ISO/IEC TR 14165-117

Edition 1.0 2007-09

TECHNICAL REPORT

Information technology – Fibre channel –
Part 117: Methodologies for jitter and signal quality (MJSQ)

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

PRICE CODE **XC**

ICS 35.000

ISBN 2-8318-9290-2

Contents

INFORMATION TECHNOLOGY – FIBRE CHANNEL –

Part 117: Methodologies for jitter and signal quality (MJSQ)

FOREWORD

1) ISO (International Organization for Standardization) and IEC (International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards. Their preparation is entrusted to technical committees; any ISO and IEC member body interested in the subject dealt with may participate in this preparatory work. International governmental and non-governmental organizations liaising with ISO and IEC also participate in this preparation.

2) In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

3) The formal decisions or agreements of IEC and ISO 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 and ISO member bodies.

4) IEC, ISO and ISO/IEC publications have the form of recommendations for international use and are accepted by IEC and ISO member bodies in that sense. While all reasonable efforts are made to ensure that the technical content of IEC, ISO and ISO/IEC publications is accurate, IEC or ISO cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.

5) In order to promote international uniformity, IEC and ISO member bodies undertake to apply IEC, ISO and ISO/IEC publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any ISO/IEC publication and the corresponding national or regional publication should be clearly indicated in the latter.

6) ISO and IEC provide no marking procedure to indicate their approval and cannot be rendered responsible for any equipment declared to be in conformity with an ISO/IEC publication.

7) All users should ensure that they have the latest edition of this publication.

8) No liability shall attach to IEC or ISO or its directors, employees, servants or agents including individual experts and members of their technical committees and IEC or ISO member bodies 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 of, use of, or reliance upon, this ISO/IEC publication or any other IEC, ISO or ISO/IEC publications.

9) Attention is drawn to the reference documents cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.

10) Attention is drawn to the possibility that some of the elements of this Technical Report, type 3, may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

The main task of IEC and ISO technical committees is to prepare International Standards. In exceptional circumstances, ISO/IEC JTC 1 or a subcommittee may propose the publication of a technical report of one of the following types:

- type 1, when the required support cannot be obtained for the publication of an International Standard, despite repeated efforts;
- type 2, when the subject is still under technical development or where, for any other reason, there is the future but not immediate possibility of an agreement on an International Standard;
- type 3, when the technical committee has collected data of a different kind from that which is normally published as an International Standard, for example 'state of the art'.

Technical reports of types 1 and 2 are subject to review within three years of publication to decide whether they can be transformed into International Standards. Technical reports of type 3 do not necessarily have to be reviewed until the data they provide are considered to be no longer valid or useful.

ISO/IEC TR 14165-117, which is a technical report of type 3, was prepared by subcommittee 25: Interconnection of information technology equipment, of ISO/IEC joint technical committee 1: Information technology.

This Technical Report has been approved by vote of the member bodies, and the voting results may be obtained from the address given on the second title page.

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

INFORMATION TECHNOLOGY –
FIBRE CHANNEL –

Part 117: Methodologies for jitter and signal quality (MJSQ)

1 Scope

The measurement methods and specifications are intended to be used as part of a total signal performance compliance requirement set where the phase content of the signal is involved. A more generalized concept for jitter compliance testing is developed where the phase properties of the signals at signal levels other than the nominal receiver switching point are considered as well as the phase properties at the nominal receiver detection threshold. The purpose of this report is to provide background information for revising and expanding the signal specifications presently contained within the FC-PH-n, FC-PI-n, FC-100-DF-EL-S and 10GFC standards and draft standards. The MJSQ technical report is used as a basis for many of the signal specification methodologies in these documents. A further purpose is to increase the general understanding of jitter in multi-gigabaud serial transmissions for application to transports other than Fibre Channel. Documenting high speed serial signal measurement methods provides encouragement to instrument companies to create compatible measurement systems and fixturing capable of supporting 1 GBd and higher transmission rates and more generalized jitter concepts.

Although this document is optimized for use with Fibre Channel, the measurement methodologies are applicable to a broad range of serial transmission schemes.

This Technical Report applies to fully functional Fibre Channel subsystem and FC port implementations as well as to the individual components that comprise the link. This allows device and enclosure level qualification and the inclusion of system jitter contributions such as power supply noise, motor noise, crosstalk and signal rejuvenaters.

A major goal of MJSQ is to improve the relationship between measurements on signals and receiver performance in terms of bit errors.

The report adds to or extends previous work in the following areas:

a) Exposing serious implementation errors commonly found from improper use of BERT’s and sampling oscilloscopes (improper use of time references and improper extraction of total jitter from sampling oscilloscopes)
b) Algorithms for separating jitter components
c) Complete specifications for executing tests including test fixtures, instrumentation specifications, calibration schemes, measurement processes and data output formats - examples for several electrical and optical applications
d) Methodology for specifying launched and received signals when pre-emphasis or receiver signal processing is used
e) Inclusion of events occurring at all signal levels within the allowed eye opening at the specified total population probability (e.g., 10^{-12})
f) Extending the receiver tolerance methodology to consider effects of different population distributions.

The MJSQ Technical Report is informative and advisory only. Certain contents of this document may be incorporated into the appropriate INCITS standards in the future.

2 Normative references

The following 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.

2.1 Approved references

[1] ISO/IEC 14165-115, *Information technology - Fibre channel - Part 115: Physical interfaces (FC-PI) [INCITS 352 -2002, Rev 13]*

[2] ISO/IEC 14165-116, *Information technology - Fibre channel - Part 116: 10 Gigabit fibre channel (10 GFC) [INCITS 364 -2003]*

[3] ISO/IEC 8802-3, *Information technology - Telecommunications and information exchange between systems – Local and metropolitan area networks – Specific requirements - Part 3: Carrier sense multiple access with collision detection (CSMA/CD) access method and physical layer specifications, Clause AE: Media Access Control Parameters, Physical Layer, Repeater and Management Parameters for 10 Gbit/s Operation (10 Gigabit Ethernet) [IEEE P802.3ae]*

2.2 Other references

All references in this subclause were correct at the time of approval of this Technical Report. The provisions of the referenced specifications, as identified in this subclause, are valid within the context of this Technical Report. The reference to a specification within this Technical Report does not give it any further status within ISO or IEC.

[4] ANSI INCITS 230 (R1999) - Fibre Channel - Physical and Signaling Interface (FC-PH)

[5] Synchronous Optical Network (SONET) Transport Systems: Common Criteria (GR-253-CORE, December 2005)

[6] ANSI T1.105, *Synchronous Optical Network (SONET) Basic Description Including Multiplex Structures, Rates and Formats*

[7] ANSI T1.105.06, *SONET: Physical Layer Specifications*

[8] OFSTP-4A (EIA/TIA-526-4) - Optical Eye Pattern Measurement Procedure