Different Oscillator Options for our Frequency Standards

Introduction

We offer many different oscillator options for our products. This document explains the differences and shows some sample plots

Products

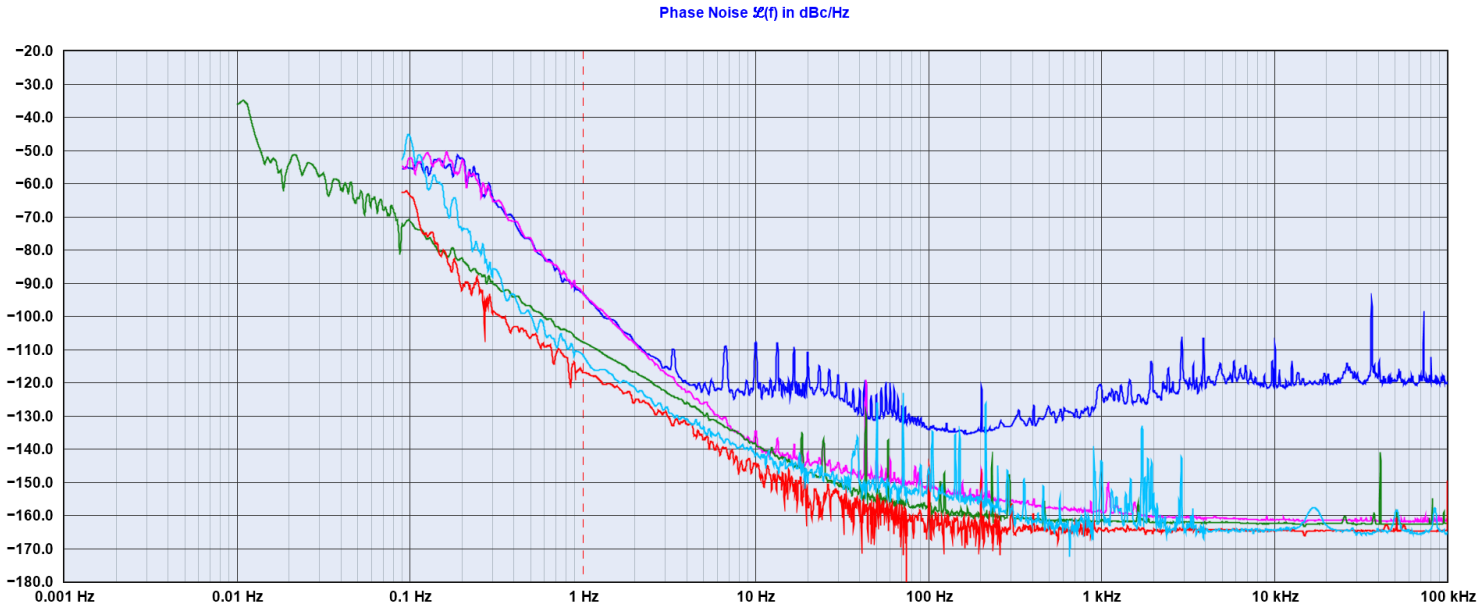
In this application note we talk about the GPS10RBN GPS Disciplined Rubidium Frequency Standard and the GPS10eR GNSS Disciplined Rubidium Frequency Standard.

Both these products use our low phase noise rubidium oscillators. The standard phase noise offered by these products is usually better than any competitive device.

However, its possible to offer even lower phase noise with optional ultra-low phase noise oscillators. This is referred to option 26 in this document.

Option 26 adds an ultra-low phase noise oscillator than is phase locked to the main rubidium. So the frequency accuracy or Allan Deviation is equal to or better than the actual rubidium, but with the advantage of lower phase noise.

Phase Noise Plots



Trace	Notes	Input Freq	Sample Interval	dBc/Hz at 1 Hz	Duration	Acquired	Instrument
DDS Inside GPS10RBN (Unsaved)	10.23 MHz	10.000 MHz	0.100 s	-93.1	15m 0s	9000 pts	TimePod 5330A
Standard GPS10RBN (Unsaved)	10 MHz	10.000 MHz	0.100 s	-93.2	15m 0s	9000 pts	TimePod 5330A
Standard GPS10eR (Unsaved)	10 MHz	10.000 MHz	1 s	-107.7	1h	3600 pts	TimePod 5330A
GPS10eR with opt 26 (Unsaved)	10 MHz	10.000 MHz	0.100 s	-116.9	15m 0s	9000 pts	TimePod 5330A
GPS10RBN with opt 26 (Unsaved)	10 MHz	10.000 MHz	0.500 s	-111.7	23m 56s	2872 pts	TimePod 5330A

The link below will open a larger version of the above plot. These are explained in detail below:

Phase Noise Plots

- **Blue Trace:** This is a DDS option than can be fitted to either the GPS10eR or GPS10RBN. It provides a sine and square output from 0 to 80 MHz settable in 1 microhertz steps. This is often used at 10.23 MHz and this plot shows the phase noise of the DDS output.
- **Pink Trace:** This is the standard phase noise of the GPS10RBN.

- **Green Trace:** This is the standard phase noise of the GPS10eR.
- **Red Trace:** This is the GPS10eR fitted with option 26, the ultra-low phase noise option.
- **Light-Blue:** This is the GPS10RBN fitted with option 26, the ultra-low phase noise option.

Summary

- The GPS10eR offers the best phase noise both as a standard product and with option 26. Option 26 has an impressive -116.9 dBc/Hz at a 1 Hz offset with a floor noise around -165 dBc/Hz. The floor noise can be improved to -170 dBc/Hz with special design.
- The DDS output is not low phase noise. This is typical of DDS.
- The option 26 is usually supplied at 10 MHz. However, it is possible to supply it at other frequencies such as 10.23 MHz, 50 MHz, 100 MHz etc. These are special builds.