



APPLICATION NOTE

Using the SV7C as a White Noise Generator

© Introspect Technology, 2024
Published in Canada on April 9, 2024
MK-G018E-E-24100

INTROSPECT.CA

Agenda

1. [Context](#)
2. [Using the Built-In White Noise Generator](#)
3. [Limitations of the Internal Generator](#)
4. [Creating a Stand-Alone White Noise Generator](#)
5. [Hardware Setup](#)
6. [Principle of Operation](#)
7. [Implementation Example](#)
8. [Setup](#)
9. [Software Setup](#)
10. [Time-Domain Example](#)
11. [Spectrum Shows Completely Flat Response](#)
12. [Level Control](#)
13. [PRBS31 Using Low Pass Filter 1GHz, 800mV](#)

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.

Components

- globalClockConfig
- jitterInjection1
- txChannelList1

txChannelList1

channels	[1, 2]
patternMode	standard
patterns	[PAT_AllZeros, PAT_PRBS_7]
holdPatternStates	[idle]
altABits	11111111
altBbits	00000000
polarities	[normal]
voltageSwings	[20.0, 800.0]
preEmphasis	
commonModeVoltages	[400.0]
jitterInjection	[jitterInjection1, None]
fineSkews	[0.0]
coarseSkews	[0.0]
channelLabeling	

Procedure

```
1 globalClockConfig.setup ()
2 txChannelList1.setup ()
```

Channel 2 is used as a normal pattern source.

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.

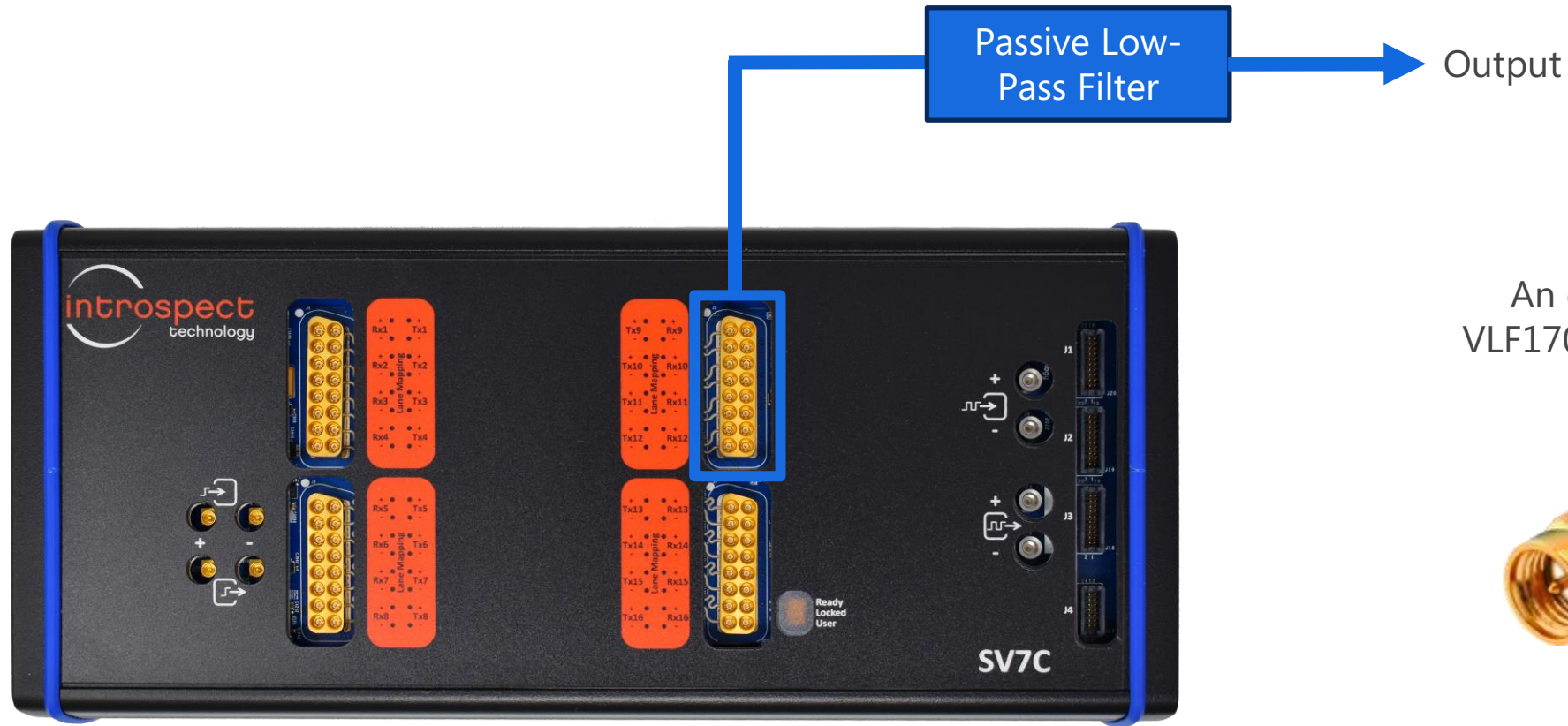
Limitations of the Internal Generator

- 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



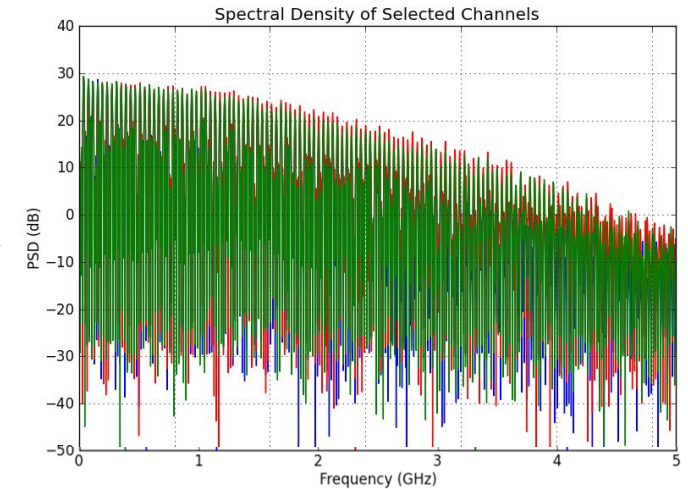
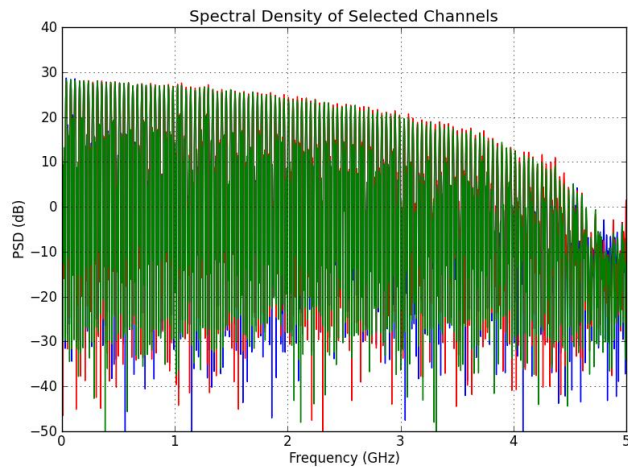
An example filter is the VLF1700+ from Mini-Circuits



Principle of Operation

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

Filter the pattern with a sharp cut-off solution.



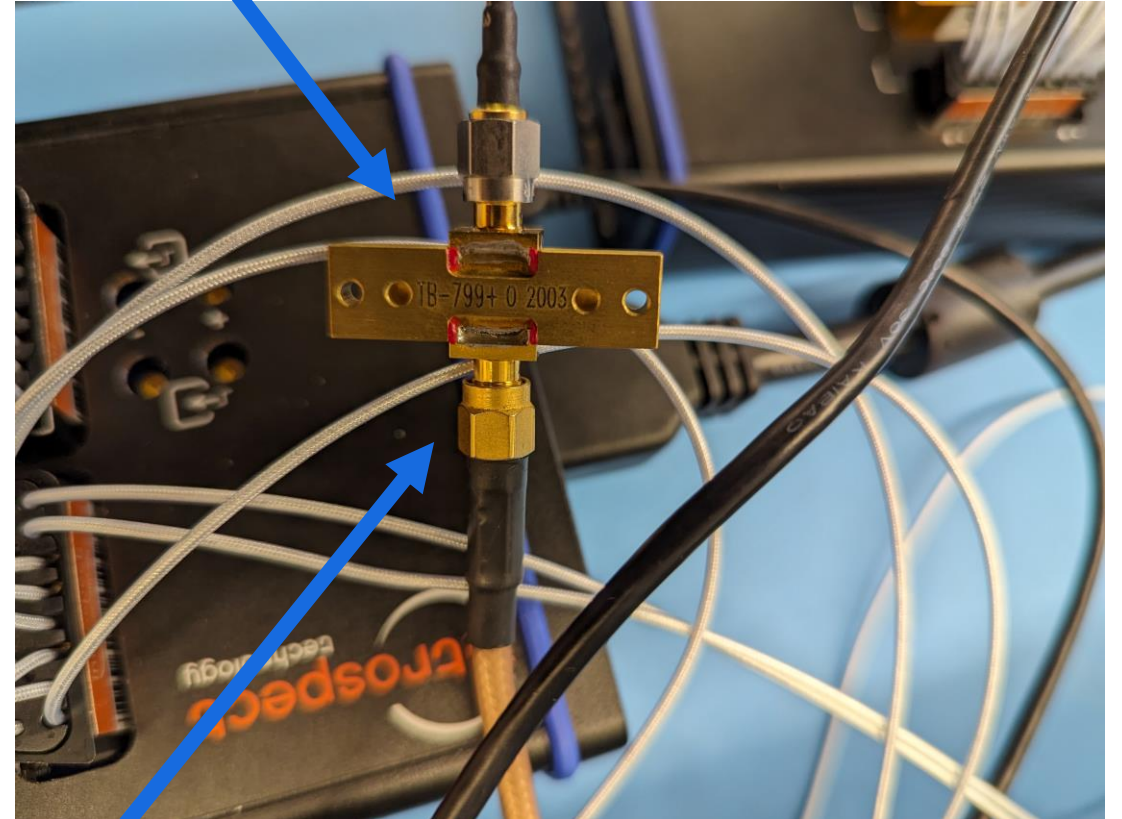
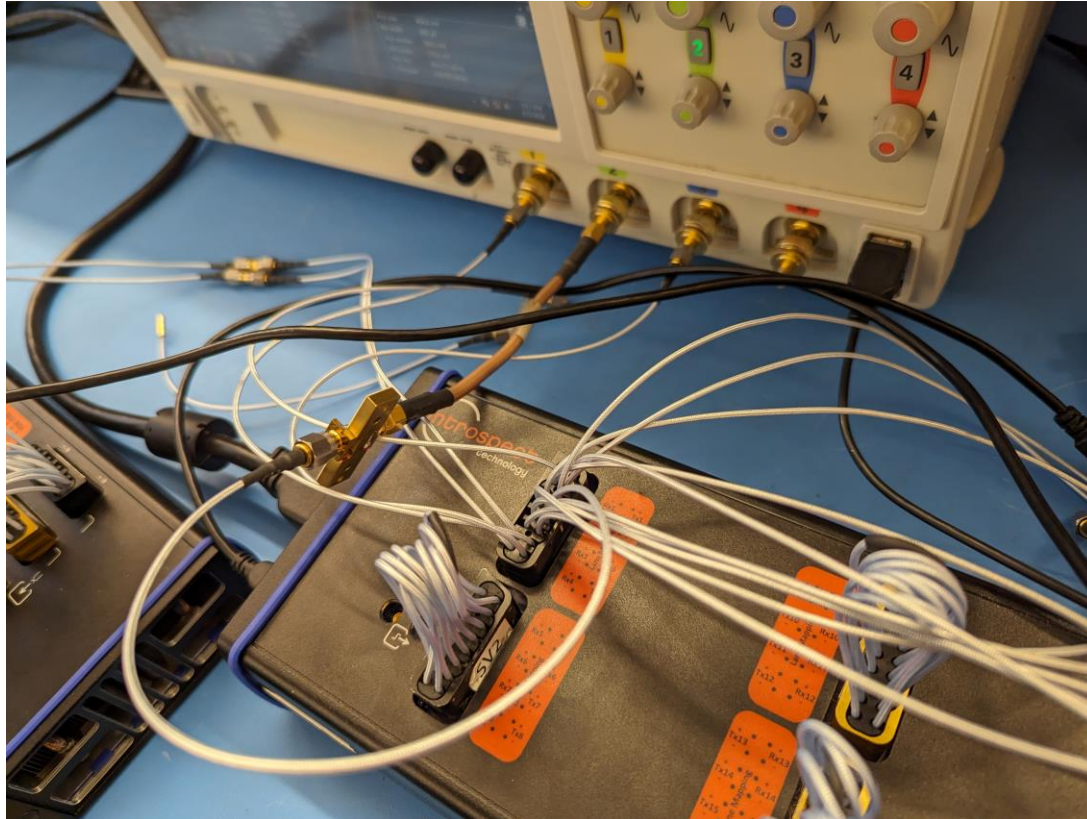
The spectrum of PRBS31 is white by design (in the discrete domain).
By running it at high speed and filtering it, we convert it to an analog white-noise signal.



Implementation Example

Setup

1.5 GHz passive filter
from Mini-Circuits



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.

Pinetree (v 24.3.b3) - Untitled (SV7C_16C17G)

File Edit IESP Tools Results Help Debug

Run Export as Zip

DEVICES

- GENERAL
 - AnalogCapture
 - BertMeasurement
 - BertScan
 - ClockSource
 - CommonModePara...
 - DigitalCapture
 - EyeMask
 - EyeScan
 - GlobalClockConfig
 - JitterInjection
 - PatternSequence
 - PatternTimeline
 - RefClocksConfig
 - RxChannelLabeling
 - RxChannelList
 - RxOptimization
 - TxChannelLabeling
 - TxChannelList
 - TxPreEmphasis
 - UserPattern
 - UserPatternFromExor

Components

globalClockConfig

txChannelList1

- channels: [1-16]
- patternMode: standard
- patterns: [PAT_PRBS_31]
- holdPatternStates: [idle]
- altABits: 11111111
- altBBits: 00000000
- polarities: [normal]
- voltageSwings: [800.0]
- preEmphasis: [normal]
- commonModeVoltages: [400.0]
- jitterInjection: [normal]

voltageSwings

Sets the digital signal output's differential peak-to-peak voltage (in mV) separately on each transmitter channel. The IESP attempts to achieve the requested voltage swing regardless of the specified pre-emphasis level. Range: min 20 mV, max 800 mV. T...

Procedure

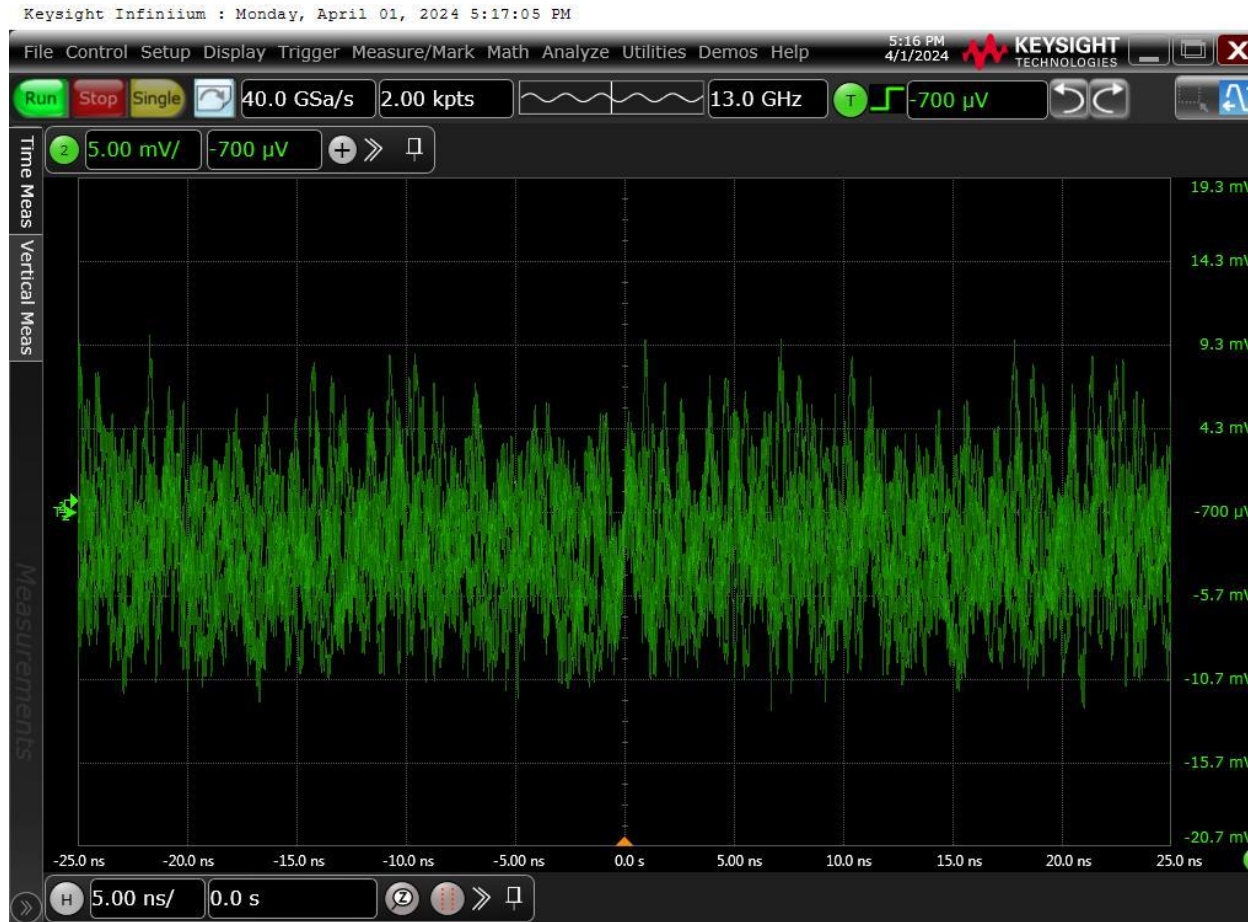
```
1 globalClockConfig.setup ()
2 txChannelList1.setup ()
```

LOG

```
Starting TX ChannelList setup
Test finished
Test took 8.4 seconds
-----
checkConnection: device not responding, so disconnecting
Disconnected IESP.
```

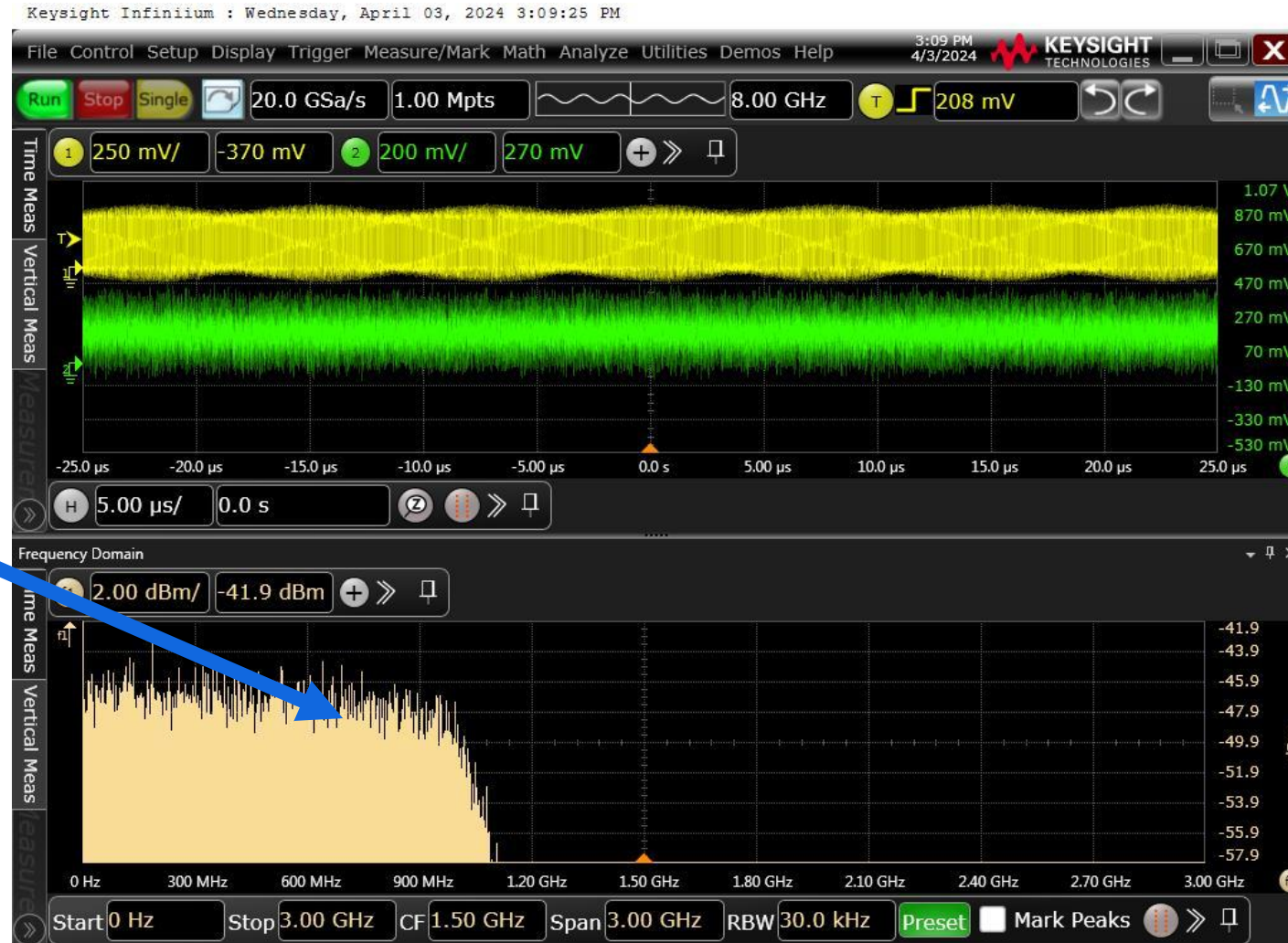
Run Time: 00:00:08 Serial #: -- Personality: -- Not Connected Status: -- Temperature: --

Time-Domain Example

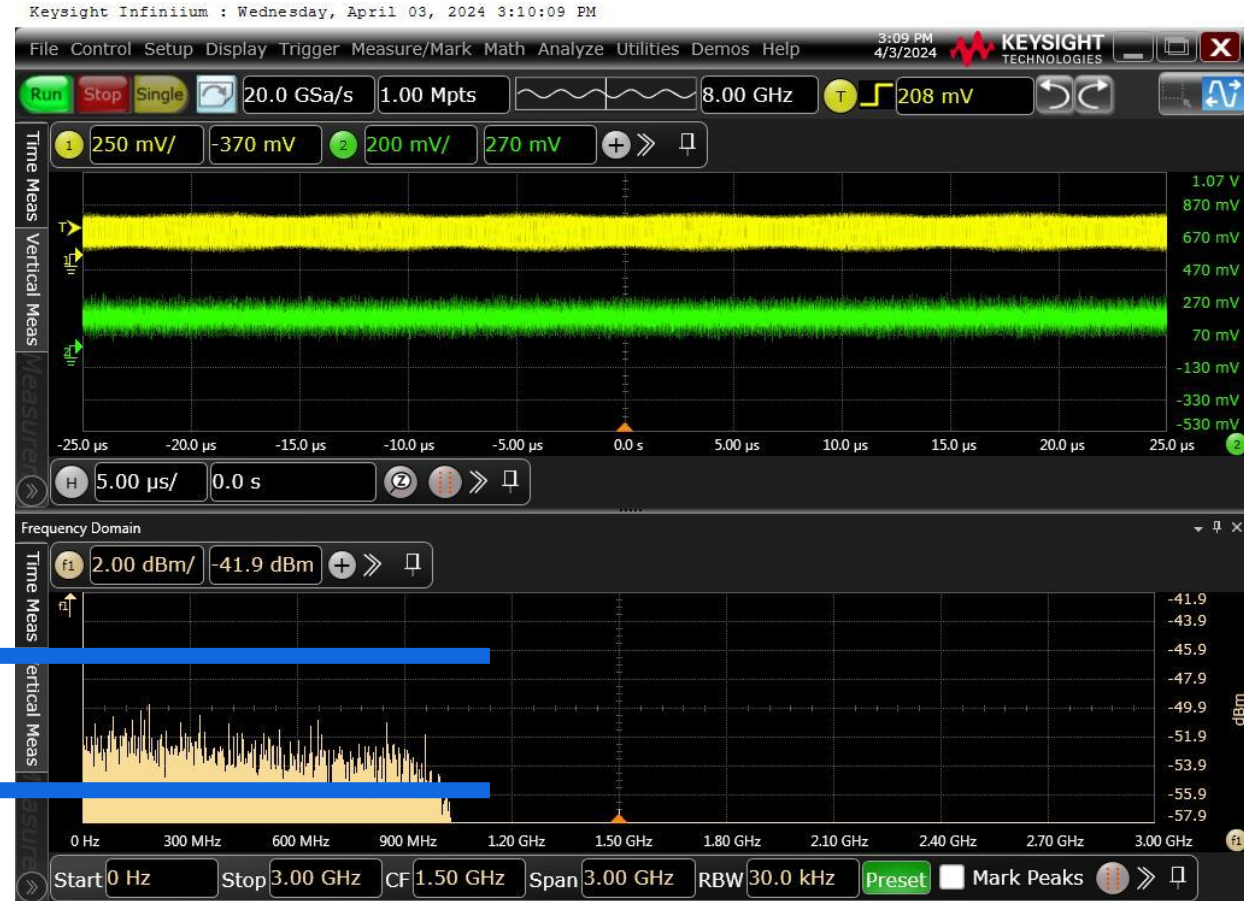
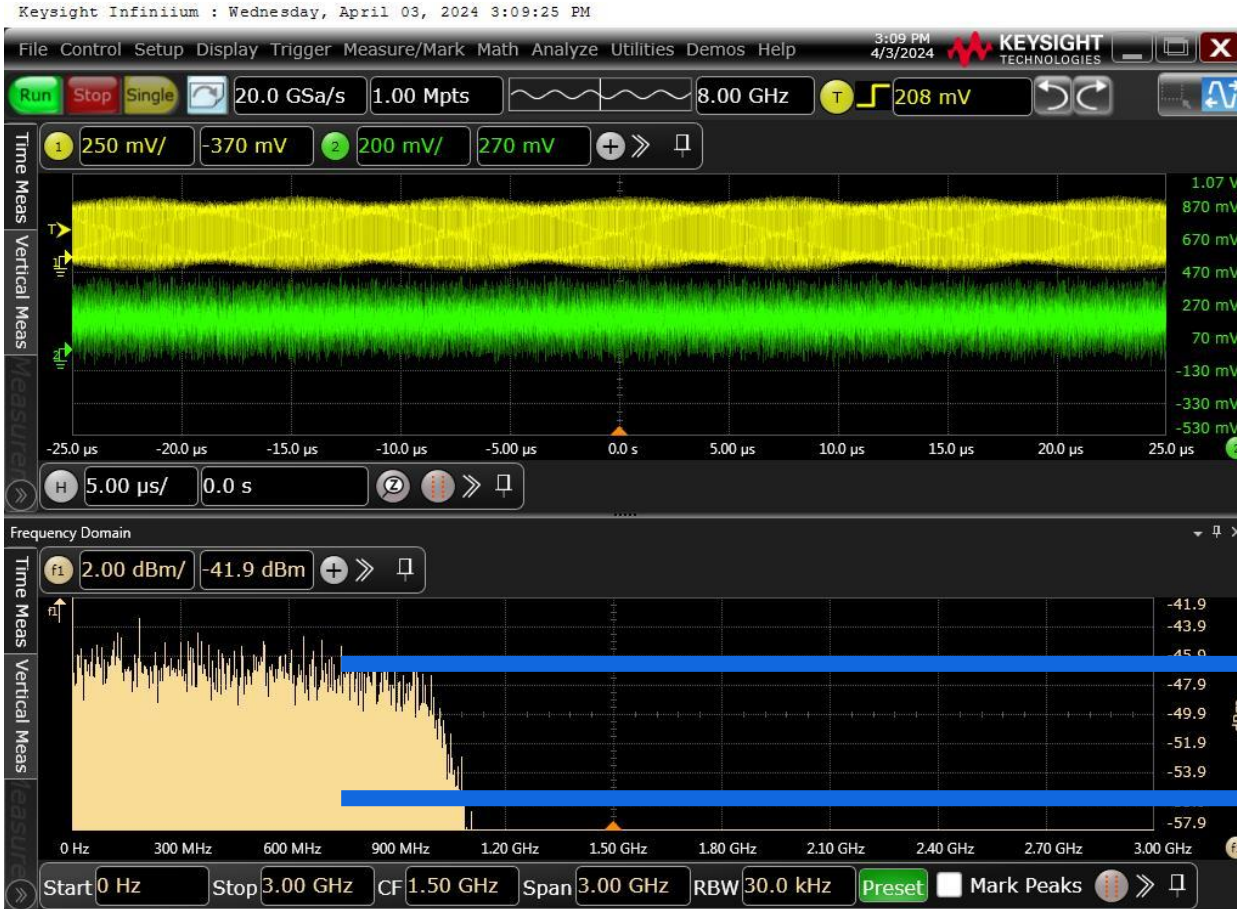


Spectrum Shows Completely Flat Response

The limitation here is the filter and not the SV7C.



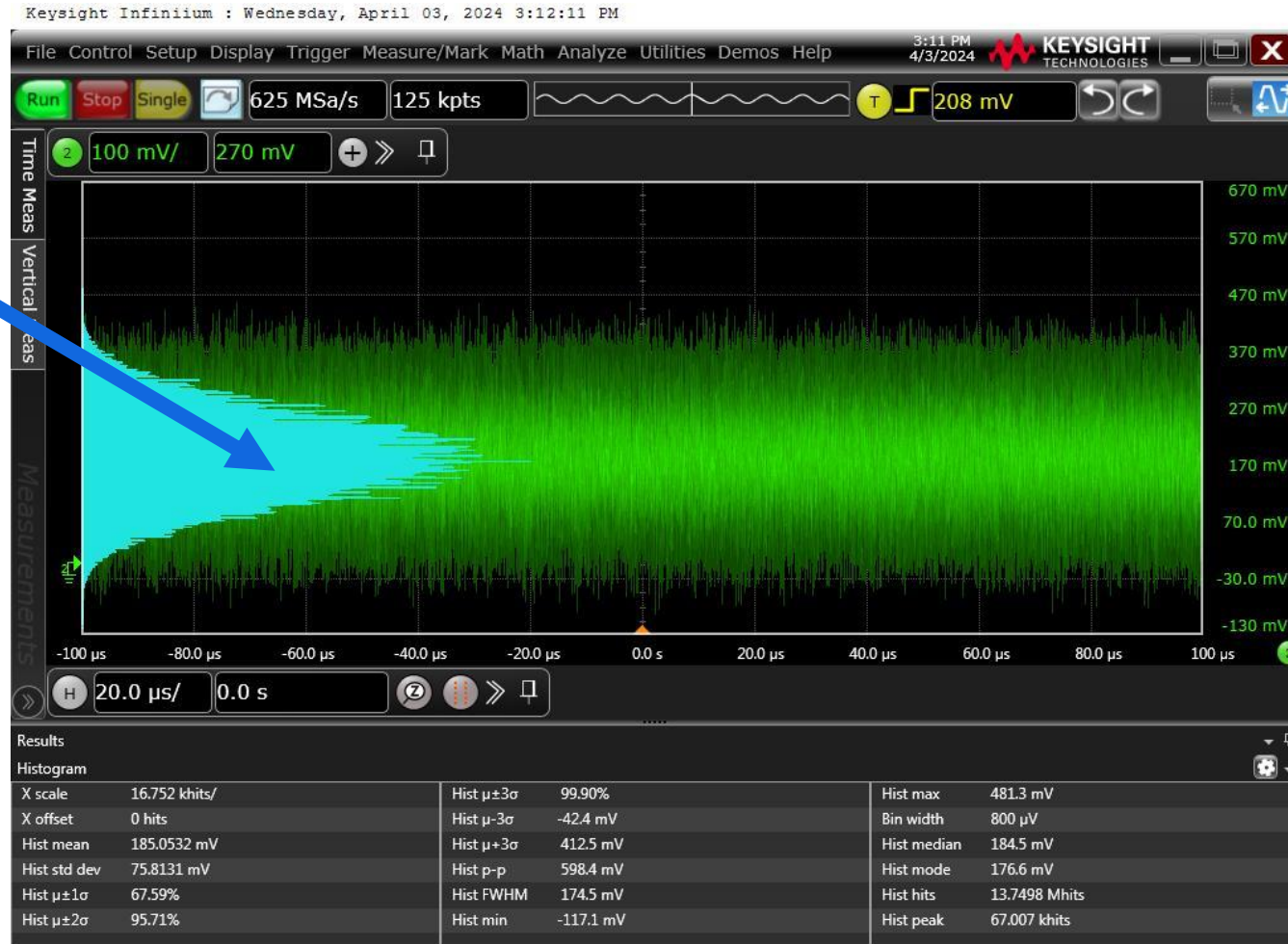
Level Control



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

PRBS31 Using Low Pass Filter 1GHz, 800mV

The histogram is pure.





To Learn More Visit:
INTROSPECT.CA