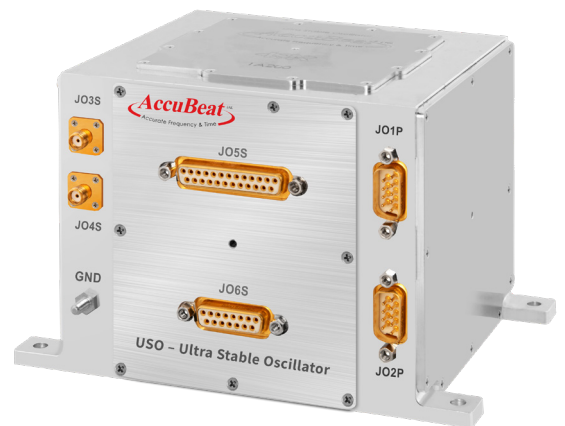


## Ultra Stable Oscillator (USO) for Deep Space Exploration

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  $100\mu$  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.

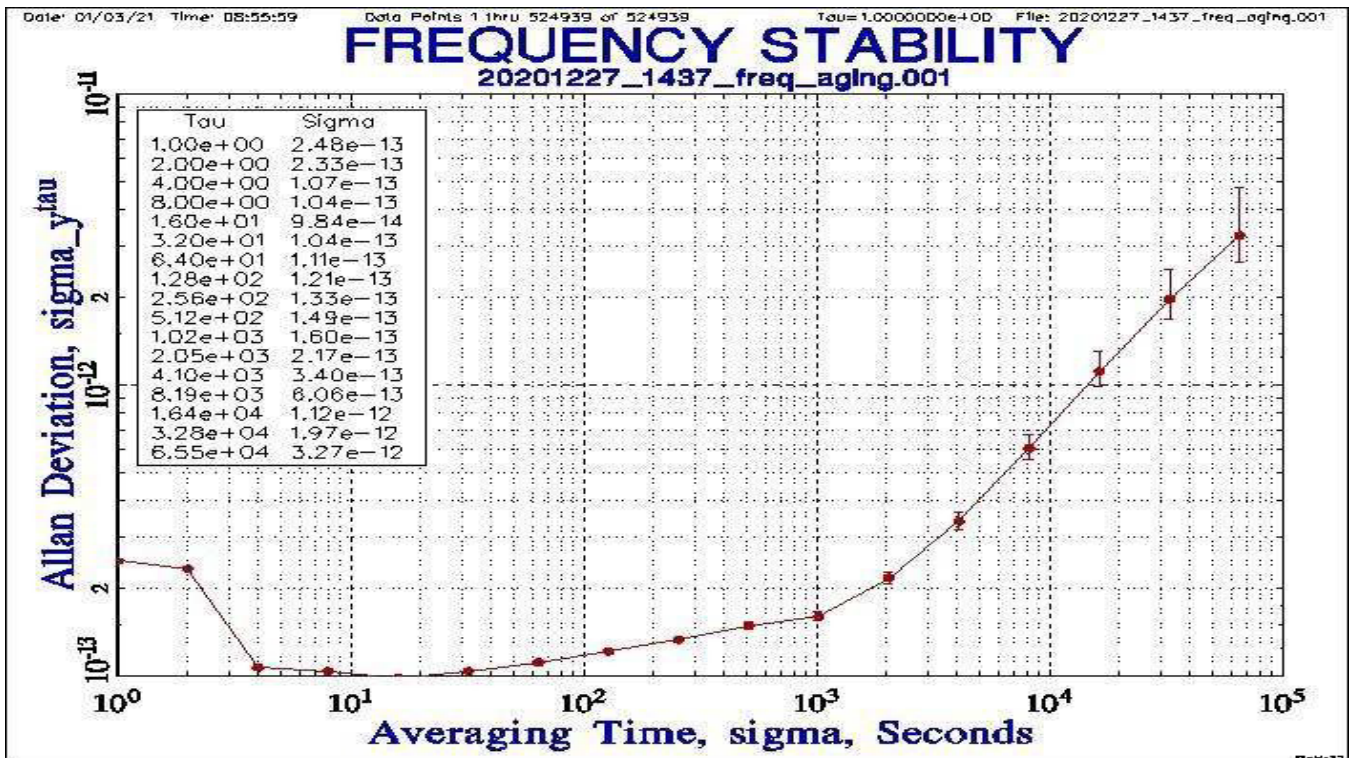
For three and a half years, JUICE will sweep around the giant planet, exploring its turbulent atmosphere, enormous magnetosphere, and tenuous set of dark rings, as well as studying its three largest icy moons - Europa, Ganymede and Callisto all with the help of AccuBeat's USO designed for Deep Space 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 Poinignon, the JUICE project manager. AccuBeat's USO is currently being integrated into the JUICE spacecraft by AIRBUS.



## 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 @ $\geq 1000$ Hz
Frequency Aging	7E-11 in 24 Hours
Temperature Range	
Operational:	-20°C to +50°C
Non Operational:	-30°C to +60°C
EMC	
Per ESA JUI-EST-SYS-EID-001	

Power Requirements	
Nominal (steady-state under vacuum) power input	$\leq 6.5$ W
Peak power allocation (warm-up)	$\leq 8$ W
Input Voltage	
Nominal Input Voltage	+28.0 Vdc $\pm$ 0.14V
Input Voltage Range	+26.5 to +29.0 Vdc
Inrush current (peak current)	$\leq 1$ A
Functional Specifications	
Nominal frequency (f0) for 2 outputs	57.51852 MHz
Signals Characteristics	
Source impedance	50 $\Omega$
RF level	+0 dBm $\pm$ 1.0 dB
Harmonics of f0	$\leq -30$ dBc
Harmonics of f0/12	$\leq -30$ dBc
Spurious	$\leq -80$ 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 -20°C to +50°C		

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