



***Society of Cable
Telecommunications
Engineers***

**ENGINEERING COMMITTEE
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Measurement Procedure for Noise Power Ratio

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1.0 SCOPE

This procedure defines a method of measurement for Noise Power Ratio (NPR) of active Cable Telecommunications equipment. It is intended for measurement of 75-ohm devices having type "F" or 5/8-24 KS connectors. See SCTE 96 2008 *Cable Telecommunications Testing Guidelines* for a discussion of proper testing techniques.

This procedure uses a spectrum analyzer to measure the noise power in a narrow frequency band. Other means of measurement such as a narrow band filter followed by a power meter may be used as long as the results can be shown to correlate to this method.

2.0 INFORMATIVE REFERENCES

The following documents may provide valuable information to the reader but are not required when complying with this standard.

[SCTE 96] SCTE 96 2008 *Cable Telecommunications Testing Guidelines*

3.0 COMPLIANCE NOTATION

"SHALL"	This word or the adjective "REQUIRED" means that the item is an absolute requirement of this specification.
"SHALL NOT"	This phrase means that the item is an absolute prohibition of this specification.
"SHOULD"	This word or the adjective "RECOMMENDED" means that there may exist valid reasons in particular circumstances to ignore this item, but the full implications should be understood and the case carefully weighted before choosing a different course.
"SHOULD NOT"	This phrase means that there may exist valid reasons in particular circumstances when the listed behavior is acceptable or even useful, but the full implications should be understood and the case carefully weighed before implementing any behavior described with this label.
"MAY"	This word or the adjective "OPTIONAL" means that this item is truly optional. One vendor may choose to include the item because a particular marketplace requires it or because it enhances the product, for example; another vendor may omit the same item.

4.0 DEFINITIONS AND ACRONYMS

- 4.1 Noise Power Ratio (NPR) Test: A test method that examines the amount of noise and intermodulation distortion in a channel. A test signal, comprised of flat Gaussian noise band limited to the frequency range of interest and with a narrow band (channel) of the noise deleted by a notch filter or other means, is injected into the Device Under Test (DUT). The NPR is measured at the output of the DUT as the test signal is swept across a power range. See Figure 1 for an example of an NPR test signal.
- 4.2 Noise Power Ratio: The ratio of the signal power density to the power density of the combined noise and intermodulation distortion in the channel. Essentially, NPR is the depth of notch. The signal power density is defined with the entire passband filled with energy. The power density of the noise and intermodulation distortion shall be measured by removing signal power from a range of frequencies with a notch filter while maintaining constant total signal power at the DUT input.
- 4.3 Signal: In an NPR measurement, the injected noise is referred to as the “signal.”
- 4.4 Noise Region: The range of input powers where the power in the notch is dominated by thermal noise, laser RIN, shot noise, and other noise contributors that do not change with signal level. The noise region is on the left side of a dynamic range plot. In the noise region, NPR increases approximately 1:1 with an increase in input power.
- 4.5 Intermodulation Region: The range of input powers where the power in the notch is dominated by intermodulation noise. In a dynamic range plot this is evidenced by a rounding of the top of the curve. The intermodulation region is between the noise and clipping regions. If the distortion performance of the DUT is extremely good, the NPR curve will transition from the noise region to the clipping region with a minimal or no intermodulation region present.
- 4.6 Clipping Region: The range of input powers where the power in the notch is dominated by high order intermodulation noise caused by clipping. Clipping occurs when RF or optical devices are driven into an operating region in which the input-to-output transfer function is quickly reduced. The clipping region is on the right side of a dynamic range plot. In the clipping region, NPR decreases rapidly with an increase in input power. See Figure 2 for an example of a DUT output in the clipping region.
- 4.7 Dynamic Range: The range of input levels that produces a desired NPR.