BEGINNING OF DOSIMETRY AUDITS IN BULGARIA

SSDL-Sofia situated in ISUL begun the Quality Assurance (QA) of 60-Co Tele-Gamma Therapy Units (TGTU) (ROKUS, USSR) in the late 1960s:
- Acceptance, commissioning, performance tests
- Calibration of TGTU with 60-Co
- Training and qualification of local staff

Around 1985 there are 13 Co-60 systems
- 11 РОКУС (ROKUS, USSR)
- 1 ЛУЧ (Luch, USSR)
- 1 Gamatron 3 (Siemens)

*Figure 1. Bulgarian map and towns with ⁶⁰Co units*
SSDL-София starts postal intercomparisons with TLD in 1975 as part of the dosimetry quality audit (DQA) on RT departments in the country:

- 15 runs are accomplished till 1999
- A method similar to the IAEA's (Eisenlohr H., PMB 22, 1971)
- LiF (TLD-100) in plastic capsules and Harshow 2000 TL Analyzer
- SSD=60 cm and SSD=75 cm; Field Size=10x10cm at water surface (SID=75 cm of ROKUS)

Table 1. Data for fifteen runs of SSDL – Sofia programme

| Run No. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | Total |
|---------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|       |
| Number of participants | 7 | 8 | 9 | 8 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 10 | 11 | 12 | 11 | 11 | 1 | 143   |
| Number of beams | 14 | 16 | 16 | 18 | 18 | 18 | 18 | 19 | 22 | 20 | 24 | 18 | 22 | 22 | 22 | 285  |
| Participants outside acceptance limits | 2 | 1 | 0 | 2 | 2 | 2 | 0 | 1 | 1 | 1 | 1 | 4 | 1 | 1 | 1 | 1 | 20    |
| Mean deviation [%] | -0.1 | 1.7 | 0.7 | 2.4 | 2.2 | 0.6 | 1.0 | 2.8 | 1.5 | -0.5 | -0.4 | -0.9 | -0.9 | -2.2 | -3.3 | 0.4 ± 3.4 |

SSDL-Sofia conducts 15 postal intercomparison runs with TLD from 1975 to 1999 as part of the dosimetry quality audit (DQA) on RT departments in the country:

- about 20 intercomparison runs were made by 2005

Figure 2. Frequency distribution of audit results for radiotherapy centres in Bulgaria
DQA IN BULGARIA

SSDL-Sofia participates in IAEA audits for SSDLs 1979-1999

- \( D_w \) according to IAEA TRS 277
- All are within the tolerance range of \( \pm 3.5\% \)

![Graph](image1.png)

\[ \text{Legend: } \circ \text{ Co } \quad + \text{ 43 MV} \]

**Figure 3.** Plot of the deviations relative to the IAEA dose

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POSTAL DQA OF TGTU – 2006 г.
SSDL-Sofia

![Graph](image2.png)

Acceptable deviation: \( \Delta \leq 3.5\% \) (IAEA)
SSDL–Sofia IN NCRRP: 2007

- SSSDL-Sofia moves from ISUL to the NCRRP in 2007
- Modernized with two national projects under the IAEA TC programme (first project: 2010-2012; second project: 2013-2015)

SSDL–Sofia IN NCRRP

- SSSDL-ISUL moves to the NCRRP in 2007
- Modernized with two national projects under the IAEA TC programme (2011-2013; 2013-2015)
RESULTS OF 2017 IAEA POSTAL DQA IN BULGARIA

- Number of participating institutions - 12
- Number of units - 16
- Number of beams checked - 29
- Number of sets sent - 30
- 30 evaluated sets for which Dratio was calculated:
  - 29 were within 5% acceptance levels; 1 - outside (96.67% of the results were within those 5%)
- 1 follow-up -> 100% improved Dratio index
- Average of Dratio = 1,007 (δ=1.634%)

- * The uncertainty in the RPLD measurement of the dose is 1.5% (1 standard deviation); this does not include the uncertainty intrinsic to the dosimetry protocol (see IAEA TRS-398).
- ** % deviation relative to IAEA measured dose = 100 x (User stated dose - IAEA mean measured dose)/ IAEA mean measured dose. A relative deviation with negative (positive) sign indicates that the user estimates lower (higher) dose than what is measured; a patient would therefore receive higher (lower) dose than what is intended by the factor given in the last column.
- Agreement within +/-5% between the user stated dose and the IAEA measured dose is considered satisfactory.

RESULTS OF RPLD MEASUREMENTS FOR Co-60 AND HIGH ENERGY PHOTONS

<table>
<thead>
<tr>
<th>Beam</th>
<th>Radiation unit</th>
<th>Set #</th>
<th>User stated dose [Gy]</th>
<th>IAEA (measured) dose [Gy]*</th>
<th>IAEA mean dose [Gy]</th>
<th>% deviation relative to IAEA mean dose**</th>
<th>IAEA mean dose User stated dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 Mv</td>
<td>Tumorex Electr1</td>
<td>2001</td>
<td>2.00</td>
<td>2.01</td>
<td>2.00</td>
<td>-0.3</td>
<td>2.00</td>
</tr>
</tbody>
</table>

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Agreement within +/-5% between the user stated dose and the IAEA measured dose is considered satisfactory.
REFERENCES

- Пенчев, Вл., Б.Константинов, Св.Петрова. Сравнение на дозата при телегаматерапевтичните уредби в страната с термолуминесцентни дозиметри. V Конгрес на бълг. рентгенол. и радиол., Пловдив, 1980, Сб.Рез., с.120.

THANK YOU FOR YOUR ATTENTION!