

Simultaneous PicoPak and TimePod Measurements of an MTI 574 OCVCXO

Data Files: Parallel-TimePod.phd and Parallel-PicoPak.phd in Stable32 format, 2 March 2015

Simultaneous measurements were made on a small 10 MHz Milliren Technologies Model 574 ovenized crystal oscillator using Miles Design TimePod and breadboard Hamilton Technical Services PicoPak clock measurement systems. The measurement systems used a common rubidium reference, a Datum LPRO called Rb1. The purpose of this run was to validate the PicoPak results against a known good instrument having lower noise and better resolution. These 1 second measurements were started very nearly at the same time and ran for about 51 minutes. During the run, visual comparisons were made between the TimePod and PicoPak frequency readings and plots, and they were, for all practical purposes, identical at the $pp10^{11}$ level. The crystal oscillator displayed obvious thermal cycling that adds a distinctive feature to the records.

The PicoPak and TimePod frequency records are shown side-by-side in Figures 1 and 2 below. The scales are the same, and a few of the extreme PicoPak values are omitted. The PicoPak record has obvious quantization but is otherwise very similar. The frequency averages are nearly identical, $1.900e-10$ and $1.885e-10$ respectively. They both show the same cycling and small positive trend.

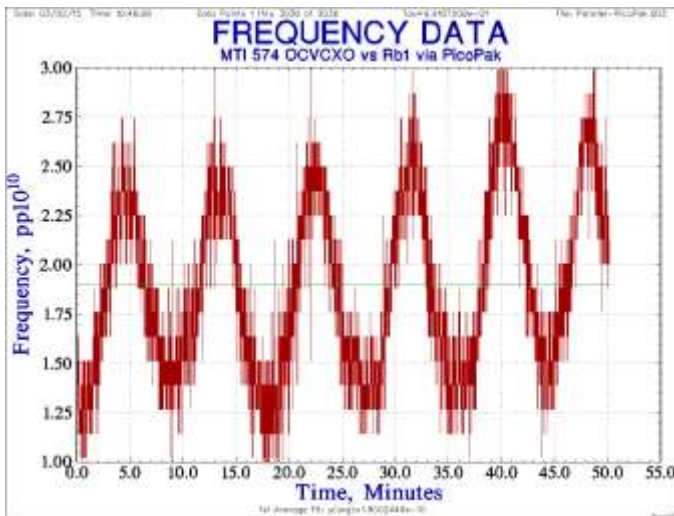


Figure 1. PicoPak Frequency Record

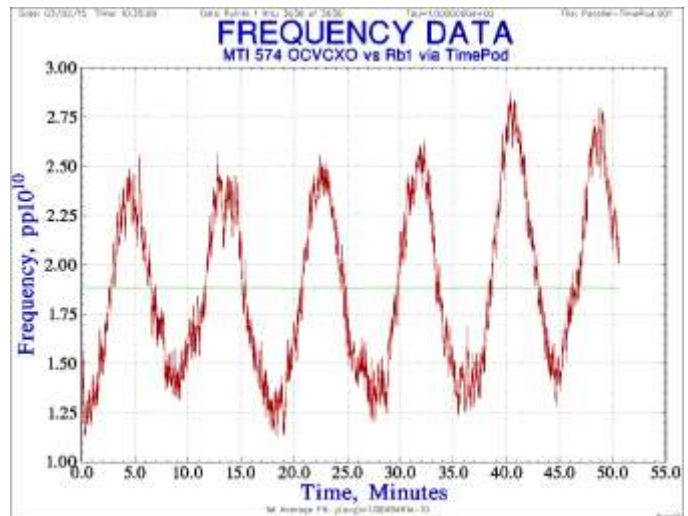


Figure 2. TimePod Frequency Record

Similarly, the PicoPak and TimePod stability plots are shown side-by-side in Figures 3 and 4 below. The results are essentially identical for averaging times of 8 seconds and longer. Below that, the PicoPak quantization noise limits its resolution.

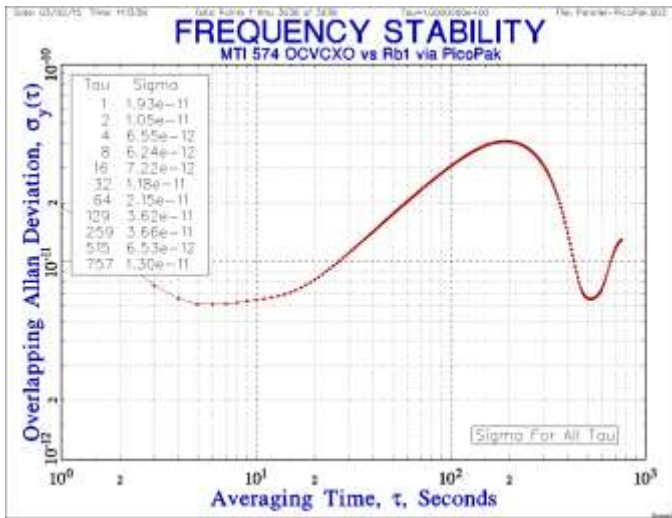


Figure 3. PicoPak Stability Plot

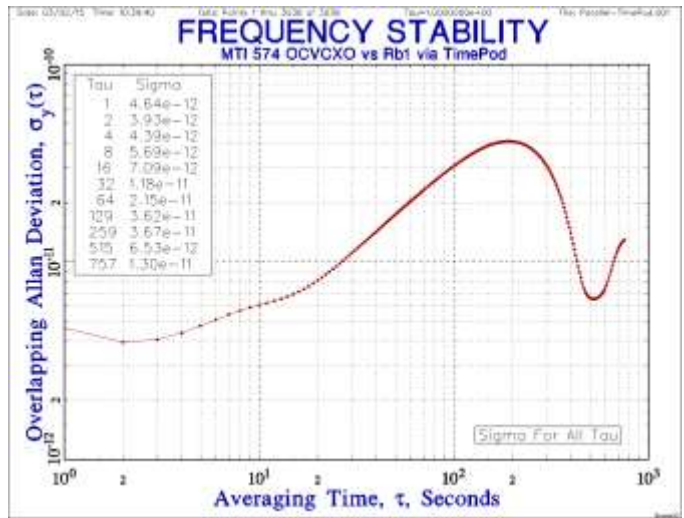


Figure 4. TimePod Stability Plot

The same PicoPak stability plot is shown without the table in Figure 5 so that it not cover the results at small tau. This PicoPak stability plot also contains a green line showing its approximate noise floor as measured with coherent 10 MHz inputs.

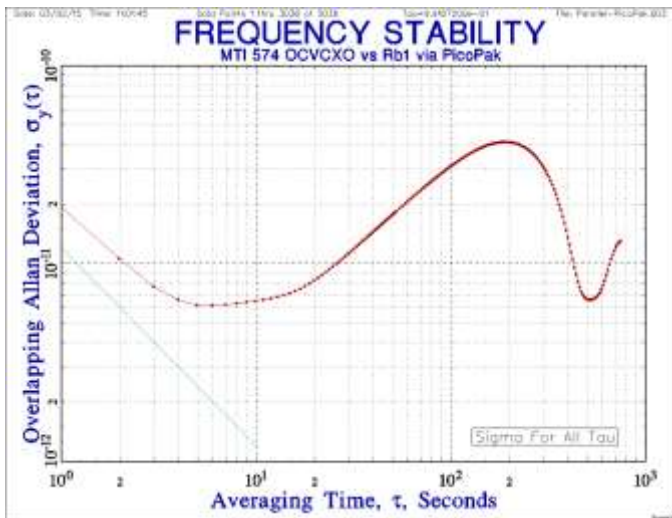


Figure 5. PicoPak Stability Plot

The TimePod measurements are obviously better, but it is also a much more expensive instrument. Within the limitations imposed by its pp10¹¹ quantization, the PicoPak seems to be performing satisfactorily. It captures the essential features of the OCVCXO behavior and provides equivalent results for averaging times longer than a few seconds.