INTRODUCING THE NEW DIS

An Electronic Legal Dosimetry system using the patented Direct Ion Storage principle
DIS-1 is a unique Electronic Dosimeter from RADOS designed to serve as the legal dosimetry device for measuring the official doses in all areas where TLD or Film dosimeters are used today. The radiological performance of DIS-1 is excellent covering the Hp (10) and Hp (0.07) photon and beta energies without compromise. The wide dose and energy range and its ability to operate in pulsed fields and at high dose rates makes DIS-1 the ideal device for all kinds of radiation dosimetry. The immunity of DIS-1 to external interference is unequaled, even at very high EM or RF fields there are no changes in the dose readings.

DIS-1 could be described as a passive electronic TLD/Film badge which can be infinitely non-destructively read without loss of dose information. This unique feature allows the wearer of the DIS-1 to instantly readout his/her accumulated doses whenever required. The actual DIS-1 badge is small, light with rugged and watertight construction making the DIS-1 badge reliable and easy to use.

**How does it work?**

The Direct Ion Storage (DIS) dosimeter is based on the combination of an ion chamber and a non-volatile electronic charge storage element. In a modern nonvolatile solid-state memory cell the analog information is stored in a form of electronic charge trapped on the floating gate of a MOSFET transistor. The DIS principle is based on the discovery whereby the entire memory cell is surrounded with a conductive wall and the floating gate of the cell is set in direct contact with the gas inside the wall. Thus an ion chamber is formed between the wall and the floating gate.

For photon radiation, the initial interactions take place in the wall material and the secondary electrons thus formed ionize the gas between the wall and the gate. For charged particle radiation, if the wall...
is thin enough, the charged particles are allowed to transfer all or part of their energy in the air space. The dosimetric characteristics can therefore be adjusted by altering the wall material and gas used.

The DIS-1 dosimeter actually consists of three independent ion chambers; two for deep and one for shallow dose. These chambers cover the low and medium doses. There is additionally two MOSFET transistors which are used for measuring the very high doses.

**ADVANTAGES**

- Direct measurement of $H_p(10)$ and $H_p(0.07)$ over the entire energy range
- Instant non-destructive readout and dose reset with a bench-top reader
- Passive operation
- No battery to replace*
- Small, rugged and waterproof
- Insensitive to EM or RF interference
- Operation at high dose rates and in pulsed fields
- Built-in memory chip for user identification storage
- A replacement to TLD and film
- Up to 12 months issue period

*contains a lithium cell with an expected service life of 10 years
The excellent radiological features and the easy and fast reading of the DIS-1 dosimeter makes the new DIS based RADOS Electronic Legal Dosimetry (ELD) system superior to any Film dosimetry or TLD system without need for complicated processing systems. Just plug the DIS-1 badge into the small and simple to use DBR-1 reader and in a couple of seconds the doses are shown on the display and stored in a local database.

The instant reading capability allows the user to control his/her doses on daily basis and makes the monthly or quarterly change of the dosimeter unnecessary. The control period can be indefinite (in excess of a year) because the dose readings can be transmitted via electronic method rather than physically sending the badge away for reading and recording of official doses.

The DBR-1 reader can be used in various modes. In the simplest mode the reader just reads the doses and shows them on it's display. The DBR-1 can also be connected directly to a local PC or via intra- or internet to a remote PC for storing the doses from DIS-1 into dosimetric data base. With the sensitivity of the DIS-1 dosimeter and the versatility of the DBR-1 reader as either a stand alone or entry/exit reader, the ELD system is ideally suited for all types of control and/or legal dosimetry applications.
The DIS-1 has the added flexibility of storing and measuring/recording the total dose received to the badge since the last Hard Reset/Calibration as well as a short term dose measurement. This feature allows the total dose record to be kept for legal dosimetry reporting, but allows the dosimeter to be soft reset/zeroed and used to report doses received for either specific time periods (Day, Week, Month) or specific tasks.

APPLICATIONS
for personnel and work dosimetry in:

- Medical Organizations
- Transportation of Radioactive Materials
- Non Destructive Testing
- Nuclear Research Centers
- Civil Defense Organizations
- Military
The ELD system can consist of a number of components, dependent on the requirements of the user. These components are the DIS-1 badges, DBR-1 bench-top readers for data transfer and administration, a Pocket Display and Alarm Unit (PDU-1) for personal indication with the ability to alarm at predefined alarm threshold settings and a PC-linked reader (PCR-1) to download dose data directly from the PDU-1.

The ELD system is suited for use in small single reader departments through to large facilities needing a network of readers for entry and exit control and sophisticated dose management software. Additionally, dose records can be transmitted electronically directly to a legal service provider, removing the lengthy and costly administration currently associated with legal dosimetry services and negating the need to change badges on a regular basis.

The heart of the ELD system is the DIS-1 dosimeter that can be worn in a clip on a holder or inserted into a pocket size display and alarm unit which offers full alarming dosimeter features.

When the DIS-1 badge is attached to the pocket size display-alarm unit PDU-1 it operates like a conventional electronic dosimeter having the superior dosimetric capabilities of the DIS principle.
The RADOS DoseControl Software is developed for easy control and management of the every day personnel doses. The DoseControl Software completes the ELD system by providing a versatile dose management platform for handling and reporting the official doses. There are two different DoseControl Software solutions available. One for small scale applications with only a small number of dosimeters in use. The other one is for applications where a large number of dosimeter readings will be stored and analyzed.

In conclusion, the DIS offers a total solution to low maintenance, highly efficient dosimetry management, whether it is for a small or a large system. We at Rados are convinced that DIS will revolutionize legal and control dosimetry bringing state of the art technology into an area of the radiation measurement industry that has not changed for over 30 years.
Technical Specifications

DIS-1 Badge

Radiological:
Sensitive to gamma, x-ray and beta.
Instant readout of ICRU dose equivalents
H(10) and H(0.07)
Dose measurement range
H(10) 1 µSv to 40 Sv (0.1 mrem to 4000 rem)
H(0.07) 10 µSv to 40 Sv (1 mrem to 4000 rem)
Calibration accuracy
±5% at 1 mSv Cs-137 Hp (10)
±5% at 10 mSv Cs-137 Hp (0.07)
Energy response in the dose range up to 0.5 Sv
Photons:
H(10) ±30% from 15 keV to 9 MeV
H(0.07) ±30% from 6 keV to 9 MeV
Beta:
H(0.07) +10…-50% from 240 keV to 2.2 MeV (E_{max})
Angular Response
H(10) ±20% up to 60° of 65 keV
H(0.07) ±20% up to 60° of 65 keV
Insensitive to neutrons (<5%)
Temperature range from -10 to 50 °C
Functional:
Memory
H(10) and H(0.07) official dose memory
for reset only by authorized persons
H(10) and H(0.07) temporary dose memory
for daily resetting by dose management system
or HP personnel
Calibration date
User ID or name up to 16 characters
H(10) and H(0.07) alarm thresholds

Mechanical/Miscellaneous
Size (w/o holder) 41 x 44 x 9 mm
Weight (w/o holder) 20 g
Beta window aluminized PI (app. 7 mg/cm²)
Holder plastic or aluminium

DBR-1 Reader

Operation
Display of H(10) and H(0.07) doses
Reset of the short term doses
Display of the doses of various chambers
Real time clock
Operating temperature +10 - +50 °C
Mains voltage 90-240 VAC
Built-in back-up battery
Mechanical/Miscellaneous
Gold plated connector for dosimeter reading
2x16 alphanumeric LCD display with electroluminescent backlight; 9.5 mm digits
Heavy duty 16 keypad
Rugged metal case
RS-232 serial port
Size: 260x265x230mm
Weight: 8.3kg
Wall/bench-top mounting