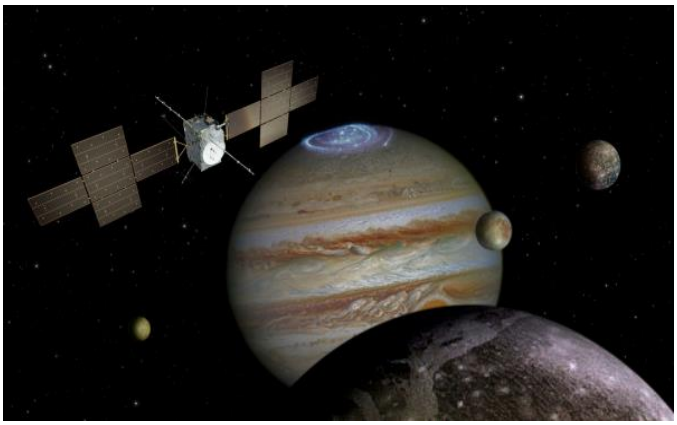
# Ultra Stable Oscillator (USO)

## for Deep Space Exploration


**AccuBeat is proud to introduce its Ultra Stable Oscillator (USO) specially designed for Deep Space exploration programs. AccuBeat's USO has a frequency stability (ADEV) of 1E-13 in the range of 1-1000 seconds** and will be deployed by the European space Agency (ESA) in their prestigious **JUICE** (Jupiter Icy Moons Explorer) mission. The space qualified USO *will serve as the central source of timing for communications in the mission and will be an integral part of a radio science occultation experiment* that 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 *almost 5 times better than the required spec of 5E-13 at integration constants of 1 to 1000 seconds*, making it **the most stable oscillator of its type designed for deep space exploration.** (See detailed specs on next page).

JUICE is the flagship project of the European Space Agency and in May 2022, the spacecraft will set off on an almost 600 million Km journey to Jupiter, where it will arrive in 2030. For three and a half years, JUICE will sweep around the giant planet, exploring its turbulent atmosphere, enormous magnetosphere, and tenuous set of dark rings, as well as studying its three largest icy moons - Europa, Ganymede and Callisto *all with the help of AccuBeat's USO designed for Deep Space Exploration.* "The goal is to investigate whether there are liquid oceans under these icy crusts which might harbour organic components or even life" says Vincent Poinsignon, the JUICE project manager. AccuBeat's USO is currently being integrated into the JUICE spacecraft by AIRBUS.

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AccuBeat Ltd.
Accurate Frequency & Time

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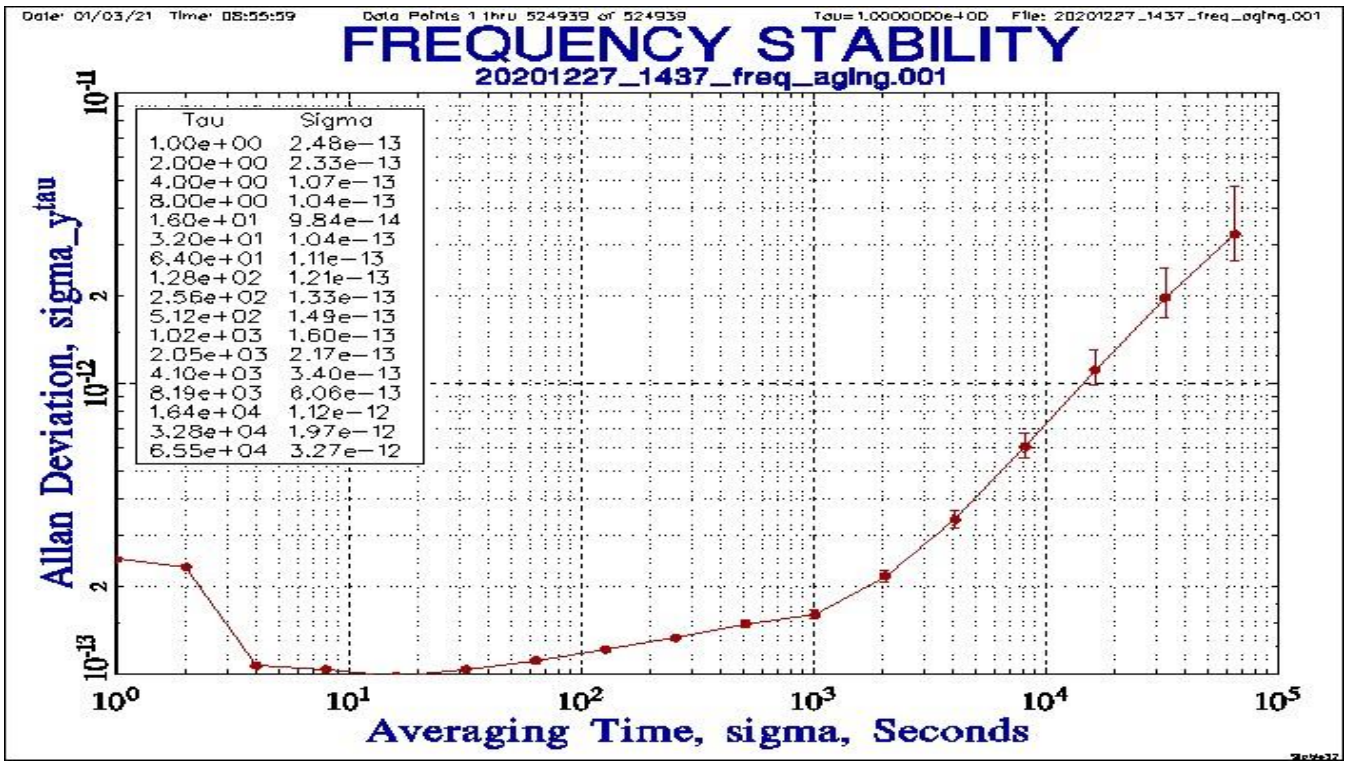
## for Deep Space Exploration

## Main Specifications and Performance

| | |
|---|---|
| Frequency Stability (ADEV) | 5E-13 @ 1 sec |
| | 5E-13 @ 10 sec |
| | 5E-13 @ 100 sec |
| | 6E-13 @ 1000 sec |
| | |
| Phase Noise | -80 dBc/Hz @ 1 Hz |
| | -100 dBc/Hz @ 10 Hz |
| | -117 dBc/Hz @ 100 Hz |
| | -119 dBc/Hz @ ≥1000 Hz |
| | |
| Frequency Aging | <7E-11 in 24 Hours |
| | |
| Temperature Range | |
| Operational: | -20ºC to +50ºC |
| Non Operational: | -30ºC to +60ºC |
| | |
| EMC | |
| Per ESA JUI-EST-SYS-EID-001 | |

| | |
|---|---|
| Power Requirements | |
| Nominal (steady-state under vacuum) power input | ≤6.5W |
| Peak power allocation (warm-up) | ≤8W |
| Input Voltage | |
| Nominal Input Voltage | +28.0 Vdc ± 0.14V |
| Input Voltage Range | +26.5 to +29.0 Vdc |
| Inrush current (peak current) | ≤1 A |
| Functional Specifications | |
| Nominal frequency (f0) for 2 outputs | 57.51852 MHz |
| Signals Characteristics | |
| Source impedance | 50 Ω |
| RF level | +0 dBm ± 1.0 dB |
| Harmonics of f0 | ≤ -30 dBc |
| Harmonics of f0/12 | ≤ -30 dBc |
| Spurious | ≤ -80 dBc above 10 kHz from carrier |




| | | | |
|---|---|---|---|
| Dimensions: | 132.6 (W) x 120 (D) x 105 (H) mm | Weight: | ≤ 2 Kg |
| Total Ionizing dose within the USO enclosure: | | 50 krad (Si) | |
| TVAC: | The unit is specified to 10-5 torr for performance over the operational temperature -20ºC to +50ºC | | |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