Fibre Channel
Methodologies for Jitter and Signal Quality Specification - MJSQ

1 Scope

MJSQ supersedes the previously published MJS technical report (NCITS TR-25-1999). MJSQ represents a significant advance over MJS and obsoletes some concepts documented in MJS.

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 signals 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, 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-GBaud serial transmissions for application to transports other than FC. Documenting high speed serial signal measurement methods provides encouragement to instrument companies to create compatible measurement systems and fixturing capable of supporting 1 GBaud 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.