ITRAC-3 Nuclear Science Training Course with NUCLEONICA
Karlsruhe, May 11-13, 2011

Velko Velev

Institute of Public Health
Ionizing Radiation Department
Skopje, Republic of Macedonia
Established in 2002 in the frame of IAEA Technical Co-operation Project

Purpose:
- Calibration of radiation protection instruments used in:
  - Medicine,
  - Industry,
  - State border control,
  - Education and etc.

Based on the ISO standards 4037-1/2/3

In process of implementation of quality standard ISO 17025 (General requirements for the competence of testing and calibration laboratories)
The main tasks of the laboratory are:

- Through the traceability of higher metrological standard, establishing and maintaining with a national metrological standard of Ionizing radiation dosymetry quantity in term of “Air Kerma” (Kair) (Gy), for photon ionizing radiation only.

- Providing a instruments calibrations for radiation protection to the end users, in terms of:
  - Air Kerma (Kair),
  - Ambient dose equivalent H*(10),
  - Personal dose equivalent Hp(10) and Hp(007).

- Contribution in the process of education to the students and other interested individuals for ionizing radiation metrology.
Instruments can be calibrated at Laboratory
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Equipments on disposal:

- **Irradiators:**
  - $^{137}$Cs irradiator unit type ST OB6, 740GBq-May 2003,
  - X-Ray irradiator with PANTAK 225kV high frequency generator

- **Traceable Standard Instruments:**
  - **Chambers:**
    - 1 x PTW32002/LS01 1 litre volume (secondary std. BIPM/PTB through IAEA),
    - 1 x PTW32003/LS10 10 litre volume (secondary std. BIPM/PTB through IAEA),
    - 1 x PTW32002/LS01 1 litre volume (working std.),
    - NE2575 0.6 litre (working std.),
  - **Electrometers:**
    - 2 x PTW type UNIDOS
Irradiators
1 l. Referent
Ionization Chamber
LS01/32002
10 I. Referent
Ionization Chamber
LS10/32003
Referent Electrometers PTW - UNIDOS
Laboratory capabilities

- Laboratory’s referent ionizing radiation qualities, by the standard ISO 4037-1, includes the next:
  - X-Ray Radiation,
  - (γ)Gamma radiation
- X-Ray Radiation:

- Filtered X radiation, within the energy range of (40 – 200) KeV,

- Traceability with higher standard is for qualities of narrow spectrum, “N” series, with mean energy from 33 KeV to 164 KeV, denoted as: N-40; N-60; N-80; N-100; N-120; N-150; N-180 and N-200,

- Dose capabilities of the unit for $k_{air}$ is:
  $(2.0 \times 10^{-4} \text{ до } 6.0 \times 10^{-2})$ Gy/h at reference calibration distance of 2m,

- Uncertainty of dose determining $u\% = 4\%$ with approximately 95% confidence probability, $k=2$
- (γ) Gamma radiation:

- For high energy calibration, 740 Gbq (May, 2003) $^{137}\text{Cs}$ nuclide source is used only.

- The energy of the gamma photons are 661.6 KeV.

- The referent radiation is denoted as a S-Cs quality.

- Dose capabilities of the OB6 unit for $K_{\text{air}}$ is:
  \[(7.5 \times 10^{-6} \text{ до } 5.0 \times 10^{-2}) \text{ Gy/h.}\]

- Uncertainty of dose determination is $u\% = 3\%$ with approximately 95% confidence probability, $k=2$.
Ionizing Calibration Laboratory
International Audits

Regularly takes part in TLD audits for radiation protection calibrations, organized by the IAEA.

As a result of audits, a difference more than the 3% has never been shown between delivered / IAEA measured. The max. acceptable difference limit set by the IAEA is 7%.
Laboratory is a full member in the IAEA/WHO network of the secondary standard dosimetry laboratories from 2006th.
Thank you for your attention