Individual Monitoring Services (IMS) for External and Internal Exposures

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Contribution to the “Italy in Japan 2011” initiative Science, Technology and Innovation
The IMS is processing about 70,000 dosemeters per year:

- 6000 photon dosemeter;
- 1300 thermal neutron dosemeters;
- 1300 fast neutron dosemeters;
- 2000 extremity dosemeters

for monitoring period of 45 days and 90 days for extremity dosemeters.

The IMS provides dosemeters to about 200 external users:

- 25% hospital,
- 25% research institute,
- 25% industry,
- 5% decommissioning of the nuclear plants
- 20% other mainly private laboratory.
The IMS provides 5 kinds of dosemeters to assess Personal Dose Equivalent Hp(d) and Ambient Dose Equivalent H*(d) as required by Italian Legislation (D. Lgs. 241/2000).

- Photon dosemeter
- Thermal Neutron Dosemeter
- Fast neutron dosemeter

- whole body TL dosemeter for photons, based on 2 detectors of LiF(Mg,Cu,P) (GR200);
- whole body TL dosemeter for thermal neutrons and gamma based on 2 detectors of LiF(Mg,Cu,P) (GR200) and $^7$LiF(Mg,Cu,P) (GR207);
- whole body SSNDT (CR-39®) dosemeter for fast neutrons;
Extremity dosemeters

- extremity TL dosemeter for X, $\gamma$ and high energy $\beta$ with one detector of LiF(Mg,Cu,P) GR200
- extremity TL dosemeter for X, $\gamma$ and mean energy $\beta$ with one thin detector of LiF(Mg,Cu,P) MCP-Ns

both available with ring or bracelet supports suitable for sterilization
### Intercomparisons

<table>
<thead>
<tr>
<th>Intercomparison</th>
<th>Year</th>
<th>Dosemeter Description</th>
<th>Estimated Quantities</th>
</tr>
</thead>
<tbody>
<tr>
<td>EURADOS</td>
<td>1999</td>
<td>Whole-body for photons, $\beta$, neutrons (TLD and PADC)</td>
<td>$H_p(10)$ for $X$, $\gamma$, $\beta$, $n$</td>
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<tr>
<td>DOE</td>
<td>1996</td>
<td>Environmental dosemeters (TLD)</td>
<td>Kerma in air in $\mu$Gy</td>
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<td></td>
<td>2000</td>
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<tr>
<td>IAEA</td>
<td>2003</td>
<td>Whole-body for neutrons (TLD and PADC)</td>
<td>$H_p(10)$ for thermal neutrons and fast neutrons</td>
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<tr>
<td></td>
<td>2005</td>
<td></td>
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<tr>
<td>EURADOS-CONRAD</td>
<td>2007</td>
<td>Extremity dosemeters (TLD)</td>
<td>$H_p(0.07)$ for $X$, $\gamma$, $\beta$</td>
</tr>
<tr>
<td>EURADOS</td>
<td>2008</td>
<td>Whole-body for photons (TLD)</td>
<td>$H_p(10)$, $H_p(0.07)$ for $X$, $\gamma$</td>
</tr>
<tr>
<td>EURADOS</td>
<td>2009</td>
<td>Extremity dosemeters (TLD)</td>
<td>$H_p(0.07)$ for $X$, $\gamma$, $\beta$</td>
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</table>
The internal dosimetry (Laboratories for in vivo measurements)

- Casaccia: High Energy whole body counter - Low energy organ counter;
- Saluggia: High Energy whole body counter;
- Bologna: High Energy whole body counter - transportable Thyroid counter
- Trisaia High Energy whole body counter

Monitoring measurements performed per year: about 1000 (35% for ENEA workers).

The Internal dosimetry (Laboratory for in vitro measurements)

The unit is organized as a unique laboratory split into three separate, intercalibrated sub-labs, Casaccia, Saluggia and Trisaia, all of them equipped by alpha spectrometry, scintillation counting, gamma spectrometry, alpha and beta counting (ICP mass spectrometry only in Casaccia)

Main analyses provided: Actinides, Uranium isotopes, $^{226}$Ra, $^{210}$Po, $^{90}$Sr, $^{14}$C, $^{3}$H, gamma emitters.

Monitoring analysis performed per year: over 2000 (30% for ENEA workers).

The lab regularly participates to PROCORAD Intercomparisons since 1994
Internal exposure (Casaccia, Bologna, Saluggia and Trisaia): in vivo measurement systems

- Casaccia: whole body counter
- Trisaia: whole body counter
- Bologna: whole body counter
- Casaccia: lung (organ) counter
- Saluggia: whole body counter
- Bologna: thyroid counter
Calibration phantoms for in vivo counting

L.L. THORSO PHANTOM

BOMAB PHANTOM

ANSI THYROID PHANTOM

Lung counting calibration by L.L. THORSO PHANTOM

L.L. THORSO PHANTOM: additional chest plates

Home Made SKULL PHANTOM (24 point sources of Am-241)
Technical Services

Internal exposure (Casaccia, Saluggia and Trisaia): bioassay measurements laboratories
Technical Services

Internal exposure (Casaccia, Saluggia and Trisaia): bioassay measurements laboratories
References


References


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