Short Operation Manual
First Responder Kit
FOR RADEYE B20/B20-ER

Thermo SCIENTIFIC

Radiation Measurement & Security Instruments

1 The RadEye B20 / B20-ER should be operated at a location with low radiation background. Measurements mode should be performed at different locations for the determination of the best spot for the setup.

2 Perform a **background measurement** with the RadEye B20 / B20-ER inside the sample holder, at least once per day. Leave the planchet or jar empty and set the RadEye's background measurement time (t_0) to **1800 s** (recommended) and the total counts to 9999. The derived background value must be stored (RadEye Display: Save value → Yes).

3 Set the **scaler measurement time** (t_m) of the RadEye B20/B20-ER

Initial Sample Check: Recommended time t_m[s] = 300

Impact of measurement time can be seen from the formular at the bottom of this page. Extented measurement times (sample and background time) improve the detection limit. Please see the below stated simplified formula.

4 Check that the operation mode of the RadEye B20/B20-ER is set to **scaler mode.** The net result [cps] will be provided directly by the RadEye B20/B20-ER if the **Scaler netto** function is active.

5 Perform the sample measurements according to page 2. Verify the actual background radiation level on a regular basis. Calculate the Bq result by using the below stated formula:

Net result [cps] X ***F [Bq / cps]*** = ***Result [Bq]***

The calibration factor "F" is typically 5 Bq / cps (approx. 20% Beta efficiency for Cesium and Iodine mixtures).
Practical Hints: Liquid samples: Only beta radiation from top layer of liquid is contributing to the measurement result. Please see page 2 for a described measurement procedure with related I-131 calibration factor.
Solid samples: Only beta radiation from the top surface facing the detector can be measured. If appropriate, then turn the sample around and measure again.

Simplified formula for the detection limit calculation:

$$\text{Detection Limit} = 3.3 \times F \times \sqrt{\frac{R_0}{t_m} + \frac{R_0}{t_0}}$$

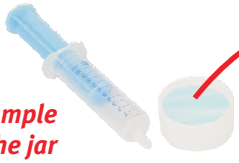
R_0 = Background Count Rate [cps]
t_m = Measurement Time [s]
t_0 = Background Measurement Time [s]

The formula allows the determination of the limit of detection. Increasing t_m lowers the limit of detection.

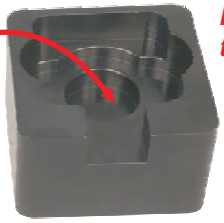
Procedure I-131 in Liquids* (Milk, Water)

Sorting out of clearly contaminated liquids

Start



Fill 15 ml of the sample into the jar



Place the jar inside the sample holder

RadEye B20/B20-ER set to "Scaler" mode

Put RadEye B20/B20-ER on top

CPS Result

Example

Info

Start measurement

I-131 Calibration factor for this setup and sample volume: 15 kBq/l per net cps

Result in kBq/l Iodine 131

*The stated calibration factor was determined with an Iodine solution on water basis with known I-131 activity. Typical detection limit: 2000 Bq/l in 5 min. Since the beta energy for Cs-137 and Cs-134 is similar to I-131, the stated calibration factor can be used for those isotopes as well. Cross comparision with gamma measurements is recommended for fine adjustment of the calibration factor.

Procedure: Solid Materials

Measurement of Surface Contamination

Start

Fill the sample into a planchet

Place the planchet inside the sample holder

Put RadEye B20/B20-ER on top

CPS Result

RadEye B20/B20-ER set to "Scaler" mode

Info

Start measurement

Example

Result in Bq/cm²

Example: 1.19 net cps x 5 Bq / net cps / 20 cm² = 0.3 Bq/cm²
Sample Area = 20 cm²