

## Space & Avionics



## Space Products

### FROM CRYSTALS

- **ESA/ESCC QUALIFIED –**
  - AT CUT
  - for TCXOs & OCXOs
  - Up to 140 MHz
- **CNES QUALIFIED –**
  - **std. & QAS Xtals.**
  - **SC CUT HIGH STABILTY (low G sensitivity)**

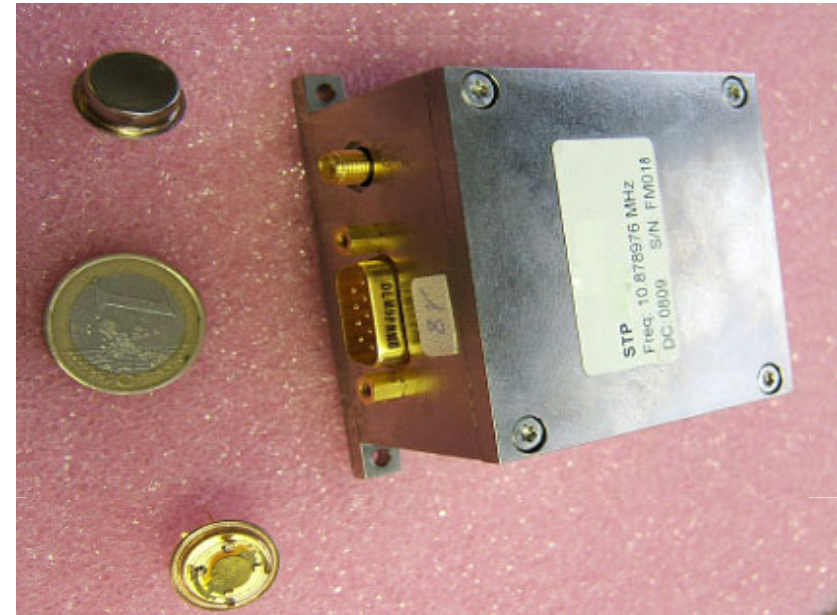
Mode	Holder type	Frequency Range (MHz)		
		ESCC-3501 qualified		Program qualified
		HC35CW T-805 / TO-5	HC37CW T-1507 / TO-8	HC40CW T-2111
Fundamental	F	14 to 35	3 to 20	2 to 10
third Overtone	3rd. OT	25 to 100	10 to 30	10 to 30
fifth Overtone	5th. OT	50 to 140	15 to 50	10 to 50



## Low G sensitive Space OCXOs

### ✓ Mini-OCXO

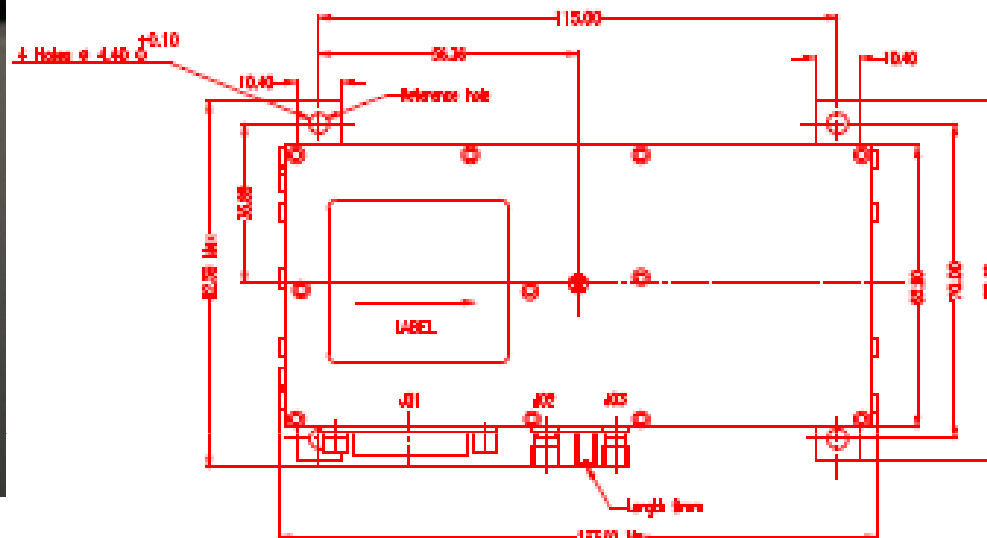
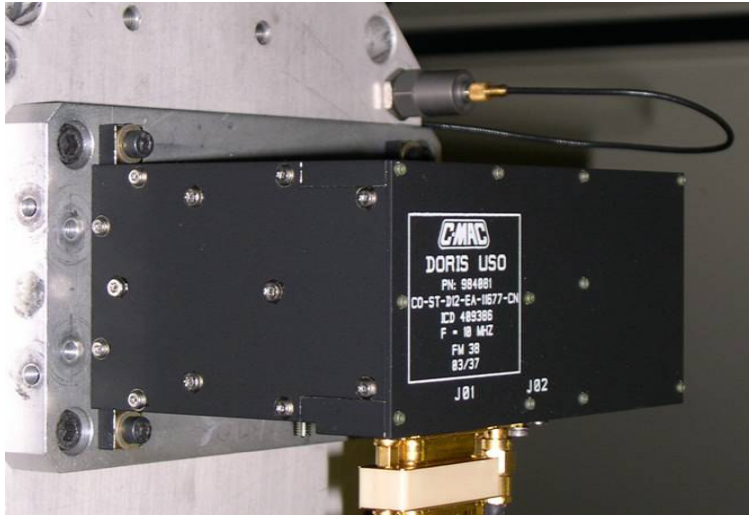
- QAS crystal resonator
- Frequency Stability better than 100 ppb over lifetime all causes inclusive



### • High-end OCXO

- QAS crystal resonator
- Frequency Stability better than 50 ppb all causes over lifetime

## Space Products



- **ULTRA STABLE OCXO (Ultimate Performances)**
  - **FREQUENCY STABILITY: - 10, + 60°C <math>< 1.E-11</math>**
  - **LONG TERM down to a few E-13/DAY (SPOT , DORIS...)**
  - **SHORT TERM (1 s): 6.0 E-14 @ 5 MHz & 1.2 E-13 @ 10 MHz**

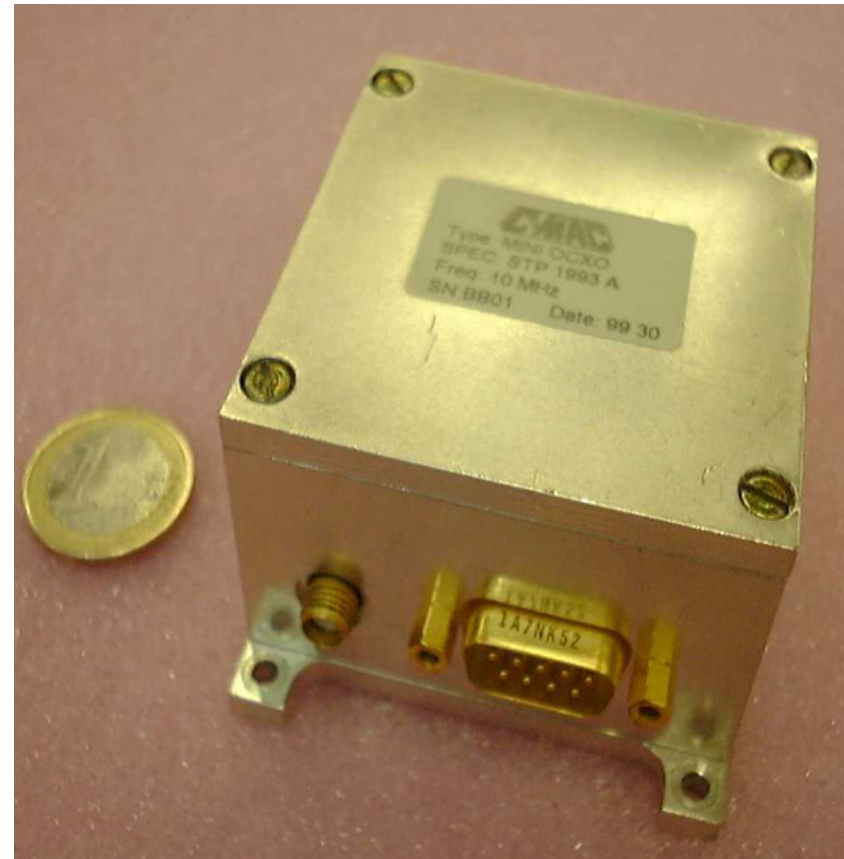
## Current Space OCXOs Capability

Frequency Stability	USO	Mini USO	OCXO	Mini OCXO
Over temperature range	$\leq \pm 2 \text{ E} - 11$ over - 15, + 50°C	$\leq \pm 2 \text{ E} - 11$ over - 15, + 50°C	$\leq \pm 5 \text{ E} - 10$ over - 20, + 65°C	$\leq \pm 1 \text{ E} - 9$ over - 20, + 65°C
Short term (10s)	$\leq \pm 1,5 \text{ E} - 13$	$\leq \pm 1,5 \text{ E} - 13$	$\leq \pm 1 \text{ E} - 12$	$\leq \pm 2 \text{ E} - 12$
Per Day	$\leq \pm 2 \text{ E} - 11$	$\leq \pm 2 \text{ E} - 11$	$\leq \pm 5 \text{ E} - 11$	$\leq \pm 5 \text{ E} - 11$
Per Year	$\leq \pm 5 \text{ E} - 9$	$\leq \pm 5 \text{ E} - 9$	$\leq \pm 1 \text{ E} - 8$	$\leq \pm 1 \text{ E} - 8$
Variation for 1 Gauss	$\leq \pm 5 \text{ E} - 12$	$\leq \pm 5 \text{ E} - 12$	$\leq \pm 5 \text{ E} - 11$	$\leq \pm 5 \text{ E} - 11$
Variation for 1 g	$\leq \pm 5 \text{ E} - 10$	$\leq \pm 5 \text{ E} - 10$	$\leq \pm 5 \text{ E} - 10$	$\leq \pm 5 \text{ E} - 10$
Variation for 1 bar	$\leq \pm 5 \text{ E} - 9$	$\leq \pm 5 \text{ E} - 9$	$\leq \pm 1 \text{ E} - 8$	$\leq \pm 1 \text{ E} - 8$
Volume / Mass	0,9 litre 1.2 k g	0,4 litre 0.5 k g	0,15 litre 200g	0,07 litre 120g
Status	Qualified - Doris, Spot, Helios, Pharao, Envisat, Syracuse ...	under development	Qualified - (QZSS, Mars Detector)	Qualified (Elisa)



### Airborne Product range (Low G sensitive OCXO)

- ▶ Program specific for most part of devices
  - ▶ from XO to OCXO
  - ▶ Radars, counter measures, etc.
- ▶ New Designs qualified (European customer)
  - ▶ low Phase Noise OCXO
  - ▶ specific High Frequency XO
- ▶ New Mini-OCXO (Generic Design)
  - ▶ Qualified @ Rakon
  - ▶ Qualification in customers equipment (Boeing & Airbus)



Avionics Product range (various oscillators)

