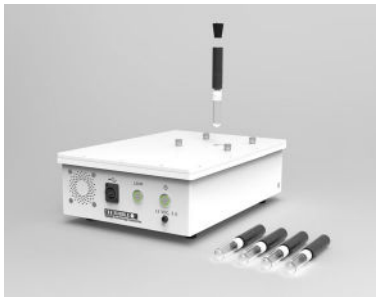
Bubble Detectors
Neutron Dosimeters

- Accurate, sensitive, real-time neutron dosimeters
- Immediate visible response to neutron radiation
- Ideal for ALARA programs and rapid measurements of neutron radiation fields
- Tissue-equivalent, energy-independent, neutron dose measurements
- Zero sensitivity to gamma radiation, providing accurate neutron dosimetry in mixed fields
- Lightweight, rugged, and compact
- Low cost and reusable hundreds of times
- Simple to use, maintenance-free, no power required
- Fully temperature-compensated
- Proven, patented, reliable technology
- Meets ICRP-60 sensitivity requirements

Bubble Detectors are the most sensitive, accurate, neutron dosimeters available. Used for over 15 years by nuclear facilities, research institutes, military personnel, and the medical community, Bubble Detectors provide instant visible detection and measurement of neutron dose. Inside the detector, tiny droplets of superheated liquid are dispersed throughout a clear polymer. When a neutron strikes a droplet, the droplet immediately vaporizes, forming a visible gas bubble trapped in the gel. The number of droplets provides a direct measurement of the tissue-equivalent neutron dose.

The Bubble Detector is the only neutron dosimeter where the response is independent of dose rate and energy, with zero sensitivity to gamma radiation. Bubble Detectors are so compact, lightweight, and rugged, that they can be clipped to a coat or shirt pocket, placed in areas with limited access, or used in close proximity to a neutron source for a quick assessment. With an isotropic angular response, neutron dose can be accurately measured regardless of the direction of neutrons relative to the detector. Bubble Detectors are ideal for ALARA programs, providing the user with an immediate measurement of neutron hazards.



The **BDR-III™ Automatic Bubble Reader** is an affordable solution for automatic counting of large numbers of detectors. The BDR-III provides bar code-ready, fully automated counting with machine vision technology that generates database compatible files in a compact, simple-to-use instrument.

- Affordable solution for routine bubble detector reading
- Fully automated counting
- Database compatible file generation
- Bar code-ready
- Compact, simple to use
- Image storage for audit and archiving

Applications:

Bubble detectors are ideal for rapid and accurate measurements in a broad range of applications:

- Nuclear power stations and nuclear research laboratories (neutron dosimetry and shielding verification)
- Hospitals involved in radiation therapy/nuclear diagnostics (neutron dosimetry and LINAC shielding verification)
- Airline crew dosimetry and space applications (high altitude neutron dosimetry)
- Military personnel (neutron dosimetry and hazard detection)

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BUBBLE DETECTORS
Technical Specifications
(Visit www.bubbletech.ca for more information)

	BD-PND	BDT	BDS
Energy Range	< 200 keV to > 15 MeV	Thermal (~ 1/V for epithermals)	Six thresholds: 10, 100, 600, 1000, 2500 and 10000 keV
Sensitivity (Ordered detectors are selected from range)	1 - 2 bub/mrem (0.1 - 0.2 bub/μSv) 10 - 19 bub/mrem (0.9 - 1.8 bub/μSv) 20 - 40 bub/mrem (1.9 - 3.7 bub/μSv)	20 - 40 bub/mrem (1.8 - 3.6 bub/μSv)	1 - 2 bub/mrem (0.1 - 0.2 bub/μSv)
Automatic Temperature Compensation	Yes	Yes	No
Optimum Temperature Range	20 - 37 °C	20 - 37 °C	20 °C (± 0.5 °C)
Size	153 mm length x 19 mm diameter	160 mm length x 19 mm diameter	80 mm length x 16 mm diameter
Weight (each detector)	58 g	58 g	20 g
Re-use	Yes	Yes	> 10 cycles
Recompression Method	Integrated assembly	Integrated assembly	External recompression chamber required
Notes	Recommended for personal neutron dosimetry	Thermal:fast neutron sensitivity > 10:1	Ideal for neutron spectral characterization

All bubble detectors offer:

- Zero gamma sensitivity
- Energy-independent above threshold, dose rate-independent, tissue-equivalent dose measurements
- Isotropic angular response
- 90 day warranty

Available Bubble Detector Models

BD-PND:
The BD-PND is the recommended detector for personal neutron dosimetry. Its sensitivity exceeds the ICRP-60 requirements for neutron dosimetry. It incorporates automatic compensation for sensitivity change with temperature over the operational range of 20 - 37 °C. Nuclear laboratories, utilities, and military personnel have found that the BD-PND's immediate visual response and high sensitivity, coupled with its small size, light weight and rugged construction, make it the ideal device for ALARA programs.

BDT:
Health physicists and others who are especially concerned with **thermal** neutron dose can take advantage of the simplicity and low cost of thermal Bubble Detectors. The BDT Bubble Detector is preferentially sensitive to thermalized neutrons, with an exclusion ratio of thermal-to-fast neutron response exceeding 10:1.

BDS:
The BDS is a complete low-cost neutron spectrometer package consisting of 36 Bubble Detectors that have been specifically formulated with six different energy thresholds. Each spectral measurement can be made with 18 detectors (3 of each threshold supplied – 10, 100, 600, 1000, 2500, 10000 keV). A simple algorithm is included for "unfolding" the neutron measurement data. Detectors can be re-used through recompression in a pressure chamber (available from BTI).

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