

Recommendation

ITU-T P.834.2 (09/2024)

SERIES P: Telephone transmission quality, telephone installations, local line networks

Methods for objective and subjective assessment of speech and video quality

Extension of the methodology for the derivation of equipment impairment factors from instrumental models for fullband speech codecs

ITU-T P-SERIES RECOMMENDATIONS

Telephone transmission quality, telephone installations, local line networks

Vocabulary and effects of transmission parameters on customer opinion of transmission quality	P.10-P.19
Voice terminal characteristics	P.30-P.39
Reference systems	P.40-P.49
Objective measuring apparatus	P.50-P.59
Objective electro-acoustical measurements	P.60-P.69
Measurements related to speech loudness	P.70-P.79
Methods for objective and subjective assessment of speech quality	P.80-P.89
Voice terminal characteristics	P.300-P.399
Objective measuring apparatus	P.500-P.599
Measurements related to speech loudness	P.700-P.709
Methods for objective and subjective assessment of speech and video quality	P.800-P.899
Audiovisual quality in multimedia services	P.900-P.999
Transmission performance and QoS aspects of IP end-points	P.1000-P.1099
Communications involving vehicles	P.1100-P.1199
Models and tools for quality assessment of streamed media	P.1200-P.1299
Telemeeting assessment	P.1300-P.1399
Statistical analysis, evaluation and reporting guidelines of quality measurements	P.1400-P.1499
Methods for objective and subjective assessment of quality of services other than speech and video	P.1500-P.1599

For further details, please refer to the list of ITU-T Recommendations.

Recommendation ITU-T P.834.2

Extension of the methodology for the derivation of equipment impairment factors from instrumental models for fullband speech codecs

Summary

Recommendation ITU-T P.834.2 describes an extension of the methodology for deriving equipment impairment factors from instrumental models of Recommendation ITU-T P.834. It is intended that it be primarily applied to determine fullband equipment impairment factors $I_{e,FB}$, capturing the degradation introduced by fullband speech codecs. The resulting fullband equipment impairment factors derived by this methodology are intended to be used on the extended transmission rating scale underlying the fullband E-model (see clause 6.2 of Recommendation ITU-T G.107.2). They reflect the auditory impairments of the corresponding equipment in a listening-only mode.

The methodology of Recommendation ITU-T P.834.2 makes use of instrumental models (so called "objective methods"), e.g., the model defined in Recommendation ITU-T P.863. It is to be considered as supplementary to the methodology based on auditory listening-only tests, described in Recommendation ITU-T P.833.2. It provides valid $I_{e,FB}$ values only for those codecs for which the instrumental model used produces meaningful estimations.

Speech material associated with Recommendation ITU-T P.834.2 is freely available on the test signal database at <https://www.itu.int/net/itu-t/sigdb/genaudio/AudioForm-g.aspx?val=100008342>.

History*

Edition	Recommendation	Approval	Study Group	Unique ID
1.0	ITU-T P.834.2	2024-09-29	12	11.1002/1000/16151

Keywords

Codec, E-model, equipment impairment factor, fullband speech, impairment factor method, objective method, transmission.

* To access the Recommendation, type the URL <https://handle.itu.int/> in the address field of your web browser, followed by the Recommendation's unique ID.

FOREWORD

The International Telecommunication Union (ITU) is the United Nations specialized agency in the field of telecommunications, and information and communication technologies (ICTs). 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.

INTELLECTUAL PROPERTY RIGHTS

ITU draws attention to the possibility that the practice or implementation of this Recommendation may involve the use of a claimed Intellectual Property Right. ITU takes no position concerning the evidence, validity or applicability of claimed Intellectual Property Rights, whether asserted by ITU members or others outside of the Recommendation development process.

As of the date of approval of this Recommendation, ITU had not received notice of intellectual property, protected by patents/software copyrights, which may be required to implement this Recommendation. However, implementers are cautioned that this may not represent the latest information and are therefore strongly urged to consult the appropriate ITU-T databases available via the ITU-T website at <http://www.itu.int/ITU-T/ipr/>.

© ITU 2025

All rights reserved. No part of this publication may be reproduced, by any means whatsoever, without the prior written permission of ITU.

Table of Contents

	Page
1 Scope	1
2 References.....	1
3 Definitions	2
3.1 Terms defined elsewhere	2
3.2 Terms defined in this Recommendation.....	2
4 Abbreviations and acronyms	2
5 Conventions	3
6 Experimental set-up and data processing	3
6.1 Input speech material.....	3
6.2 Reference conditions	4
6.3 Processing of speech material	5
6.4 Calculation of MOS estimations using the instrumental model.....	6
7 Derivation of fullband equipment impairment factors	6
8 Limitations of the instrumentally derived fullband equipment impairment factor values	8
Annex A – Speech files.....	9
Appendix I – Calculation of equipment impairment factors from scores provided by the instrumental model described in ITU-T P.863	10
Bibliography.....	12

Introduction

ITU-T has introduced the impairment factor method in order to describe the joint effect of different types of degradations on the overall transmission quality. According to this method, transmission impairments can be transformed into so-called "psychological factors", which are assumed to be additive on a psychological scale. The transmission rating scale (R scale) underlying the E-model (see [ITU-T G.107]) is assumed to reflect such a psychological scale.

The impairment factor method allocates a value of impairment to each parameter describing the transmission channel, and then allows the simple addition of these impairments to determine the overall impairment. The overall transmission rating, R , is finally calculated by subtracting the overall impairment from the maximum value R_{max} . Whereas the R scale and the E-model were originally formulated for narrowband (300-3 400 Hz) speech transmission only, [ITU-T G.107.2] presents an extension of this scale to fullband (20-20 000 Hz) speech transmission. Appendix V to [ITU-T G.113] provides values for fullband equipment impairment factors $I_{e,FB}$, which describe the degradation resulting from selected fullband speech codecs on the extended R scale.

This Recommendation describes a methodology for the derivation of $I_{e,FB}$ values for other fullband speech codecs, based on the results of so-called "objective methods".