APPLICATION NOTE

Using the SV7C as a White Noise Generator

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Agenda

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Context

- There is a need to create a jitter tolerance test with an additional white noise source.
- Can the SV7C help with this test?

Using the Built-In White Noise Generator

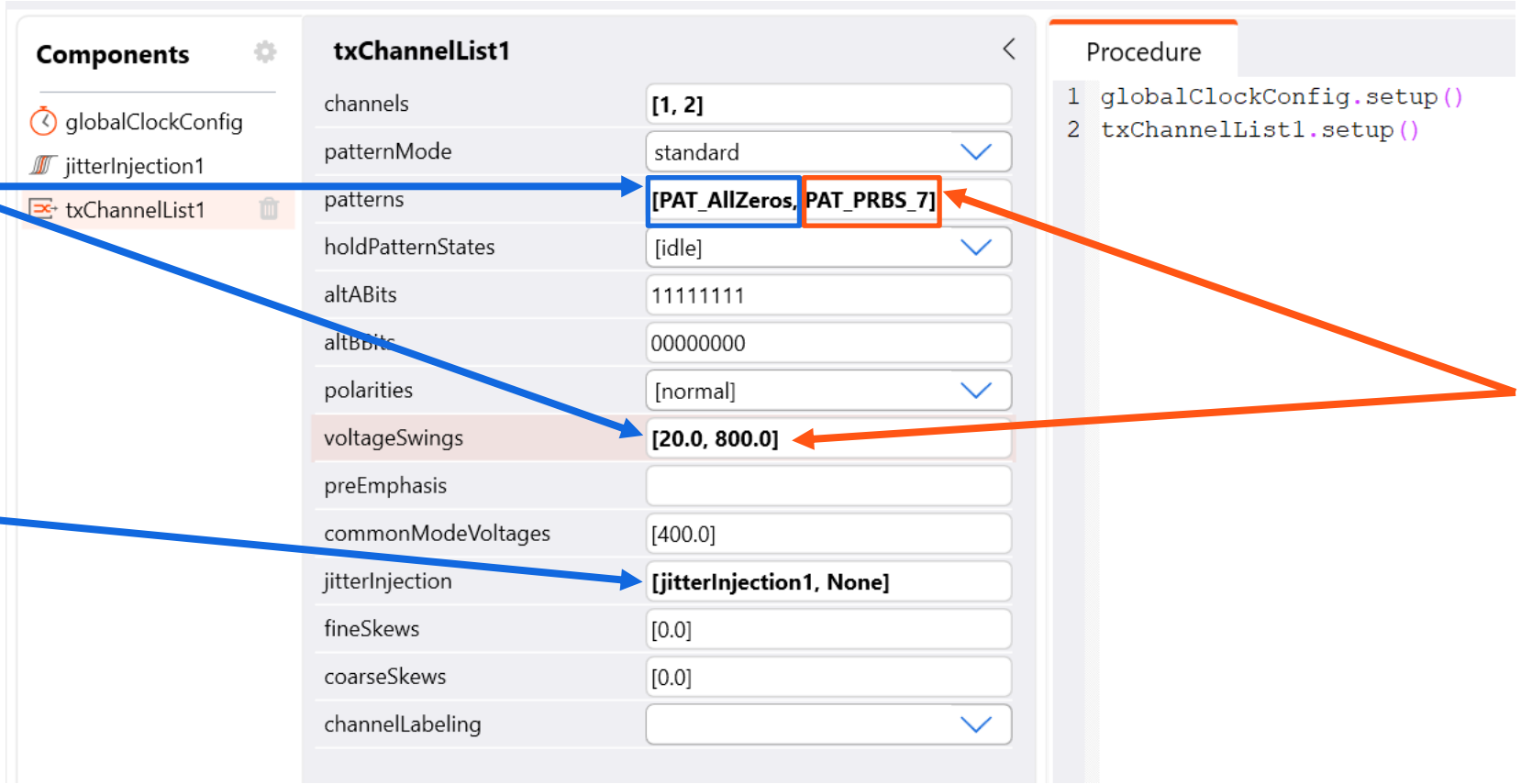
- The SV7C has a common-mode noise injection circuit.
- This circuit adds noise on top of a playing pattern.
- If you set the playing pattern to be an all zero pattern with minimum voltage swing, then the built-in white noise generator can be used as a stand-alone white noise source.

Using the Built-In White Noise Generator

EXAMPLE

Channel 1 appears as being idle (playing all zeros pattern at minimum amplitude).

But channel 1 has the noise source enabled, so there will be noise on the output.



Channel 2 is used as a normal pattern source.

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Using the Built-In White Noise Generator

- An alternative way to separate channels is to create two channel lists:
  - txChannelList1 plays only the noise signal
  - txChannelList2 plays only the digital pattern

- Additionally, the SV7C supports an “idle” pattern mode. So, you can use it instead of playing all zeros with low amplitude.

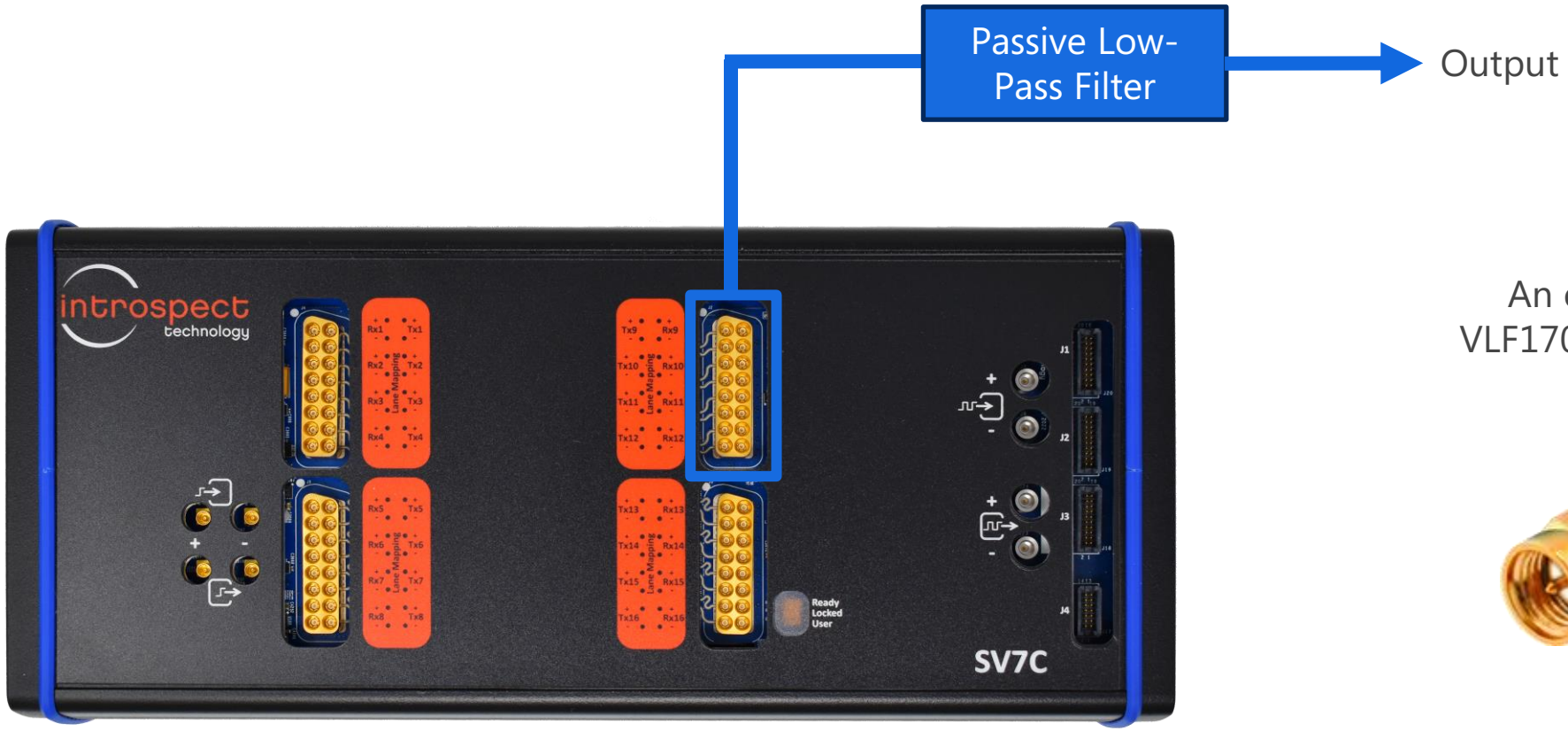
Limitations of the Internal Generator

- The internal generator has a limited amplitude range of 25-50 mV pk-to-pk.
- So, the next slides show an alternative solution with much higher amplitude range for the white noise generator.

Creating a Stand-Alone White Noise Generator

- Since the SV7C has a very wide bandwidth on the pattern generator, a method of implementation for generating a stand-alone white noise generator is described in the following slides.

Hardware Setup



An example filter is the VLF1700+ from Mini-Circuits

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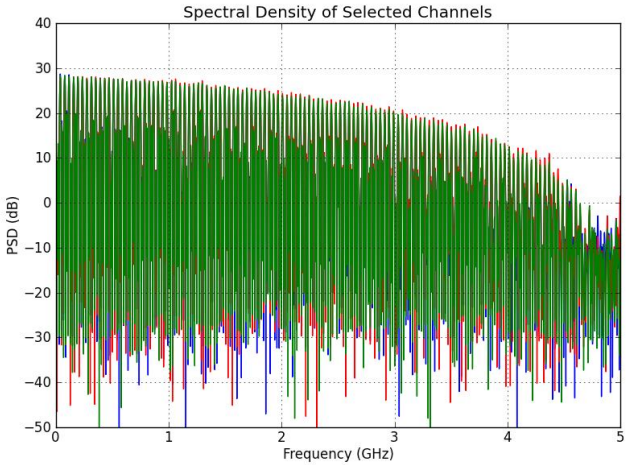
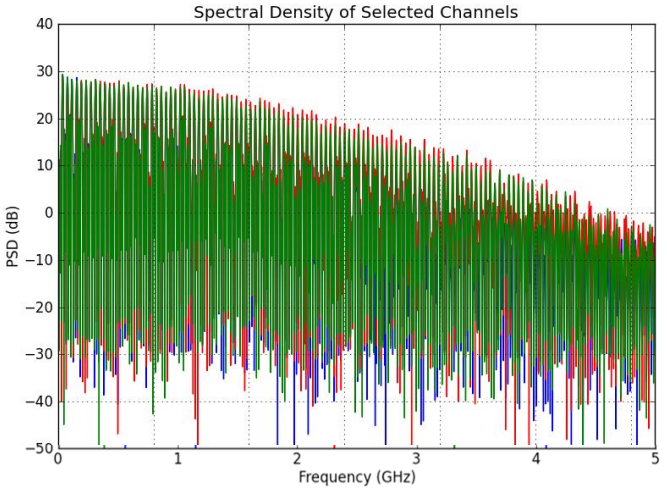
Principle of Operation

Play a PRBS31 pattern at the maximum speed of the SV7C.



Filter the pattern with a sharp cut-off solution.



The spectrum of PRBS31 is white by design (in the discrete domain).
By running it at high speed and filtering it, we convert it to an analog white-noise signal.

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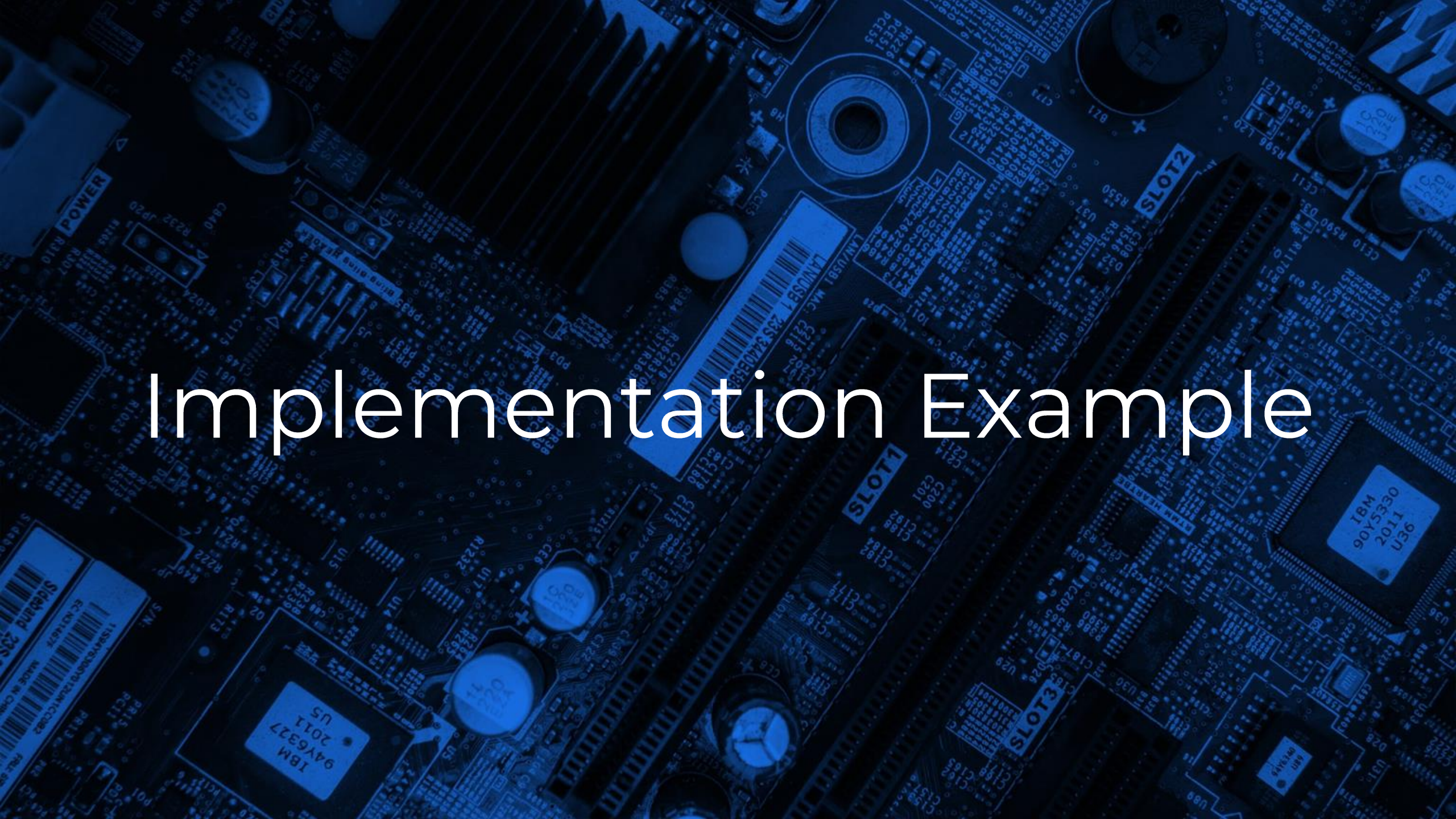
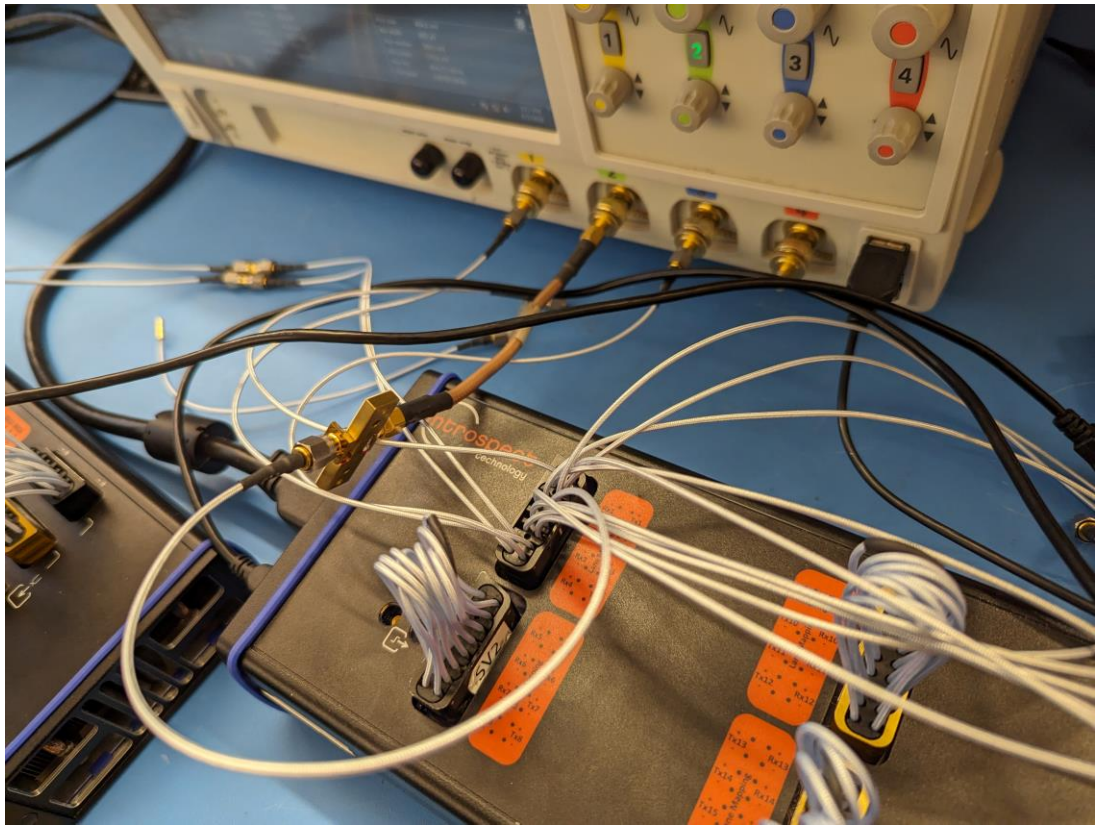
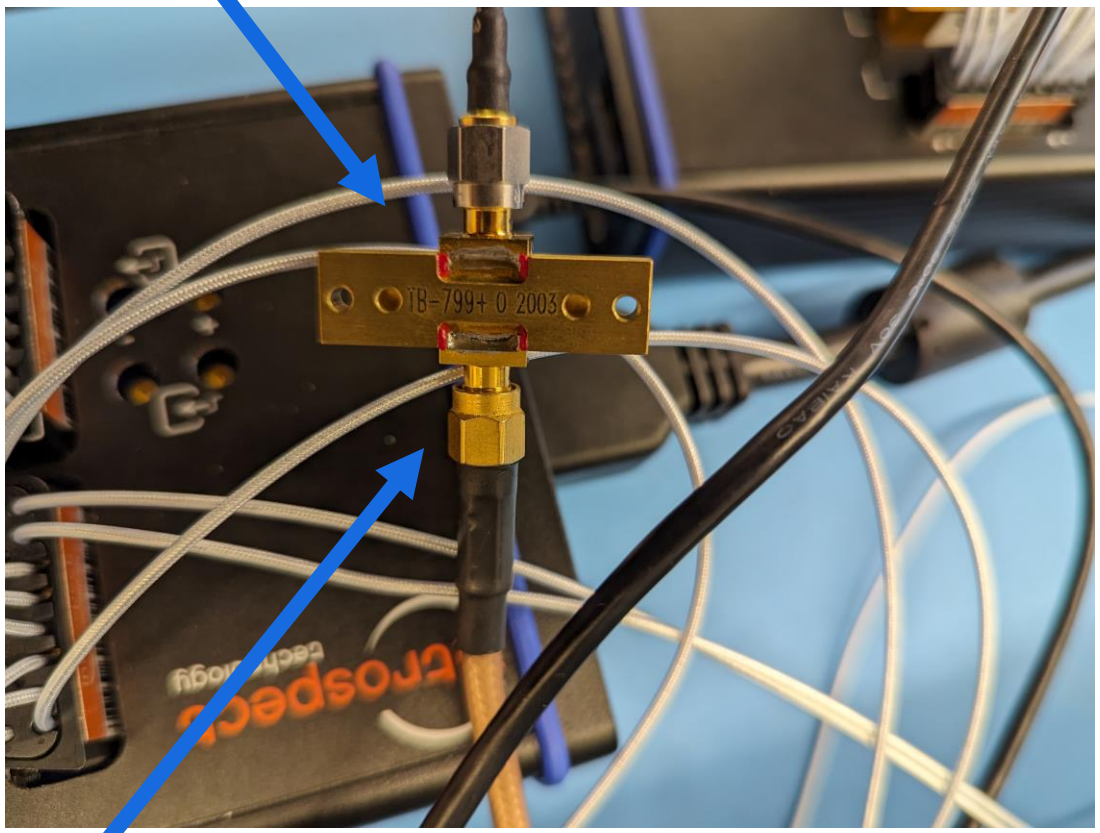


Implementation Example

Setup

1.5 GHz passive filter
from Mini-Circuits





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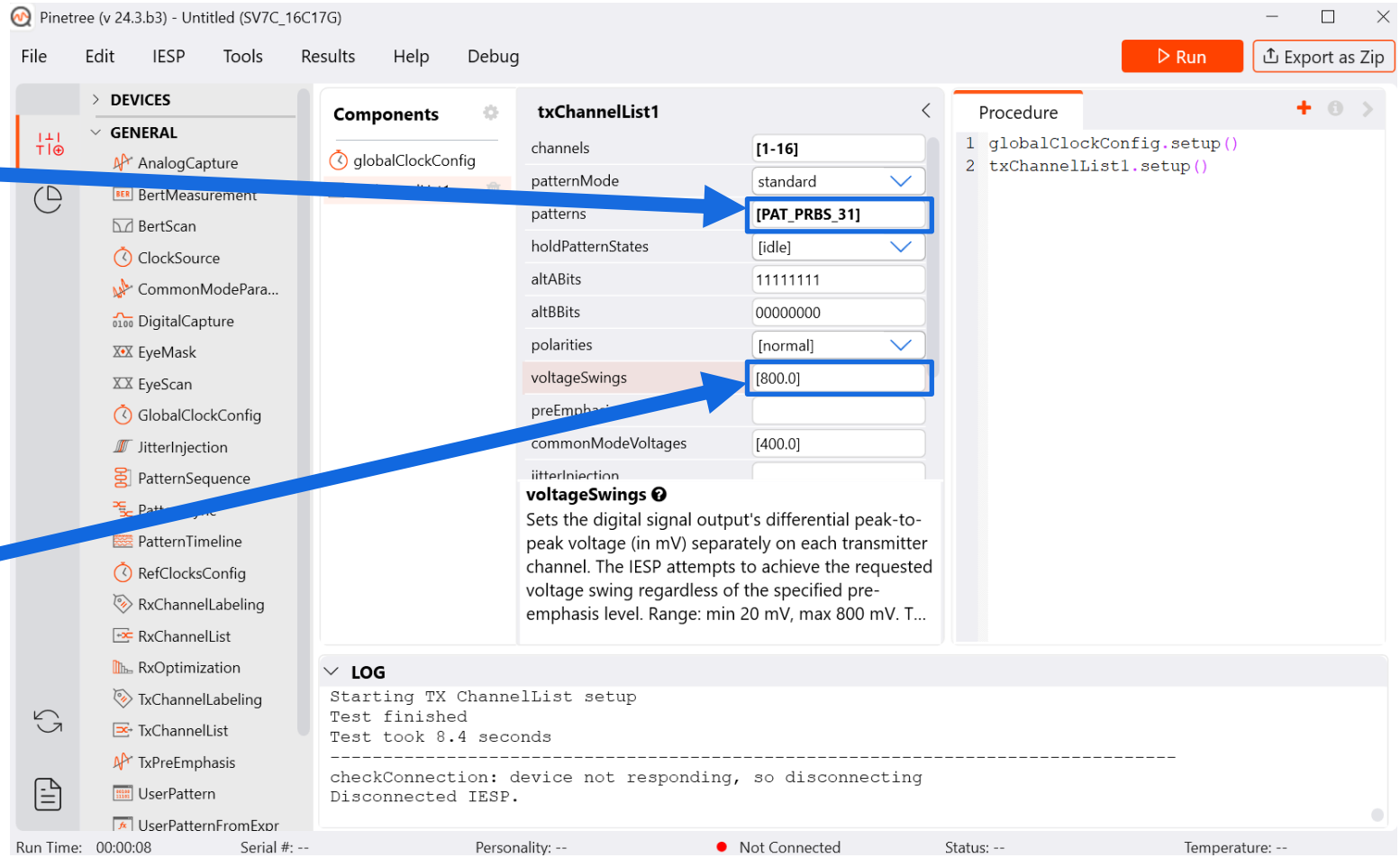
Software Setup

It is always recommended to use PRBS31 for the flattest spectrum.

Adjust the voltage swing to directly adjust the RMS value of the white noise.



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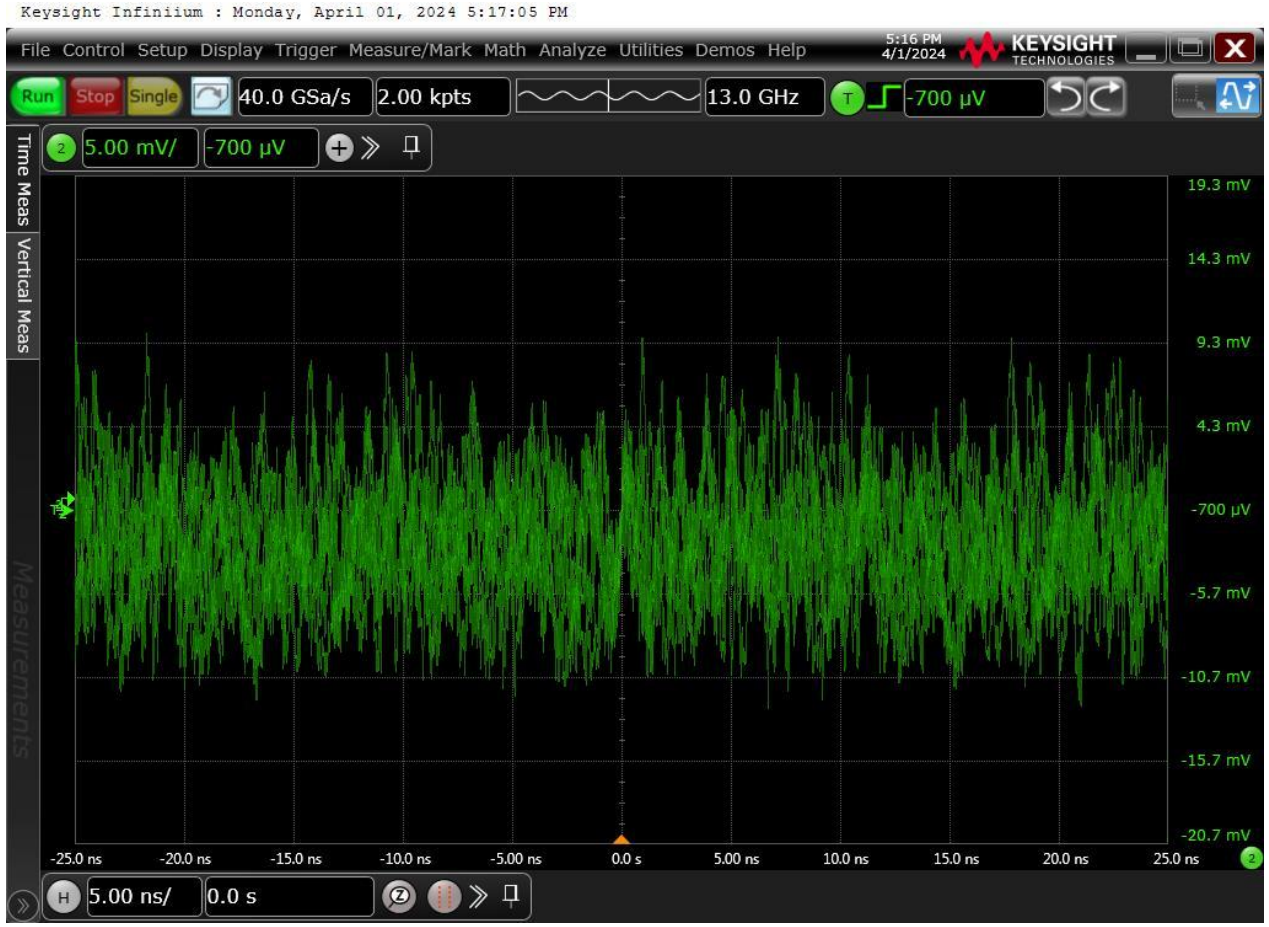
Time-Domain Example



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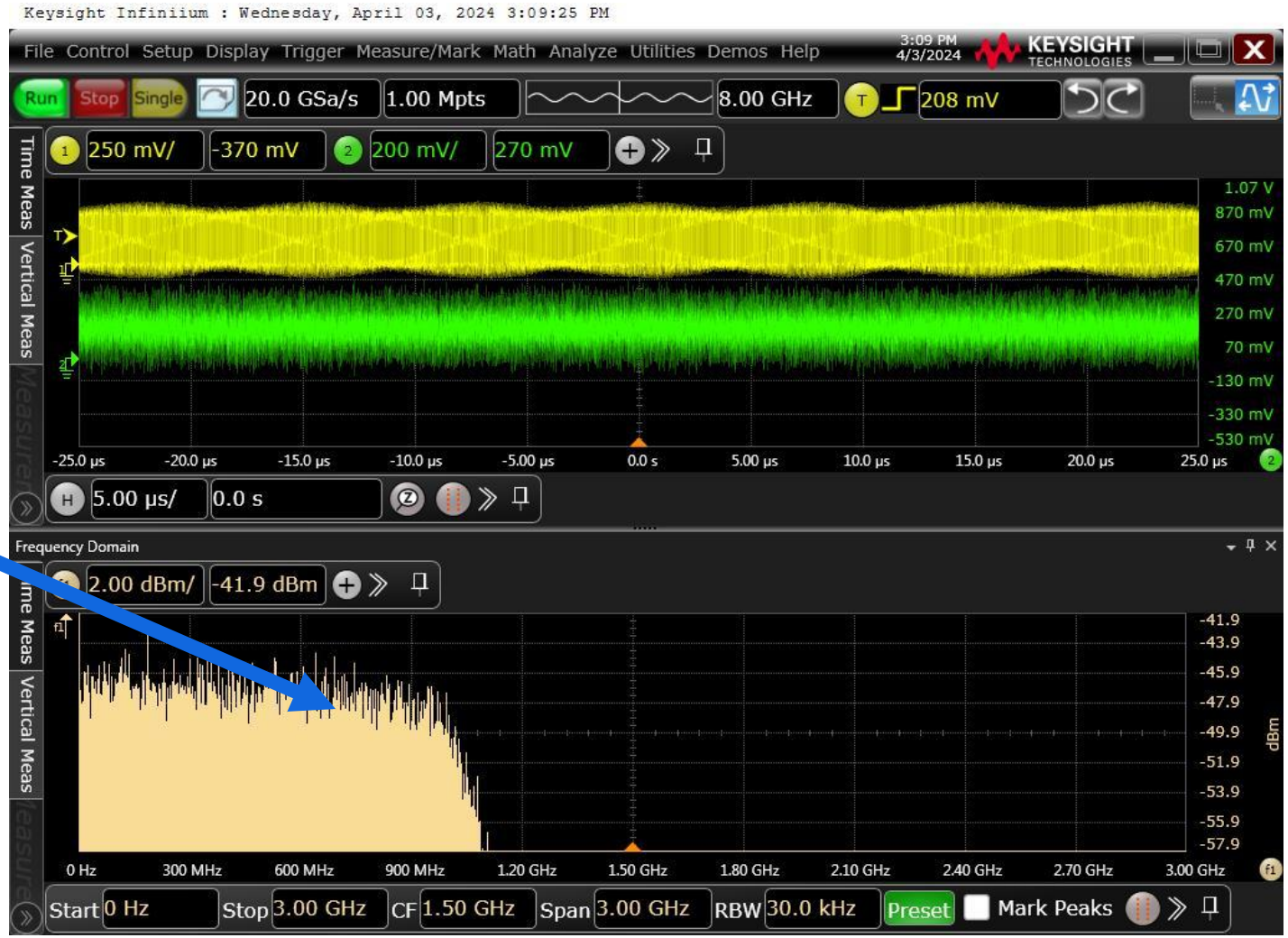
Spectrum Shows Completely Flat Response

The limitation here is the filter and not the SV7C.



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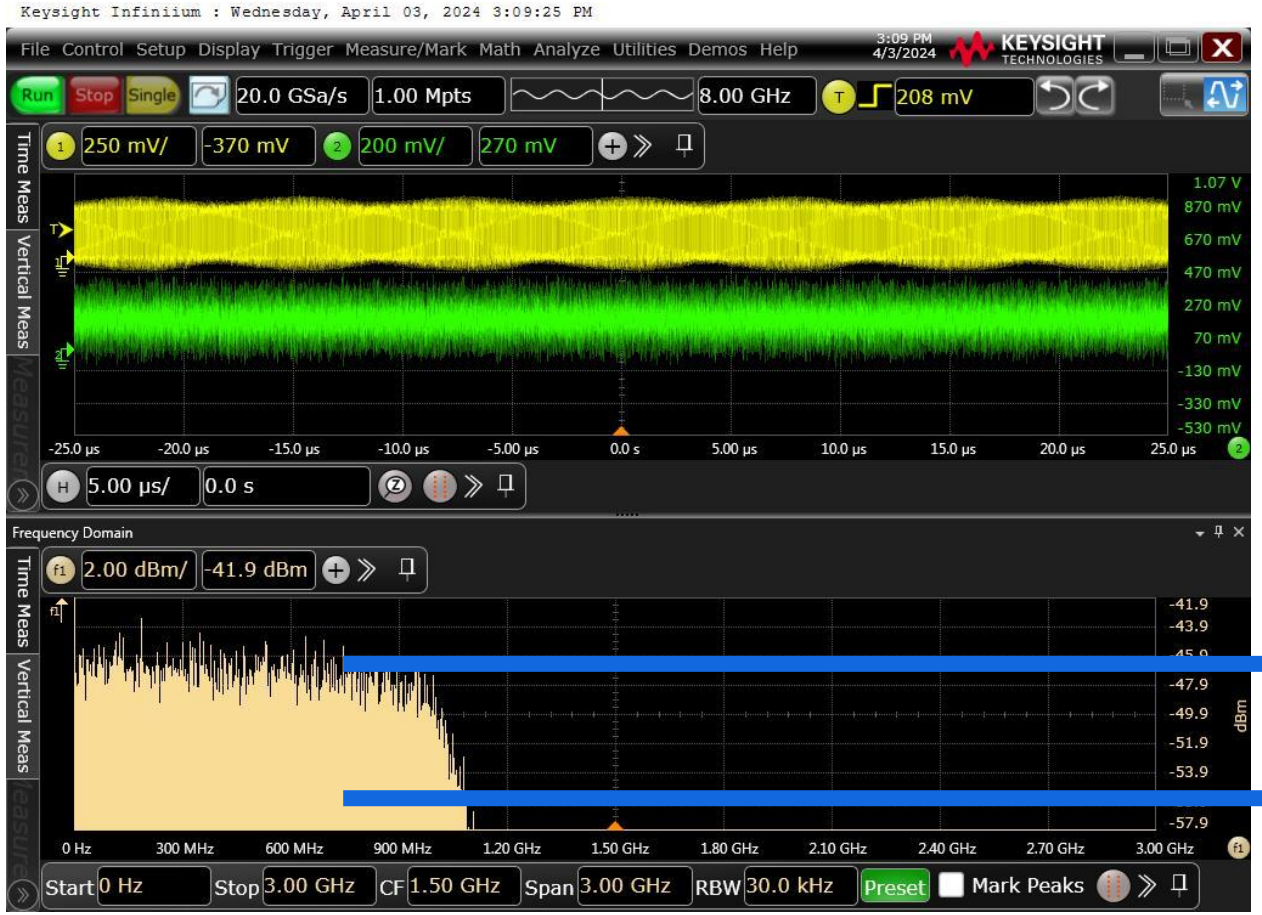
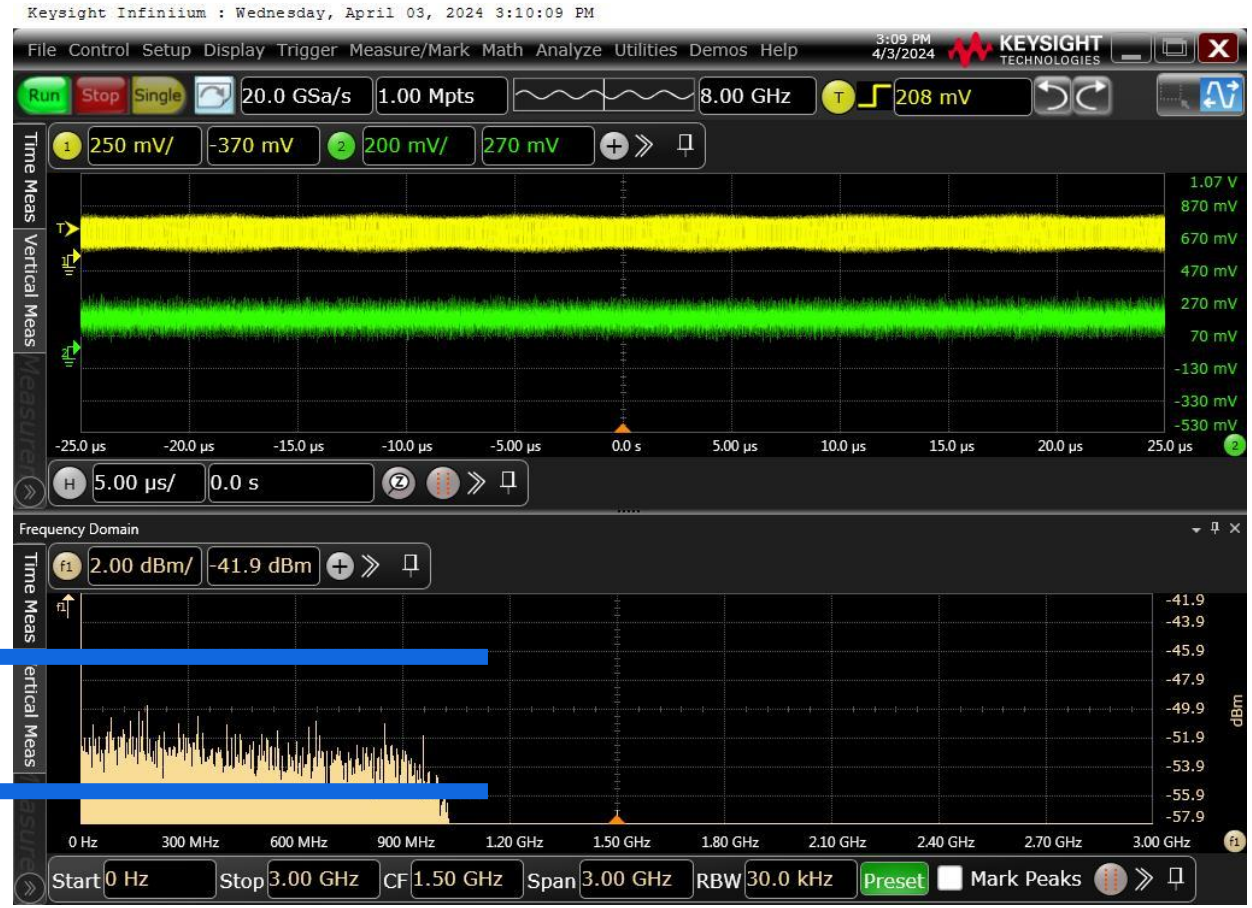
Level Control





There is a 6 dB difference in the noise spectrum because we changed the voltage swing from 800 mV to 400 mV.

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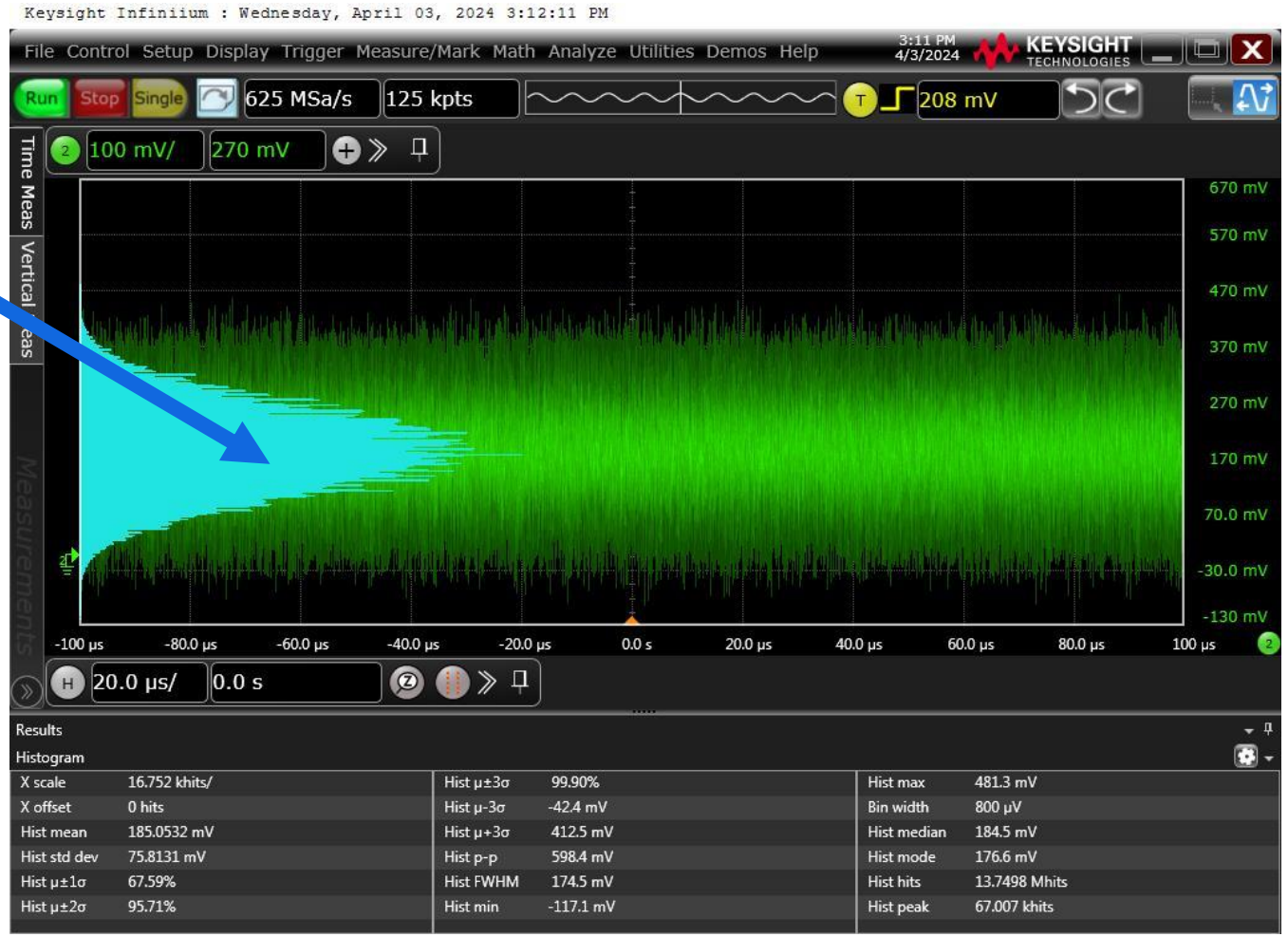
PRBS31 Using Low Pass Filter 1GHz, 800mV

The histogram is pure.



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