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MicroTCA.4 Hardware Evaluation for wire scanner

SIS8300 + SIS8900

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Date	Revision	Description	Authors
October-2016	0.1	Initial draft.	Rafael A. Baron,
October	0.2	Added plots for lower amplitude signals and added filtered data	Rafael A. Baron,

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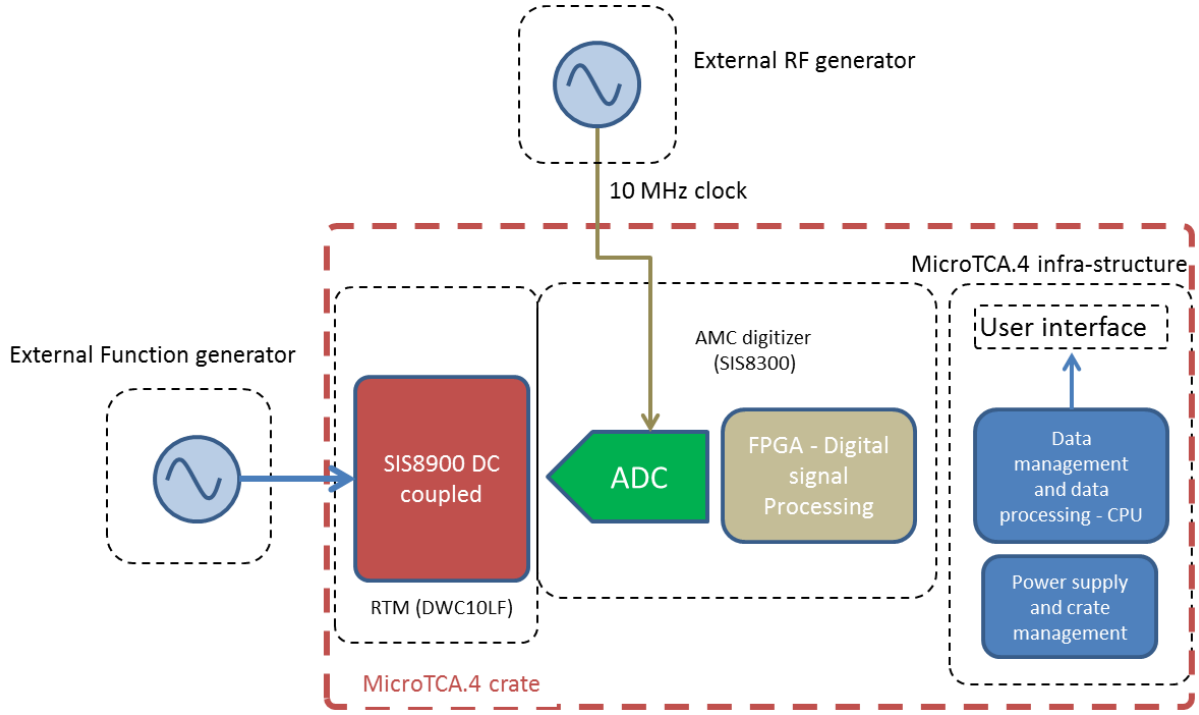
1. GENERAL INFORMATION

- **About the document:** Test Report for the MicroTCA.4 wire scanner hardware proposal based on the Struck hardware SIS8300 and SIS8900. External signals were applied to the hardware which is configured for DC-coupling. Time and frequency domain evaluation have been investigated for the DC-coupling configuration.

2. Hardware performance

2.1 Block diagram



2.2 Pulse tests

Pulse tests parameters:

Parameter	Value	Comments
Pulse width	5 us to 1 ms	6 ns rise and falling edge
Pulse amplitude	500 mV, from -250 mV to 250 mV	Approximate output voltage
ADC clock	10 MSPs	The sampling frequency can go up to 125 MSPs
Repetition rate	100 Hz	
Acquisition time	100 ms	

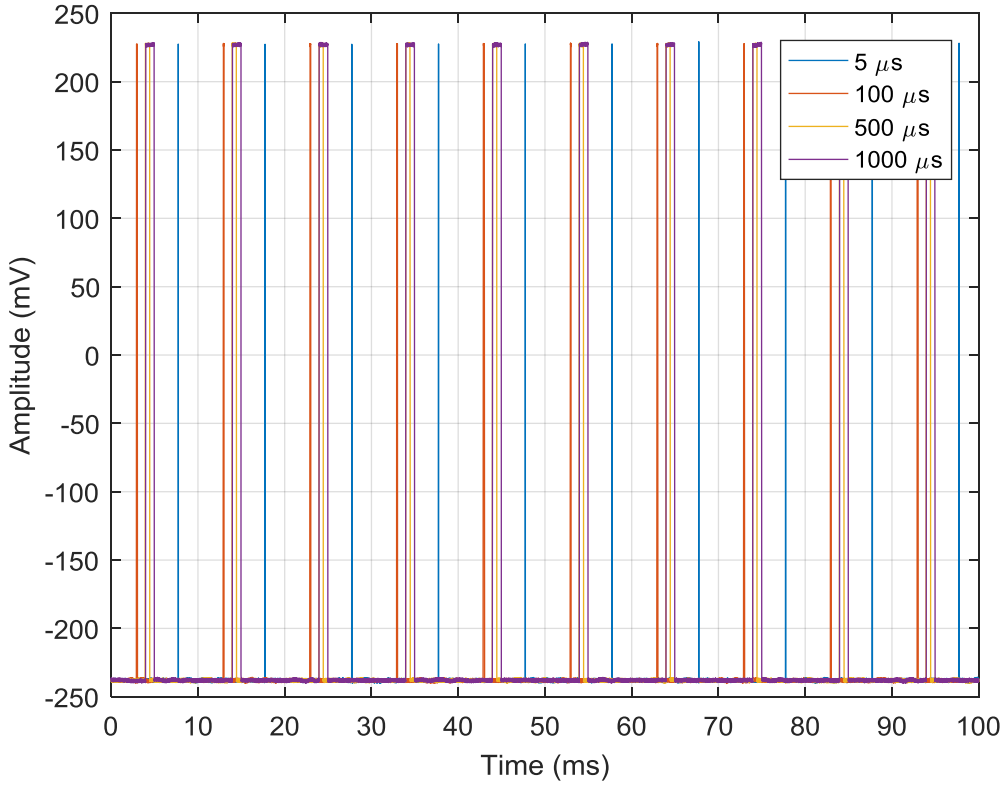


Figure: Acquisition of 100 ms of data for 100 Hz repetition rate and different pulse width. The pulse width is indicated on the legend.

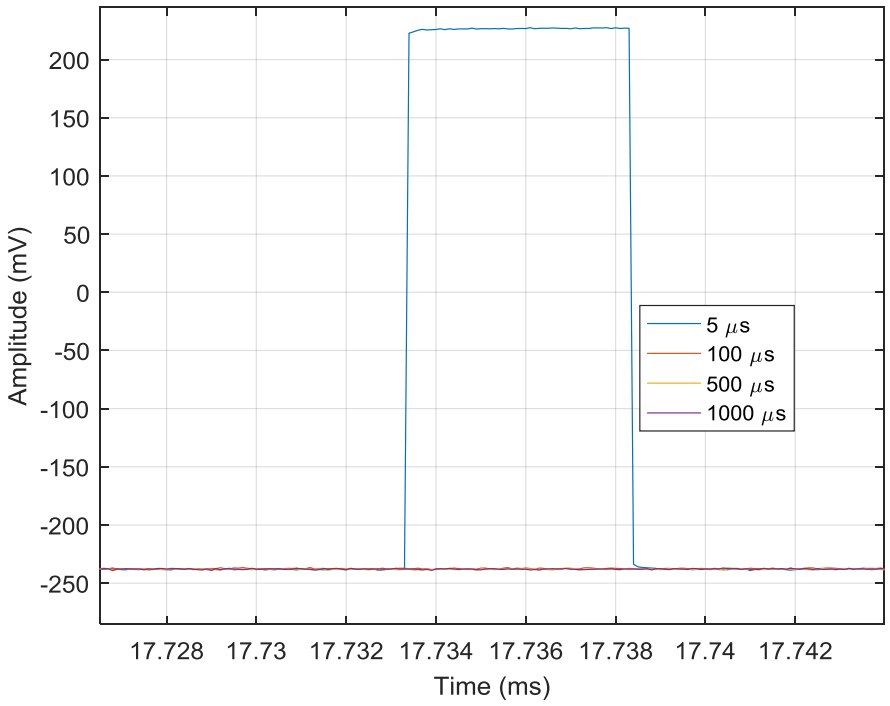


Figure: 5 us pulse width details

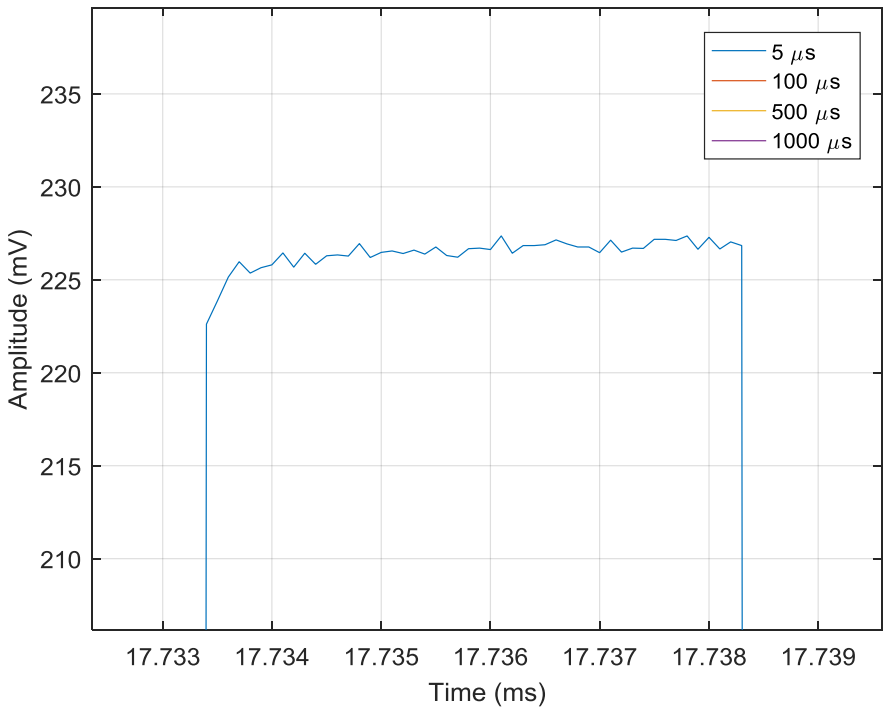


Figure: 5 us pulse width details

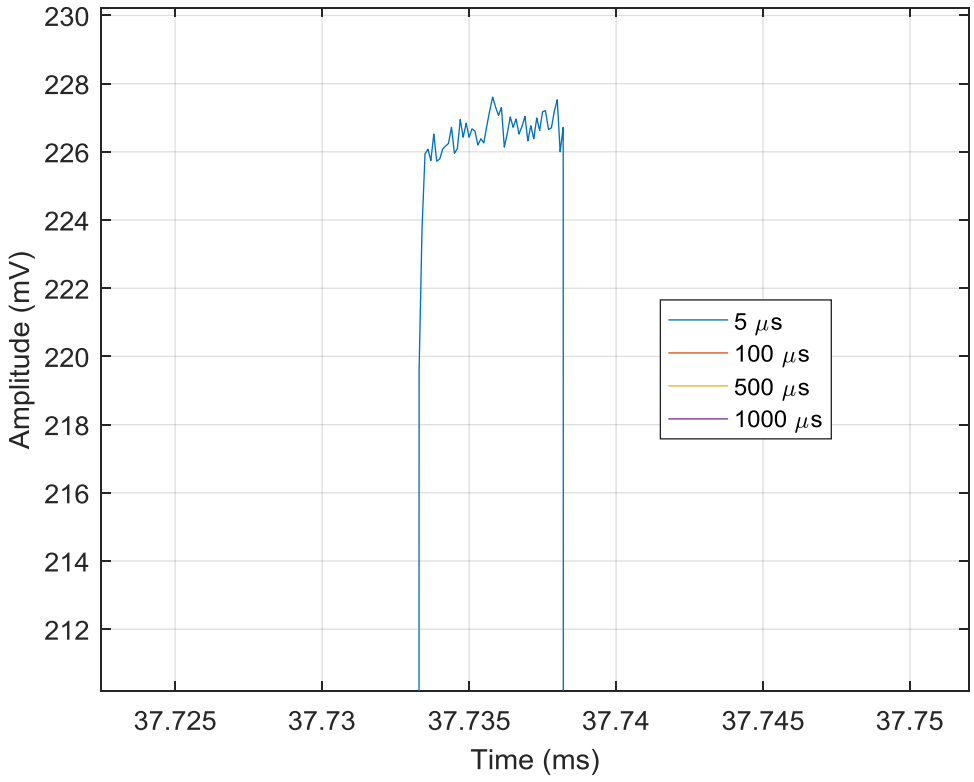


Figure: 5 us pulse width details

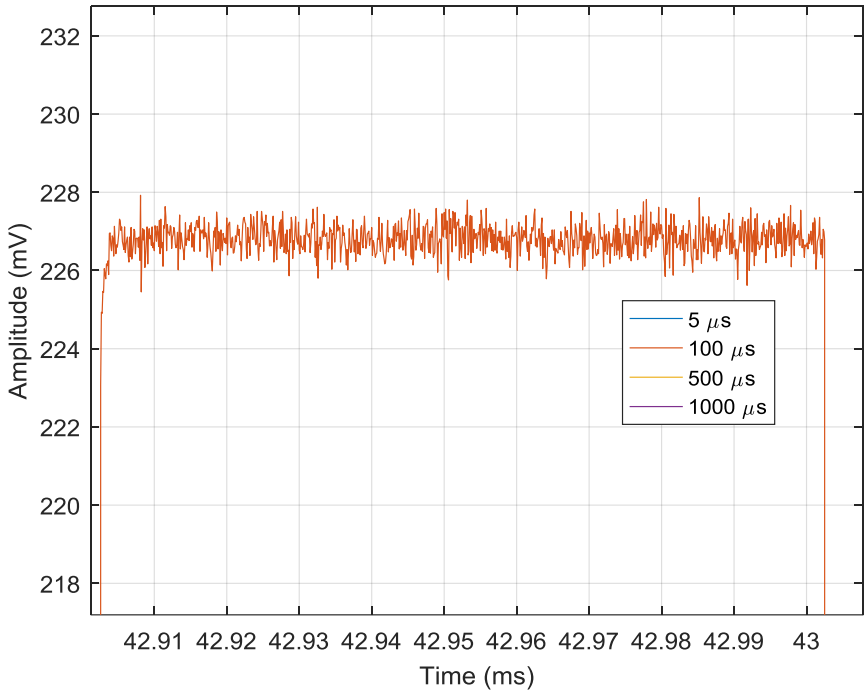
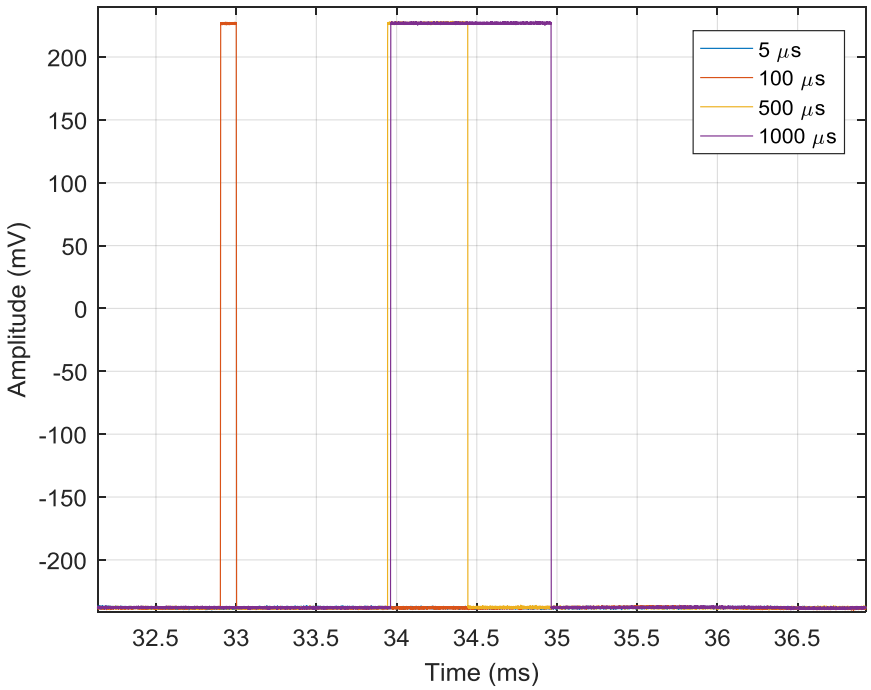


Figure: Details for the 100 us pulse



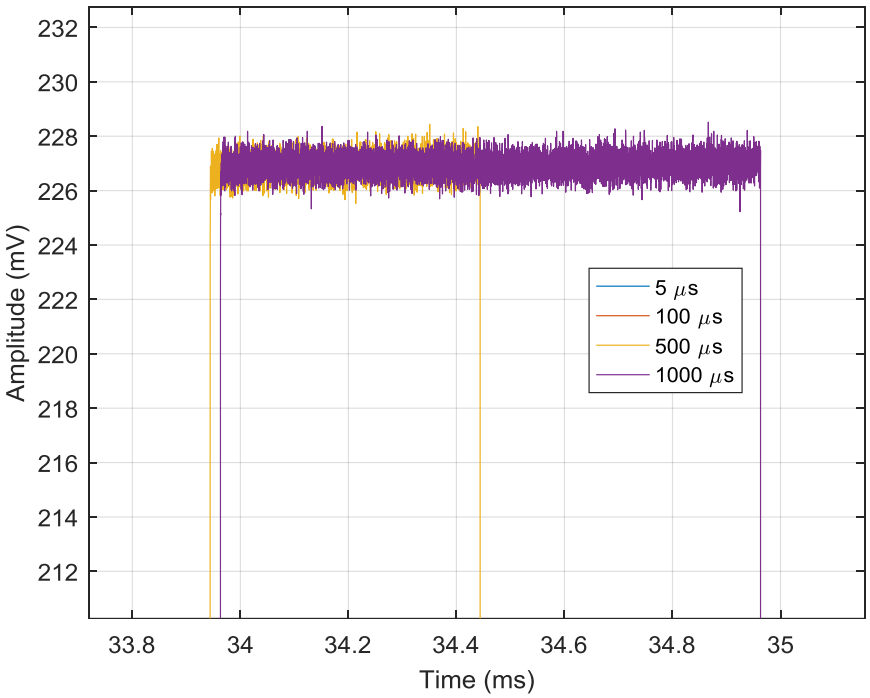


Figure: Details for the 1000 us pulse

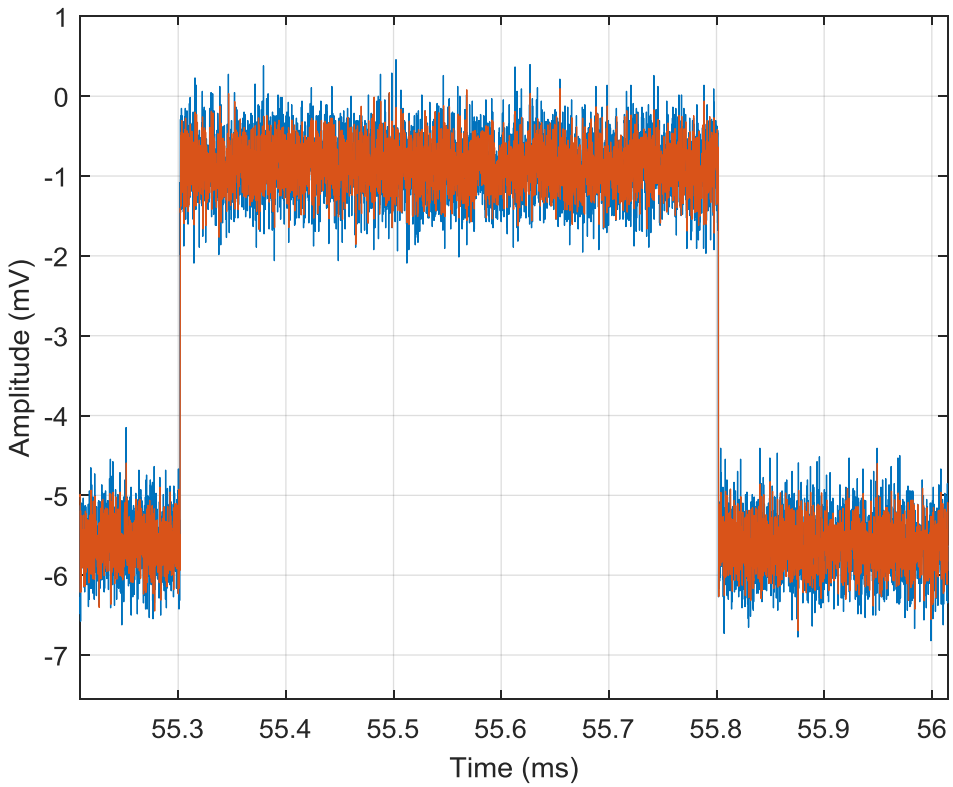


Figure: 500 us pulse, 5 mV amplitude, full-bandwidth.

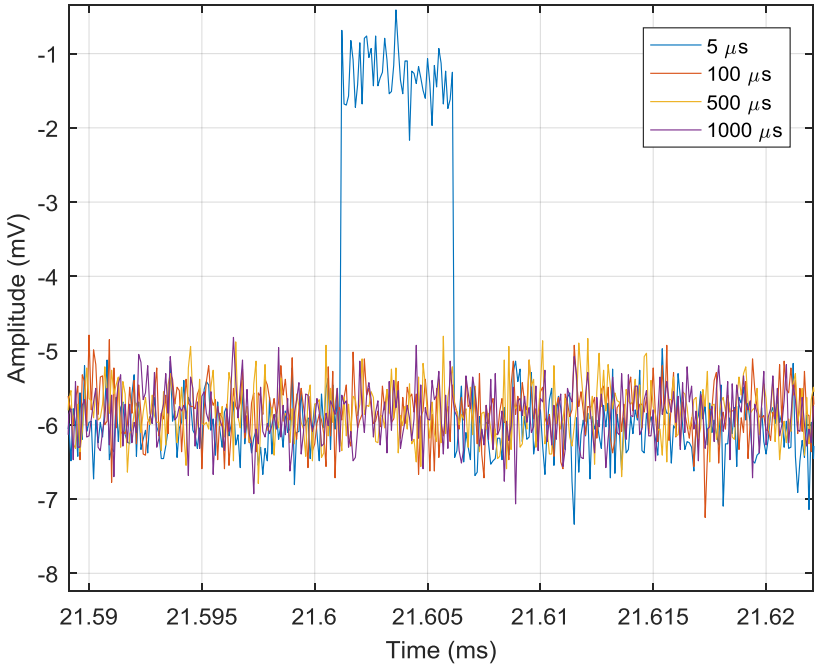


Figure: 5 us pulse, 5 mV amplitude, full-bandwidth.

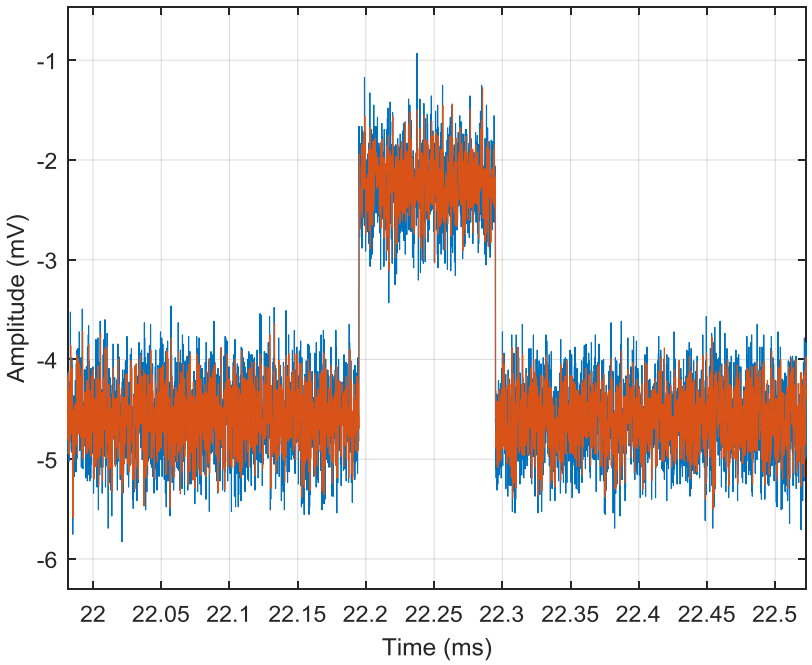


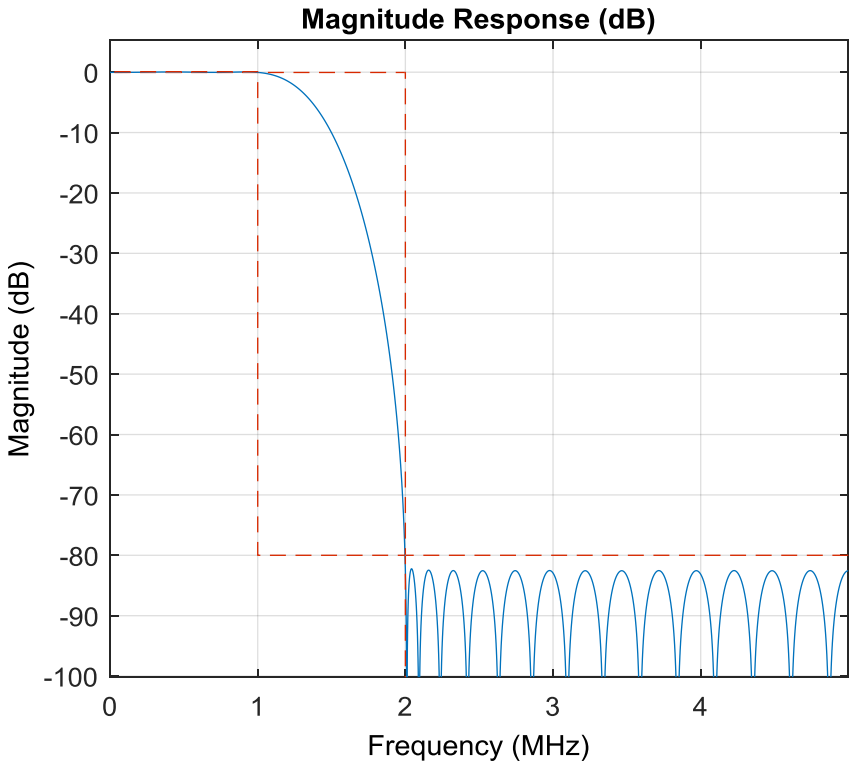
Figure: 100 us pulse, 2 mV amplitude, full-bandwidth.

2.3 Low pass filter 1 MHz bandwidth applied to the data

The SIS8300 and SIS8900 boards are configured for ~30 MHz bandwidth and higher frequency noise couple and alias from higher frequency components to the first one. A Low pass filtering was applied to the data in order to evaluate the performance improvement:

- Table: Low pass filter characteristics.

Parameter	Value	Comments
Filter bandwidth (3 dB)	1 MHz	
Filter stopband	2 MHz	
Passband ripple	0.1 dB	
Stopband attenuation	80 dB	
Sample rate	10 MSPs	



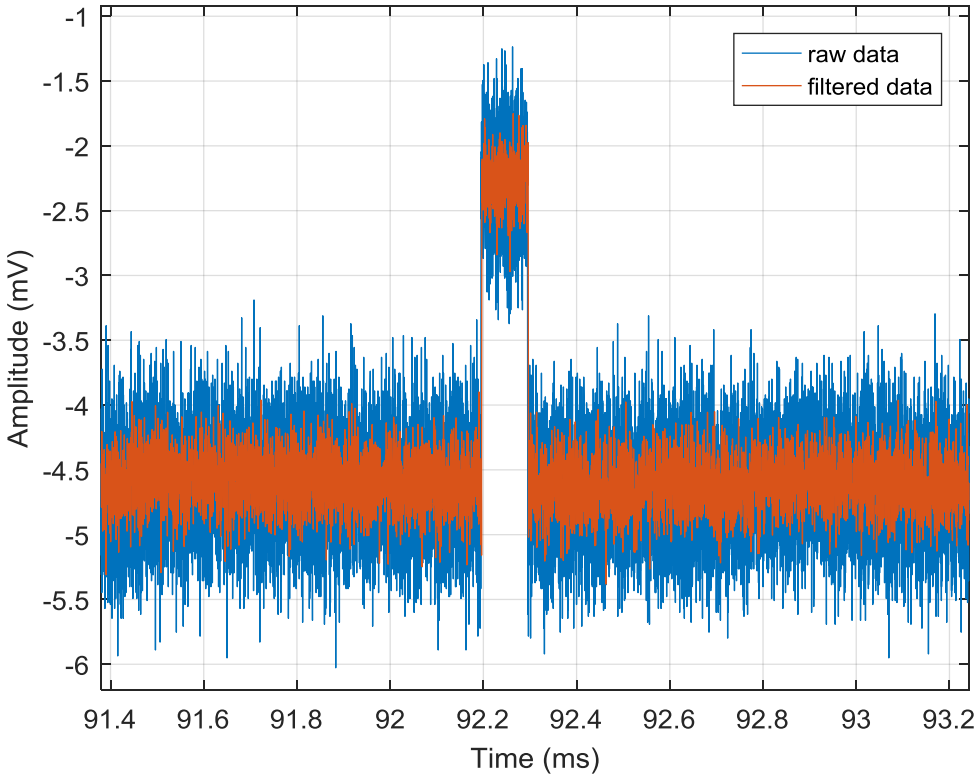


Figure: Example of raw data and filtered data. The pk-pk noise can be minimized to 0.5 mV pk-pk if the data is filtered.

2.4 Frequency domain evaluation

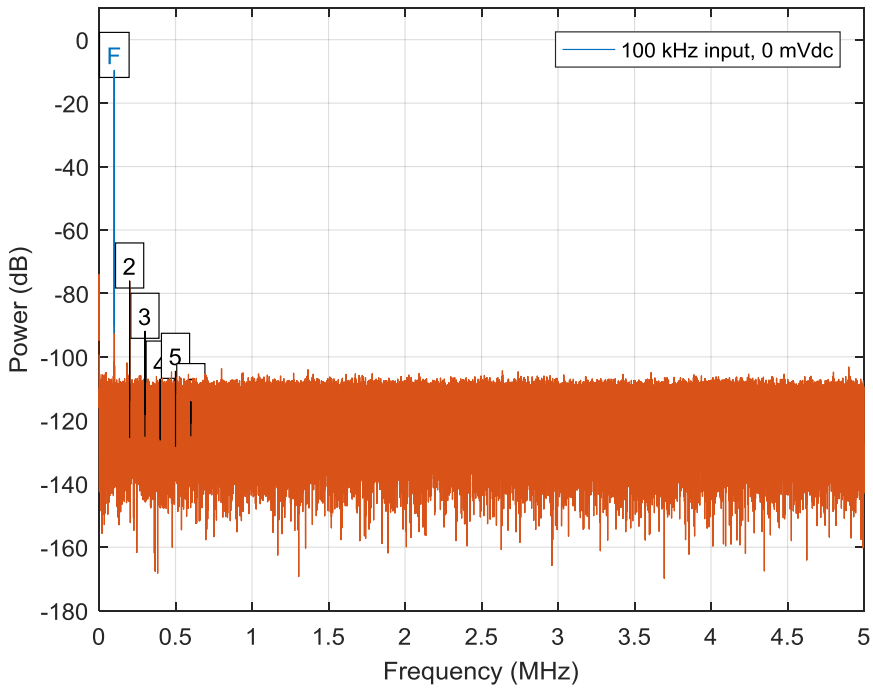
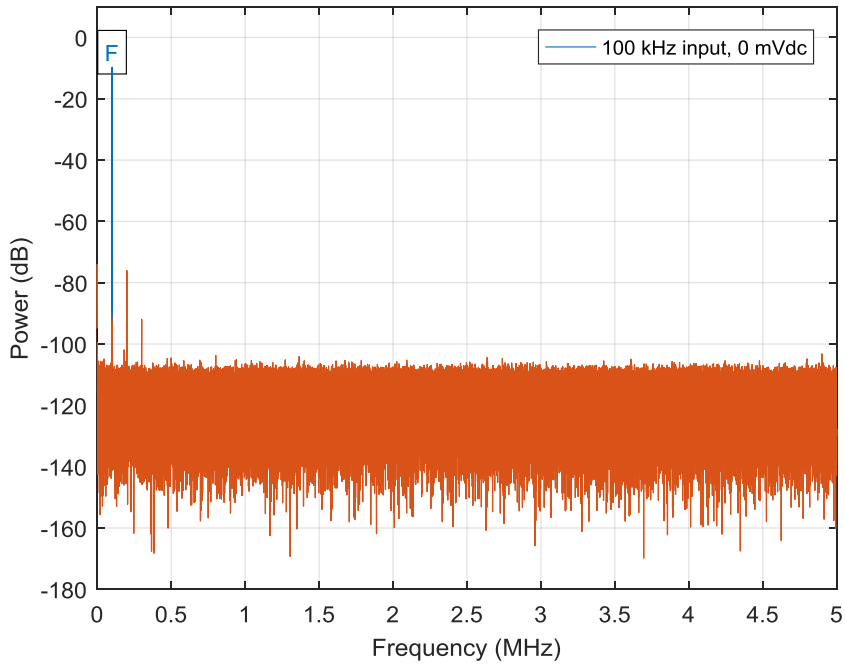
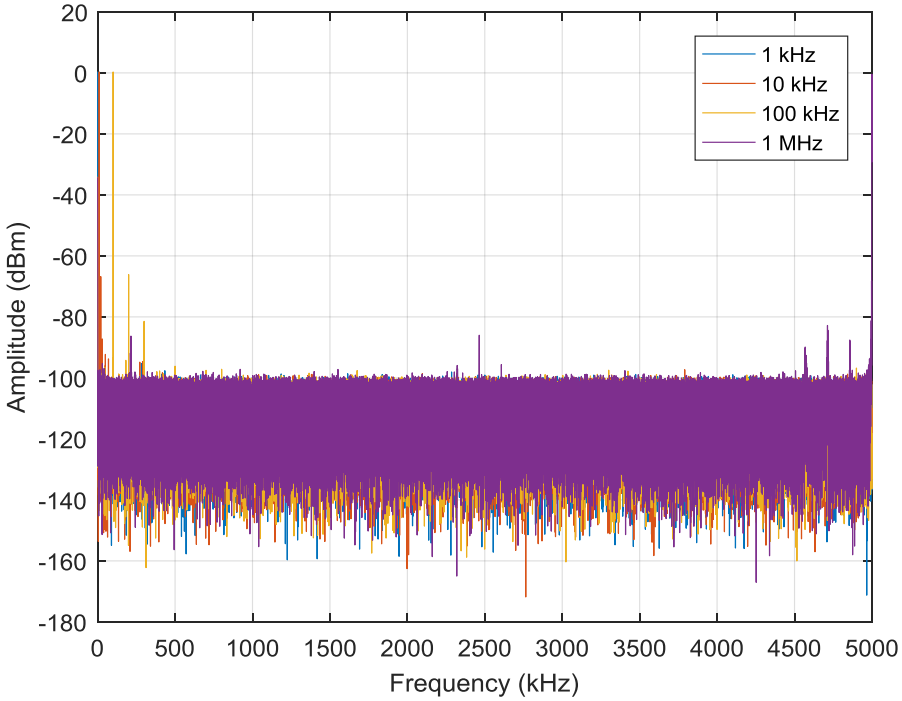


Figure: the first 5 harmonics are shown in the plot.


F
100 kHz input, 0 mVdc
Power (dB)
0
-20
-40
-60
-80
-100
-120
-140
-160
-180
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
Frequency (MHz)


1 kHz
10 kHz
100 kHz
1 MHz
Amplitude (dBm)
20
0
-20
-40
-60
-80
-100
-120
-140
-160
-180
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
Frequency (kHz)

- Table: Specifications for theSIS8300+SIS8900 DC coupled electronics[1].

Parameter	Value	Comments
SNR	65 dB	100 kHz input frequency, 10 MSPs. Increasing the sampling frequency to 80 MSPs, it might be possible to increase the SNR around 10 dB.
SFDR	76 dB	100 kHz input frequency. The generator is also contributing to the SFDR.
SINAD	65 dB	100 kHz input frequency
ENOB	~12.6 bits	100 kHz input frequency, 10 MSPs
Noise floor	~ -100 dBm	100 kHz input frequency
Full-Bandwidth (3 dB)	>5 MHz	10 MSPs ADC sampling rate. Limited measurement by the sampling rate. According to specifications, the bandwidth is around 30 MHz.
Noise pk-pk	~1 mVpp	Full-bandwidth
Noise pk-pk	~ 0.5 mVpp	1 MHz bandwidth

[1] The frequency domain response is limited by the function generator performance. If more accurate measurements are needed, higher performance equipment must be used.