



Intrinsic jitter in SDH regenerators

The generation of jitter in network elements is limited by recommendations such as the ITU-T G.958, which determines maximum values for SDH optical regenerators. With Victoria you can quantify this generation using its jitter analyzer and its capacity for measuring RMS jitter.



Application Note ANVAJWINT22E



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High frequency jitter and the input of an SDH network element may cause the clock of the incoming signal to be recovered incorrectly. This leads to an incorrect sampling of the signal in question and the appearance of bit errors. Likewise, a high amplitude of jitter may cause these errors to accumulate and eventually lead to signal frames being lost.

ITU and ANSI recommendations limit the amplitude of jitter present at any point in the network. *Interface jitter* is made up of the jitter transferred from the input to the output of the previous network element and the jitter generated intrinsically by the element itself. Both the transfer and generation of jitter must be restricted to prevent the interface jitter limit from being passed.

MEASURING INTRINSIC JITTER IN REGENERATORS

The recommendations ITU-T G.958 and ANSI T1.105-3 specify a limit for the amplitude of intrinsic jitter in SDH regenerators: This limit is $0.01 U_{I_{rms}}$ for all synchronous hierarchies. When intrinsic jitter is measured in network elements that generate an internal clock, such as multiplexers, no signal need be present at the input. Network elements like regenerators, however, obtain their reference clock from the incoming data signal (STM-N frame) and in this case a jitter-free incoming signal needs to be generated in order to avoid distorting the measurement results. For this reason, the intrinsic jitter in the signal generator/analyzer must be low, much lower than the intrinsic jitter to be measured.

The measurement should be set up as shown in the figure below:

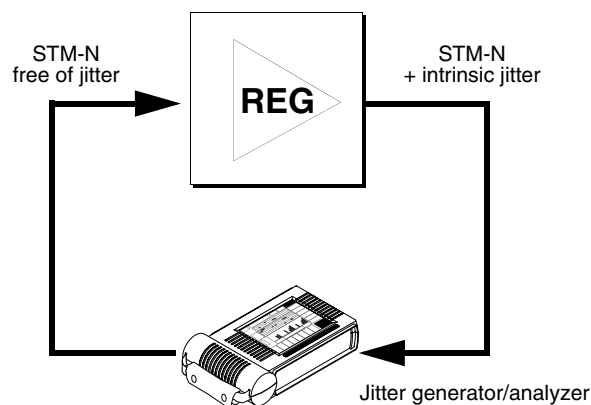
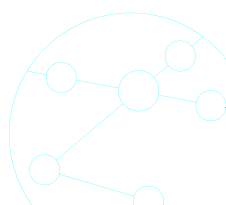


Figure 1

Measuring intrinsic jitter in a regenerator



PARAMETERS FOR MEASURING RMS JITTER

The duration of the measurement (integration period) for RMS jitter measurements is not defined in the recommendations, but the one defined for peak-to-peak measurements can be used instead, ie 60s. With regard to the measurement filters to be used, for RMS measurements the recommendations stipulate filters for each hierarchy, with a lower cut-off frequency of 12 kHz and a higher cut-off frequency depending on the hierarchical rate.

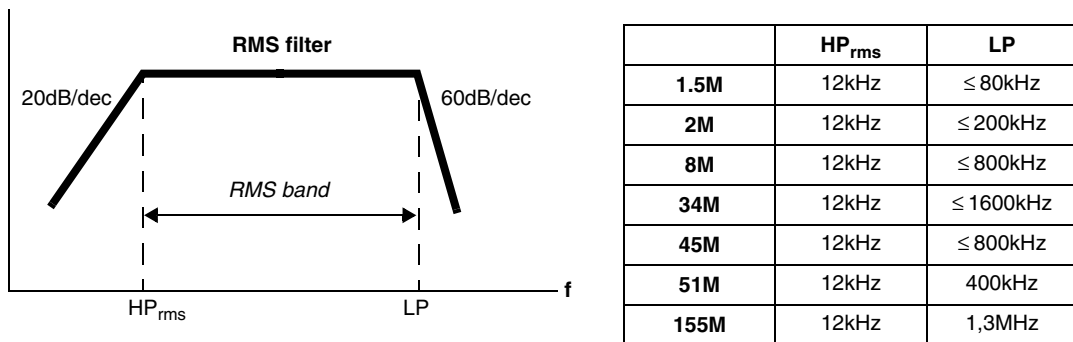
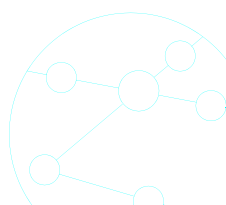


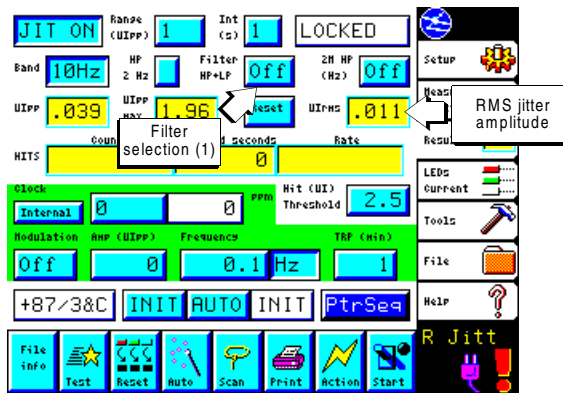
Figure 2 Measurement filters for RMS jitter amplitude: The synchronous interfaces are 51 and 155M.

MEASURING INTRINSIC JITTER WITH VICTORIA

Victoria¹ is a generator/analyzer that lets you perform all kinds of jitter measurements in plesiochronous and synchronous interfaces up to 155 Mbit/s in compliance with recommendations O.172 and O.171, which define the characteristics for this type of instrument. The internal clock of the generator is of sufficient quality to generate jitter-free signals, making it possible to use the measurement set-up shown above. The analyzer quantifies peak-to-peak jitter, maximum peak-to-peak jitter and RMS jitter, needed to compare the measurement results obtained with the limit of $0.01 U_{I_{rms}}$ set by the recommendations for synchronous interfaces. The measurement results are immediately shown on screen, including the RMS amplitude. This amplitude can also be presented in a time graph on the GUI of the instrument. Other features include the option of printing out or transferring results to a PC using files with a delimited text format (CSV)².

1. Victoria Jitter/Wander, ref. 3065C from Trend Communications
2. CSV: Comma Separated Values





Figure

3

Jitter results: RMS

Victoria allows different integration times (1, 10 and 60s) and RMS filters to be selected for these measurements. Simply by selecting a button, the RMS filter corresponding to the hierarchical rate of the signal being measured (see figure 2) is automatically programmed. □



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