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Contents

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Foreword

This European Standard (Telecommunications series) has been produced by the Transmission and Multiplexing (TM) Technical Committee.

The present document has been produced to provide requirements for synchronization networks that are compatible with the performance requirements of digital networks. It is one of a family of documents covering various aspects of synchronization networks:

Part 1-1:	"Definitions and terminology for synchronization networks";
Part 2-1:	"Synchronization network architecture";
Part 3-1:	"The control of jitter and wander within synchronization networks";
Part 4-1:	"Timing characteristics of slave clocks suitable for synchronization supply to Synchronous Digital Hierarchy (SDH) and Plesiochronous Digital Hierarchy (PDH) equipment";
Part 4-2:	"Timing characteristics of slave clocks suitable for synchronization supply to Synchronous Digital Hierarchy (SDH) and Plesiochronous Digital Hierarchy (PDH) equipment Implementation Conformance (ICS) Statement";
Part 5-1:	"Timing characteristics of slave clocks suitable for operation in Synchronous Digital Hierarchy (SDH) equipment";
Part 6-1:	**"Timing characteristics of primary reference clocks";**
Part 6-2:	"Timing characteristics of primary reference clocks Implementation Conformance (ICS) Statement";
Part 7-1:	"Timing characteristics of slave clocks suitable for synchronization supply to equipment in local node applications".

Parts 1-1, 2-1, 3-1 and 5-1 have previously been published as ETS 300 462 Parts 1, 2, 3 and 5, respectively.

Additionally, parts 4-1 and 6-1 completed the Voting phase of the Two Step Approval procedure as ETS 300 462 Parts 4 and 6, respectively.

It was decided to prepare ICS proformas for several of the parts and this necessitated a re-numbering of the individual document parts. It was also decided to create a new part 7-1.

This in turn led to a need to re-publish new versions of all six parts of the original ETS. At the same time, the opportunity was taken to convert the document type to EN.

This has involved no technical change to any of the documents. However part 5-1 has been modified, due to editorial errors which appeared in ETS 300 462-5.

National transposition dates	
Date of adoption of this EN:	22 May 1998
Date of latest announcement of this EN (doa):	31 August 1998
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	28 February 1998
Date of withdrawal of any conflicting National Standard (dow):	28 February 1998

1 Scope

This European Standard (Telecommunications series) outlines requirements for Primary Reference Clocks (PRCs) suitable for synchronization supply to digital networks.

NOTE: The requirements in the present document apply under environmental conditions according to one of the environmental classes defined in ETS 300 019 [1], unless stated otherwise. The manufacturer will need to specify to which specific environmental class an equipment belongs.

A typical PRC provides the reference signal for the timing or synchronization of other clocks within a network or section of a network. The long-term accuracy of the PRC should be maintained at 1 part in 10^{11} or better with verification to Universal Co-ordinated Time (UTC).

The long-term accuracy of 1 part in 10^{11} or better is adequate when a single PRC provides the reference synchronization signal to all other clocks within a network (synchronous mode of operation). In the pseudo-synchronous mode, i.e. not all clocks in the network have timing traceable to the same PRC, the long term accuracy requirement is dependent on the number of PRCs in that network.

When more than one PRC is used in a network, a statistical approach is needed to determine the long-term accuracy requirement of each PRC in that network.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, subsequent revisions do apply.
- A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.

[1] ETS 300 019 (1994): "Equipment Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment".

[2] EN 300 462-1-1: "Transmission and Multiplexing (TM); Generic requirements for synchronization networks; Part 1-1: Definitions and terminology of synchronization networks".

[3] EN 300 462-2-1: "Transmission and Multiplexing (TM); Generic requirements for synchronization networks; Part 2-1: Synchronization network architecture".

[4] EN 300 462-3-1: "Transmission and Multiplexing (TM); Generic requirements for synchronization networks; Part 3-1: The control of jitter and wander within synchronization networks".

[5] EN 300 462-4-1: "Transmission and Multiplexing (TM); Generic requirements for synchronization networks; Part 4-1: Timing characteristics of slave clocks suitable for operation in synchronization supply to Synchronous Digital Hierarchy (SDH) and Plesiochronous Digital Hierarchy (PDH) equipment".

[6] EN 300 462-5-1: "Transmission and Multiplexing (TM); Generic requirements for synchronization networks; Part 5-1: Timing characteristics of slave clocks suitable for Synchronous Digital Hierarchy (SDH) equipment".

[7] ITU-T Recommendation G.703 (1991): "Physical/electrical characteristics of hierarchical digital interfaces".

3 Definitions and abbreviations

For the purpose of the present document, the definitions and abbreviations of EN 300 462-1-1 [2] apply.

4 Frequency accuracy

The maximum allowable fractional frequency offset for observation times greater than one week is 1 part in 10^{11}, over all applicable environmental conditions as defined in ETS 300 019 [1].

5 Noise generation

The noise generation of a PRC clock represents the amount of phase noise produced at its output. A suitable reference, for practical testing purposes, implies a performance level that is more stable than the output requirements. The ability of the clock to limit this noise is described by its frequency stability. The measures Maximum Time Interval Error (MTIE) and Time Deviation (TDEV) are useful for characterization of noise generation performance.

It is important for consistency in measuring MTIE and TDEV parameters that an anti-aliasing filter, maximum sampling time and measurement interval are specified. These are given in annex A of EN 300 462-3-1 [4].

5.1 Wander

The wander, expressed in MTIE, measured using the independent clock configuration defined in figure 2.A of EN 300 462-1-1 [2] should have the following limits:

MTIE: $(0{,}275 \times 10^{-3}\tau + 0{,}025)$ µs for $0{,}1\text{s} < \tau \leq 1\,000$ s

$(10^{-5}\tau + 0{,}29)$ µs for $\tau > 1\,000$ s

The resultant requirements are shown in figure 1.

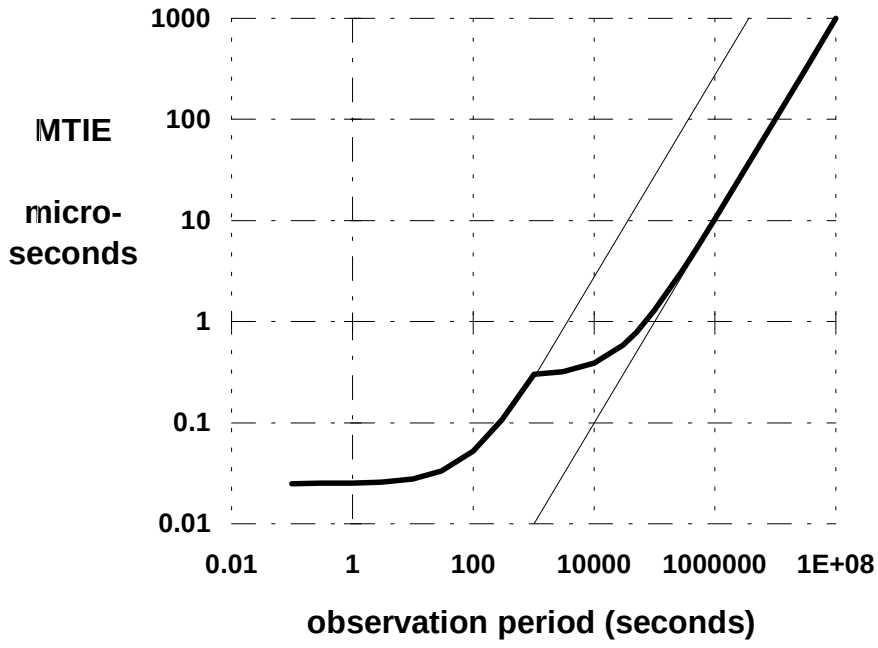

Figure 1: MTIE as a function of an observation (integration) period τ