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Product Note No 22

High Order Intermod Load Pull Measurements

This measurement technique is used in order to characterize power transistors for multichannel transmission applications.
Both the MTS and CCMT Load Pull systems support this technique (N-IMD) and include drivers for most popular Spectrum Analyzers.
Load and Source Pull measurements of any combination of two high order Intermod products is possible using the N-IMD routine. The measured data can be processed to ISO contour plots.

Introduction

Two tone Intermod characteristics is a key criterion for the performance of digital cellular transceiver modules. It can be obtained as the ratio of the carrier wave power to the power included in the upper (and lower) intermod product.

The CCMT and MTS measurement software supports JDC measurements for Spectrum Analyzers with and without the JDC option.
In the first case the load pull software retrieves the final data from the spectrum analyzer and processes them to contour plots etc.
For Spectrum Analyzers without the JDC option we have developed a generic measurement algorithm that permits to measure the adjacent-channel power spectrum using User selectable parameters. The data are taken automatically for upper and lower channel of two sidebands simultaneously.
The distance of these channels from the carrier, the number and bandwidth of the sampling windows and the averaging factor can be pre-selected by the User.

This note describes the JDC measurement algorithm, setup and selectable parameters in a step by step manner.

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High Order Intermod Measurement Setup

The typical load pull setup used for High Order Intermod measurements includes two GPIB or manual signal sources (preferrably synthesizers) a GPIB spectrum analyzer, two programmable tuners, test fixture, bias tees, isolators and a power supply.

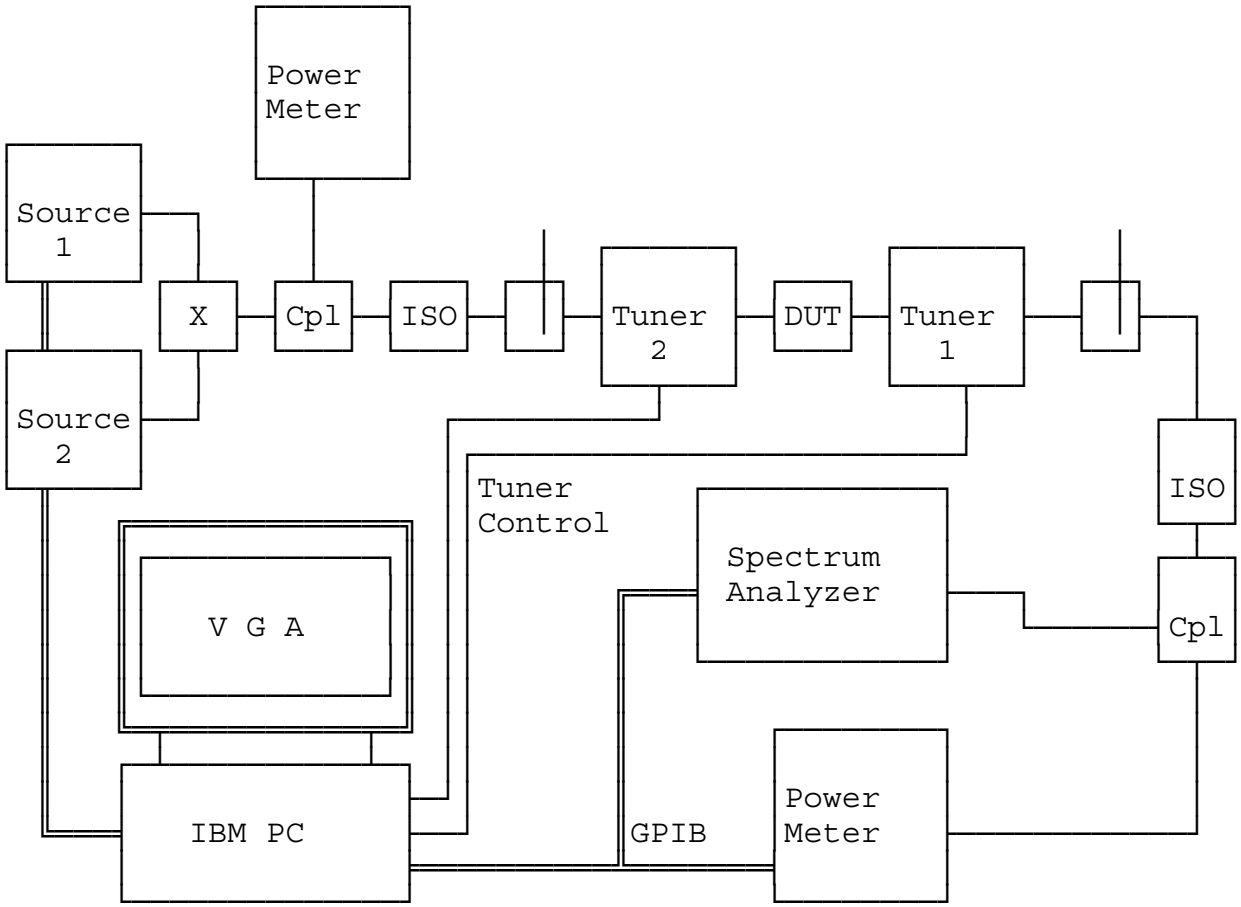


Figure 1: High Order Intermod load pull setup

Measurement Algorithm

There are two methods used:

-**Auto**:

The 'built in' software routines in the spectrum analyzers themselves, like the Advantest R3271 or Anritsu MS2602A, are used and the final results are processed as delivered by the analyzer. The only parameter adjustable by the operator in this case is the center frequency. The analyzer measures automatically the adjacent-channel leakage power at preset conditions, in general at 50 and 100 kHz below and above the carrier.

- Custom:

A specific measurement algorithm has been developed, which is compatible with spectrum analyzers without the JDC option. It permits to set markers, sample the channel power at distinct windows and integrate signal power in order to generate results equivalent to the automatic option.

In this case the User has control over the following parameters of the measurement procedure:

Adjacent-Channel Leakage Power Test	Default Value
- Center frequency	Tuner Frequency
- Sideband 1 Offset	50 kHz
- Sideband 2 Offset	100 kHz
- Frequency Step between Samples δf	1 kHz
- Number of Samples (per sideband) N	5
- Averaging Factor	2
- Settling Sweeps (before sample)	1

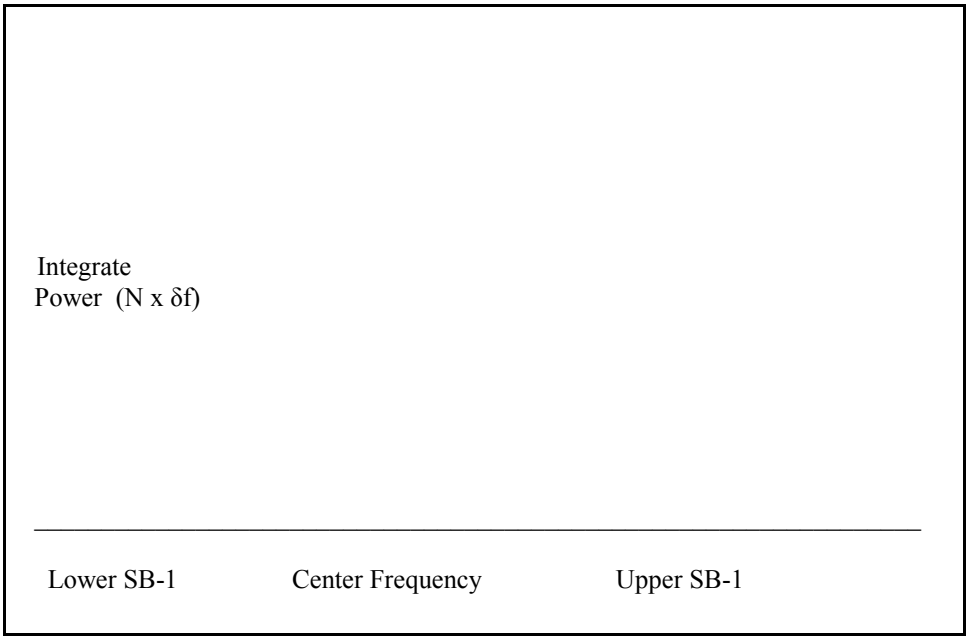
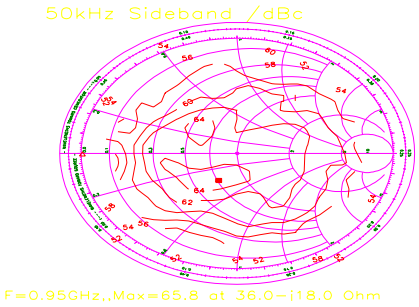


Figure 2: Adjacent-Channel Leakage Power measurement technique

The measurement itself follows the algorithm below:

1-	Take M settling sweeps to stabilize the response of the analyzer	
2-	Take full sweep (TS)	
3-	Set Marker at center frequency	
4-	Measure N-samples around the center frequency	
5-	Average (Integrate) power at center frequency (Carrier) = Pcf	
6-	Measure N-samples in Upper and Lower Sideband 1 (USB-1, LSB-1)	
7-	Average (Integrate) power at USB-1	= Pusb1, LSB-1 = Plsb1
8-	Measure N-samples in Upper and Lower Sideband 1 (USB-2, LSB-2)	
9-	Average (Integrate) power at USB-2 = Pusb2, LSB-2 = Plsb2	
10-	Compute	SPECTRUM-1 = Pcf - ½ (Pusb1 + Plsb1)
		SPECTRUM-2 = Pcf - ½ (Pusb2 + Plsb2)

Measurement Example



JDC contours measured using Custom software and Hewlett Packard 8562 spectrum analyzer