

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Digital audio – Interface for non-linear PCM encoded audio bitstreams applying IEC 60958 –

Part 9: Non-linear PCM bitstreams according to the MAT format

Audionumérique – Interface pour les flux de bits audio à codage MIC non linéaire conformément à la CEI 60958 –

Partie 9: Flux de bits MIC non linéaire selon le format MAT

<https://standards.iteh.ai/catalog/standards/iec/225e417e-d020-4188-8a61-cd2f21d86ac6/iec-61937-9-2007>



THIS PUBLICATION IS COPYRIGHT PROTECTED
Copyright © 2007 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester.
If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de la CEI ou du Comité national de la CEI du pays du demandeur.
Si vous avez des questions sur le copyright de la CEI ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de la CEI de votre pays de résidence.

IEC Central Office
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00
info@iec.ch
www.iec.ch

About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigenda or an amendment might have been published.

Useful links:

IEC publications search - www.iec.ch/searchpub

The advanced search enables you to find IEC publications by a variety of criteria (reference number, text, technical committee,...).

It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished

Stay up to date on all new IEC publications. Just Published details all new publications released. Available on-line and also once a month by email.

Electropedia - www.electropedia.org

The world's leading online dictionary of electronic and electrical terms containing more than 30 000 terms and definitions in English and French, with equivalent terms in additional languages. Also known as the International Electrotechnical Vocabulary (IEV) on-line.

Customer Service Centre - webstore.iec.ch/csc

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: csc@iec.ch.

A propos de la CEI

La Commission Electrotechnique Internationale (CEI) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

A propos des publications CEI

Le contenu technique des publications de la CEI est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

Liens utiles:

Recherche de publications CEI - www.iec.ch/searchpub

La recherche avancée vous permet de trouver des publications CEI en utilisant différents critères (numéro de référence, texte, comité d'études,...).

Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

Just Published CEI - webstore.iec.ch/justpublished

Restez informé sur les nouvelles publications de la CEI. Just Published détaille les nouvelles publications parues. Disponible en ligne et aussi une fois par mois par email.

Electropedia - www.electropedia.org

Le premier dictionnaire en ligne au monde de termes électroniques et électriques. Il contient plus de 30 000 termes et définitions en anglais et en français, ainsi que les termes équivalents dans les langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (VEI) en ligne.

Service Clients - webstore.iec.ch/csc

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: csc@iec.ch.

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Digital audio – Interface for non-linear PCM encoded audio bitstreams applying IEC 60958 –
Part 9: Non-linear PCM bitstreams according to the MAT format**

**Audionumérique – Interface pour les flux de bits audio à codage MIC non linéaire conformément à la CÉI 60958 –
Partie 9: Flux de bits MIC non linéaire selon le format MAT**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 33.160.30; 35.040

ISBN 978-2-83220-523-5

**Warning! Make sure that you obtained this publication from an authorized distributor.
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.**

CONTENTS

FOREWORD.....	3
1 Scope.....	5
2 Normative references	5
3 Terms, definitions and abbreviations	5
3.1 Terms and definitions	5
3.2 Abbreviations	5
4 Mapping of the audio bitstream on to IEC 61937-1	5
4.1 General.....	5
4.2 MAT burst-info.....	6
5 Format of MAT data-bursts.....	6
5.1 General.....	6
5.2 Pause data-burst.....	6
5.3 Audio data-bursts	6
5.3.1 The MAT data.....	6
5.3.2 Latency of the MAT decoder.....	8
Bibliography.....	9
Figure 1 – MAT data-burst.....	7
Figure 2 – Latency of MAT decoding.....	8
Table 1 – Fields of burst-info	6
Table 2 – Repetition period of the pause data-bursts	6
Table 3 – Data-type-dependent information for MAT	7
Table 4 – Sample rate of MAT encoded audio and IEC 60958 frame rate.....	7

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**DIGITAL AUDIO –
INTERFACE FOR NON-LINEAR PCM ENCODED
AUDIO BITSTREAMS APPLYING IEC 60958 –**

Part 9: Non-linear PCM bitstreams according to the MAT format

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with an IEC Publication.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 61937-9 has been prepared by technical area 4: Digital system interfaces and protocols, of IEC technical committee 100: Audio, video and multimedia systems and equipment.

This bilingual version (2012-12) corresponds to the monolingual English version, published in 2007-08.

The text of this standard is based on the following documents:

FDIS	Report on voting
100/1198/FDIS	100/1265/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

The French version of this standard has not been voted upon.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

The list of all parts of the IEC 61937 series, under the general title *Digital audio – Interface for non-linear PCM encoded audio bitstreams applying IEC 60958*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

Withdrawing

iTech Standards
(<https://standards.iteh.ai>)
Document Preview

[IEC 61937-9:2007](https://standards.iteh.ai/standards/iec/225e417e-d020-4188-8a61-cd2f21d86ae6/iec-61937-9-2007)

<https://standards.iteh.ai/standards/iec/225e417e-d020-4188-8a61-cd2f21d86ae6/iec-61937-9-2007>

DIGITAL AUDIO – INTERFACE FOR NON-LINEAR PCM ENCODED AUDIO BITSTREAMS APPLYING IEC 60958 –

Part 9: Non-linear PCM bitstreams according to the MAT format

1 Scope

This part of IEC 61937 describes the method to convey non-linear PCM bitstreams encoded according to the MAT format.

2 Normative references

The following Standards contain provisions which, through reference in the text, referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60958 (all parts), *Digital audio interface*

IEC 61937-1:2007, *Digital audio – Interface for non-linear PCM encoded audio bitstreams applying IEC 60958 – Part 1: General*

IEC 61937-2:2007, *Digital audio – Interface for non-linear PCM encoded audio bitstreams applying IEC 60958 – Part 2: Burst info*

3 Terms, definitions and abbreviations

For the purpose of this standard, the following definitions and abbreviations apply.

3.1 Terms and definitions

3.1.1 latency

delay time of an external audio decoder to decode a MAT data-burst, defined as the sum of two values of the receiving delay time and the decoding delay time

3.2 Abbreviations

IEC	International Electrotechnical Commission
ISO	International Organization for Standardization
ISO/IEC MPEG	The Moving Picture Experts Group, a joint committee of ISO and IEC
MAT	Metadata-enhanced Audio Transmission

4 Mapping of the audio bitstream on to IEC 61937-1

4.1 General

The coding of the bitstream and data-burst is in accordance with IEC 61937-1 and 61937-2.

4.2 MAT burst-info

The 16-bit burst-info contains information about the data which will be found in the data-burst.

Table 1 – Fields of burst-info

Bits of Pc	Value	Contents	Reference point R	Repetition period of data-burst in IEC 60958 frames
0 – 4		Data-type		
	0 – 21	According to IEC 61937		
	22	MAT	R-MAT	15 360
	23 – 31	According to IEC 61937		
5, 6		Sub- data-type		
	0	MAT		
	1 – 3	According to IEC 61937		
7 – 15		According to IEC 61937		

5 Format of MAT data-bursts

5.1 General

This clause specifies the audio data-burst MAT. Specific properties such as reference points, repetition period, the method of filling stream gaps, and decoding latency are specified.

The decoding latency (or delay), indicated for the data-type, should be used by the transmitter to schedule data-bursts as necessary to establish synchronization between picture and decoded audio.

5.2 Pause data-burst

Pause data-burst for MAT is given in Table 2

Table 2 – Repetition period of the pause data-bursts

Data-type of audio data-burst	Repetition period of pause data-burst	
	Mandatory	Recommended
MAT	-	4 IEC 60958 frames

5.3 Audio data-bursts

5.3.1 The MAT data

The MAT bitstream consists of a sequence of MAT frames. The data-type of a MAT data-burst is 22, and the sub-data-type is 0. When MAT data is being transmitted, the transmission device shall ensure that both the data-type and sub-data-type values are set correctly. Additionally, the receiving device shall utilize both the data-type and sub data-type values to ensure that the content of the data-burst is correctly identified as MAT. The data-burst is headed with a burst-preamble, followed by the burst-payload. The burst-payload of each MAT data-burst shall contain 1 complete MAT frame.

The length of the MAT data-burst will depend on the encoded bit rate (which determines the MAT frame length).

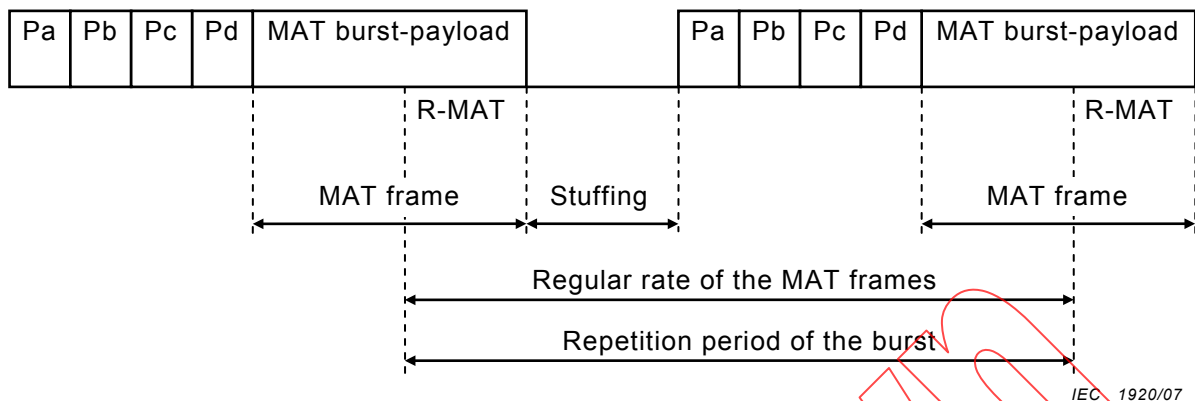


Figure 1 – MAT data-burst

The data-type-dependent information for MAT is given in Table 3.

Table 3 – Data-type-dependent information for MAT

Bits of Pc LSB..MSB	Value	Contents
8 - 12	00h	Reserved, shall be set to '0'

Table 4 shows the relation between the sample rate of MAT encoded audio and the IEC 60958 frame rate used to deliver MAT data via the IEC 61937 interface.

Table 4 – Sample rate of MAT encoded audio and IEC 60958 frame rate

MAT sample rate	IEC 60958 frame rate
48 kHz	768 kHz
96 kHz	768 kHz
192 kHz	768 kHz
44,1 kHz	705,6 kHz
88,2 kHz	705,6 kHz
176,4 kHz	705,6 kHz

The reference point of a MAT data-burst (R-MAT) is the IEC 60958 frame that occurs half-way through the MAT burst-payload. The data-bursts containing MAT frames shall occur at a regular rate, with the reference point of the MAT data-burst beginning 15 360 IEC 60958 frames after the reference point of the preceding MAT data-burst.

The units of **burst-length** shall be in bytes. The maximum size of a MAT burst-payload is 61 424 bytes.

5.3.2 Latency of the MAT decoder

The latency of a MAT decoder which receives this signal is specified, with respect to the reference point of the MAT data-burst, to be equal to the time occupied by 1/12 of a MAT frame (equivalent to 1 280 IEC 60958 frames at the IEC 60958 frame rate).

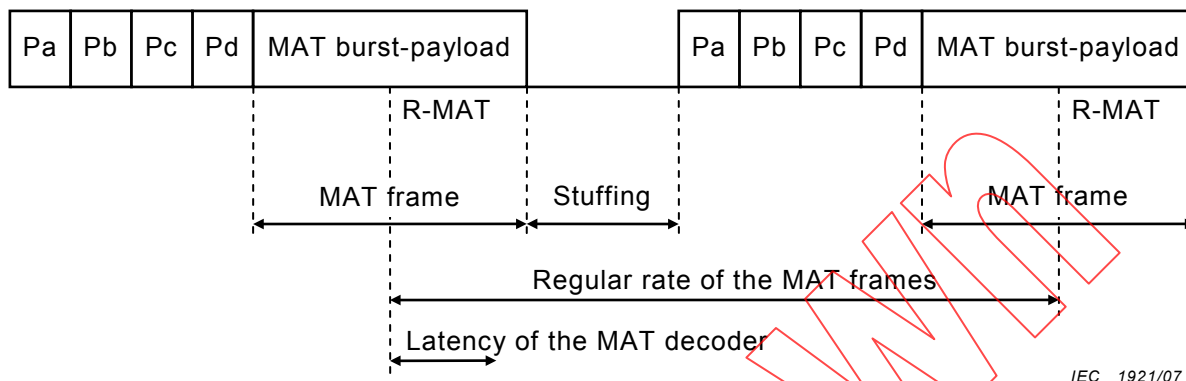


Figure 2 – Latency of MAT decoding

It is recommended that Pause data-bursts are used to fill stream gaps in the MAT bitstream as described in IEC 61937-1, and that pause data-bursts be transmitted with a repetition period of 4 IEC 60958 frames, except when other repetition periods are necessary to fill the precise stream gap length (which may not be a multiple of 4 IEC 60958 frames), or to meet the requirement on burst spacing (refer to IEC 61937-1, 6.3.3).

When a stream gap in a MAT stream is filled by a sequence of pause data-bursts, the Pa of the first pause data-burst shall be located one frame repetition period following the Pa of the previous MAT frame. It is recommended that the sequence(s) of Pause data-bursts which fill the stream gap should continue from this point up to (as close as possible considering the 4 IEC 60958 frame length of the Pause data-burst) the Pa of the first MAT data-burst which follows the stream gap.

The gap length parameter contained in the pause data-burst is intended to be interpreted by the MAT decoder as an indication of the number of decoded PCM samples which are missing (due to the resulting audio gap). If the sizes of the MAT frames before and after the stream gap are not equal (due to a bitrate change in the interrupted MAT bitstream), this value may differ from the actual number of sampling periods of the audio contained in the stream gap due to the definition of the MAT data-burst reference points.