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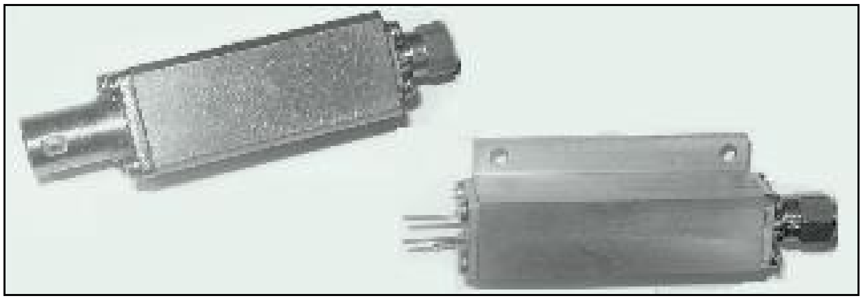
BROADBAND COAXIAL MICROWAVE NOISE SOURCES
1 MHz TO 26.5 GHz



DESCRIPTION

Micronetics' line of broadband coaxial noise sources are specially designed for easy integration into microwave systems. They are designed to be rugged with excellent long-term stability.

RUGGED/STABLE DESIGN:

The heart of Micronetics microwave noise source is a small chip and wire hermetic noise module. This is embedded in the housing with a precision launch to the coaxial jack. This design is much more stable and rugged than traditional coaxial noise sources which rely on pill packaged diodes and beryllium copper bellow assemblies which not only are less reliable, but use hazardous materials.

TEMP/VOLTAGE STABILITY:

The NST series noise sources all feature an embedded regulated driver which offers maximum stability of the noise diode RF circuit.

SPECIFICATIONS

- Operating Temp: -55 to +95°C
- Storage Temp: -65 to +125°C
- Supply Voltage: +15 VDC, +28 VDC
- Temperature Stability: 0.01 dB/°C
- Ouput Impedance: 50 ohm
- Peak Factor: 5:1

MEDIUM ENR BROADBAND COAXIAL MICROWAVE NOISE SOURCES

MODEL	FREQUENCY RANGE	RF OUTPUT ENR dB	STYLE CODE
NSL2	1 MHz to 1000 MHz	30 +/-1	N, N1
NST04*	10 MHz to 4 GHz	25 (min)	Y
NST18*	10 MHz to 18 GHz	25 (min)	Y
NST26*	100 MHz to 26.5 GHz	24 (min)	Y

LOW ENR BROADBAND COAXIAL MICROWAVE NOISE SOURCES

Micronetics low ENR noise sources feature a large value embedded attenuator ideal for Y-factor tests. The attenuator serves dual purposes of lowering the ENR to a suitable Y-factor amplitude and also improves both on and off state VSWR which increases noise figure measurement accuracy.

MODEL	FREQUENCY RANGE	ENR	VSWR	STYLE CODE
NSL2L	1 MHz to 1000 MHz	14 - 16 dB	1.3:1 (max)	N, N1
NST04L*	10 MHz to 4 GHz	14 - 16 dB	1.3:1 (max)	Y
NST18L*	10 MHz to 18 GHz **	13 - 17 dB	1.4:1 (max)	Y
NST26L*	100 MHz to 26.5 GHz	13 - 17 dB	1.6:1 (max)	Y

** TTL compatible*

*** 2 GHz to 18 GHz ENR range is 14-16 dB*

TAILORED ENR FOR YOUR NOISE FIGURE MEASUREMENT APPLICATION

Micronetics offers other ENR values upon request. The optimum ENR of the noise source is dependant on the expected noise figure of the DUT. If the expected noise figure is high, the measured difference of the off and on noise source states will be too hard to discern accurately with the DUT's comparatively large amount of self generated thermal noise. However if the expected noise figure is very low than using a noise source with too high a level of ENR will cause the two measured values to have such disparate amplitudes that non-linear dynamic range issues may compromise accuracy. Depending on how crucial the measurement uncertainty window needs to be, the designer can mathematically calculate the theoretical best ENR. This process can be exhaustive mathematically. *Table 1* indicates a quick rule of thumb for ENR vs. expected noise figure. It should be noted that any path loss between the noise source and DUT must be accounted for. If a 10 dB noise source makes sense for the DUT but there is a 10 dB coupler and 3 dB of insertion loss, than a noise source with a 20 - 25 dB ENR is needed.

Expected Noise Figure	Noise Source Nominal ENR
0 to 10 dB	5 dB
10 to 20 dB	10 dB
20 to 35 dB	15 dB

MICRONETICS NOISE PRODUCTS

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BROADBAND COAXIAL MICROWAVE NOISE SOURCES

CALIBRATION AND QUALITY ASSURANCE:

Each noise source is accurately calibrated using a reference noise source traceable to NIST/NPL Calibration data consists of calibration points at 1 GHz intervals across the fullband*. Data is supplied as a print out. Special calibration data can also be supplied upon request (consult factory).

Standard choices are:

- **More calibration points across the spectrum**
- **Special discrete calibration frequencies**
- **Data supplied in soft format as screen capture or text file on floppy or CD-ROM**

In addition to the calibration data, a certificate of calibration and a certificate of conformance is supplied with each unit.

** 100 MHz intervals for the NSL-2*

USING NOISE FOR BUILT-IN-TEST:

There are three primary uses for employing a noise signal for built-in-test.

1. **Noise Temperature (noise figure) or Sensitivity Testing:** This test uses the noise source to supply a known excess noise ratio (ENR) to a device under test for a Y-factor measurement. By taking two receiver readings, one with the noise on and one with it off, Y-factor can be determined. By knowing the ENR and Y-factor, one can calculate noise temperature (figure) or sensitivity.
2. **Frequency Response:** The noise source being broadband can be used as a replacement of a swept source to calculate frequency response of a receiver or other device. By putting in a known spectral signal at the input and taking a reading at the output, one can determine the gain or loss over frequency of the entire system. Noise sources are inherently extremely stable devices. In addition, the circuitry is much simpler than a swept source which increases reliability and lowers cost.
3. **Amplitude Reference Source:** The noise source can be used as a known reference signal. By switching in the noise source from the live signal, a quick test can be performed to check the health of the chain or calibrate the gain/loss. For this test, noise can be injected into the IF system to test/calibrate its chain as well as the RF.

For more information on using noise for built-in-test, read the Feb 2004 Microwave Journal article authored by Patrick Robbins of Micronetics.
http://www.micronetics.com/articles/microwave_journal_02-04.pdf

USEFUL NOISE EQUATIONS

Calculating Y-Factor:

$Y_{Fact} = N_2 / N_1$ *Where N_2 is measured power output with noise source on and N_1 is the measured power output with noise source off.*

Calculating Noise figure from ENR and Y-factor:

$NF(dB) = ENR\ (dB) - 10\ \log10\ (Y_{Fact} - 1)$

Converting ENR to Noise spectral density (N_0):

0 dB ENR = -174 dBm/Hz

Calculating noise power in a given bandwidth (BW) from noise spectral density:

$Power\ (dBm) = N_0 + 10\log(BW)$

HOW TO ORDER:

N S X X X X - X

Model (N S X X X X)

Bias Voltage (X)

A = +28V

B = +15V

MICRONETICS NOISE PRODUCTS