

Multipurpose Baseband Instrument

using AsAP Digital Signal Processing

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October 26th, 2009

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Multipurpose Baseband Instrument

Multipurpose Baseband Instrument



Instrument Modes

The multipurpose baseband instrument supports several different operation modes:

- 1 Spectrum Analyzer
- 2 Oscilloscope
- 3 Arbitrary Waveform Generator
- 4 Signal Source

The operation mode can be changed on-the-fly.

Instrument Specifications

Specification	RF Input	RF Output
Frequency Range	DC to 120 MHz	DC to 120 MHz
BW	120 MHz	120 MHz
Sample Rate	500 MS/s	500 MS/s
Waveform Memory	2 GB	2 GB
Impedance	50 Ω	50 Ω

Measurement Board Assembly

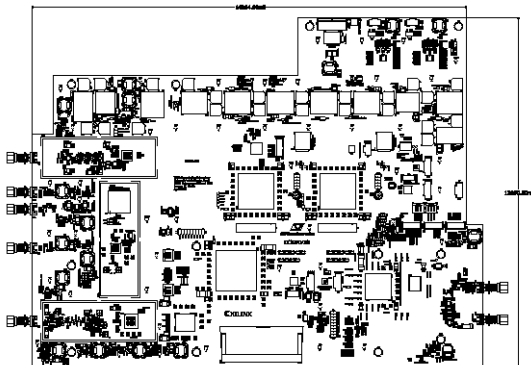


Figure: Measurement Board Assembly Top.

Measurement Board Information

The Measurement board contains:

- 2 AsAP ICs providing up to 500 GigaOps/sec of signal processing capability.
- 16-bit, 1GS/s Digital-to-Analog Converter.
- 12-bit, 500MS/s Analog-to-Digital Converter.
- Xilinx Virtex-5 SX50T
- QDR-II SRAM, 36Mbit, Burst of 4, 250MHz
- DDR2 SDRAM, 2GB, 250MHz

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AsAP DSP Tasks

- **4096-point Fast Fourier Transforms.**
- Window Filters: Hanning, Flattop, and Gaussian
- Signal Statistics: Minimum, Maximum, Average, Frequency.
- Magnitude, Phase, Magnitude Squared.

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Multipurpose Baseband IF Block Diagram

Baseband IF Block Diagram

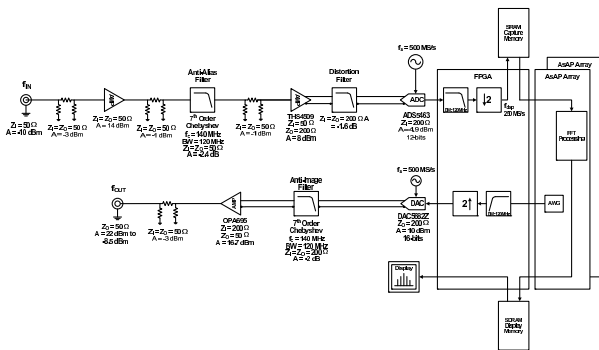


Figure: Instrument IF Block Diagram.

- $f_s = 500$ MS/s, $BW = 120$ MHz, and $f_{dsp} = 250$ MS/s.

Anti-Alias Lowpass Filter

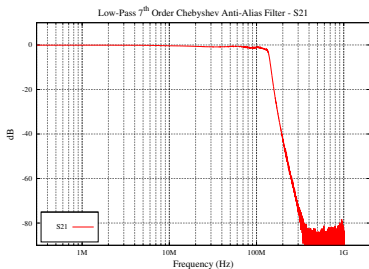


Figure: Frequency Response

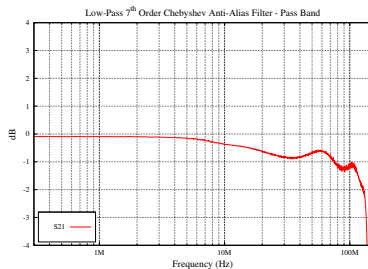


Figure: Pass-band Response

Digitized 100MHz Sine Wave

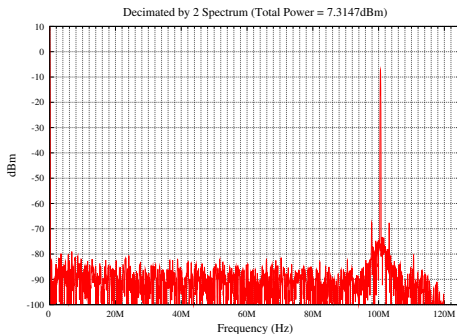


Figure: f_{in} : 100 MHz - Decimated-by-2.

Signal Generator

40MHz Sine Wave

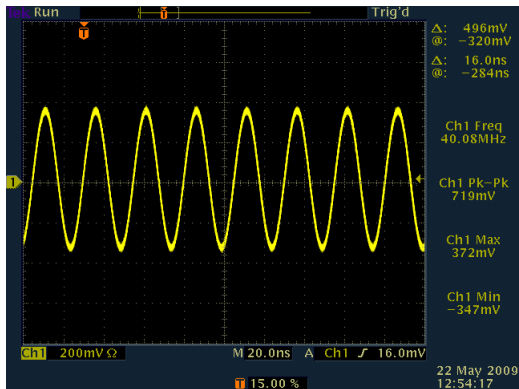


Figure: f_{out} : 40 MHz