

Allan Deviation of AccuBeat’s High Reliability Ultra-Stable Oscillator for ESA’s JUICE Mission

AccuBeat is developing an Ultra Stable Oscillator (USO) for ESA’s JUICE (Jupiter Icy Moons Explorer) mission as part of a radio science occultation experiment headed by the radio science laboratory in Rome University. The experiment will probe Jupiter’s atmosphere by following the phase variations of the radio waves passing through the atmosphere while the spacecraft transmits to earth using AccuBeat’s ultra-high stability frequency source. AccuBeat’s USO is a high-stability quartz crystal oscillator utilizing a high Q crystal resonator and high temperature stability in the range of 100μ kelvin. The USO designed by AccuBeat has an Allan deviation below 5E-13 at integration constants of 1 to 1000 seconds as can be seen in figure 1.

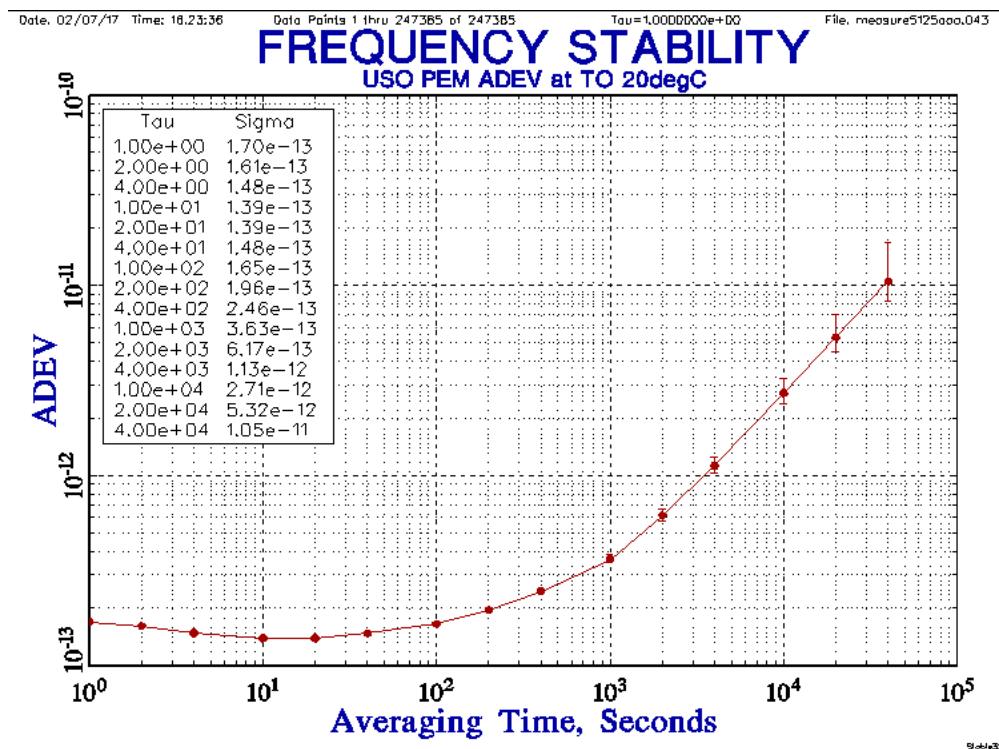


Figure 1 – ADEV measurement of the USO

The measurement seen in figure 1 includes the aging of the USO which manifests itself as the rising slope at long integration constants. The aging is specified at 7E-11 per day but is actually much lower as can be seen from the stability results. The USO has been designed to meet this specification while subjected to demanding EMC effects and the harsh environment around Jupiter with radiation levels reaching as high as 100kRad on some internal components.

This product has shown tremendous capabilities for the required time scales and has supplemented AccuBeat's long scale stability capabilities as manifested in our line of atomic clocks. The following figure compares the stability performance of the USO to our tactical rubidium clocks as well as other frequency references.

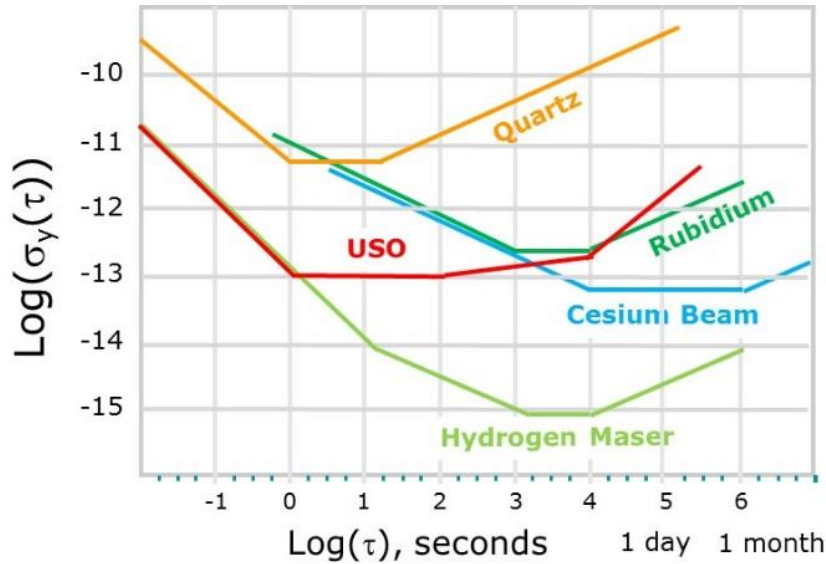


Figure 2 – Comparison of the USO to various frequency sources

AccuBeat will be presenting a paper on our unique USO at the upcoming Microwave Technology and Techniques Workshop (MTT) taking place at ESTEC in April 2017. The paper will be given by Aviv Shapira, who is the Technical Team Leader of the project. Should you wish to meet with Mr. Shapira at MTT, please send him an email to aviv@accubeat.co.il