RF Characterization Data

UBX

USRP™ Daughterboard

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Introduction

This document provides characterization data for the RF performance of the UBX Daughterboard. The UBX Daughterboard has a frequency range from 10 MHz to 6 GHz and bandwidth options of 40 or 160 MHz. Gain range for both RX and TX is 0-31.5 (the maximum RX gain seen in the tests of 37.5dB is due to the additional 6dB provided by the ADC in the USRP motherboard on top of the UBX's maximum gain). Measurements were taken with the UBX Daughterboard installed in an X-series USRP.

Data Presented

**Receiver (Freq: 50 MHz to 6 GHz, Gain: 0 to 37.5):**
- Gain
- IQ Imbalance
- DC Offset
- IIP3
- IIP2
- Noise Figure

**Transmitter (Freq: 50 MHz to 6 GHz, Gain: 0 to 31.5):**
- Output Power
- IQ Imbalance
- DC Offset
- OIP3
- OIP2

Chart Formats

For each direction (i.e., RX or TX), the data is presented in two ways:

**Fixed Gain, Sweeping Frequency**
In these charts, the gain is fixed to particular value, and the curves are plotted over the frequency range of the daughterboard.

**Fixed Frequency, Sweeping Gain**
In these charts, the frequency is fixed to a particular value, and the curves are plotted over the gain range of the daughterboard.

You can tell which format the chart is in by reading the title, which will indicate “Figure vs. Frequency” or “Figure vs. Gain”, and then provide the fixed setting for the independent variable.
RX Figure vs Frequency w/ Gain=2.50dB

The graph shows various parameters against frequency. The x-axis represents frequency in Hz, ranging from 500MHz to 6GHz. The y-axis represents All Figures in dB, with a range from -100dB to 80dB.

Key parameters marked on the graph include:
- Gain (brown line)
- IQ Balance (green line)
- DC Offset (red line)
- Input IP2 (blue line)
- Noise Figure (magenta line)

Each line indicates the performance of a particular parameter across the frequency spectrum.
RX Figure vs Gain w/ Frequency=350.00MHz
RX Figure vs Gain w/ Frequency=1100.00MHz
RX Figure vs Gain w/ Frequency=1350.00MHz
RX Figure vs Gain w/ Frequency=1950.00MHz
RX Figure vs Gain w/ Frequency=4650.00MHz
TX Figure vs Frequency w/ Gain=1.50dB

- Power
- IQ Balance
- DC Offset
- Output IP3
- Output IP2
- ** "Null" **
TX Figure vs Frequency w/ Gain=29.00dB

Frequency (Hz)

Power
IQ Balance
DC Offset
Output IP3
Output IP2
** Null **

All Figures (dB / dBm / dBm)
TX Figure vs Gain w/ Frequency=200.00MHz
TX Figure vs Gain w/ Frequency=550.00MHz
TX Figure vs Gain w/ Frequency=600.00MHz

The graph shows the relationship between Gain (dB) and various parameters such as Power, IQ Balance, DC Offset, Output IP3, and Output IP2. The x-axis represents Gain (dB) ranging from 0.00 to 37.50, while the y-axis represents different parameters with dB levels ranging from 0.00 to 100.00.
TX Figure vs Gain w/ Frequency=750.00MHz
TX Figure vs Gain w/ Frequency=3300.00MHz

- Power
- IQ Balance
- DC Offset
- Output IP3
- Output IP2
- "Null"
TX Figure vs Gain w/ Frequency=4150.00MHz
TX Figure vs Gain w/ Frequency=5050.00MHz

- **Power**
- **IQ Balance**
- **DC Offset**
- **Output IP3**
- **Output IP2**
- **Null**

The graph plots the relationship between Gain (dB) and All Figures (dBc/dbc) for different parameters at a frequency of 5050.00 MHz.
TX Figure vs Gain w/ Frequency=5900.00MHz