

A Note about Rubidium Oscillators

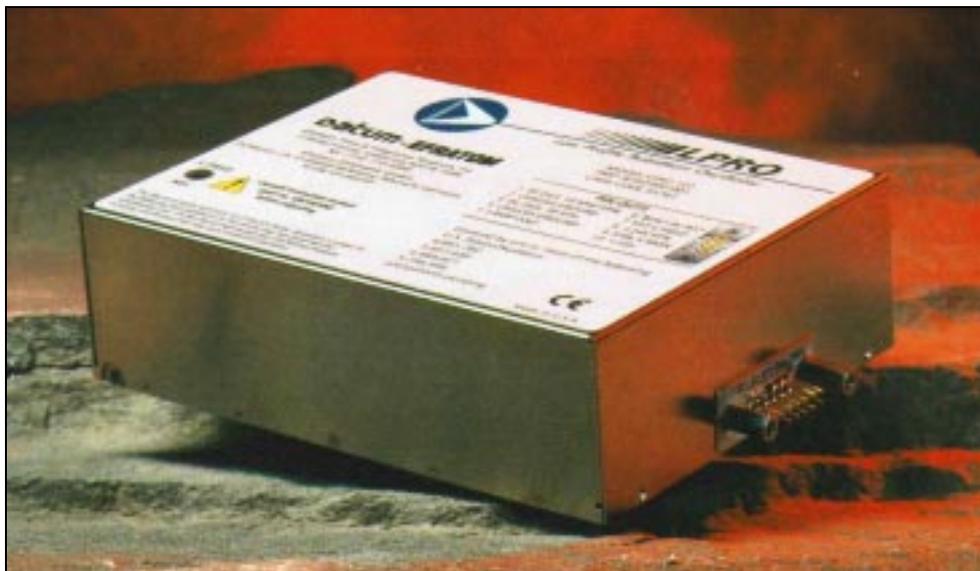
Datum is the inventor and world's leading manufacturer of Rubidium Oscillators. Since starting production in 1971 at Efratom Elektronik GmbH in Munich, we have produced more than 80,000 units. We fully understand their characteristics and applications, and we use that expertise to provide our customers with superior timing products.

Over our 27 years of Rubidium oscillator development and production experience, we have shown that the lifetime of our physics package is virtually unlimited. Datum is the only company worldwide, being able to guarantee a lifetime warranty on lamp and cell. There are no "wear-out" or "use-up" mechanisms in a Datum Efratom Rubidium oscillator. Our customers sometimes confuse Rubidium oscillator "life" with Cesium tube "life." Cesium tubes use up the Cesium over their lifetime and must be replaced periodically. (Datum Cesium tubes have improved to the point where we offer a 12-year warranty, though!) Any Rubidium oscillator failures that do occur are due to normal electronic component failure (resistors, capacitors, etc.) therefore *Datum Rubidium oscillators* are extremely reliable.

The demand for *Datum Rubidium oscillators* in telecommunications applications has increased dramatically recently. This increased volume of production has led to a significant decrease in cost. Today, Datum produces more than 300 Rubidium oscillators per day, and therefore we have been able to reduce our prices dramatically. *Datum Rubidium oscillators* are quite economical.

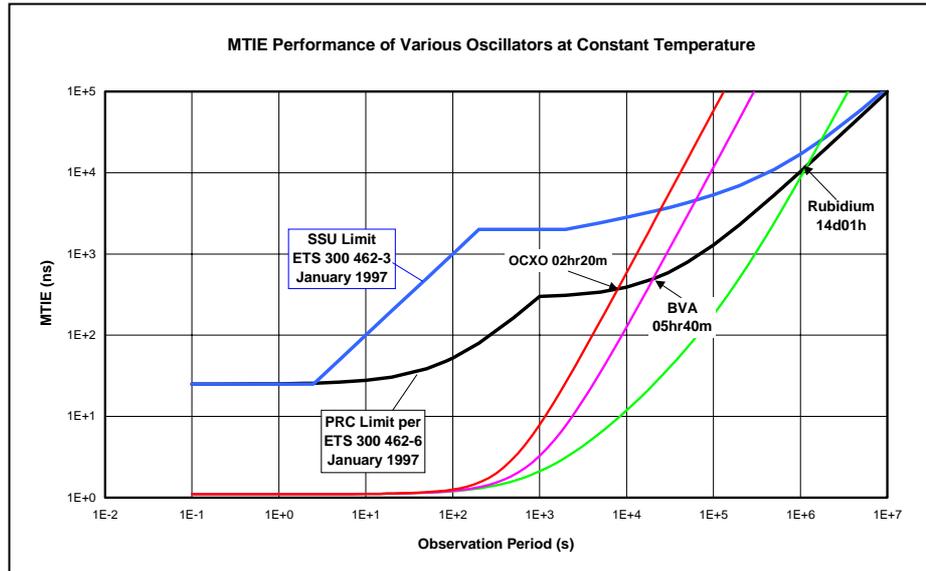
We strongly recommend that customers consider *Datum Rubidium oscillators* for every telecom synchronization application. The benefit to the user is that *Datum Rubidium oscillators* warm up in less than 10 minutes and maintain Stratum 2E holdover performance for almost two weeks – even under varying temperatures. This superior holdover provides the operator a very comfortable timetable for the repair of a site which has gone into holdover.

Rubidium holdover is especially attractive when contrasted to the 5 hour holdover for BVA (crystal) oscillators and even less for normal crystal oscillators (OCXOs). There is a dramatic cost difference between visiting a site for repairs sometime within two weeks versus sometime within the next 5 hours! When Rubidium holdover oscillators are used, the need to make emergency visits to a site to repair a clock which has entered holdover is entirely eliminated. This substantial maintenance cost savings allows Telecom operators to easily recover the incremental cost of Rubidium oscillators.



Rubidium-Oscillator, Model LPRO

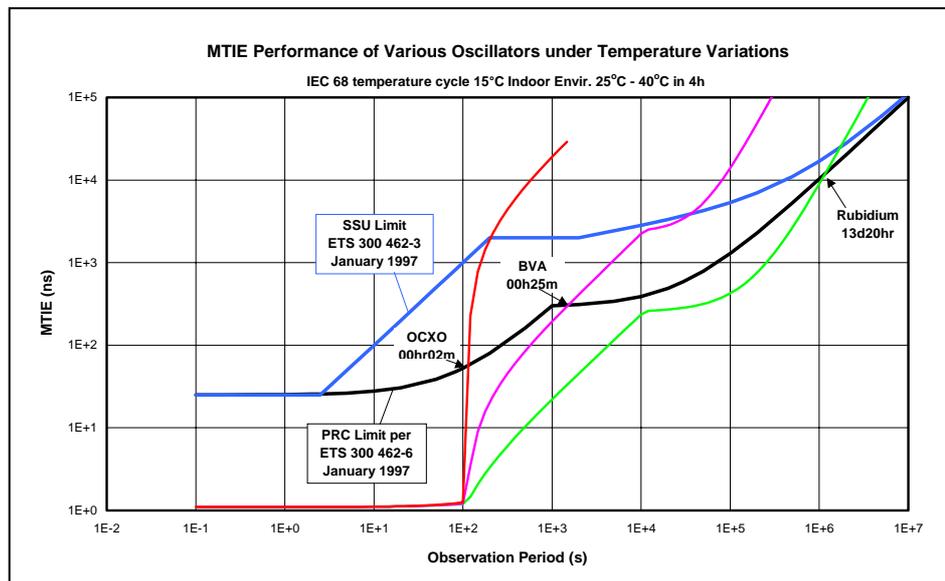
The graph shows the specified performance of Oven Controlled Crystal Oscillators (OCXO's), BVA Quartz Oscillators and *Datum Rubidium Oscillators* over time at a constant temperature. Also plotted are the ETSI stability limits ETS 300 462-6 and ETS 300 462-3. At constant temperature, the OCXO exceeds the specified limit in 2 hours 20 minutes, the BVA Oscillator exceeds it in 5 hours 40 minutes, while *Datum Rubidium Oscillators* take more than 14 days to exceed the MTIE limit.



The graph below plot the same information for oscillators which are experiencing temperature variations. The plot are MTIE performance in the presence of the IEC 68 specification for indoor telecommunication equipment with an 15 °C. temperature cycle (+25 °C to +40 °C) over 4h.

It is normal for a site to experience both diurnal and weather-related temperature variations, so it is important to consider the temperature sensitivity of a holdover oscillator. When the clock system is in holdover, the stability must be maintained in order to keep the telecommunications equipment functioning. A Datum Rubidium holdover oscillator is very inexpensive insurance against system failure.

Exceptional holdover performance is maintained by *Datum Rubidium oscillators* - even in the presence of temperature variations.



Datum GmbH = known as Efratom Elektronik GmbH