CCITT
STUDY GROUP XV
Specialists Group on Coding for Visual Telephony

Document # 497
March 1989

Oslo, 7-10.3.1989

Source: FINLAND
Title: Signalling quantizer stepsize change in TYPE2 or TYPE3

1. Observations

The GOB size of 33 macro blocks makes the control loop instable if quantizer step size is adjusted only on GOB level. The instability is disturbing especially with QCIF format where a GOB represents 1/3 of the whole picture area and low transmission rate is used. Therefore it is necessary to control the quantizer step size inside a GOB always when QCIF format is used.

RM7 with QCIF was simulated. Quantizer step size was changed once in a GOB or every 11'th MB. The resulting SN ratio curves for Miss America and Claire are shown in Figures 1 to 4.

When quantizer step size is controlled every 11'th MB the SN ratios in the simulations become stable. Also the subjective picture quality is much higher compared to controlling quantizer only on GOB level.

2. Current method for signalling quantizer stepsize

According to current specification it is possible to change quantizer step size at MB level. This is accomplished by sending QUANT2 bits within a MB if so signalled in TYPE3.

The presence of QUANT2 bits is independent of other properties signalled in TYPE3. Therefore it may be necessary to spend nearly 1 bit/MB to signal this event.

Typically about 50% of MB's are modified, requiring the signalling of the presence of QUANT2 in each of them. Resulting bit rates for signalling only are:

	#MB/pic	50%	10 Hz [bit/s]	15 Hz [bit/s]	30 Hz [bit/s]
FCIF	396	~200	**2000**	**3000**	**6000**
QCIF	99	~50	**500**	**750**	

3. Alternative method.

If we specify that QUANT2 is sent regularly after every 11'th MB, but not at other times, we can use this a priori knowledge to reduce signalling bits considerably with the following procedure.

A. QUANT1 is sent normally in the GOB header and it is valid on Macro Blocks 1..11.

B. QUANT2 is sent along the first modified MB on row 12..22 and is valid up to MB 22.

C. QUANT2 is sent along the first modified MB on row 23..33 and is valid to the end of the GOB.

One of the spare bits of TYPE2 (bit 3..6) is used to indicate whether QUANT2 bits (items B. and C.) are sent or not. If they are not sent QUANT1 is valid in the whole GOB.

In this way no quantizer signalling information need be included in TYPE3.

The bit rates spent for signalling in TYPE2 are:

	#GOB/pic	10 Hz [bit/s]	15 Hz [bit/s]	30 Hz [bit/s]
FCIF	12	**120**	**180**	**360**
QCIF	3	**30**	**45**	

4. Conclusion

At low transmission rates and QCIF quantizer step size control inside a GOB is necessary. A way to reduce bit rate for signalling is presented. In this method the change of quantizer step size is restricted to occur regularly:

- once in a GOB or
- every 11'th MB (three times in a GOB).

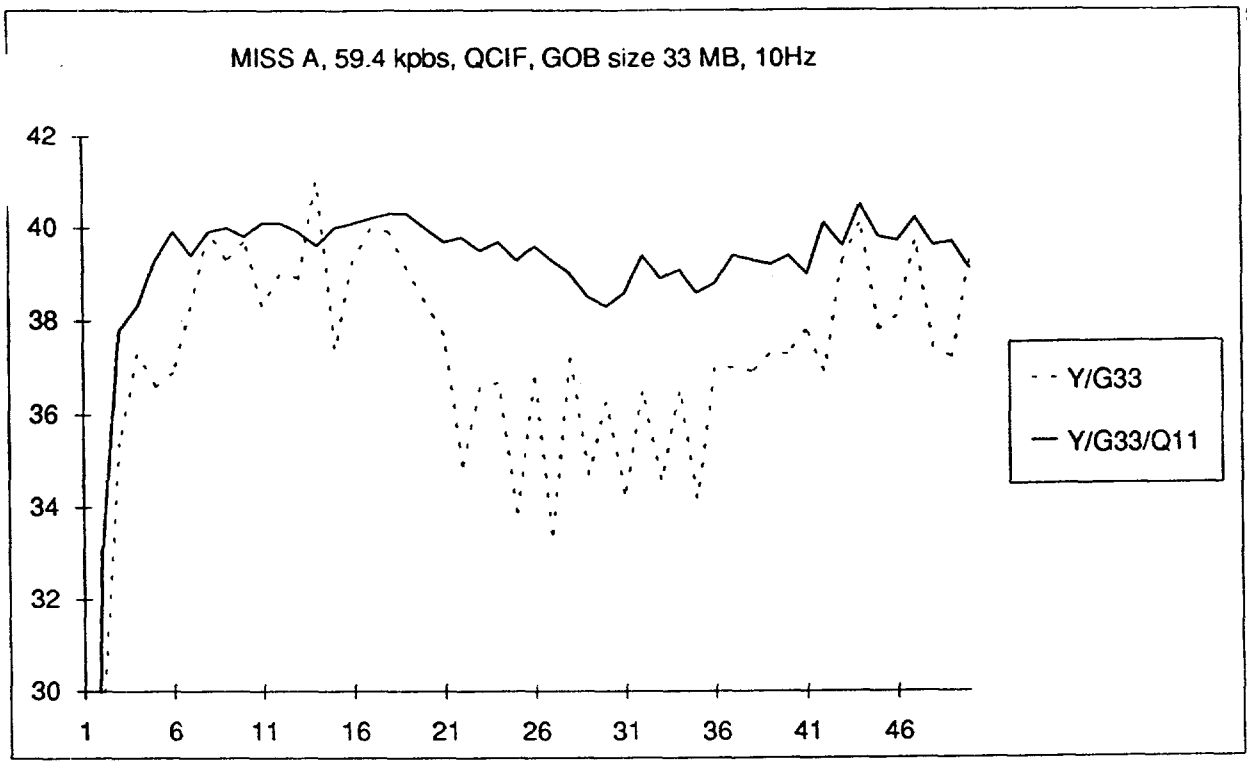
MISS A, 59.4 kpbs, QCIF, GOB size 33 MB, 10Hz
42
40
38
36
34
32
30
1
6
11
16
21
26
31
36
41
46
Y/G33
Y/G33/Q11

Fig 1.

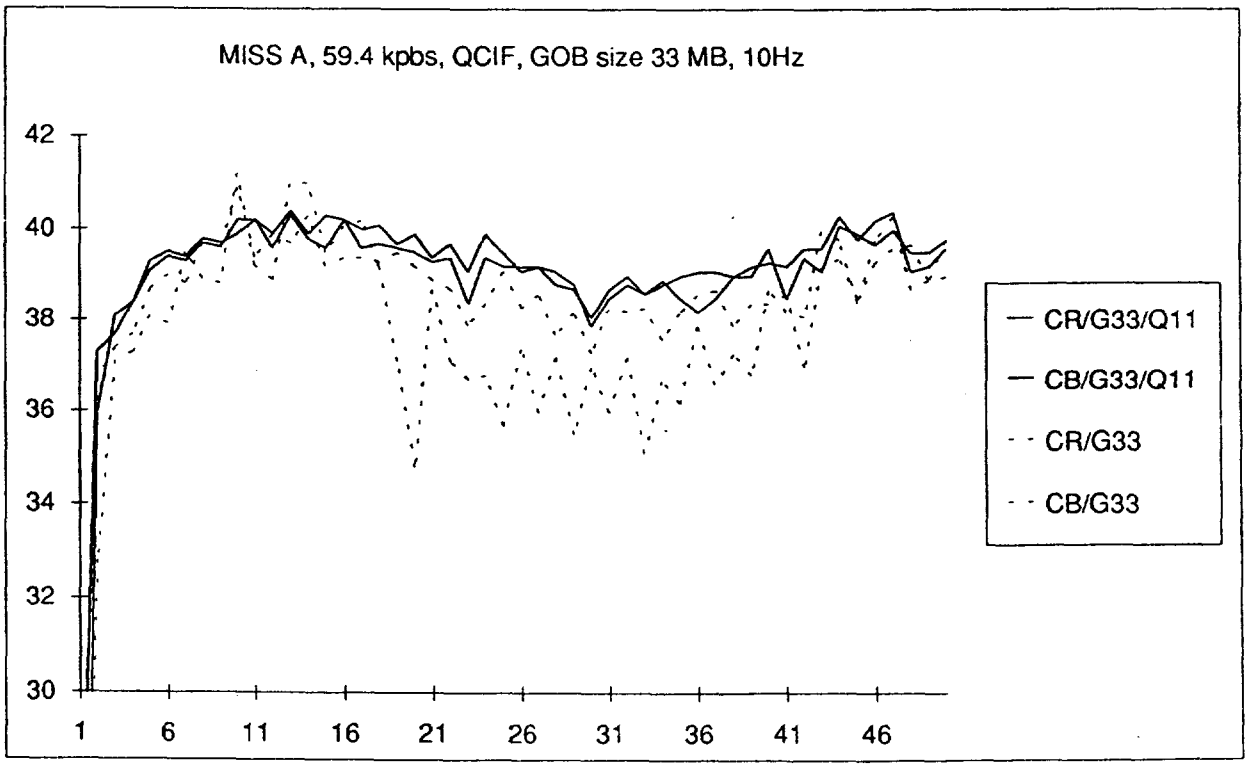
MISS A, 59.4 kpbs, QCIF, GOB size 33 MB, 10Hz
42
40
38
36
34
32
30
1
6
11
16
21
26
31
36
41
46
CR/G33/Q11
CB/G33/Q11
CR/G33
CB/G33

Fig 2.

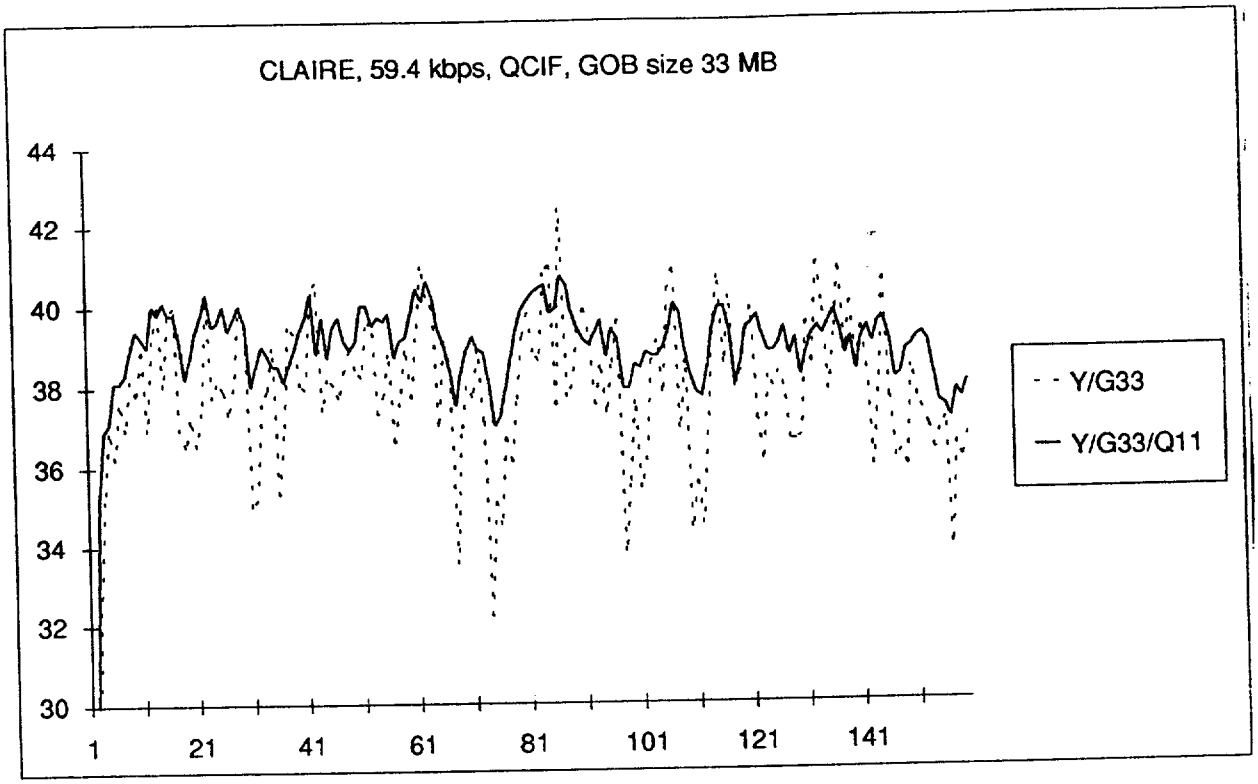
CLAIRE, 59.4 kbps, QCIF, GOB size 33 MB
44
42
40
38
36
34
32
30
1
21
41
61
81
101
121
141
Y/G33
Y/G33/Q11

Fig 3.

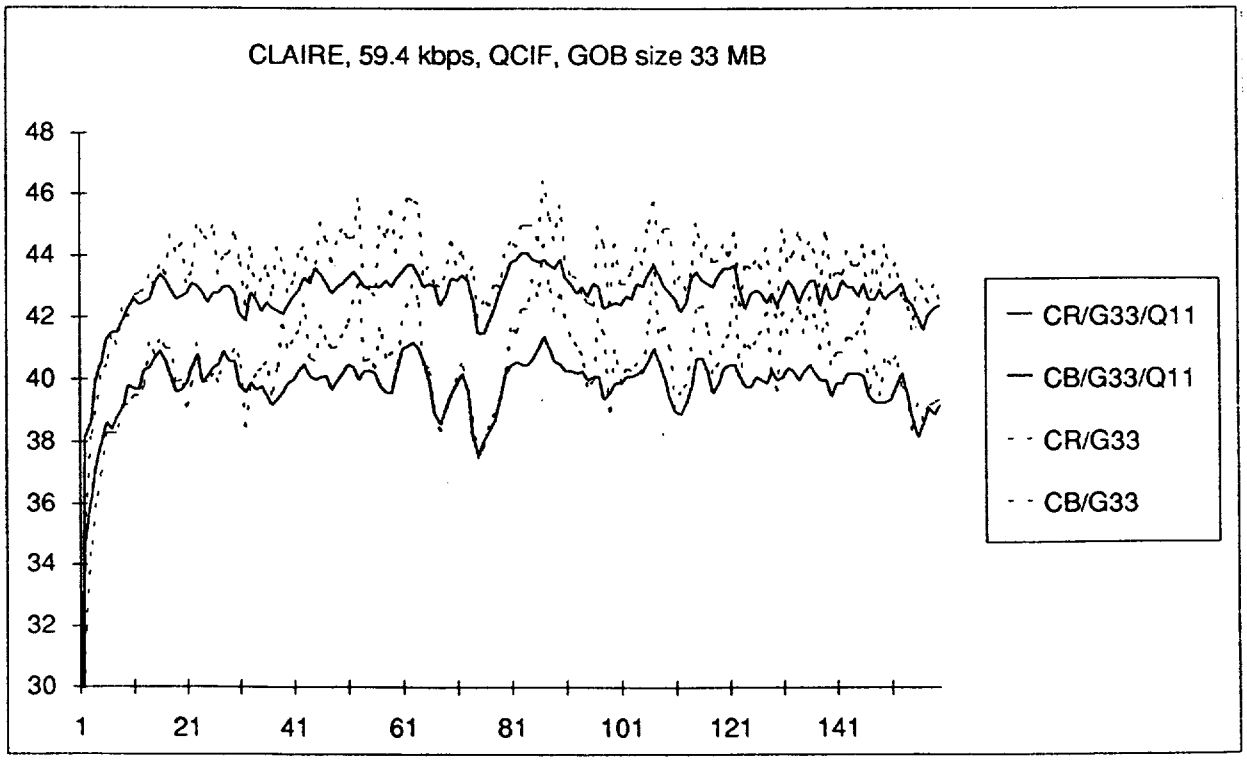
CLAIRE, 59.4 kbps, QCIF, GOB size 33 MB
48
46
44
42
40
38
36
34
32
30
1
21
41
61
81
101
121
141
CR/G33/Q11
CB/G33/Q11
CR/G33
CB/G33

Fig 4.