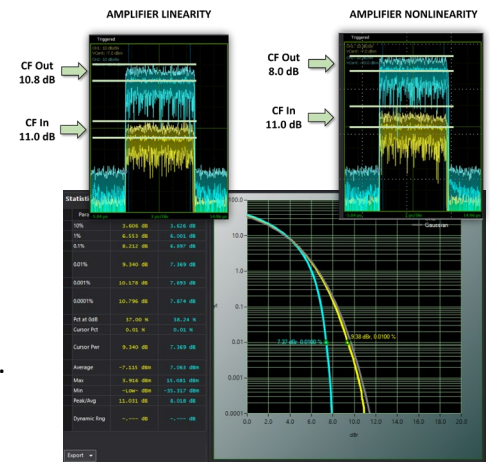


## High-power Amplifier Linearity Testing for Satellite Networks

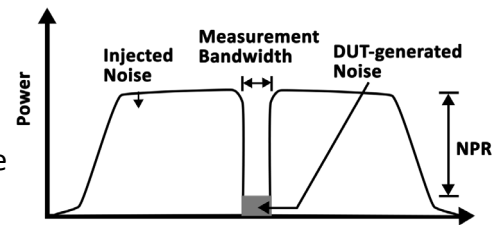
Linearity is a characteristic used to determine the behavior and performance of amplifiers, which are critical components for high-fidelity satellite communications. Linear amplifiers reproduce signal transmissions faithfully, while nonlinear amplifiers can introduce waveform distortions and reduce the satellite system's dynamic range.

Crest factor (CF) offers an accurate and cost-effective approach for linearity assessment. The CF method applies a band-limited additive white Gaussian noise (AWGN) waveform, which mimics multiple carrier signals, to an amplifier. Boonton RTP5000 Series Real-Time USB Peak Power Sensors observe the amplifier's input and output, with a large discrepancy between CFs indicating nonlinearities. For further insight, the complementary cumulative distribution function (CCDF) provides a statistical analysis of CF values.

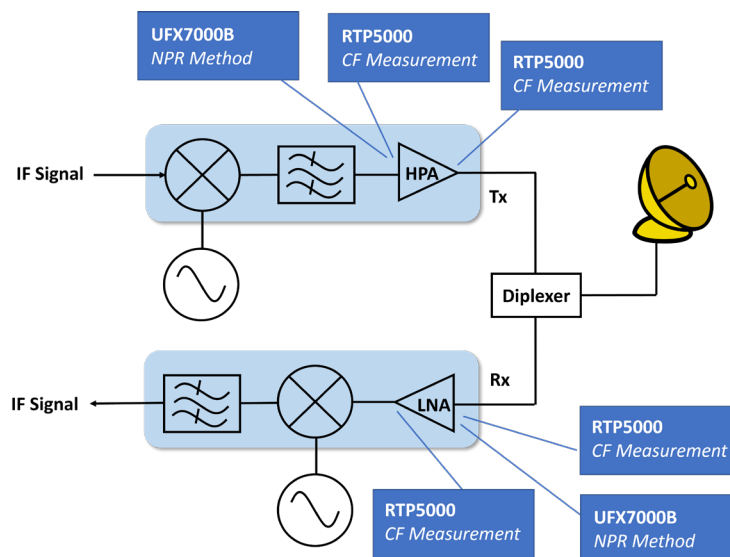
Another methodology for determining a satellite amplifier's linearity involves calculating the noise power ratio (NPR). The NPR method uses a notched, band-limited AWGN signal, which can be created by the Noisecom UFX7000B Programmable Noise Generator. As the AWGN signal passes through an amplifier under test, intermodulation distortion (IMD) products will gather at the notch frequency. NPR is determined by measuring the change in notch depth between the amplifier's input and output. A low NPR indicates a notable decrease in notch depth due to IMD.



**CF Measurements and CCDF**

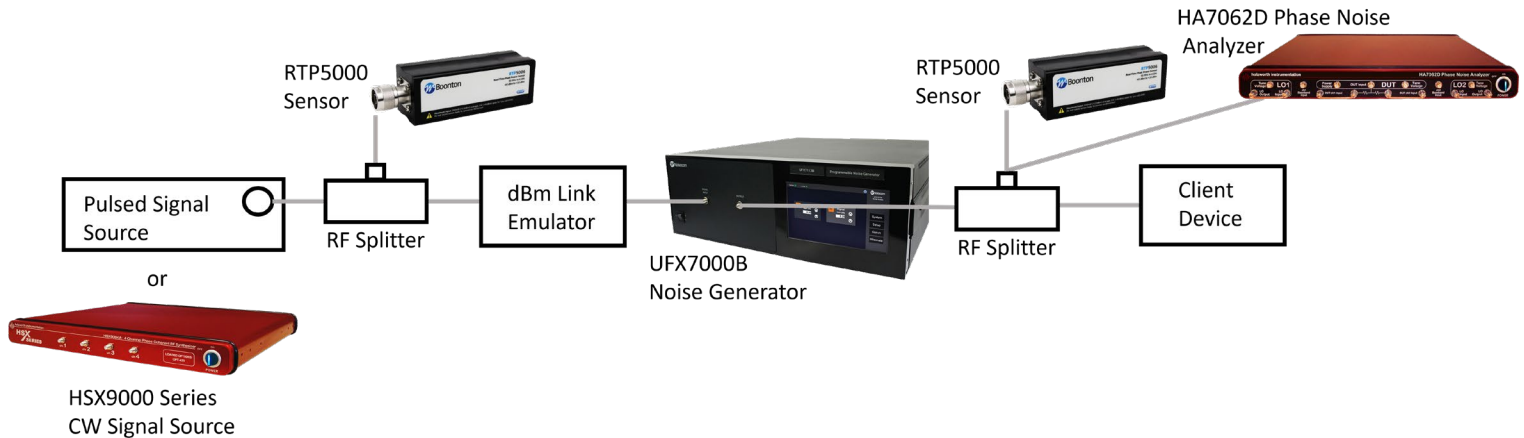


**NPR Method**



## SATELLITE 2023 Test Setup:

An RTP5000 Series sensor monitors the CF from the output of the signal source. The dBm link emulator contains the amplifier under test for this measurement setup, which can be distorted to show examples of nonlinear performance. Another RTP5000 Series sensor measures the CF of the signal that has passed through the amplifier for linearity analysis.



## Product Overviews:

### **Noisecom UFX7000B Programmable Noise Generator:**

The Noisecom UFX7000B Programmable Noise Generator has a powerful single board computer with a flexible architecture used to create complex custom noise signals for advanced test systems. Precision components provide high output power with superior flatness, and the flexible architecture allows control of multiple attenuators, switches, and filter banks.

### **Boonton RTP5000 Series Real-Time USB Peak Power Sensors:**

Boonton RTP5000 Series sensors deliver the fastest measurement rate of 100,000 measurements per second, 3 ns rise times, 195 MHz of video bandwidth, and 100 ps time resolution. Crest factor measurement capability can quickly establish if amplifiers are being driven into compression.

## More Resources:

Visit [info.wtcom.com/satellite-2023](http://info.wtcom.com/satellite-2023) to learn more about T&M solutions for satellite communications from Boonton, Holzworth, and Noisecom.