International Telecommunication Union

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

G.113

Amendment 1
(06/2006)

SERIES G: TRANSMISSION SYSTEMS AND MEDIA, DIGITAL SYSTEMS AND NETWORKS

International telephone connections and circuits – General Recommendations on the transmission quality for an entire international telephone connection

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Transmission impairments due to speech processing

Amendment 1: New Appendix IV – Provisional planning values for the wideband equipment impairment factor *Ie,wb*

ITU-T Recommendation G.113 (2001) – Amendment 1

ITU-T

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ITU-T Recommendation G.113

Transmission impairments due to speech processing

Amendment 1

New Appendix IV – Provisional planning values for the wideband equipment impairment factor *Ie,wb*

Source

Amendment 1 to ITU-T Recommendation G.113 (2001) was agreed on 13 June 2006 by ITU-T Study Group 12 (2005-2008).

FOREWORD

The International Telecommunication Union (ITU) is the United Nations specialized agency in the field of telecommunications. The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of ITU. ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

Compliance with this Recommendation is voluntary. However, the Recommendation may contain certain mandatory provisions (to ensure e.g. interoperability or applicability) and compliance with the Recommendation is achieved when all of these mandatory provisions are met. The words "shall" or some other obligatory language such as "must" and the negative equivalents are used to express requirements. The use of such words does not suggest that compliance with the Recommendation is required of any party.

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As of the date of approval of this Recommendation, ITU had not received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementors are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database.

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ITU-T Recommendation G.113

Transmission impairments due to speech processing

Amendment 1

New Appendix IV – Provisional planning values for the wideband equipment impairment factor *Ie,wb*

This appendix provides up-to-date information on available values of Wideband Equipment Impairment Factors, *Ie,wb,* for a number of codecs or codec families. It is intended to be updated regularly. These values are to be used on an extended transmission rating scale (*R*-scale) as it is defined in Appendix II/G.107.

Table IV.1/G.113 – Provisional planning values for the wideband equipment impairment factor *Ie,wb* for wideband codecs

Codec type	Reference	Operating rate kbit/s	*Ie,wb* value
ADPCM	ITU-T Rec. G.722	64	13
		56	20
		48	31
Modifies Lapped Transform Coding	ITU-T Rec. G.722.1	32	13
		24	19
CELP	ITU-T Rec. G.722.2	23.85	8
		23.05	1
		19.85	3
		18.25	5
		15.85	7
		14.25	10
		12.65	13
		8.85	26
		6.6	41

Table IV.2/G.113 – Provisional planning values for the wideband equipment impairment factor *Ie,wb* for narrow-band codecs

Codec type	Reference	Operating rate kbit/s	*Ie,wb* value
PCM (see Note)	ITU-T Rec. G.711	64	36
ADPCM	ITU-T Recs G.726, G.727	40	38
	ITU-T Recs G.721 (1988), G.726, G.727	32	43
	ITU-T Recs G.726, G.727	24	61
	ITU-T Recs G.726, G.727	16	86
LD-CELP	ITU-T Rec. G.728	16	43
		12.8	56
CS-ACELP	ITU-T Rec. G.729	8	46
	G.729-A + VAD	8	47
VSELP	IS-54	8	56
ACELP	IS-641	7.4	46
QCELP	IS-96a	8	57
RCELP	IS-127	8	42
VSELP	Japanese PDC	6.7	60
RPE-LTP	GSM 06.10, Full-rate	13	56
VSELP	GSM 06.20, Half-rate	5.6	59
ACELP	GSM 06.60, Enhanced Full Rate	12.2	41
ACELP	ITU-T Rec. G.723.1	5.3	55
MP-MLQ	ITU-T Rec. G.723.1	6.3	51
NOTE – Table IV.3 provides additional descriptive information on various low bit-rate codecs.			

Table IV.3/G.113 – Brief description of the low bit-rate codecs

IS-54	First generation digital TDMA cellular system in North America utilizing Vector Sum Excited Linear Prediction (**VSELP**) coding at a net bit rate of 7.95 kbit/s (plus 5.05 kbit/s FEC).
IS-96a	First generation digital CDMA cellular system in North America utilizing Qualcomm Code-Excited Linear Prediction (**QCELP**) coding at a variable net bit rate of 8, 4, and 2 kbit/s.
IS-127	Second generation digital CDMA cellular system in North America utilizing Residual Code-Excited Linear Prediction (**RCELP**) coding at a variable net bit rate of 8, 4, and 2 kbit/s.
IS-641	Second generation digital TDMA cellular system in North America utilizing Algebraic Code-Excited Linear Prediction (**ACELP**) coding at a net bit rate of 7.4 kbit/s (plus 5.6 kbit/s FEC).
GSM-FR	First generation digital European Global System for Mobile communications (**GSM**) cellular system utilizing Regular Pulse Excitation Long Term Prediction (**RPE-LTP**) coding at a net bit rate of 13 kbit/s (plus 9.8 kbit/s FEC). Defined in ETSI GSM 06.10.
GSM-HR	Half-rate version of the voice codec for the GSM system utilizing Vector Sum Excited Linear Prediction (**VSELP**) coding at a net bit rate of 5.6 kbit/s. Defined in ETSI GSM 06.20.

Table IV.3/G.113 – Brief description of the low bit-rate codecs

GSM-EFR	Second generation speech codec of the digital European Global System for Mobile communications (GSM) cellular system utilizing Algebraic Code-Excited Linear Prediction (**ACELP**) coding at a net bit rate of 12.2 kbit/s (plus 10.6 kbit/s FEC). Defined in ETSI GSM 06.60.
PDC	First generation digital Japanese Personal Digital Communication (PDC) system utilizing a Japanese version of Vector Sum Excited Linear Prediction (**JVSELP**) coding at a net bit rate of 6.7 kbit/s (plus 4.5 kbit/s FEC).
G.722	ITU-T Recommendation for 7 kHz audio coding within 64 kbit/s using sub-band adaptive differential pulse code modulation (SB-ADPCM) within a bit rate of 64 kbit/s
G.722.1	ITU-T Recommendation for low-complexity coding at 24 and 32 kbit/s for hands-free operation in systems with low frame loss
G.722.2	ITU-T Recommendation for wideband coding of speech at around 16 kbit/s using Adaptive Multi-Rate Wideband (AMR-WB)
G.723.1	ITU-T Recommendation for speech coding in PSTN videophones utilizing Algebraic Code-Excited Linear Prediction (**ACELP**) coding at 5.3 kbit/s and Multipulse Maximum Likelihood Quantization (**MP-MLQ**) at 6.3 kbit/s.
G.726	ITU-T Recommendation for speech coding at 40, 32, 24, and 16 kbit/s utilizing Adaptive Differential Pulse Code Modulation (**ADPCM**).
G.728	ITU-T Recommendation for speech coding at 16 kbit/s utilizing Low-Delay Code-Excited Linear Prediction (**LD-CELP**) Coding. This algorithm also has 12.8 and 9.6 kbit/s bit-rate extensions.
G.729	ITU-T Recommendation for speech coding at 8 kbit/s utilizing Conjugate Structure Algebraic Code-Excited Linear Prediction (**CS-ACELP**) Coding.

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