FOR RECOMMENDATION AV.221 (BELLCORE)

By utilizing the 2-frame submultiframes in the revised draft H.221, statistical multiplexing of data and application channels become viable. Principles regarding the needs of audiovisual services are set forth, statistical multiplexing is applied to the needs, and new BAS code assignments are proposed. It is concluded that having a single BAS to specify the succeeding submultiframe is still practical with this proposal.

#302 COMPARISON BETWEEN RM4 AND MACRO BLOCK APPROACHES AT 384 kbit/s
(FRANCE, NETHERLANDS)

The simulation results show that the macro block scheme performs as well as RM4 at 384 kbit/s, while it outperforms RM4 at 64 kbit/s. It is concluded that the macro block should be taken into account when drafting the 384 kbit/s recommendation.

#303 PERFORMANCE OF MACROBLOCK BASED CONFIGURATION AT 64 kbit/s (NETHERLANDS)

Simulation results are presented for "Claire" and "Miss America" at 10Hz, concluding that;

1) Overhead bits are 10%.
2) Image quality is rather good in spite of annoying mosquito noise.
3) The scheme ensures compatibility with 384 kbit/s configuration.

#304 PATENTS RELEVANT TO THE FLEXIBLE HARDWARE SPECIFICATION - Issue 2 (CHAIRMAN)

Updated version of TD No. 3 (Red Bank) including the information provided at the Red Bank meeting or later.

#305 UK CODER HARDWARE TAPE (UK)

A list of tape demonstrations is presented with experimental parameter setting.

#306 DRAFT H.13x - AV.222 (DRAFTING GROUP)

Frame structure part separated from the first draft of H.12x.

#307 ONES DENSITY PROBLEM FOR nx384 kbit/s CODECS (FRANCE)

Some disadvantages of the AT&T proposal are listed; overuse of AC bits, additional delay, additional hardware complexity, error multiplication and problem in unframed mode. The following alternative possible solutions are presented;

- H.130 method,
- Careful design of video multiplex coding,
- Use of external unit.

It is concluded that more information is required concerning needs for encryption and acceptance of transmission errors.

#308 SIMULATION RESULTS AT 64 kbit/s BASED ON MACRO BLOCK APPROACH (FRANCE)

Numerical data for the simulation are presented. Same conclusion is shared with Doc. #303.

#309 NON RM4-BASED SIMULATIONS AT 64 kbit/s (SWEDEN, FRG)

An algorithm is presented for information which incorporates 16x16 block size, "curtain effect" scene cut control, transmission of low-pass picture in pel domain, estimation and transmission of motion field as in Doc. #265, and temporal recursive post filtering. Notably better picture quality is reported, compared to RM4 but with 16x16 block size.

#310 A HYBRID CODER FOR nx384 kbit/s WITH 64 kbit/s CAPABILITY (FRG)

A refined macro block approach codec is described, which allows for block attributes and motion vectors on an 8x8 as well as on a macro block basis. Signalling of the quantizers is modified to on a subpicture basis consisting of four Y-macro blocks and two C-macro blocks, while the GOB is doubled in size compared to the current nx384 specification. It is concluded that this scheme meets the compatibility requirements between nx384 and future mx64 codecs.

#311 TRANSMISSION OF 384 kbit/s AUDIO-VISUAL SIGNALS IN THE ISDN (FRG, NETHERLANDS, UK)

A problem is pointed out that the initial stage ISDN can provide 384 kbit/s transmission and switching in the form of only 6B channels without TSSI, instead of H0 channels with TSSI. Possible solutions should be found in terminals; use of H.221 framing in each channel or use of training sequence at the start of the call. As a conclusion, further consideration of this subject is encouraged and proposed.

#312 COMPATIBILITY BETWEEN nx384 kbit/s and mx64 kbit/s CODECS (FRANCE, FRG, NETHERLANDS, UK)

Since there is a strong interest in a coding scheme that operates from nx384 kbit/s down to mx64 kbit/s, namely px64 kbit/s (p=1,2, ..., 30), and "macro block" approach is one candidate to allow for compatibility between the two categories, it is proposed that the final recommendation for draft H.12x incorporate flexibility (e.g. for video multiplex) or further study items to allow for operation down to 64 kbit/s.

#313 PATENT INFORMATION DISCLOSURE POLICIES (CHAIRMAN)

A collection of statements submitted by organizations participating in the Specialists Group.

#314 SUMMARY OF TRANSFORM CHIP DESIGN PROPOSALS (HASKELL)

Tables summarizing the responses of 8 companies to the letter (Annex 3 to Doc. #276R) to solicit transform chip design proposals.

#315 STATUS OF nx384 kbps TEST GENERATOR (DELTA INFORMATION SYSTEMS)

According to the test results of the first version test signal generator, the following modifications are made in the second version PROMs;

- Reversing bars are corrected.
- All intra-coded GOBs include chrominance blocks as well.
- In 2 GOBs, 18 different colors are produced.
- One block contain a detailed black and white pattern.

#316 OBJECTIVE TESTING OF MOTION PERFORMANCE OF TELECONFERENCING VIDEO CODECS (DELTA INFORMATION SYSTEMS)

Information is provided regarding a possible approach of the objective measurement of the codec motion rendition; where it is intended that the following test pictures are fed into the coder and output waveform of the decoder is measured;

- "Scene Cut" pattern to measure the codec's ability to respond to an instantaneous change.
- "Rotating Wheel" pattern to measure to measure the codec's ability to reproduce typical teleconferencing motion.

Temporary Documents

No. 1 Agenda (Chairman)
No. 2 Available documents (Chairman)
No. 3 List of tape demonstrations (Chairman)
No. 4 Action plan for nx384 kbit/s codec toward Blue Book (Chairman)
No. 5 Face sheet for white contribution on drafts H.12x and H.13x (Chairman)
No. 6 Report of small group meeting (Small group on transforms)
No. 7 Summary of discussion on January 27 (Chairman)
No. 8 Summary of the discussion on picture format for mx64 (Chairman)
No. 9 Draft report of the eleventh meeting in Tokyo (Chairman)
No.10 Response to ISO/TC97/SC2/WG8 (Haskell)
No.11 White contribution for Draft Recommendations H.12x and H.13x (Drafting group)
No.12 H.12x items under study (Drafting group)

Annex 2 to Doc. #317R

LIST OF TAPE DEMONSTRATIONS (January 26, 1988)

Topics	Source / Document	
a. Flexible Hardware performance	UK	#305
b. Feature identifier (simulation)	UK	#294
c. Flexible Hardware performance (384 kbit/s, 128 kbit/s, 2 Mbit/s)	France	-
d. Flexible Hardware performance	FRG	-
e. Flexible Hardware performance (2nd project)	Japan	#283
f. Filter in the coding loop	Japan	#286
g. Flexible Hardware performance (1st project)	Japan	#283
h. Quantizer characteristics	Japan	#285
i. Buffer size (64K, 96K, 128K)	Japan	#287
j. Test signal Generator (Jerkiness in Sliding Bar)	Japan	#290
k. Precision of IDCT and refresh cycle	Japan	#284
l. Inverse transform compatibility	USA	#281
m. Comparison between RM4 and Macro Block at 384 kbit/s	France	#302
n. Macro Block scheme at 64 kbit/s	France	#308
o. Picture formats for 64 kbit/s	Japan	#279
p. 64 kbit/s source coding	Sweden	#309
q. Comparison of RM4 and Macro Block approach at 64 kbit/s	Netherlands	#303
r. Test sequence "SWING"	FRG	#297
s. Comparison of different picture resolutions	FRG	#298
t. Results of the hardware codec from AEG	FRG	#299
u. Objective testing of motion performance of video codecs	USA	#316

Annex 3 to Doc. #317R

Report of Small Group Meeting on Transforms

After consideration of the initial submissions from chip manufacturers, plus the revised submissions from those that responded to a second round of questions, we felt that the likelihood of low cost chips being available soon was good, as long as the specifications were not unnecessarily rigorous. Moreover, we believe that a refresh rate specification is possible that will not affect the picture quality is any noticeable way. Our thoughts are summarized in the attached matrix of requirements and solutions. Thus, we propose the following course of action:

1. CLI will re-run their RM4 simulations at a video rate of 320kbs, in order to ascertain reasonable values for mismatch error and refresh rate. Some European organizations undertake to carry out corresponding experiments for 64 kbit/s. Others are invited to perform similar studies.

2. CLI & AT&T will endeavor to construct some worst-case test vectors for input to the IDCT. Others are invited to contribute also.

3. Chip designers will be asked to input the test vectors to simulations of their IDCT chip and report results, possible chip modifications and modified availability schedules.

4. A request will be made for chip simulation software so that it can be inserted into the receiver section of RM4. For this we need volunteers who have working software for RM4. Measurements of error and required refresh rate will be reported.

5. A request will be made for prototype chips to be used in flexible hardware experiments if that is feasible.

6. A request is made to each chip design proposer to consider the possibility to produce a unified industry standard.

APPROACH / REQUIREMENTS	BASELINE IDCT E > 0		CHOOSE A CHIP E = 0	LOWER RESOLUTION MATRIX E = 0	OTHER FAST ALGORITHM
	E ≅ 0	E > 0			
LOW COST CODEC EQUIPMENT	?	OK	OK	NOT NECESSARILY	?
DSP IMPLEMENTATION	OK	OK	?	OK	OK
ENSURE GOOD PERFORMANCE	OK	?	OK	OK	OK
AVOID TROUBLES IN SG XV	OK	OK	NO	OK	?

PREFERRED APPROACH

Annex 4 to Doc. #317R

ACTION PLAN FOR nx384 CODEC TOWARD BLUE BOOK

Specialists Group is charged with producing the following draft Recommendations for the Blue Book;

H.12x Codec for Audiovisual Services at nx384 kbit/s,
H.13x Frame Structure for 384-2048 kbit/s channels in Audiovisual Teleservices.

Considering the remaining time before the final Study Group XV meeting in April and suggestions obtained in the previous Working Party meeting (see §2.1 2) of Doc. #277), the following action plan is proposed;

1) We review thoroughly the second drafts, Doc. #296 and #306, in this meeting. We add agreed contents based on the hardware experiments and other considerations to these drafts, making the third drafts.

2) The Specialists Group issue a late contribution according to the outcome of this meeting, describing the intention to fill the 'under study' items at the final Working Party meeting in April.

   Submitting a white contribution is required to prevent the situation that there occurs opposition to recommendation on the ground that time for consideration is lacking. February 10 is the deadline for white contributions.

3) We will complete the text as much as possible at the Hague meeting of the Specialists Group. The outcome will be put into the final Working Party meeting in Geneva as a temporary document.

4) Since extensive hardware experiments are going to be carried out from now, and the meeting schedules give a 2.5 week gap between our Hague meeting and the final Working Party meeting, we need to agree on a correspondence procedure to include the latest experimental results as well as to elaborate our drafts. Members are requested to take this into account when they prepare contributions for the hague meeting and indicate the points which may be amended through correspondence.

5) If unfortunately some items still remain 'under study' at the Hague meeting, though we should avoid this as far as possible, we will complete the work by the end of 1988, and propose to apply the accelerated procedure at the first meeting of Study Group XV meeting in 1989.

Annex 5 to Doc. #317R

WHITE CONTRIBUTION FOR DRAFT RECOMMENDATIONS H.12x AND H.13x

International Telegraph and Telephone
Consultative Committee
(CCITT)

COM XV-
January 29, 1988
Original: English

Period 1985-1988

Questions: 4/XV, 5/XV

STUDY GROUP XV - CONTRIBUTION

SOURCE: SPECIALISTS GROUP ON CODING FOR VISUAL TELEPHONY
TITLE : DRAFT RECOMMENDATIONS ON nx384 kbit/s CODEC

The following two draft Recommendations are proposed, based on the work carried out by the Specialists Group on Coding for Visual Telephony;

Recommendation H.12x	Codec for Audiovisual Services at nx384 kbit/s,
Recommendation H.13x	Frame Structure for 384-2048 kbit/s channels in Audiovisual Teleservices.

Annexes 1 and 2 are the text for these draft Recommendations. Since the hardware experiments are still going on at this moment, the text includes items under study. We will do our best to complete the text before the final Working Party meeting in April. Contents to be added to the current text will be proposed at that occasion in a temporary document.

Since codecs of this type are also suitable for some television services when full broadcast quality is not required, these draft Recommendations H.12x and H.13x should be brought to the attention of CMTT.

Annex 1 Draft Recommendation H.12x

CODEC FOR AUDIOVISUAL SERVICES AT nx384 kbit/s

Contents

1. Scope
2. Brief Specification
3. Source Coder
4. Video Multiplex Coder
5. Video Data Buffering
6. Transmission Coder

The CCITT,

considering

that there is significant customer demand for videoconference service;

that circuits to meet this demand can be provided by digital transmission using the H0 rate or its multiples up to the primary rate;

that ISDNs are likely to be available in some countries that provide a switched transmission service at the H0 rate;

that the existence of different digital hierarchies and different television standards in different parts of the world complicates the problems of specifying coding and transmission standards for international connections;

that videophone services are likely to appear using basic ISDN access and that some means of interconnection of videophone and videoconference terminals should be possible;

that Recommendation H.120 for videoconferencing using primary digital group transmission was the first in an evolving series of recommendations;

appreciating

that advances are being made in research and development of video coding and bit rate reduction techniques which will lead to further recommendations for videophone and videoconferencing at multiples of 64kbit/s during subsequent study periods, so that this may be considered as the second in the evolving series of recommendations;

and noting

that it is the basic objective of CCITT to recommend unique solutions for international connections;

recommends

that in addition to those codecs complying to Recommendation H.120, codecs having signal processing and interface characteristics described below should be used for international videoconference connections.

Note 1: Codecs of this type are also suitable for some television services where full broadcast quality is not required.
Note 2: Equipment for transcoding from and to codecs according to Recommendation H.120 is under study.

1. Scope

This Recommendation.....

2. Brief Specification

An outline block diagram of the codec is given in Figure 1.

2.1 Video input and output

To permit a single recommendation to cover use in and between 625 and 525 line regions, pictures are coded in one common intermediate format. The standards of the input and output television signals, which may, for example, be composite or component, analogue or digital and the methods of performing any necessary conversion to and from the intermediate coding format are not subject to recommendation.

2.2 Digital output and input

Digital access is at the primary rate of 1544 or 2048 kbit/s with vacated timeslots in accordance with Recommendation I.431.

Interfaces using ISDN basic accesses are under study. (Recommendation I.420)

2.3 Sampling frequency

Pictures are sampled at an integer multiple of the video line rate. This sampling clock and the digital network clock are asynchronous.

2.4 Source coding algorithm

A hybrid of inter-picture prediction to utilize temporal redundancy and transform coding of the remaining signal to reduce spatial redundancy is adopted. The decoder has motion compensation capability, allowing optional incorporation of this technique in the coder.

2.5 Audio channel

Audio is coded to according to mode 2 of Recommendation G.722. This is combined with control and indication information and conveyed in one 64 kbit/s timeslot which conforms to Recommendation H.221.

2.6 Data channels

Recommendation H.221 permits part of the 64 kbit/s timeslot carrying the audio to be used for auxiliary data transmission.

Additionally, one of the timeslots normally used for video may be reassigned as a 64 kbit/s data channel. The possibility of further such channels is under study.

2.7 Symmetry of transmission

The codec may be used for bidirectional or unidirectional audiovisual communication.

2.8 Error handling

Under study.

2.9 Propagation delay

Under study.

2.10 Additional facilities

Under study.

3. Source Coder

3.1 Source format

The source coder operates on non-interlaced pictures occurring 30000/1001 (approximately 29.97) times per second. The tolerance on picture frequency is ±50ppm.

Pictures are coded as luminance and two colour difference components (Y, C_R and C_B). These components and the codes representing their sampled values are as defined in CCIR Recommendation 601.

Black = 16
White = 235
Zero colour difference = 128
Peak colour difference = 16 and 240

These values are nominal ones and the coding algorithm functions with input values of 0 through to 255.

For coding, the luminance sampling structure is 288 lines per picture, 352 pels per line in an orthogonal arrangement. Sampling of each of the two colour difference components is at 144 lines, 176 pels per line, orthogonal. Colour difference samples are sited such that their block boundaries coincide with luminance block boundaries as shown in Figure 2. The picture area covered by these numbers of pels and lines has an aspect ratio of 4:3 and corresponds to the active portion of the local standard video input.

Note: The number of pels per line is compatible with sampling the active portions of the luminance and colour difference signals from 525 or 625 line sources at 6.75 and 3.375 MHz, respectively. These frequencies have a simple relationship to those in CCIR Recommendation 601.

3.2 Video source coding algorithm

The video coding algorithm is shown in generalised form in Figure 3. The main elements are prediction, block transformation, quantisation and classification.

The prediction error (INTER mode) or the input picture (INTRA mode) is subdivided into 8 pel by 8 line blocks which are segmented as transmitted or non-transmitted. The criteria for choice of mode and transmitting a block are not subject to recommendation and may be varied dynamically as part of the data rate control strategy. Transmitted blocks are transformed and resulting coefficients are quantised and variable length coded.

3.2.1 Prediction

The prediction is inter-picture and may be augmented by motion compensation (§3.2.2) and a spatial filter (§3.2.3).

3.2.2 Motion compensation

Motion compensation is optional in the encoder. The decoder will accept one vector for each luminance block of 8 pels by 8 lines. The range of permitted vectors is under study.

A positive value of the horizontal or vertical component of the motion vector signifies that the prediction is formed from pels in the previous picture which are spatially to the right or below the pels being predicted.

Motion vectors are restricted such that all pels referenced by them are within the coded picture area.

3.2.3 Loop filter

The prediction process may be modified by a two-dimensional spatial filter.

The filter characteristics are under study.

The filter may be switched on or off on a block by block basis. The method of signalling this is under study.

3.2.4 Transformer

Transmitted blocks are coded with a separable 2-dimensional transform of size 8 by 8. The input to the forward transform and output from the reverse transform have 9 bits. The arithmetic procedures for computing the transforms are under study.

Note: The output from the forward and input to the reverse are likely to be 12 bits.

3.2.5 Quantisation

The number of quantisers, their characteristics and their assignment are under study.

3.2.6 Classification

Luminance block coefficients may be transmitted in any one of k sequence orders as indicated by CLASS. The value of k is under study.

Chrominance block coefficients are transmitted in one sequence order.

The sequence orders are under study.

3.2.7 Clipping

To prevent quantisation distortion of transform coefficient amplitudes causing arithmetic overflow in the encoder and decoder loops, clipping functions are inserted. In addition to those in the inverse transform, a clipping function is applied at both encoder and decoder to the reconstructed picture which is formed by summing the prediction and the prediction error as modified by the coding process. This clipper operates on resulting pel values less than 0 or greater than 255, changing them to 0 and 255 respectively.

3.3 Data rate control

Sections where parameters which may be varied to control the rate of generation of coded video data include processing prior to the source coder, the quantiser, block significance criterion and temporal subsampling. The proportions of such measures in the overall control strategy are not subject to recommendation.

When invoked, temporal subsampling is performed by discarding complete pictures. Interpolated pictures are not placed in the picture memory.

3.4 Forced updating

This function is achieved by forcing the use of the INTRA mode of the coding algorithm. The update interval and pattern are under study.

4. Video Multiplex Coder

4.1 Data Structure

Note 1: Unless specified otherwise the most significant bit is transmitted first.
Note 2: Unless specified otherwise all unused or spare bits are set to zero.

4.2 Video Multiplex arrangement

4.2.1 Picture Header

The structure of the Picture Header is shown in Figure 4. The transmission of Picture Headers for dropped pictures is under study.

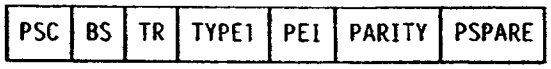


Figure 4/H.12x Structure of Picture Header

Picture Start Code (PSC)

A unique word of 21 bits which cannot be emulated by error free data. Its value is under study.

Buffer State (BS)

6 bits representing the encoder buffer fullness, sampled at the top of picture. The unit of measure is under study.

Temporal Reference (TR)

A three bit number derived using modulo-8 counting of Picture Start Codes.

Type Information (TYPE1)

Information about the complete picture;

Bit 1 Split screen indicator. '0' off, '1' on.
Bit 2 Document camera. '0' off, '1' on.
Further bits and their uses are under study.

Extra Insertion Information (PEI)

Under study.

Parity Information (PARITY)

For optional use. 8 parity bits each representing odd parity of the aggregate of the corresponding bit planes of the locally decoded PCM values of Y, C_R and C_B in the previous picture period.

Spare Information (PSPARE)

Under study.

4.2.2 Group of Blocks Header

A group of blocks consists of two lines of 44 luminance blocks each, one line of 22 C_R blocks and one line of 22 C_B blocks.

The structure of the Group of Blocks Header is shown in Figure 5.
Transmission of GOB Headers for non-transmitted GOBs is under study.

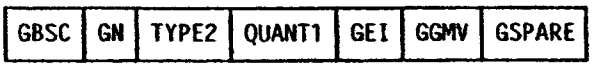


Figure 5/H.12x Structure of Group of Blocks Header

Group of Blocks Start Code (GBSC)

A word of 16 bits, 0000 0000 0000 0001.

Group Number (GN)

A 5 bit number indicating the vertical position of the group of blocks. GN ranges from 00001 at the top of the picture to 10010 at the bottom of the picture.

Note: GBSC plus the following GN is not emulated by error-free video data.

Type Information (TYPE2)

TYPE2 is p bits which give information about all the transmitted blocks in a group of blocks. The value of p is under study.

Bit 1 When set to '1' indicates all 132 blocks are transmitted in INTRA mode.
Bit 2 to p Spare, under study.

Quantiser Information (QUANT1)

Under study.

Extra Insertion Information (GEI)

Under study.

Group of Blocks Global Motion Vector (GGMV)

Under study.

Spare Information (GSPARE)

Under study.

4.2.3 Block data alignment

An example of the structure of the data for each transmitted block is shown in Figure 6. Exact order is under study. Elements are omitted when not required.

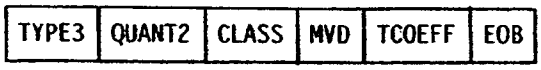


Figure 6/H.12x Data structure of transmitted block

Block Address (BA)

A Variable Length Code-word indicating the position of a block within a group of blocks. VLC codewords are under study.

The transmission order and addressing of blocks are under study.

As an example, for the purpose of run-length calculation, the block is regarded as continuous beginning with the upper line of luminance blocks through the lower ones, through C_R and ending with C_B blocks.

As an example, the ranges of absolute block addresses for the upper and lower lines of luminance blocks are 0 to 43 and 44 to 87 respectively. The ranges of absolute block addresses for the C_R and C_B lines of chrominance blocks are 88 to 109 and 110 to 131 respectively.

When all blocks in a GOB are coded in INTRA mode, BA is not transmitted for those blocks.

Block Type Information (TYPE3)

A variable length codeword indicating the type of block and which data elements are present. Block types and VLC codewords are under study.

Quantiser (QUANT2)

A fixed length code of q bits signifying the table(s) employed to quantise the transform coefficients. The value of q is under study. QUANT2 is not present when the first bit of QUANT1 in the Group Header is set to '1'.

Classification Index (CLASS)

A Variable length codeword present in luminance blocks specifying the transmission sequence of transform coefficients. The codewords are under study.

Motion Vector Data (MVD)

Calculation of the vector data is under study.

When the vector data is zero, this is signalled by TYPE3 and MVD is not present.

When the vector data is non-zero, MVD is present consisting of a variable length codeword for the horizontal component followed by a variable length codeword for the vertical component.

Variable length coding of the vector components is under study.

Transform Coefficients (TCOEFF)

The quantised transform coefficients are sequentially transmitted according to the sequence defined by the CLASS. The DC component is always first. Coefficients after the last non-zero one are not transmitted.

The coding method and tables are under study.

End of Block Marker (EOB)

Use of and codeword for EOB are under study.

4.3 Multipoint considerations

4.3.1 Freeze picture request

Causes the decoder to freeze its received picture until a picture freeze release signal is received. The transmission method for this control signal is under study.

4.3.2 Fast update request

Causes the encoder to empty its transmission buffer and encode its next picture in INTRA mode with coding parameters such as to avoid buffer overflow. The transmission method for this control signal is under study.

4.3.3 Data continuity

The protocol adopted for ensuring continuity of data channels in a switched multipoint connection is handled by the message channel. Under study.

5. Video Data Buffering

The size of the transmission buffer at the encoder and its relationship to the transmission rate are under study.

Transmission overflow and underflow are not permitted. Measures to prevent underflow are under study.

6. Transmission coder

6.1 Bit rate

The net bit rate including audio and optional data channels is an integer multiple of 384 kbit/s up to and including 1920 kbit/s.

The source and stability of the encoder output clock are under study.

6.2 Video clock justification

Video clock justification is not provided.

6.3 Frame structure

6.3.1 Frame structure for 384-2048kbit/s channel

The frame structure is defined in Recommendation H.222.

6.3.2 Bit assignment in application channel

Under study.

6.3.3 Timeslot positioning

According to Recommendation I.431.

6.4 Audio coding

Recommendation G.722 56/48 kbit/s audio, 0/8 kbit/s data and 8 kbit/s service channel in the first timeslot.

The delay of the encoded audio relative to the encoded video at the channel output is under study.

6.5 Data transmission

One or more timeslots may be allocated as data channels of 64 kbit/s each. The first channel uses the fourth timeslot.

Positioning of the other channels, and possible restrictions on availability at lower overall bit rates are under study. The BAS codes used to signal that these data channels are in use are specified in Recommendation H.221.

6.6 Error handling

Under study.

6.7 Encryption

Under study.

6.8 Bit Sequence Independence Restrictions

Under study.

6.9 Network interface

Access is at the primary rate with vacated timeslots as per Recommendation I.431.

Fro 1544 kbit/s interfaces the default H0 channels is timeslots 1 to 6. Interface code is AMI or B8ZS.

For 2048 kbit/s interfaces the default H0 channel is timeslots 1-2-3-17-18-19. Interface code is HDB3.

Interfaces using ISDN basic accesses are under study. (Recommendation I.420)

END

Note: The following sections (indicated with bars in the left margin) are not included in the submission to CCITT Secretariat; §2.8, §2.9, §2.10, §6.6, §6.7 and §6.8. Subsequently, the current §6.9 is changed into §6.6 there.

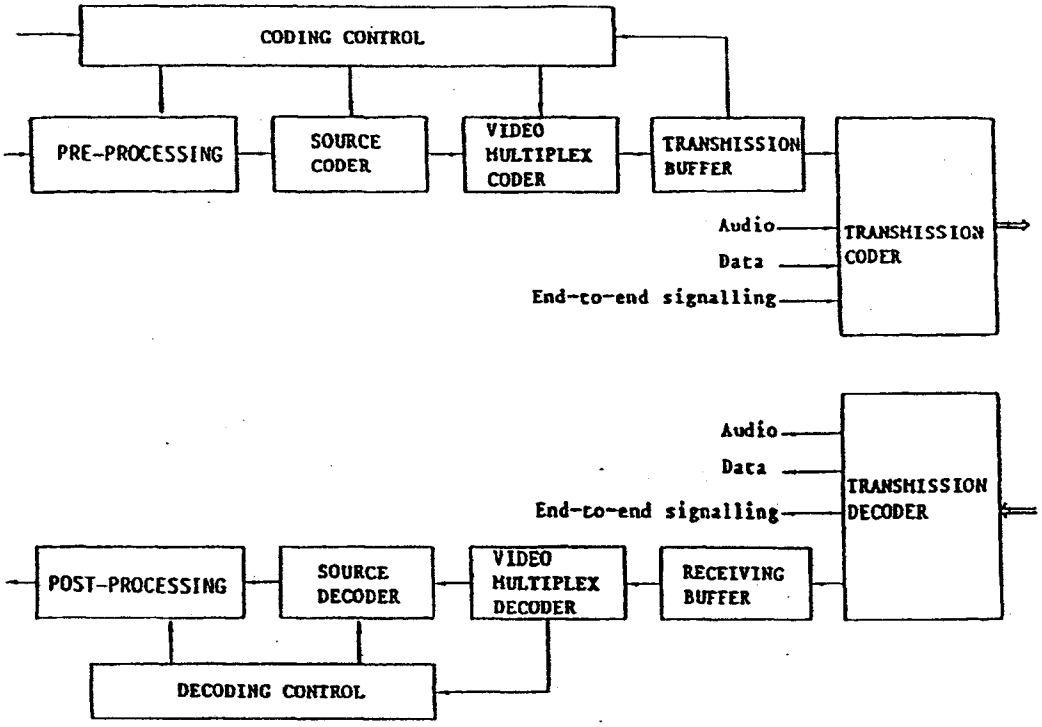


Figure 1/H.12x Outline of block diagram of the codec

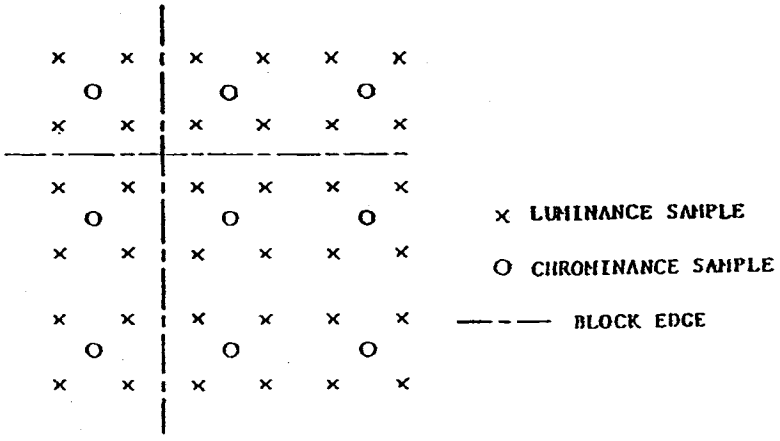
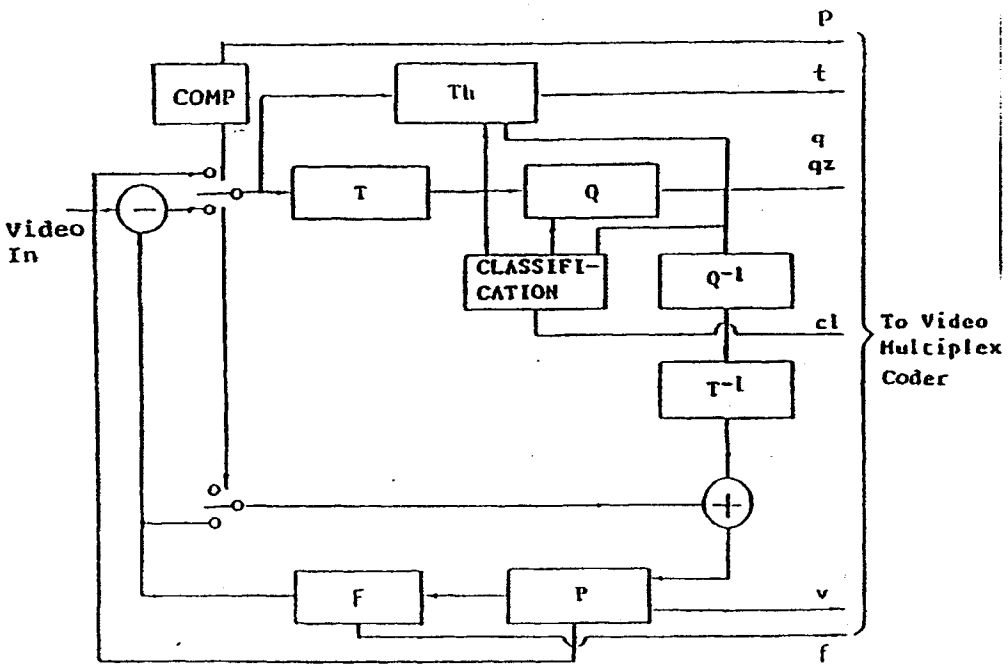


Figure 2/H.12x Positioning of luminance and chrominance samples



COMP Comparator for intra/inter
Th Threshold
T Transform
Q Quantizer
P Picture memory with motion compensated variable delay
F Loop filter

p Flag for intra/inter
t Flag for transmitted or not
q Quantizing index for transform coefficietns
qz Quantizer indication
v Motion vector
cl Classification index
f Switching on/off of the loop filter

Figure 3/H.12x Video coding algorithm

Annex 2 Draft Recommendation H.13x

Frame Structure for 384-2048 kbit/s Channels in Audiovisual Teleservices

1. Scope

This recommendation provides a mechanism to multiplex multimedia signals such as audio, video, data, Control & Indication etc. for audiovisual teleservices using an nx384 kbit/s (n=1-5) channel.

2. Basic Structure

The multiplex structure is based upon multiple octets transmitted at 8 kHz as in Recommendation I.431.

An nx384 kbit/s channel consists of 6xn timeslots of 64 kbit/s (see Fig. 1). The first 64 kbit/s timeslot has a frame structure conforming to Recommendation H.221, containing Frame Alignment signal (FAS), Bit rate Allocation Signal (BAS) and Application Channel (AC).

3. BAS Codes

Particular codes for allocating audio, video and data signals in an nx384 kbit/s channel are given in Table /Annex 1 to Recommendation H.221 for Attribute '001'.

4. Data Transmission

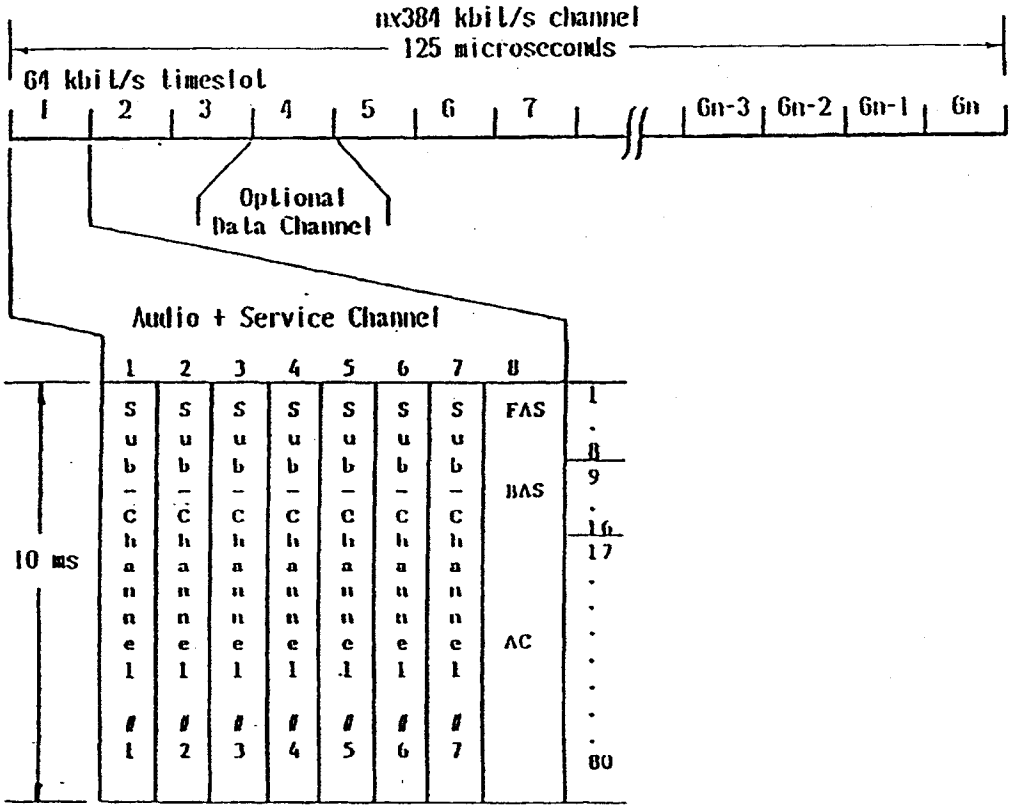
A 64 kbit/s data channel can be allocated to the fourth timeslot in the nx384 kbit/s channel if controlled by the corresponding BAS code.

Provision of more than one 64 kbit/s data channels is for further study.

5. Bit Assignment in Application Channel

Application Channel conveys Control & Indication Signals, message channel, etc. for audiovisual teleservices using nx384 kbit/s transmission. Bit assignment is under study.

END



FAS: Frame Alignment Signal (note)
BAS: Bitrate Allocation Signal
AC: Application Channel

Note: The block termed as FAS also contains information other than for frame alignment purposes.

Figure 1/H.13x Frame structure for nx384 kbit/s audiovisual teleservices

Annex 6 to Doc. #317R

ITEMS NEEDING URGENT STUDY FOR H.12x

1. Interfaces using ISDN 'B' channels
2. More than one 64 kbit/s data channel
3. Error handling
4. Range of motion vectors
5. Loop filter shape and boundary
6. Loop filter signalling
7. Transform
8. Number of quantisers
9. Quantiser laws
10. Quantiser assignment
11. Number of classes (sequence orders)
12. Sequence orders, i.e. scanning patterns
13. Forced update - related to transform
14. Picture Headers in dropped fields
15. Last 5 bits of PSC
16. Definition of transmitted Buffer Status
17. Spare bits in TYPE1
18. Extra spare bits optionally inserted in Picture Header
19. Transmission of GOB Headers for GOB with no transmitted blocks
20. Number and use of spare bits in TYPE2
21. Extra spare bits optionally inserted in GOB Header
22. GOB Global Motion Vector
23. Order of elements for each block
24. Block addressing and block order
25. Block types and codewords
26. VLC words for CLASS
27. Motion vector encoding
28. Transform coefficients coding; one- or two-dimensional VLC, VLC tables
29. EOB
30. Freeze picture request
31. Fast update request
32. Picture freeze release flag
33. Data continuity - multipoint
34. Video data buffer - size and strategy
35. Channel clock
36. Bits in Application Channel
37. Audio-video delay
38. Encryption
39. One's density

Annex 7 to Doc. #317R

REPLY TO ISO/TC97/SC2/WG8

CCITT SG XV, WP1 January 29,1988

Specialists Group on Coding for Visual Telephony

Title: Response to ISO/TC97/SC2/WG8.
Liason of Motion and Still-Frame
Image Compression
Recommendations for ISDN

In many applications, users of ISDN will wish to communicate both motion imagery and still color pictures. These may alternate on a single display, simultaneously share a single display or appear at the same time on separate displays. Several motion video pictures and/or several still pictures of various sizes and shapes may be windowed togetherin a fixed or variable arrangement. In summary, considerable flexibility will be required ofISDN imaging terminals, and therefore coordination and forethought will be required to keep equipment costs at a minimum.

Hardware costs can be reduced if as many components as possible are shared by the various functions of the imaging terminal. In particular, circuits for color processing, pixel 8 x 8 block formation, forward and inverse transformation, variable word-length coding/decoding, FEC coding and decoding, quantization, etc. could all be used for both interframe and intraframe coding.

Also, the progressive update methods currently under study for still-frame coding are remarkably like motion video interframe coding in many respects. Errors between successive frames are coded with varying spatial resolution and varying quantization accuracy, depending on the bit-rate available for transmission. As the error between frames diminishes and/or the bit-rate increases, the frame difference can be coded with higher resolution and higher quantization accuracy.

The same thresholding, quantizing, run-length coding, two-dimensional variable word-length coding, picture header, video multiplex, audio multiplex, etc. could, in principle, also be used for motion and still-frame imagery. This could be the subject for further study and negotiation in the next CCITT study period.

CCITT Study Group XV is going to produce Recommendations H.12x and H.13x at its final meeting in April 1988. The current draft based on the work up to Jan.29 is attached for reference of ISO/TC97/SC2/WG8.

Note: The attached draft is the one which is submitted to CCITT Secretariat as a white contribution .

EXHIBIT 7

W68 N831
1988.11.

CCITT SGXV
Working Party XV/1
Specialists Group on Coding for Visual Telephony

Document #395R
Sep. 22, 1988

SOURCE: CHAIRMAN
TITLE : REPORT OF THE THIRTEENTH MEETING IN PARIS (September 19-22, 1988)

CONTENTS

1. General
2. Documents for the Meeting
3. Tape Demonstrations
4. Report of the Final WPXV/1 and SGXV Meetings
5. Discussion on 384 kbit/s Codec
6. Discussion on 64 kbit/s Codec
7. Scope of Recommendations and Future Work Plan
8. Others

1. General

The Specialists group met in Paris, France, from September 19 to 22, 1988 at the kind invitation of Alcatel CIT with the support of SAT and CNET.

The list of participants appears at the end of this report.

At the opening session, Chairman reported that Finland had indicted its willingness to send a specialist to the Group and that Mr. Helkio would attend the meetings as an observer until it would be approved in the coming Study Group XV meeting.

At the closing session, Chairman thanked the hosting organization for the meeting facilities provided and the excellent operation of the meeting.

2. Documents for the Meeting (TD2)

For this meeting, 49 normal documents and 11 temporary documents have been available. Annex 1 shows the outline of each document.

3. Tape Demonstrations (TD3)

A number of tape demonstrations as listed in Annex 2 were presented during the meeting.

4. Report of Final Working Party XV/1 and Study Group XV Meetings (#347, #348)

Chairman reported the results obtained at the final meetings of WPXV/1 and SGXV which were held in April 1988 focusing on the topics of our direct concern; new terms of reference for the Specialists Group, new Recommendations, revised existing Recommendations and new Questions.

5. Discussion on 384 kbit/s Codec

5.1 Field trial

Mr. Speidel reported with a tape demonstration on international compatibility check between FRG/Netherlands and UK Flexible Hardware as well as coder to decoder loopback test. During the technical visit, a live videoconferencing between Paris and Ipswich was demonstrated via a

satellite link using France and UK Flexible Hardware operating at 384 kbit/s.

5.2 Parameter optimization (#363)

Statistics of the coding elements in the Flexible Hardware were presented which had been collected using the initial compatibility check parameters as defined in Doc. #249. Some comments were given on the VLC sets; those for TCOEFF/EOB and Differential Motion Vectors are near optimum whereas those for TYPE3 and CLASS should be modified.

5.3 Transmission errors (#379, #394)

Doc. #379 reported how Flexible Hardware behaves under transmission errors; random and burst errors. Mr. Guichard commented it is more resilient to transmission errors than originally expected. In response to a question, he clarified that no particular error resilience measures are implemented in the Hardware.

Doc. #394 gave information on European activities on the error correction. According to the hardware experimental results, Mr. Carr expressed his view that he would prefer simpler error correction codes because the current coding scheme has error resilience to some extent and that the (511,493)BCH seems reasonable for our purpose while the (255,239)BCH may be too powerful.

5.4 IDCT mismatch errors (Annex 3/#346R, #349; #351, #364, #366, #380; #365, #367, #377; TD5, TD6)

As the background of the discussion, Mr. Carr reported the summary of the meeting of DCT chip manufacturers held in May at BTRL (Doc. #349). The idea of a common design was not accepted because of the possible future improvements in chip design and the technology already developed. The meeting confirmed we would seek the approach of defining a reference IDCT and specifying some tolerance together with refresh interval. Mr. Carr advised the meeting that it would not be a problem for chip manufactures to specify tightly as required since the progressing chip technology would easily follow the specification if once given.

Analytical study results were presented in several documents; computer simulation using random numbers (Doc. #351, #364), mismatch error analysis based on transformer models (Doc. #366, #380). Picture coding results were also presented as useful input toward finalizing the specification; an extensive hardware experiments on the perceptible limit of mismatch errors (Doc. #365), hardware experiments on allowable cyclic refresh interval from the coding efficiency reduction point of view (#367), RM5 simulation of an existing chip at 64 kbit/s.

After some discussion, the meeting requested Mr. Haskell to coordinate a small group meeting for updating the current IDCT provisional specification (TD5) through reviewing all the information made available. The updated specification of IDCT is contained in Annex 3 which will be sent to chip manufacturers for comments. For the refresh interval specification, "at least once every 128 coded frames" were agreed.

6. Discussion on 64 kbit/s CODEC

6.1 Picture format (§5.1/#346R; #354, #372, #382; TD8)

Based on the simulation results addressed to the comparison between Full CIF and 4/9CIF, the meeting had an extensive discussion on the necessity of the third medium resolution format.

To form a basis of the discussion, Mr. Schaphorst coordinated a small group meeting to produce a status report as in Annex 4.

The summary of discussion is as follows;

1) Experimental Results

- Full CIF presentations are generally superior to 4/9 CIF ones in European results (against intuition in coding noise)
- Some ambiguities in Japanese results
- Lack of common comparison method

2) Necessity of 4/9 CIF

a. Not necessary (Europe)

- Experimental evidence in 1) above
- International compatibility at the highest quality
- Service point of view including multipoint simplicity

b. Necessary (US, Japan, Canada)

- Flexibility in spatio-temporal resolution trade-off
- Cheaper implementation

3) Possible solutions

a. Proceed with the agreed two formats (Full CIF, Quarter CIF).

b. Include 4/9 CIF as proposed by Japan, three formats are defined and when two different format codecs intercommunicate, the common largest format is used.

c. 4/9 CIF is recommended as a defined option. When 4/9 CIF intercommunicates with Full CIF codec, QCIF is used.

d. 4/9 CIF is not defined as one of the picture formats, but it may be implemented as covering part of the Full CIF Video multiplex. All codecs other than QCIF codecs have the capabilities;

- to decode Full CIF pictures, and
- to send reduced size pictures in the Full CIF video multiplex.

Whole of the picture information should be displayed, but how to display it is not the matter of codec specification. In order to facilitate the full size display, indication of 4/9 CIF is inserted as a part of codec-to-codec signalling.

4) Considerations

- Simplification of the future work in the limited time frame.
- Worry about proliferation of the local standard equipment not compatible with CCITT standard codecs.

As a conclusion, the meeting agreed upon to proceed with the agreed two formats (Full CIF and Quarter CIF) unless firm, convincing evidence of 4/9CIF and consistent architecture among different formats are provided by the next meeting and agreed.

6.2 Source coding

6.2.1 Reference Model 5 based schemes

First, reports of the RM5 implementation were provided in Doc. #369 and #393, and complete description of RM5 was given in Doc. #375. Some statistics on motion compensated prediction errors and two-dimensional motion vectors were also reported in Doc. #370. As to the concentration of motion vectors on the 9 points in the first search step in Table V/Doc. #370, it was guessed as probably due to the priority given to the lower numbered position when the evaluation function values are equal.

Next, several improvements found in the simulation were presented with questions and answers accompanied;

1) Two-dimensional motion vector prediction and coding (#355, #389)

Mr. May informed that +/-15 pel displacements are required from the hardware study.

2) Loop filter (#356, #376)

Mr. Guichard raised a question to Doc. #356 how the results can be compared with the case where 121 filter is kept after the frame memory and post processing is applied to the decoded picture.

3) Coding of the first picture (#358, #389) and inter/intra switch (#389)

Necessity of intra mode was generally supported not only for the rapid build-up but also for cyclic refreshing required to cope with IDCT mismatch.

4) Entropy coding of the quantizer index (#374, #392)

It drew attention that a 1-bit code is assigned to EOB code in Tables 3-5 of Doc. #374. Block type definition was felt better to handle the abundance of EOBs. It was also pointed out that VLC might better be adapted to transmission bit rate as well. In Doc. #392, remaining EOBs after block addressing are removed by coding the number of events.

6) Variable thresholding for quantizers (#392)

This technique provides a significant gain. Mr. Kato pointed out that his previous simulation work showed some gain had been obtained by lowering the first representation level. Mr. Ericsson gave his interpretation using cost function that an isolated coefficient transmission is more costly.

7) Block addressing by transmitting coded/non-coded patterns (#357, #392)

It was pointed out that if this method is used, the code length of EOB may need be changed.

6.2.2 New elements or new schemes

The following study results were presented as the state of the art where new coding elements or new schemes different from those of RM5 are used.

1) VQ schemes (#359, #362)

2) New transforms (#360, #381, #382)

Mr. Bjoentegaard stated that the Directional Transform was designed to reproduce clearer edges with mosquito noise reduced.

3) Background prediction (#390)

Mr. Haskell pointed out that a possible problem may be in AGC of cameras.

4) Segmentation (#361)

Mr. Plompen and Mr. Brusewitz suggested that the problem of where to allocate more bits is not straightforward.

6.2.3 Summary

Based on the study results presented, the meeting obtained the following agreement on the future algorithm study;

It is agreed that the Reference Model (RM) based algorithm is the base line leading candidate for the 64 kbit/s algorithm, and that the group should continue to refine the algorithm. Since we agree that we are now in the convergence period, using RM as a base, the group will consider other algorithms after this point only if they can be shown to be significantly superior to the RM version existing at that time.

As to the improvement of the Reference Model, the meeting requested Mr. Guichard to further review those results in § 5.1 and § 5.2 above and Doc. #352, #362 in a small group meeting and decide which elements be incorporated in the RM6 and which elements require further study. The outcome is in Annex 5.

Mr. Plompen undertook to submit a document on the RM6 specification (Doc. #396) by revising Doc. #375.

6.3 Video multiplex structure (#384, #385, #386, #387)

Revision of some parts of the videomultiplex specification were proposed. Generally the concept of these proposals were understood and supported, waiting for the detailed considerations by the next meeting.

The syntax diagram used for describing video multiplex structures in Doc. #386 is recommended as an easy-to-understand and clear way of presentation.

6.4 px64 kbit/s Flexible Hardware Specification (#373)

A first draft of the specification was proposed. The meeting recognized this as a useful input. Thorough considerations are requested of the members

toward the next meeting.

7. Scope of Recommendation and Future Work Plan
(#347, #348, #353, #373; TD4, TD9)

At the start of the meeting, Chairman raised questions to clarify the scope of Recommendations we should draft and the work schedule for coming years in TD4 (Annex 6).

Japan and US expressed their opinions to support "Plan 1" in TD4 with the following reasons;

- Recommendation on nx384 have been awaited.
- We should not drop what we gained and head for other objectives.
- Criticism that we are producing nothing.
- Current draft Recommendation H.261 does not allow manufacturers to make codecs because so many items are under study.
- Saying nx384 in Blue Book and px64 now makes confusion in the market.

Europe expressed its support to "Plan 2" in TD4 with the following reasons;

- Looking at the RM5 improvements, a single standard with px64 becomes possible at an early date.
- Two Recommendations in one year difference make confusion by allowing two CCITT codecs which are not compatible at the common bit rates.
- Not so much concern in nx384 in Europe, strong concern in 64.

After some discussion, the meeting reached the conclusion that we would produce a complete draft Recommendation on the px64 kbit/s (p=1-30) codec at the end of 1989, while in March 1989 we would obtain provisional Recommendation with as much detail as possible in time available. Mr. Carr undertook to draft the following time table with explanatory notes (see p.7).

This time table was agreed by the meeting (Note).

Note: Japan stated the need to confirm this plan at the next national committee.

8. Others

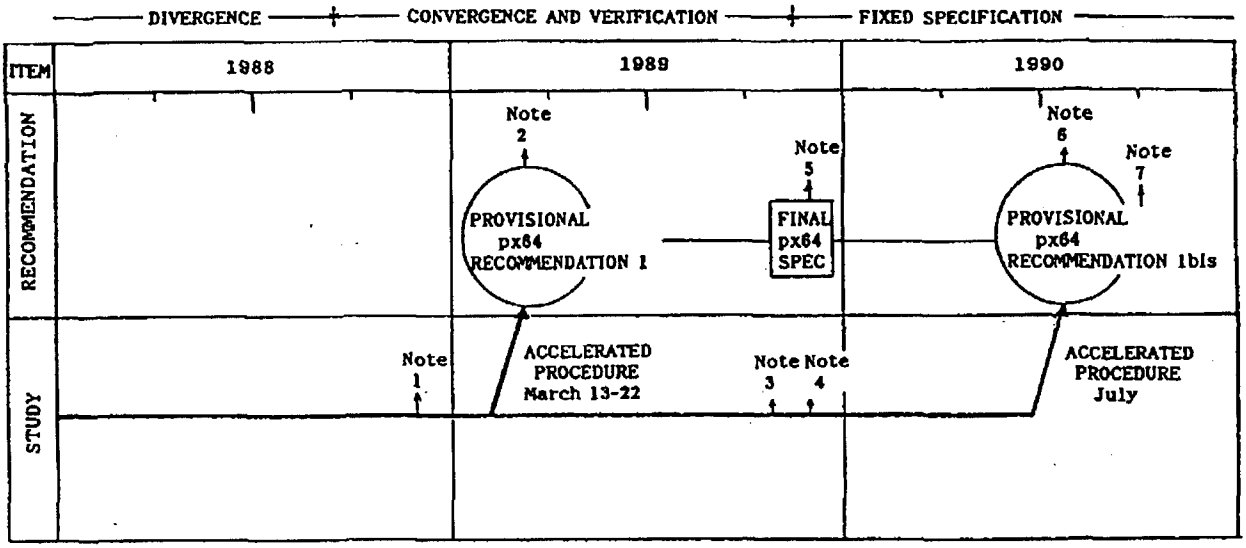
8.1 Tester (#391)

A design of the tester which outputs the test signals to confirm proper decoder operation was presented. If there are any suggestions, comments, etc., members are requested to get contact with Mr. Schaphorst.

8.2 Multiconferencing unit (#378)

Requirements were identified for the second generation codec MCU. The meeting recognized that the codec-to-codec signalling part is under its responsibility, but general system aspects should be dealt with in the Working Party. Chairman suggested the material be put forward to WPXV/1 as well.

Agreed Time Table for px64 kbit/s Codec Standardization



Note 1 Next Specialists Group meeting (14th meeting). Firm proposals for items to be included in Provisional Recommendation.

Note 2 Obtain Provisional Recommendation 1 by Accelerated Procedure with as much as possible in time available. Formal procedures need to be checked with CCITT Secretariat.

Note 3 Make proposals and agree all items for inclusion in a complete final px64 specification.

Note 4 Prepare final document for submission to CCITT Working Party meeting.

Note 5 px64 specification complete.

Note 6 Final specification becomes a Provisional Recommendation by Accelerated Procedure.

Note 7 Recommendation 1bis is a completed version of Recommendation 1 (ie all study items complete).

8.3 Patents

8.3.1 Patent information disclosing policy (#350)

AEG Olympia (FRG) informed the Group of its disclosure policy. It was recalled that new members joining the group are requested to follow the same policy and provide statements (see § 4.9/Doc. #346R).

8.3.2 Patent applications (#368, #371, #383, #388)

According to the agreements in the Hague (§4.9/#346R), the group was informed of the patent applications by the following organizations;

- NTT, KDD, NEC, FUJITSU (5 patents)
- British Telecom (4 patents)
- PKI (6 patents)
- Swedish Telecom (1 patent)

8.4 Future Meetings

- 14th meeting: Dec. 6(Tue)-9(Fri), 1988 in Florida, hosted by GPT.
- 15th meeting: Mar. 7(Tue)-10(Fri), 1989 in Oslo, hosted by Norwegian Telecom.
- 16th meeting: June 1989, Europe/Japan.
- 17th meeting: Sep-Oct 1989, Japan/Europe.

END

Annexes

Annex 1 Available documents (Reproduction of TD2)
Annex 2 List of tape demonstrations (Reproduction of TD3)
Annex 3 Report of the IDCT small group (Reproduction of TD6)
Annex 4 Report of the picture format small group (Reproduction of TD7)
Annex 5 Report of the algorithm study small group (Reproduction of TD10)
Annex 6 Scope of Recommendations and work plan (Reproduction of TD4)

LIST OF PARTICIPANTS
(Paris; September 19-22, 1988)

Chairman	S. Okubo	- NTT, Japan
Core Members		
F. R. of Germany	J. Speidel	- PKI
	G. Zedler	- FTZ
Canada	D. Lemay	- BNR
USA	A. Tabatabai	- BELLCORE
	B.G. Haskell	- AT&T Bell Laboratories
	R.A. Schaphorst	- DIS
France	G. Eude	- CNET
	J. Guichard	- CNET
Italy	M. Guglielmo	- CSELT (acting for L. Chariglione)
Japan	Y. Kato	- NTT
	M. Wada	- KDD
Korea	J-S. Lee	- ETRI
Norway	G. Bjoentegaard	- Norwegian Telecom
The Netherlands	R. Plompen	- DNL
United Kingdom	D. G. Morrison	- BTRL (acting for R. Nicol)
	N.L. Shilston	- GPT Video Systems
Sweden	H. Brusewitz	- Swedish Telecom Admin.
Assisting Experts		
F. R. of Germany	W. Geuen	- SEL
	F. May	- AEG
USA	S. Ericsson	- PictureTel
	N.J. Fedele	- David Sarnoff Research Center
	D.N. Hein	- Video Telecom
	L.V. Rennick	- CLI
	T. Townsend	- CLI
	J.W. Zdepski	- David Sarnoff Research Center
France	J-P. Blin	- CNET
	J. David	- Alcatel CIT
	D. Devimeux	- SAT
	J. Thiberville	- Alcatel CIT
Japan	T. Koga	- NEC
	K. Matsuda	- FUJITSU
	T. Murakami	- Mitsubishi Electric
	F. Sugiyama	- Toshiba
	M. Takizawa	- Hitachi
Korea	O-W. Kwon	- ETRI
United Kingdom	M.D. Carr	- BTRL
	T.S. Duffy	- GPT Video Systems
	G. Sexton	- BTRL
Observer		
Finland	R. Helkio	- VISTACOM

122

Annex 1 to Doc. #395R

DOCUMENTS FOR THE PARIS MEETING

Normal Documents

#346R REPORT OF THE TWELFTH MEETING IN THE HAGUE (CHAIRMAN)

Points agreed upon and/or left for further study in the previous meeting are recorded to provide backgrounds for discussions in this meeting.

#347 SUMMARY OF FINAL MEETINGS OF WP XV/1 AND SGXV (CHAIRMAN)

Major results on the topics of our direct concern are reported which were discussed under Questions 4/XV and 5/XV;

- Progress and future of the Specialists Group activities
- New Recommendations
- Revised existing Recommendations
- New Questions C/XV and D/XV

#348 PROPOSAL FOR ITEMS TO BE STUDIED UNDER THE NEW QUESTION ON 64 kbit/s VIDEOPHONE DURING THE NEXT STUDY PERIOD (FINLAND)

- A list of system parameters should be worked out.
- Only field proven coding methods should be taken into account for
- the final evaluation work.
- Only those proprietary coding methods declared to be available on "reasonable terms" should be taken into consideration.

#349 REPORT OF THE MEETING OF DCT CHIP MANUFACTURERS - MARTLESHAM UK 24-25 MAY 1988 (CHAIRMAN OF DCT CHIP MANUFACTURERS MEETING - Mike Carr)

The meeting strongly supported to define a test specification rather than a single structure. Some suggestions were made to improve the test procedure; inclusion of critical test patters, 64-bit floating point accuracy for the reference data, and use of reference data comprising several thousands blocks with known results.

#350 STATEMENT ON DISCLOSE OF PATENTS (AEG)

It is stated that AEG follows the policy "B" in Doc. #342.

#351 PERFORMANCE OF A NEW FAST ALGORITHM FOR 8*8 IDCT (TELECOM PARIS UNIVERSITY)

Simulation results for the IDCT mismatch are presented for a new fast DCT algorithm. Only mean square error (0.029) is outside the provisional specification (0.02). Lower and higher ranges of input to DCT are also experimented.

#352 BLUE JACKET (JAPAN)

Information on the test sequence "BLUE JACKET" is provided with some statistics.

123

#353 CONTRIBUTIONS ON mx64 kbit/s CODING ALGORITHM IN JAPAN (JAPAN)

An overview is given to the standardization activities in Japan by describing the organization, its current status and outlines for submitted documents.

#354 4/9 CIF (JAPAN)

Based on the RM5 simulation results for Full CIF, 4/9CIF and Quarter CIF, 4/9CIF is concluded to be included in Recommendation because it gives better SNR for critical scenes and better temporal resolution for simple sequences.

#355 IMPROVEMENT OF MOTION COMPENSATION IN RM5 (JAPAN)

Use of differential vector coding (coding of prediction error between an average of surrounding 4 vectors and the current vector) and use of one of 9 surrounding vectors as the initial step for 3-step vector detection are proposed. Information is also provided on a pel-based motion compensation without DCT as a potential means to improve coding efficiency at higher bit rates.

#356 LOOP FILTER IMPROVEMENT (JAPAN)

Improvements of RM5 with an adaptive loop filter placed before the frame memory are shown as 0.3 to 0.6 dB in SNR. Adaptivity is controlled by block attributes and the step size. Due to its potentiality, it is concluded that the characteristics should be further investigated and optimized.

#357 BLOCK ADDRESSING METHOD FOR MACRO BLOCK ATTRIBUTE (JAPAN)

It is proposed to encode the six coded/non-coded flags in a macro-block by categorizing them into 7 patterns to reduce the number of bits for macro block attribute and EOBs.

#358 IMPROVEMENT OF THE 1ST FRAME PICTURE QUALITY (JAPAN)

The following three techniques are applied to the first coded frame;
- DPCM for DC components of macro-blocks,
- Separate VLCs for AC components and addressing,
- Equalization of the step sizes throughout the 1st frame.

It is reported that these techniques improve performance of the first 10 coded frames but does not affect the subsequent frames.

#359 A COMPARISON BETWEEN VQ AND DCT IN RM5 BASED CODING SYSTEM (JAPAN)

VQ is implemented by replacing the DCT-IDCT part of RM5 and loop filters are optimized for each DCT and VQ schemes. Simulation results show that the performance is comparable for the present, relative merits being dependent upon test sequences. It is concluded that more study is required to clarify whether the quantization scheme itself or the block size is more influential.

#360 ENHANCEMENT TO THE ENCODING CHARACTERISTICS (JAPAN)

Information on a movement-adaptive DCT scheme is provided to show the possibility of RM5, concluding that further study is required on the current RM5.

#361 IMPROVEMENT OF PICTURE IN THE FACIAL REGION (JAPAN)

Experimental results are shown for a scheme to assign more bits for the detected rectangular facial region. Considering its possibility, it is proposed to take into account some means to send extra information to designate the position and size of the rectangle.

#362 SIMULATION OF A VECTOR QUANTIZATION AND SOME COMMENTS ON EVALUATION OF CODING SCHEMES (JAPAN)

Results of coding simulation on a VQ scheme are reported and some comments on the evaluation of coding schemes are given.

#363 STATISTICS OF CODED ELEMENTS IN FLEXIBLE HARDWARE (NTT, KDD, NEC, FUJITSU)

Measured statistics on Block Address, Block Type, Classification Index, Motion Vector Information, Transform Coefficients and EOB are provided. After evaluating the coding efficiency of the initial compatibility check parameters (Doc. #249), comments on how they are optimum are given.

#364 MISMATCH ERRORS OF MATRIX MULTIPLICATION IDCT (NTT)

Simulation results for the mismatch against reference IDCT as well as mismatch between non-ideal IDCTs are provided where IDCT input is generated according to the method described in Doc. #346R. Effects of rounding and quantization at the IDCT input are discussed using the measured error distributions.

#365 IDCT MISMATCH EXPERIMENT BY FLEXIBLE HARDWARE (NTT, KDD, NEC, FUJITSU)

Hardware experiments are carried out to perform when the mismatch error becomes perceptible after the intra start picture for a number of combinations of coder and decoder IDCT precision with fixed step size of 4. It is concluded that;

- The coefficient precision is less influential than the transfer precision.
- Rounding should be used for the transfer.
- The transfer precision should be more than 14 for 6 second refresh cycle.

#366 PRECISION OF INVERSE DCT CALCULATION (NTT, KDD, NEC, FUJITSU)

IDCT mismatch errors are analyzed based on a model and compared with the experimental results, concluding that random number simulation is appropriate for evaluating IDCT mismatch errors, loop filter is effective in reducing mismatch errors but should not be counted for safety, expanding the number of bits at the IDCT output and thereafter is effective for mismatch error reduction. Experimental procedures to reach the specification are also suggested.

#367 EXPERIMENT OF REFRESH INTERVAL MODIFICATION IN nx384 kbit/s CODEC (NTT, KDD, NEC, FUJITSU)

Cyclic refresh intervals are changed in the Flexible Hardware operating at 384 kbit/s to observe its effects on coding performance. It is concluded that the refresh interval should be greater than 90 coded frames.

#368 RELEVANT PATENTS (NTT, KDD, NEC, FUJITSU)

Five patent applications are informed.

#369 REFERENCE MODEL 5 SIMULATION (REPUBLIC OF KOREA - ETRI)

RM5 numerical data and macroblock/block patterns are presented for MISS AMERICA and CLAIRE.

#370 A NOTE ON THE DISTRIBUTION OF MOTION-COMPENSATED INTERFRAME ERRORS AND MOTION VECTORS (REPUBLIC OF KOREA - ETRI)

Motion compensated interframe prediction errors are reported to follow Laplacian distribution, dc component as well as ac components, based on simulation results for the MISS AMERICA sequence. Two-dimensional motion vector distribution is also provided.

#371 BT PATENT APPLICATIONS (BRITISH TELECOM)

Four relevant patent applications are informed.

#372 COMPARISON OF FULL CIF AND 4/9 CIF FORMAT CODED AT 64 KBIT/S USING REFERENCE MODEL 5 (UK, FRG, NORWAY, FRANCE, NETHERLANDS)

Numerical data and processed pictures of performance comparison between Full CIF and 4/9 CIF in RM5 are reported. A broadcast quality two dimensional filter as well as simplified 2D filter is used for down/up sampling. It is concluded that both the quantitative measurement of SNR and the subjective assessment of the sequences support Full CIF as being the better format.

#373 SPECIFICATION FOR p*64 kbit/s FLEXIBLE HARDWARE AND SOME PROPOSED ADDITIONS TO RECOMMENDATION H.261 (FRANCE, FRG, ITALY, NETHERLANDS, UK, NORWAY, SWEDEN)

A first draft of the flexible hardware specification for px64 kbit/s codec is proposed based upon Rec. H.261, nx384 kbit/s Flexible Hardware Specification (Doc. #249), RM5 (Doc. #339) and ongoing studies in Europe.

#374 IMPROVEMENTS ON THE RM5 ADAPTIVENESS OF THE 2D RUNLENGTH TABLE (FRANCE)

According to the quantizer index statistics measured in RM5 (p=1,5), five 2D VLCs are generated for adaptive encoding; four for different step sizes of luminance, one for chrominance. It is concluded that by adaptively applying these tables the best improvements are gained for SWING (0.5 dB, Y) and SALESMAN (0.4 dB, Y) at p=1.

126

#375 DESCRIPTION OF REF. MODEL 5 - RM5
(NETHERLANDS, FRANCE, FRG, ITALY, SWEDEN, BTRL)

An update of Doc. #339.

#376 IMPROVEMENT REFERENCE MODEL 5 BY A NOISE REDUCTION FILTER
(NETHERLANDS)

An adaptive noise reduction filter consisting of two concatenated 1D subfilters is placed before the frame memory as a loop filter as well as outside the loop as a post processing filter. This filter is controlled adaptively by the quantizer step size and the motion vector. Simulation results show that both arrangements give a significant improvement of the subjective quality and that the loop filter performs better than the post processing filter.

#377 THOMSON DCT CHIP MISMATCH (CNET-FRANCE)

Mismatch errors of an existing chip are reported according to the test procedure in Doc. #346R. Accumulation of mismatch errors in RM5 are also presented.

#378 PROPOSAL OF A DRAFT MULTI-CONFERENCE UNIT - MCU - SPECIFICATION
(FRG, ITALY, NETHERLANDS, UK, FRANCE)

General requirements for a switched operating mode Multiconference Unit are given taking into account wider range of bit rates in the new generation codec and two different service possibilities; videophone using desk top terminals and videoconferencing using larger terminals in dedicated rooms.

#379 RESULTS OF TRIALS ON ERROR TRANSMISSION AT 384 kbit/s (FRANCE)

Transmission errors were added to the video part of the Flexible Hardware codec operated at 384 kbit/s. Decoded pictures are presented for a number of cases; a single error every 0.025-1 sec, 8/64 consecutive errors every 1 sec, 8-4096 consecutive errors every 10 sec. It is concluded that the codec scheme has some error resilience.

#380 RESULTS RELATED TO THE TRANSFORMER SPECIFICATION (CSELT)

Observations are made according to the analysis of IDCT mismatch errors;
- Using a specified arithmetic and matrix multiplication, it is possible to make DCT-IDCT transformation errorless.
- If DCT output is quantized, mismatch can not be avoided.

Considerations on fast algorithm are also given.

#381 CODING WITH DIRECTIONAL TRANSFORMS AS ALTERNATIVE TO DCT IN RM5
(NORWAY)

Directional transform is described where one of several transforms is selected according to the orientation of the block. By using this DT instead of DCT in RM5, 20% saving of bits is obtained. In conclusion it is proposed to include this type of transform as a supplement of RM5.

#382 TAPE DEMONSTRATIONS FOR mx64 kbit/s CODING (NORWAY)

A list of tape demonstrations.

127

#383 PATENT APPLICATIONS BY PKI ON LOW BIT RATE VIDEO ENCODING (PKI-FRG)

Six relevant patent applications are informed.

#384 QUANTIZER ALLOCATION BY TYPE3 (FRG)

A quantizer designation method is proposed to allow modification on a macroblock basis with fast error recovery and bit savings considered;

- A starting value is designated in the GOB header, QUANT1 but without the current first bit.
- TYPE3 codes are specified to designate a new quantizer which overrides the QUANT1 designation.
- The quantizer designated by TYPE3 is valid until the next renewal by TYPE3 or QUANT1.

#385 AN IDENTICAL SIZED GOB FOR FULL CIF AND QUARTER CIF (FRG)

A GOB structure is proposed taking into account intercommunication between Full CIF and Quarter CIF, required number of bits, fast error recovery and mixing of four coded Quarter CIF pictures into one Full CIF picture. A GOB consists of 3 lines of 11 macroblocks, resulting in 12 GOBs for Full CIF and 3 GOBs for Quarter CIF.

#386 A STRUCTURED VIDEO MULTIPLEX SCHEME (FRG)

Elaboration of the block type definition is proposed;

- TYPE1 (picture level) is not used for the block type definition.
- TYPE2 (GOB level) is the highest layer to define attributes applied to all macroblocks in the GOB.
- TYPE3 (macroblock level) denotes all parts transmitted for the macroblock.
- TYPE4 (block level) denotes particularities of a single block with a macroblock enabling optimization at higher bitrates.

Syntax diagrams are given for clarification.

#387 A STUFFING CODEWORD FOR SEVERAL PURPOSES (FRG)

To prevent the buffer underflow, use of either a picture start code with a non-valid group number or a GOB start code with a non-valid group number is proposed.

#388 INFORMATION ON PATENTS FROM STA (SWEDEN)

Application of a relevant patent is informed.

#389 IMPROVEMENTS OF RM5 (FRG)

Four techniques are proposed to improve RM5, particularly for such difficult sequences as TREVOR, SALESMAN, SWING;

- Two-dimensional prediction of VLC for the displacement vectors.
- Inter/intra switch per macroblock.
- Prevention of buffer overflow.
- Simplified and effective coding of the first picture.

#390 CODING OF REPETITIVE MOTION WITH REFERENCE MEMORIES (FINLAND)

Use of reference memory(s) is demonstrated to improve the performance of conditional replenishment codecs for uncovered backgrounds. Three strategies of updating the reference memory are also described.

#391 CONFORMANCE CHECKER (DELTA INFORMATION SYSTEMS)

A plan of making conformance checker for the forthcoming Recommendation is presented. An interface card and software package will be designed so that PC is used. It has the potential to accept encoded pictures as input by means of floppy disk.

#392 RM5 IMPROVEMENTS: VARIABLE THRESHOLDING TECHNIQUE (FRANCE)

A great improvement has been obtained in the SWING and SALESMAN sequences by making the threshold variable according to the length of zero strings. This technique speeds up the convergence of the coding scheme in stationary parts, thus allowing more bits in the moving parts.

#393 COMPUTER EVALUATION OF REFERENCE MODEL 5 (BELLCORE)

Statistical data and processed pictures are provided.

#394 ERROR CORRECTION FOR THE H261 CODEC (UK, NETHERLANDS, FRANCE)

Progress report of the European study on the error correction. Hardware experimental results are reported with tape demonstration on the (255,239)BCH and (511,493)BCH codes in random error environments.

Temporary Documents

No. 1 Agenda (Chairman)
No. 2 Available documents (Chairman)
No. 3 List of tape demonstrations (Chairman)
No. 4 Scope of Recommendations and work plan (Chairman)
No. 5 Transform part specification (Chairman)
No. 6 IDCT specification (Small group on IDCT specification)
No. 7 Evaluation of CIF and 4/9CIF tape demonstrations (Small group on picture format)
No. 8 Summary of the 4/9CIF discussion (Chairman)
No. 9 Proposed time table (Small group on future work plan)
No.10 RM6 (Small group on algorithm study)

END

129

Annex 2 to Doc. #395R

LIST OF TAPE DEMONSTRATIONS (September 19-20, 1988)

Topics	Source	Doc.
Sep. 19		
a. Field trial with flexible Hardware	FRG/NL	-
b. Refresh interval by Flexible Hardware	Japan	#367
c. IDCT mismatch discussion	Japan	#365
d. Mismatch	France	#377
e. Transmission error at 384 kbit/s	France	#379
f. Error correction	UK	#394
Sep. 20		
g. RM5 improvements	France	#392
h. 4/9 CIF vs Full CIF	France	#372
i. 4/9 CIF vs Full CIF	UK	#372
j. 4/9 CIF	Japan	#354
k. Loop filter improvements	Japan	#356
l. VQ vs DCT	Japan	#359
m. Pel based motion compensation	Japan	#355
n. Improvement of picture in facial region	Japan	#361
o. Scene change (64 kbit/s)	Japan	#358
p. VQ	Japan	#362
q. Adaptiveness of the 2D-VLC	France	#374
r. Comparison of CIF and 4/9 CIF	FRG	#372
s. RM5	NL	#375
t. Loop filter	NL	#376
u. RM5 + Directional Transform	Norway	#381 #382
v. 4/9 CIF	Norway	#372 #382
w. Improvements of RM5	FRG	#389
x. Reference method	Finland	#390
y. RM5 simulation results	USA	#393

Annex 3 to Doc. #395R - Report of the IDCT small group

To : Respondents to CCITT Request for IDCT

Dear Sirs and Mesdames,

Thank you for your responses so far to the CCITT request for IDCT chip information. Based on further computer simulations and hardware studies, we think we are very close to a performance specification for ISDN video codecs (see attached, changes from the March version are indicated by a vertical line in the left margin). Could you examine the proposed method and let us know your thoughts?

Please send responses to:

Barry Haskell
AT&T Bell Labs - Room 4C538
Holmdel, NJ 07733 USA
Phone: +1 201 949 5459
Telefax: +1 201 949 3697

with a copy to

Mr. Sakae Okubo
Visual Media Laboratory
NTT Human Interface Labs
Telefax: +81 468 59 2829

131

CCITT SGXV
Specialists Group on Coding for Visual Telephony

Sep. 22, 1988

Proposed Specification for Inverse DCT Chips

1. Generate random integer pixel data values in the range -L to +H according to the attached random number generator (C or FORTRAN). Arrange into 8x8 blocks. Data sets of 10,000 blocks each should be generated for (L=256, H=255), (L=H=5) and (L=H=300).

2. For each 8x8 block, perform a separable, orthonormal, matrix multiply, Forward Discrete Cosine Transform (FDCT) using at least 64-bit floating point accuracy.

3. For each block, round the 64 resulting transformed coefficients to the nearest integer values. Then clip them to the range -2048 to +2047. This is the 12-bit input data to the inverse transform.

4. For each 8x8 block of 12-bit data produced by step 3, perform a separable, orthonormal, matrix multiply, Inverse Discrete Cosine Transform (IDCT) using at least 64-bit floating point accuracy. Round the resulting pixels to the nearest integer, and clip to the range -256 to +255. These blocks of 8x8 pixels are the "reference" IDCT output data.

5. For each 8x8 block of 12-bit data produced by step 3, use the proposed IDCT chip or an exact-bit simulation thereof to perform an Inverse Discrete Cosine Transform. Clip the output to the range -256 to +255. These blocks of 8x8 pixels are the "test" IDCT output data.

6. For each of the 64 IDCT output pixels and for each of the 10,000 block data sets generated above, measure the peak, mean and mean square error between the "reference" and "test" data.

7. For any pixel, the peak error should not exceed 1 in magnitude.
   For any pixel, the mean square error should not exceed 0.06.
   Overall, the mean square error should not exceed 0.02
   For any pixel, the mean error should not exceed 0.015 in magnitude.
   Overall, the mean error should not exceed 0.0015 in magnitude.

8. All-zeros in must produce all zeros out.

9. Rerun the measurements using exactly the same data values of step 1, but change the sign on each pixel.

END

Annex 4 to Doc. #395R - Report of the picture format small group

EVALUATION OF CIF AND 4/9 CIF TAPE PRESENTATIONS

1. It was agreed that the full CIF presentations were generally superior to the 4/9 CIF presentations for the European contributions.

2. Representatives of the Japanese and American delegations pointed out the following difficulties with the comparison of 4/9 CIF vs Full CIF presentations;

   - The potential advantage of the exchange between temporal and spatial resolution could not be evaluated since all European demonstrations were provided at 10 frames/sec.

   - It is difficult to correlate the results of the Japanese demonstration with the European presentations due to the variable picture size.

   - There is a potential for coding the 4/9 CIF pictures more effectively to reduce the effects of artifacts.

   - The simulations using NTSC sources (Miss America, Salesman) actually used materials that had already been converted to CIF, and were then converted to 4/9 CIF. In a real-life situation, the CIF format would require two NTSC fields per frame, while the 4/9 CIF would require only one NTSC field. The relative motion between two NTSC fields would cause an additional coding loss that was not taken into account in the CIF simulations using NTSC sources.

END

33/

Annex 5 to Doc. #395R - Report of the algorithm study small group

Reference Model 6

Reference document: #375 description of RM5

Two kinds of changes have been discussed: modifications which are accepted and action points related to topics which have to be clarified before been accepted as core elements.

There are four modifications and nine action points.

I. Modifications

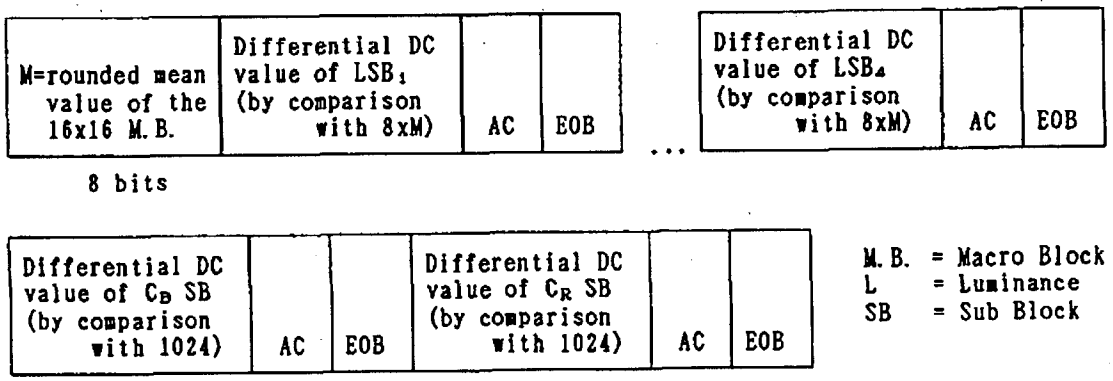
1) Variable thresholding technique as depicted in Doc. #392. (Only modification 1 of #392 is concerned. The quantization levels as well as the reconstructed levels are independent of the threshold.)

Example for g=32

Coefficients	50	0	0	0	33	34	0	40	33	34	10	32	...
Threshold	32	32	33	34	35	36	37	38	32	32	32	33	...
New Coef.	50	0	0	0	0	0	0	40	33	34	0	0	...
Quantized value	48	0	0	0	0	0	0	48	48	48	0	0	...

where "New Coef." is new coefficients after thresholding and before quantization.

2) Intra mode (derived from Doc. #389) as defined in Appendix 1 of this Annex 5. After the block has been decided intra, the coefficients are transmitted as follows;



The same quantizer and the same 2D-VLC as for inter mode are used. The modified VLC for the block attributes is;

Macro block type	Code with relative addressing
1. No MC, not coded	-
2. MC coded	1
3. MC not coded	0 1
4. MO MC coded	0 0 1
5. intra	0 0 0

3) Motion vector coding as depicted in Doc. #355 and #389. Differential technique is employed based on a 1-d prediction: the prediction is the motion vector of the previous macro block. In cage of the first macro block in GOB, previous vector is zero. The differential motion vectors are encoded by using the VLC table of Appendix 2 of this Annex.

4) The so-called method 4 described in Doc. #357 is adopted. The pattern and the VLC are depicted in Appendix 3 of this Annex.

II. **Action points**

1) Filtering in the loop (Doc. #356 and #376). The following topics have to be checked:

- the number of filters in the loop
- the position of the filter(s); before, after or both sides of the frame memory
- the adaptivity of the filter(s) and how to control it
- the effectiveness of the filter(s) in the loop v.s. outside the loop

2) DC intra prediction: coding of the prediction error (related to modification No. 2)

3) Motion estimation technique: use of surrounding motion vectors for the search technique; size and shape of the search area

4) Variable threshold: adaptation rules (related to mod. 1)

5) Directional Transform (DT): information will be provided as soon as possible by Norway.

6) Impact of the modifications at 384kbit/s

7) Number of scanning classes

8) Impact of the GOB configuration as described in Doc. #385 and #373

9) VLC optimization

END

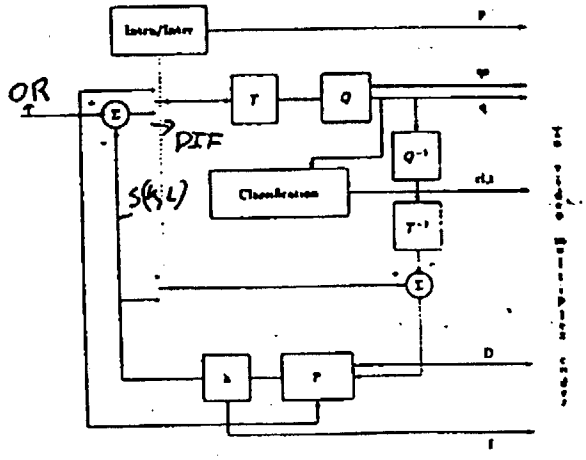
Appendix 1 to ANNEX 5/Doc. #395R

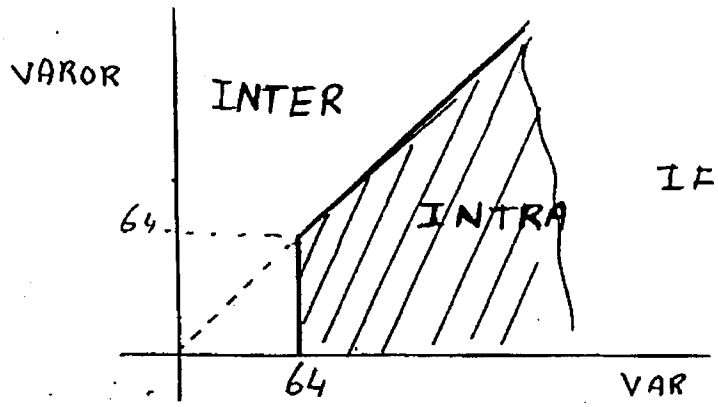
Intra switch per macro block

```
DO K=1,16
  DO L=1,16
    OR=O(K,L)
    DIF=OR - S(K,L)
    VAR=VAR + DIF*DIF
    VAROR=VAROR + OR*OR
    MWOR=MWOR + OR
  ENDDO
ENDDO

VAR=VAR/256
VAROR=VAR/256 - (MWOR/256)*(MWOR/256)
```

where OR=O(K,L)=original macro block pixels
S(K,L)=motion compensated macro block





IF(VAROR.LT.VAR.AND.VAR.GT.64)

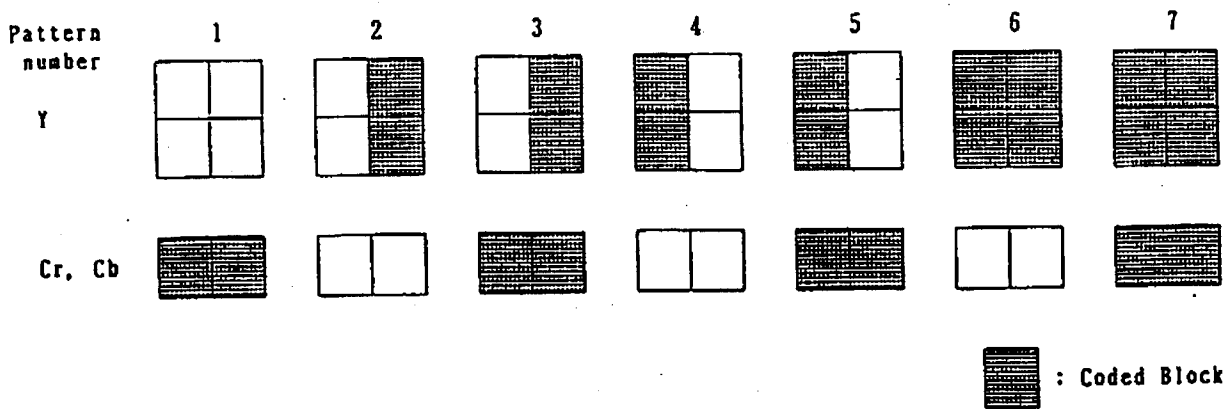
961

Appendix 2 to Annex 5/Doc. #395R - VLC Table

C	AMPLITUDE		CODE WORD	CW-LENGTH	
C			11111111111111	not allowed	
C	-64		11111111111110	14	
C	-63		11111111111101		
	.		.		
	.		.		
C	-44		11111111101010		
C	-43		11111111101001		
C	-42		11111111101000	23* 14	
C	-41		1111111110011	13	
C	-40		1111111110010		
C	-39		1111111110001		
C	-38		1111111110000		
C	-37		1111111101111		
C	-36		1111111101110		
C	-35		1111111101101		
C	-34		1111111101100		
C	-33		1111111101011		
C	-32		1111111101010		
C	-31		1111111101001		
C	-30		1111111101000	12* 13	
C	-29		111111110011	12	
C	-28		111111110010		
C	-27		111111110001		
C	-26		111111110000		
C	-25		111111101111		
C	-24		111111101110		
C	-23		111111101101		
C	-22		111111101100		
C	-21		111111101011		
C	-20		111111101010		
C	-19		111111101001		
C	-18		111111101000	12* 12	
C	-17		11111110011	11	
C	-16		11111110010		
C	-15		11111110001		
C	-14		11111110000		
C	-13		11111101111		
C	-12		11111101110	6* 11	
C	-11	1014	1111110110	10	
C	-10	1013	1111110101	10	
C	-9	1012	1111110100	10	
C	-8	505	111111001	9	
C	-7	504	111111000	9	
C	-6	251	11111011	8	
C	-5	250	11111010	8	
C	-4	124	1111100	7	
C	-3	30	11110	5	
C	-2	14	1110	4	
C	-1	6	110	3	
C	0	0	0	1	
C	1	4	100	3	
C	2	10	1010	4	
C	3	22	10110	5	
C	4	92	1011100	7	
C	5	186	10111010	8	
C	6	— —	[illegible]	8	etc
C	7	— —	[illegible]	9	
C	8	— — —	[illegible]	9	
C	9	— — —	[illegible]	10	

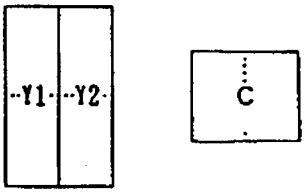
Appendix 3 to Annex 5/Doc. #395R - Block Addressing

Method 4 (7 patterns, vertical split in luminance)



Method 4 (Pattern 1~7)

Pattern number = Y1× 4 + Y2× 2 + C



Pattern number	Code Length	Code
6	2	00
2	2	10
4	2	11
7	3	011
1	4	0100
3	5	01010
5	5	01011

Note: If a macro block type is "intra", its pattern information is not transmitted.

84/138

Annex 6 to Doc. #395R - Chairman's discussion material

Temporary Document No. 4 (Paris)
September 19, 1988

SOURCE: CHAIRMAN
TITLE : SCOPE OF RECOMMENDATIONS AND WORK PALN

Questions

1. Scope of Recommendations

H.261 for nx384 (n=1-5) or H.261 for px64 (p=1-30) ?
H.262 for mx64 (m=1,2)

2. Action plans

We have only two opportunities for applying the accelerated procedure during the next study period;

- March 13-22, 1989
- Summer-autumn 1990

We must submit white contributions at least two months in advance of these Study Group meetings. nx384 can be put into the next March SGXV meeting if parameter values are filled in. As for the 64 Recommendation, next March is impossible, thus the summer-autumn 1990 becomes the target.

Taking this environment into account, what should be our action plans?

- Reference Model
- Hardware verification

Time Table

