

## Rubidium Oscillator Product Safety Data Sheet

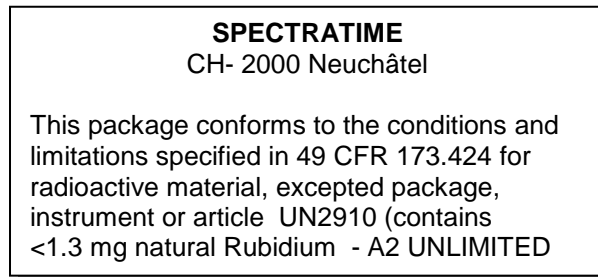
### 1. Introduction

The following PSDS (Product Safety Data Sheet) contains information which should answer any questions relating to handling/shipping of Rubidium (Rb) oscillators and products containing those oscillators.

### 2. Radioactivity

This analysis shows a total activity level of less than  $1.6 \times 10^{-4}$  micro-Curie per Rubidium oscillator due to Rb 87. The transportation of RbCl (Rubidium Chloride) in airplane is authorized. However, DOT (Department of Transportation) regulations require that shipping packages be labeled even when the level are within acceptable limit. Shipping documents or shipping containers need to show that the product is safe to handle.

Example of SpectraTime labeling / or shipping documents indications:



### NOTICE OF NONHAZARDOUS RADIOACTIVE MATERIALS

#### 2.1 ITEM

Frequency Standard: Rubidium

#### 2.2 RADIOACTIVE MATERIAL

$^{87}\text{Rb}$ , specific activity = 0.084 micro-curies/gram

#### 2.3 DECAY MODE

Beta decay, 0.27 MeV

#### 2.4 LOCATION & AMOUNT

The hermetically sealed glass rubidium lamp and cell assemblies each contain a small amount of rubidium metal. The rubidium is a mixture of natural rubidium containing:

73 atom percent of  $^{85}\text{Rb}$   
27 atom percent of  $^{87}\text{Rb}$  and separated  $^{87}\text{Rb}$  isotope.

The  $^{87}\text{Rb}$  is mildly radioactive with a half life of  $4.88 \times 10^{10}$  years. The total amount of radioactive rubidium in the frequency standard is <1.3 mg.

#### 2.5 RADIOACTIVE MATERIAL SOURCE

SpectraTime obtains the rubidium from natural sources in the form of RbCl that is a stock item in many retail stores selling chemicals.

### 2.6 RUBIDIUM ACTIVITY LEVEL

Our calculations are based on the entire rubidium content being the most active  $^{87}\text{Rb}$  so that the calculation is conservative and reflects a highest level possible. The total level of both cells combined would be less than  $1.6 \times 10^{-4}$  micro-curies.

### 2.7 EXEMPT FROM LICENSE

Since the used rubidium is a natural-occurring substance and the amount is less than 1 gram, neither the State of Arizona nor the NRC requires a license to manufacture or distribute this product.

### 2.8 TRANSPORTATION

The U.S. Department of Transportation under 49 CFR 173.424 allows for the unrestricted shipment of instruments containing rubidium conforming to the requirements of Table 7. Rubidium oscillators manufactured by SpectraTime are in conformance with the said Table and required limitations of the code.

## 3. Other Hazards Related to Rubidium Non-Radioactive Properties

### 3.1 DURING NORMAL OPERATION OF RUBIDIUM OSCILLATORS

No hazard

### 3.2 IN CASE OF RUBIDIUM RELEASE (GLASS CELL RUPTURE)

Despite the very reactive and corrosive properties of Rubidium, the limited amount of material ( $< 1.3 \text{ mg}$ ,  $< 1 \text{ mm}^3$ ) contained in the oscillators does not present any hazard.

Nevertheless the following basic precaution must be taken in case of Rubidium release following a glass cell rupture:

- Do not inhale or ingest, and avoid contact with the skin and the eyes.
- Keep away from foodstuff, beverages and feed
- Wear gloves and pick-up mechanically.
- In case of contact with eyes, rinse immediately with plenty of water

## 4. Disposal

Material should be disposed in accordance with local, state and federal or national regulations.