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

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SOURCE : JAPAN
TITLE : Clarification of AAL type2
Purpose : Discussion

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1. Introduction

There are several proposals for AAL type2[1][2][3]. However no decision was made for AAL type 2 in the Experts Group. There are two reasons;
(1)Network performance is not clear enough.
(2)There is no consensus what functions are required for our purpose.
This document shows two possibilities for AAL type2 and aims to solve the second problem when network performance becomes clear.

2. Two possibilities for AAL type 2

Two alternatives of "AAL type 2" are described in Table 1 and illustrated in Figures 1,2. This classification is done based on whether partially filled cell is allowed or not. Alternative (a) tends to high transmission efficiency without using partially filled cell. On the other hand, alternative (b) tends to guarantee maximum cell assembly delay by using partially filled cell. Their aims are different from each other. Therefore, which alternative is more appropriate for our purpose should be discussed from service aspect or implementation aspect.

Table 1 Two types of "AAL type 2"

Type	(a)	(b)
AAL-SDU size	1 Byte or 1 bits (Partially filled cell is not allowed)	Variable length (Partially filled cell is allowed)
Merit	· Transmission Efficiency · Commonality to AAL Type 1	· Cell assembly delay is guaranteed (Sometimes longer than (a) because of CS) · Commonality to AAL Type 3/4 (or 5) (Easily applicable to other packet type networks)
Demerit	· Cell assembly delay is not guaranteed without minimum bitrate restriction	· Transmission Efficiency
Constraint for Peak Cell Rate	· Minimum interval time between two consecutive AAL-SDUs	· Maximum AAL-SDU Length · Constant/minimum interval time between two consecutive AAL-SDU(Note)
Application to CBR	· Interval time between two consecutive AAL-SDUs is constant	· AAL-SDU Length is constant · Interval time between two consecutive AAL-SDU is constant
Example	AVC-294 Generic part	AVC-294 (a) - (c)?, AVC-297 (No partially filled cell but similar)

Note; Combination of maximum AAL-SDU length and minimum interval time may cause the difficulty of bitrate control mechanism. Constant interval time may be better than minimum interval time because of easy implementation.

(a) Partially filled cell is not allowed

AAL-DATA Request (DATA (mandatory), STRUCTURE (optional), FEC (optional))
AAL-DATA Indication (DATA (mandatory), STRUCTURE (optional), STATUS (optional))

DATA length is 1 Byte or 1 bit.
STRUCTURE indicates that this AAL-SDU has special meaning such as upper layer structure.
STATUS indicates whether DATA is correct or not at receiver side.

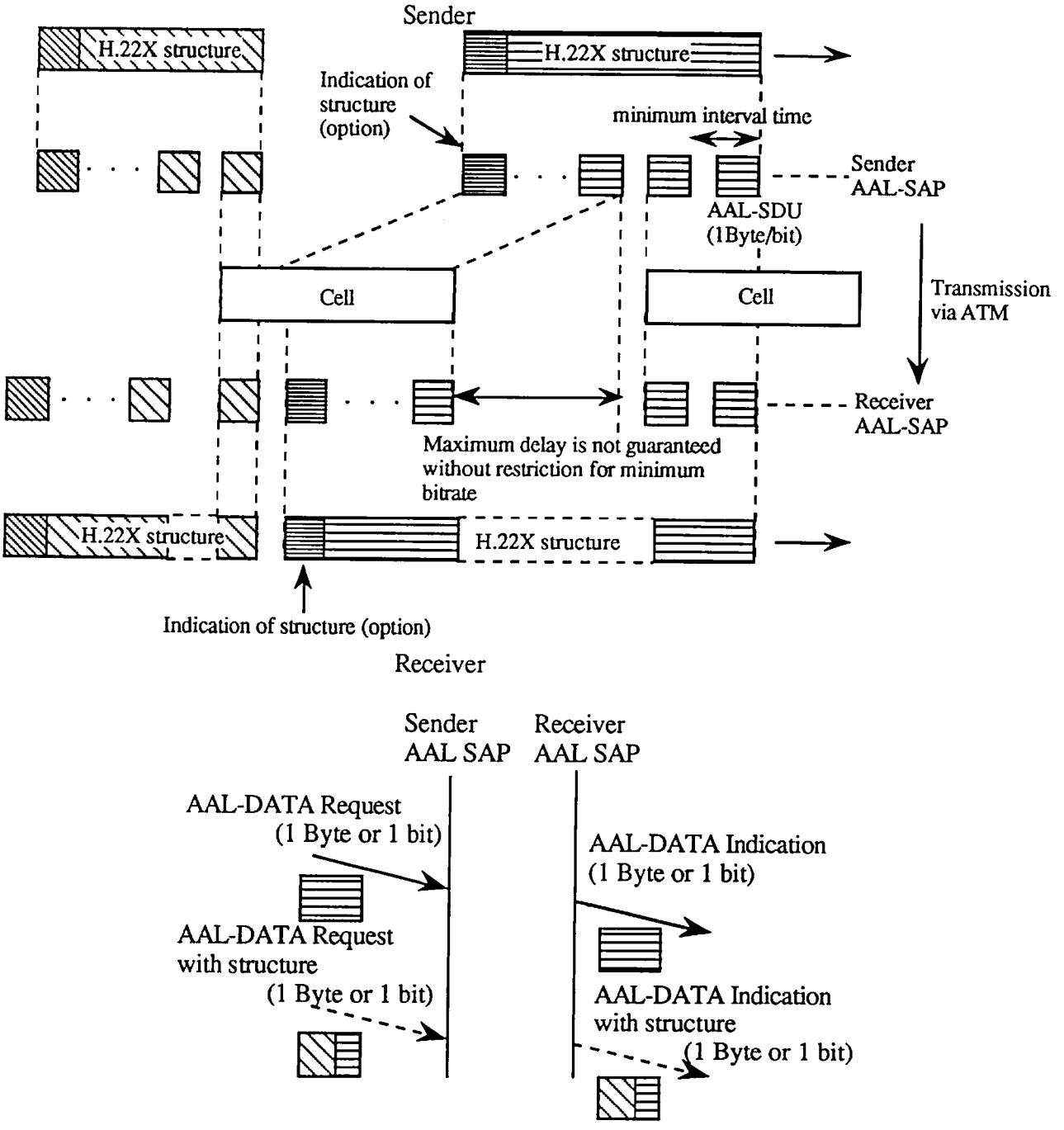


Fig.1 AAL Type 2 - alternative (a) (Partially filled cell is not allowed.)

(b) Partially filled cell is allowed

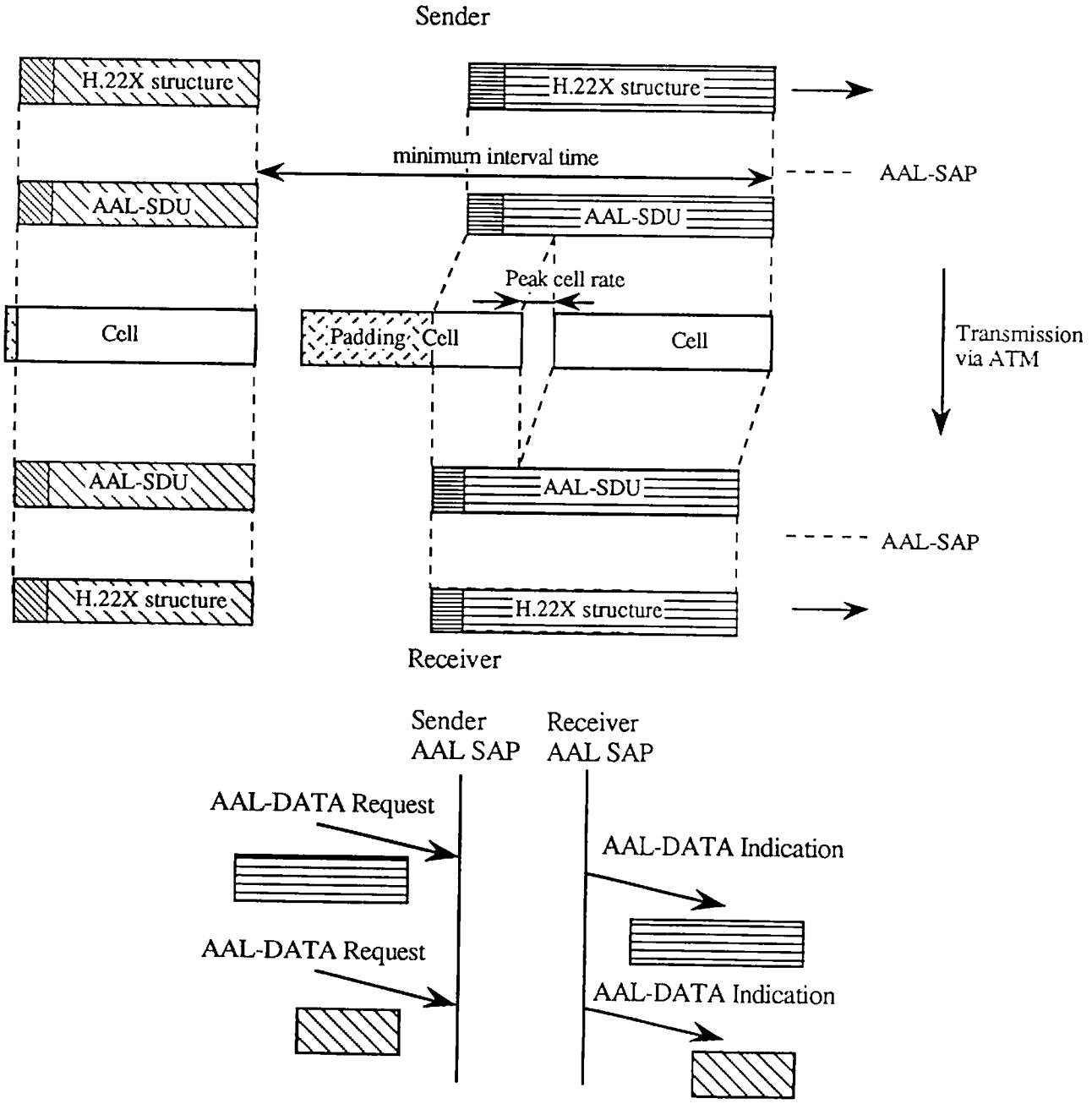
AAL-DATA Request (DATA (mandatory), FEC (optional))
AAL-DATA Indication (DATA (mandatory), STATUS (optional))

DATA length is variable. Two cases can be considered.

(1) Upper layer structure is always shorter than maximum AAL-SDU length and the start of AAL-SDU is aligned with that of upper layer structure. (Alternative (b)-1)

(2) Upper layer structure is not always shorter than maximum AAL-SDU length or the start of AAL-SDU is not always aligned with that of upper layer structure. (Alternative (b)-2)

There is no difference between alternative (b)-1 and alternative (b)-2 in AAL itself.
STATUS indicates whether DATA is correct or not at receiver side.



Type 2 - alternative (b)-1

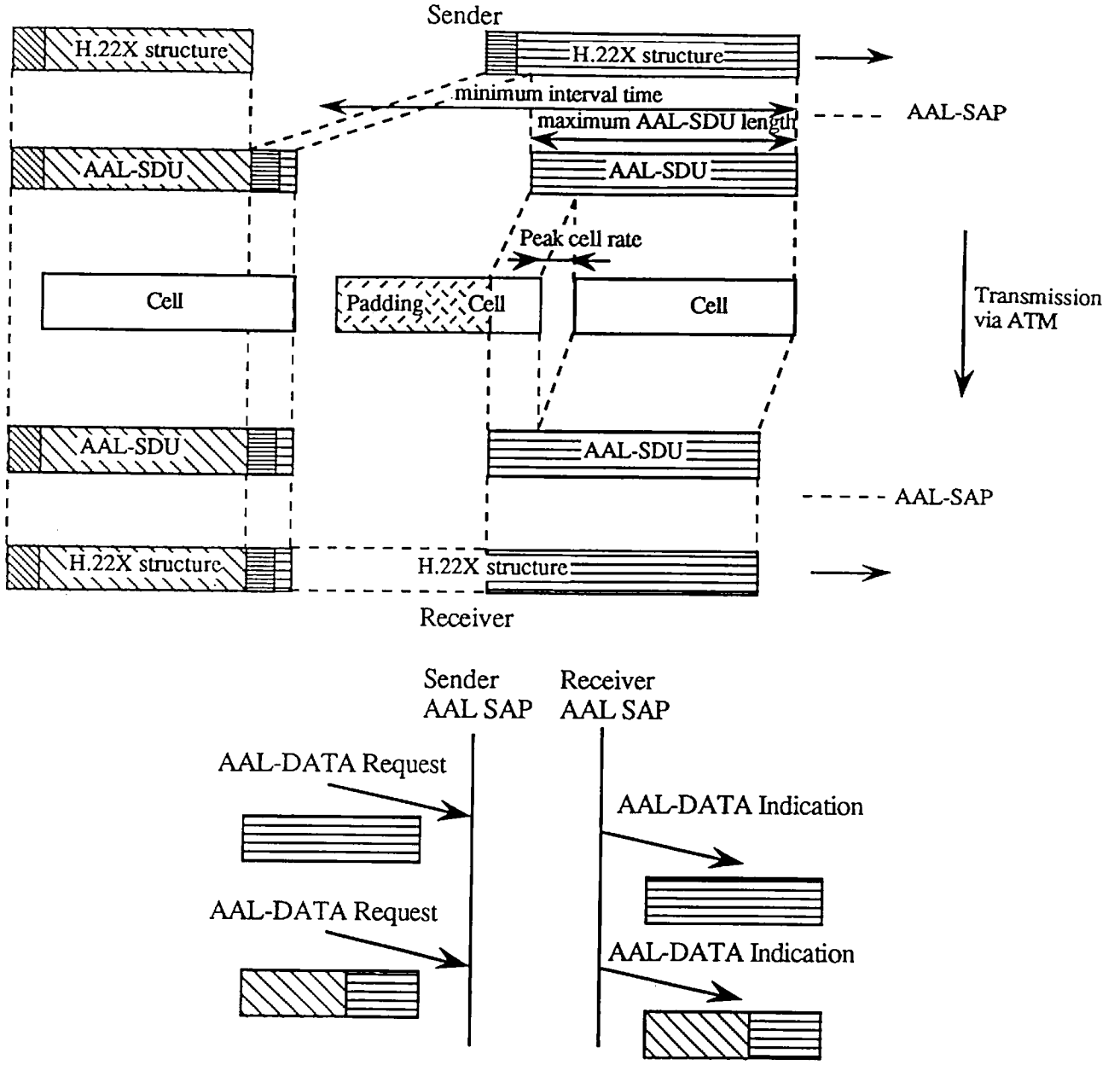


Fig.2 AAL type 2 - alternative (b) (Partially filled cell is allowed.)

3. Study items for AAL type 2

Study items for alternative (a) and alternative (b) are described in Table 1 and Table2. It should be noted that if bit error correction is necessary, decrease of transmission efficiency would occur in type (b) because of stuffing bits as shown in Fig. 3, where BCH(511,493) is used only for illustration purpose.

Table 1 Possible functions for AAL type 2 - alternative (a) Partially filled cell is not allowed

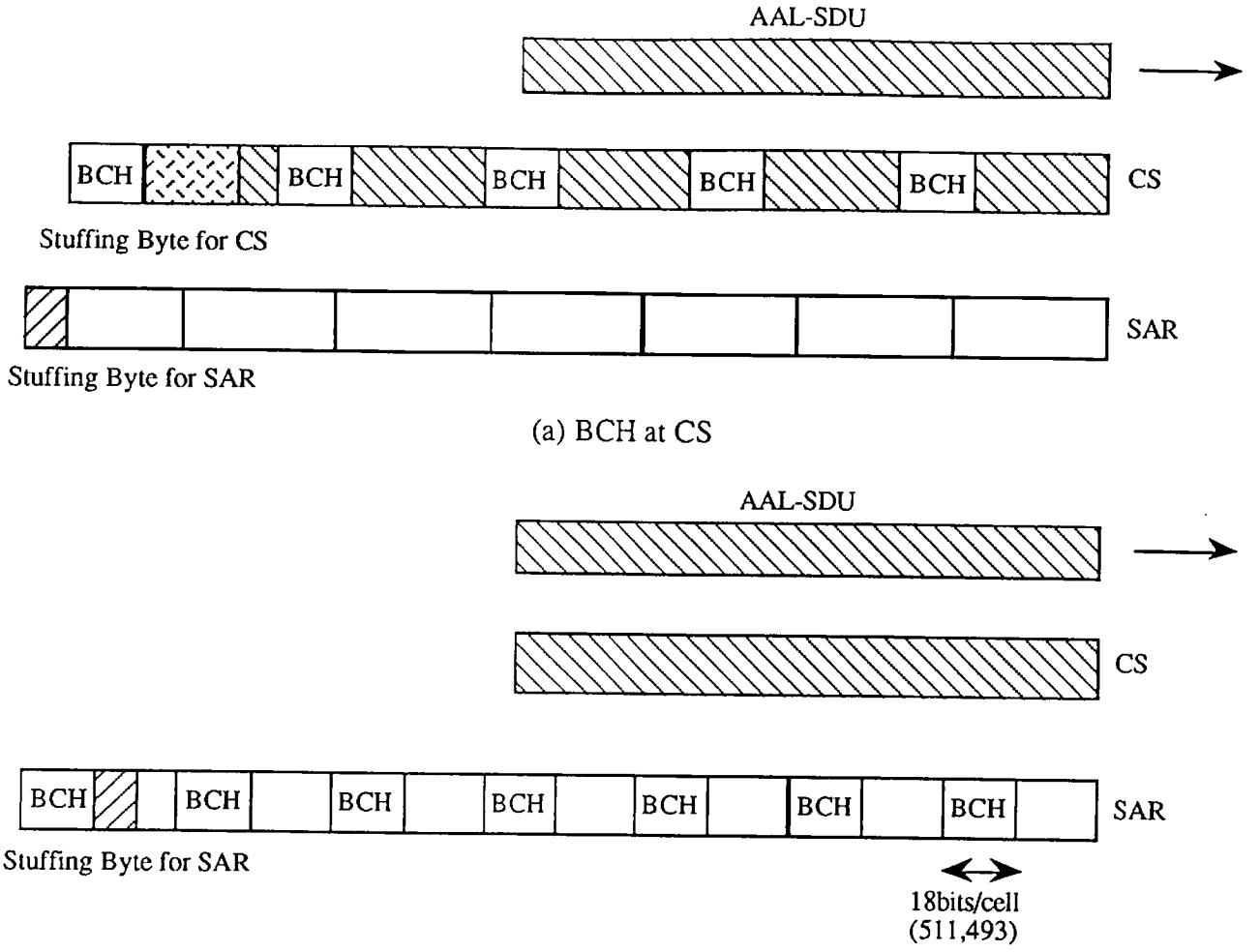
	AAL function	When necessary	How useful at upper layer	How to realize	Other methods at upper layer	Study item
Mandatory	–	–	–	–	–	–
Option	Indication of upper layer structure	–	Unique word can be removed Timing recovery may be possible	LI in each cell (6bits for Byte alignment)	Unique word	What is the upper layer? video bitstream or multiplexed bitstream?
Option for error resilience	Cell loss notification	Cell loss ratio $>5x10^{-9}$ (note)	Throw away data until upper layer resynchronization	SN in SAR	Error detection by loss of synchronization	How many bits are necessary? (how many consecutive cells are lost.)
	Dummy cell stuffing		Resynchronization using upper layer length indicator	SN in SAR	Resynchronization by unique word	Really possible in VBR?
	Upper layer structure		Guarantee resynchronization	LI in each cell (6bits for Byte alignment)	Unique word	Really useful at upper layer?
	Bit error correction	Bit error ratio $> 1.5x10^{-11}$ (note)	Reduce the bit error	CS (BCH etc.)	Bit error correction	How long does it take before resynchronization
			Reduce the bit error & quick resynchronization when cells are lost	SAR (BCH etc.)		Which do we prefer transmission efficiency or quick resynchronization?
				CS (BCH etc.) and LI in SAR		

Note; Every 2 hours for 10 Mbps bitstream.

Table 2 Possible functions for AAL type 2 - alternative (b) Partially filled cell is allowed

	AAL function	When necessary	How useful at upper layer	How to realize	Other methods at upper layer	Study item
Mandatory	AAL-SDU Length	—	—	ST and LI in SAR 1bit in ATM header and LI in CS (AAL type 5)	—	Which is better? What is the constraint?
Option	Upper layer structure	—	Unique word can be removed Timing recovery may be possible	H.22X structure length < maximum AAL-SDU length	Unique word	What is the upper layer? video bitstream or multiplexed bitstream
Option for error resilience	Cell loss notification	Cell loss ratio $>5\times10^{-9}$ (note)	Throw away data until upper layer resynchronization	SN in SAR FCS in CS	Error detection by loss of synchronization	How many bits are necessary? (how many consecutive cells are lost.)
	Dummy cell stuffing		Resynchronization using upper layer length indicator	SN in SAR	dummy bits for CBR	Really possible for VBR?
	Upper layer structure		Guarantee resynchronization	LI in each cell (6bits for Byte alignment)	Unique word	Really useful at upper layer?
	Bit error correction	Bit error ratio $>1.5\times10^{-11}$ (note)	Reduce effective bit error	CS (BCH etc.)	Bit error correction	How long does it take before resynchronization
			Reduce effective bit error & quick resynchronization without dummy cell stuffing	SAR (BCH etc.) CS (BCH etc.) and LI in SAR		Which do we prefer transmission efficiency or quick resynchronization?

Note; Every 2 hours for 10 Mbps bitstream.



(a) BCH at CS

(b) BCH at SAR

Fig.3 Bit error correction in alternative (a)

4. Conclusion

This document clarifies two types of AAL type 2. One does not allow partially filled cell. The other allows partially filled cell. The former tends to better transmission efficiency. The latter tends to guarantee the maximum transmission delay. Therefore comparison should be done not only from performance itself but also from service aspects. Study items are listed up for both mode. The difficulty of bit error correction in latter case is pointed out.

References

[1] Belgium, Germany, Italy, Netherlands, Norway, Sweden, UK; "A proposal for AAL type 2,"AVC-294, New Jersey.

[2]Australia; "The ATM Adaptation Layer for video services in the B-ISDN,"AVC-297, New Jersey.

[3] KDD; "Study on timing issue of AAL type 2," D.2236-E, SGXVIII meeting Geneva, June 1992.