

Focus Microwaves Inc.

277 Lakeshore Road

Pointe-Claire, Quebec H9S-4L2, Canada

Tel 514-630-6067 Fax 514-630-7466

Product Note No 20

Adjacent-Channel Leakage Power Measurement - JDC

This measurement technique is used in the Digital Cellular Telecommunication technology.

Both the MTS and CCMT Load Pull systems support this technique (JDC) for Spectrum Analyzers with and without the JDC option incorporated.

Load Pull and Mouse triggered measurements of two adjacent channels can be measured for any Source/Load Impedance and processed to ISO contour plots.

Introduction

The adjacent-channel leakage power is a key criterion for the performance of digital cellular transceiver modules. It can be obtained as the ratio of the carrier wave power integral to the power included in the upper (or lower) adjacent channel.

Many modern Spectrum Analyzers come with a JDC (or Adjacent-Channel Power) routine "built in", which makes it very easy for the User to operate.

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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Adjacent-Channel Leakage Power Measurement Setup

The typical load pull setup used for JDC measurements includes a modulated signal source, a GPIB spectrum analyzer, with or without JDC option, two programmable tuners, test fixture, bias tees, isolators and a power supply.

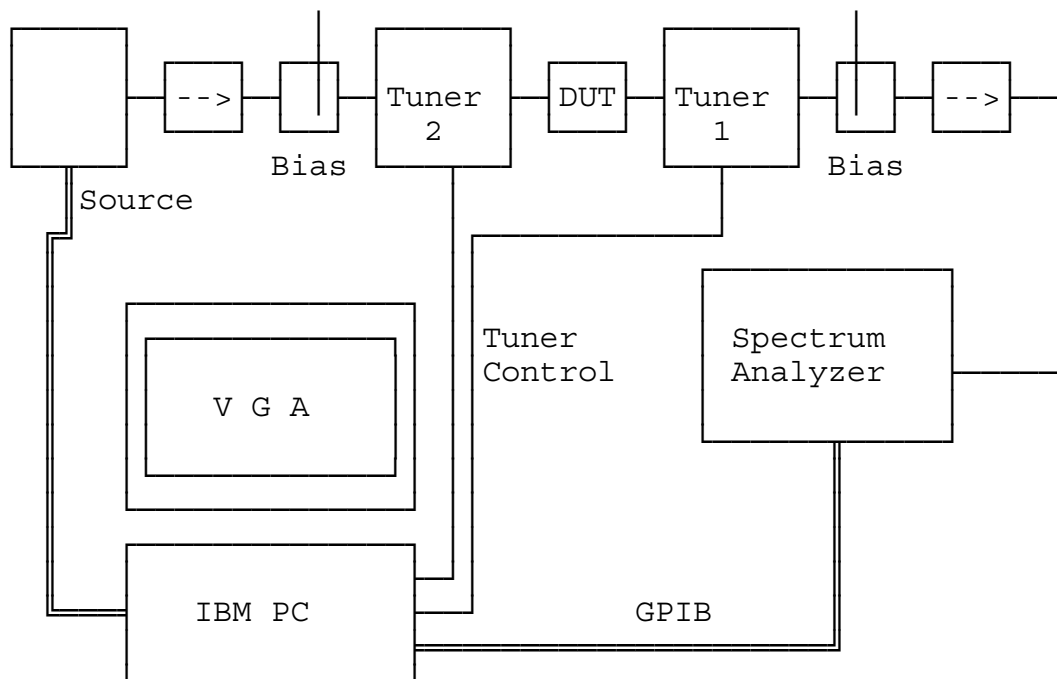


Figure 1: Adjacent-channel leakage power load pull setup

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	
- Type of Signal (Modul-Non Modulated)		0

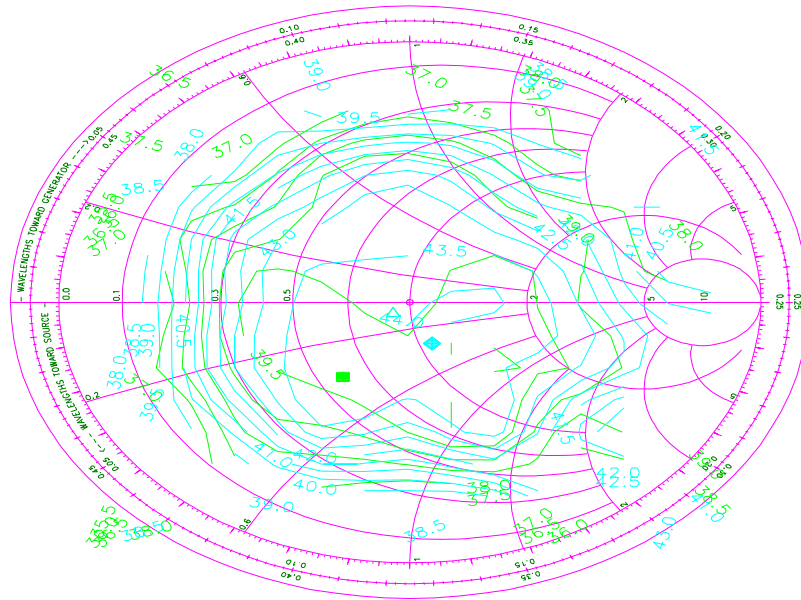
The measurement itself follows the algorithm below:

- 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 Total Signal Power (selectable between following options):
 - Unmodulated Signal: Signal Power = Peak Power.
 - Modulated Signal: Signal Power = Integral of Power or
 - Average Power: Signal Power = Average Power around Peak.
- 5- Measure N-samples in Upper and Lower Sideband 1 (USB-1, LSB-1)
- 6- Average (Integrate) power at USB-1 = P_{usb1} , LSB-1 = P_{lsb1}
- 7- Measure N-samples in Upper and Lower Sideband 2 (USB-2, LSB-2)
- 8- Average (Integrate) power at USB-2 = P_{usb2} , LSB-2 = P_{lsb2}
- 9- Compute
 - SPECTRUM-1 = $P_{cf} - \frac{1}{2} (P_{usb1} + P_{lsb1})$
 - SPECTRUM-2 = $P_{cf} - \frac{1}{2} (P_{usb2} + P_{lsb2})$

Measurement Example

JDC contours measured using Custom software and Anritsu MS-2602 spectrum analyzer

Adjacent Channel 30&50kHz



F=2.00GHz,,Max=41.0 at 29.6-j19.2 Ohm