# Beta Radiation Calibration System

**The Beta Radiation Calibration System can be used for comfortable and safe calibration of dosimeters by beta radiation sources.**

**It is designed to perform electronic personal dosimeters calibration in fully automatic process.**

## Purpose

The Beta Radiation Calibration System is intended for comfortable and safe calibration of dosimeters by beta radiation sources. It is designed for electronic personal dosimeters calibration; its advantage is its capability to calibrate electronic dosimeters in fully automatic mode with relatively high throughput.

Other beta-sensitive detectors can optionally also be calibrated using the device after necessary customization; the applicability depends on detector type and on suitability of installed radiation sources energy.

## Description

The Beta Radiation Calibration System architecture follows ISO 6980 standard for $H_P(0.07)$ detectors calibration. The main parts are:

- 3 reference sources emitting pure beta radiation:
  - **$^{147}$Pm** Promethium, recommended nominal activity 3.7 GBq (0.1 Ci)
  - **$^{85}$Kr** Krypton, recommended nominal activity 3.7 GBq (0.1 Ci)
  - **$^{90}$Sr/$^{90}$Y** Strontium/Yttrium, recommended nominal activity 460 MBq (12.7 mCi)
- Beam flattening filters, each one matching with respective source
- Rotating table step-motor driven mechanism
- Set of standardized phantoms (human body simulation)
- Electronic dosimeter reader
- Database and control software
- Ambient condition sensors (temperature, pressure, humidity)
- Safety interlocks interfaces

## Main Advantages

- Sources for $H_P(0.07)$ calibration; traceable to national standard with flattening filters
- Standardized phantoms
- Electronic dosimeter reader integrated
- Adjustable dosimeters calibration procedure
- Capability to calibrate electronic dosimeters in fully automatic mode with high throughput
- Automatic ambient temperature, pressure and relative humidity impact correction
- PC with software allowing measured data processing and archiving
- Remote control

## Standards and Certification

- International Atomic Energy Agency (IAEA) recommendations – part CALIBRATION OF BETA MEASURING INSTRUMENTS
- **ISO 6980** standard for $H_P(0.07)$
- Referential standard BSS-2

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## Description

During preparation for calibration, the dosimeter is manually fixed at working table in proper position. Up to 12 dosimeters can be placed onto the table. Then the dosimeters are irradiated by selected source for defined time/rate, measured value is acquired into data processing software and properly evaluated. In both manual and automatic mode the irradiation is disabled until all safety conditions are fulfilled.
The system takes into account current source activity, time/dose pre-set, and the ambient conditions.

### Electronic personal dosimeters automatic calibrator

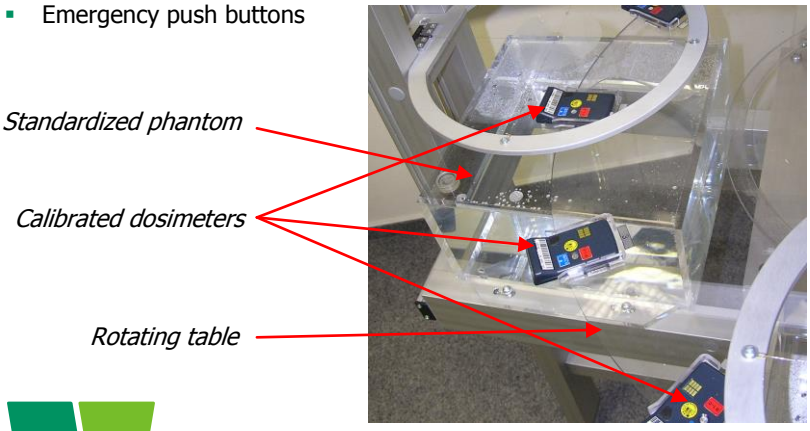
- Turntable automatic mechanism with stepping motor, absolute positioning sensors, PLC controller
- Electronic dosimeters reader, operated via control SW supports: dosimeter identification, initial zeroing, reading measured dose from source no.1, zeroing, reading measured dose from source no.2 …
- Capability to perform repeated measurements of the dose from each source in automatic process for statistical processing
- All measured data are sent to host software for data processing and archiving
- Measurement process automation (pre-programmed procedures)
- Dosimeter types capable to be calibrated: EPD Mk2, DMC-2000XB as standard, others on request.

### SW tool for measured data processing and archiving

- Takes into account current sources energies (calibrated / certified)
- Data correction depending on ambient condition
- Statistic evaluation of data measured: mean value, deviation, relative error, variation coefficient, dosimeter energy dependence
- Printable outputs

### Safety interlocks

- Automatic source valve closing to the safe position in case of any failure/malfunction/power supply shut-off
- Door open/close sensor, PIR sensor
- Status light signalling
- Emergency push buttons




## Specification

**Sources & recommended nominal activity**

| | |
|---|---|
| ▪ $^{147}$Pm | 3.7 GBq (0.1 Ci) |
| ▪ $^{85}$Kr | 3.7 GBq (0.1 Ci) |
| ▪ $^{90}$Sr/$^{90}$Y | 460 MBq (12.7 mCi) |

| | |
|---|---|
| The dose rate on surface of the irradiator holder (source in basic position) | < 0.5 mSv/h (0.05 rem/h) |

**Beam flattening filters**

Set of 3; each one matching with the source

**Phantoms**

300 x 300 x 150 mm; set of 3 (standard)

**Controlling, software, communication**

PC control, possibility to connect to centralized Database and Control Software of the calibration laboratory

Moving parts control: sensors, PLC

Communication to control PC via Ethernet

**Operating conditions**

| | |
|---|---|
| Temperature | 5 ~ 50 °C (41 ~ 122 °F) |
| Relative humidity | max. 80 % |
| Pressure | 86 ~ 106 kPa |
| **Power supply** | 220~240 VAC, 200 VA |
| **Electric protection** | IP 40 |
| **Dimensions** (W x H x D) | 1280 x 2055 x 1130 mm (50.4 x 80.9 x 44.5 in) |
| **Weight** | app. 200 kg (440 lb) |

## Models and Accessories

| Model | Description |
|---|---|
| **K0831-01** | Beta-radiation calibration system (standard configuration) |
| **Optional Accessories** | |
| ▪ Optical monitoring system<br>▪ Adapters for other types of dosimeters and/or other phantoms | |

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