



Introductory Workshop  
of First IAEA Expert Mission within National Project BUL6014  
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## ДОЗИМЕТРИЧНИ ОДИТИ В БЪЛГАРИЯ - КРАТКА ИСТОРИЯ

## DOSIMETRY AUDITS IN BULGARIA – SHORT HISTORY

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## BEGINNING OF DOSIMETRY AUDITS IN BULGARIA

SSDL-Sofia situated in ISUL begun the Quality Assurance (QA) of  $^{60}\text{Co}$  Tele-Gamma Therapy Units (TGTU) (ROKUS, USSR) in the late 1960s:

- Acceptance, commissioning, performance tests
- Calibration of TGTU with  $^{60}\text{Co}$
- Training and qualification of local staff

Around 1985 there are 13  $^{60}\text{Co}$  systems

- 11 РОКУС (ROKUS, USSR)
- 1 ЛУЧ (Luch, USSR)
- 1 Gamatron 3 (Siemens)

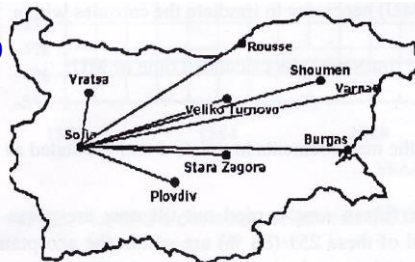


Figure 1. Bulgarian map and towns with  $^{60}\text{Co}$  units

## DQA IN BULGARIA

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)

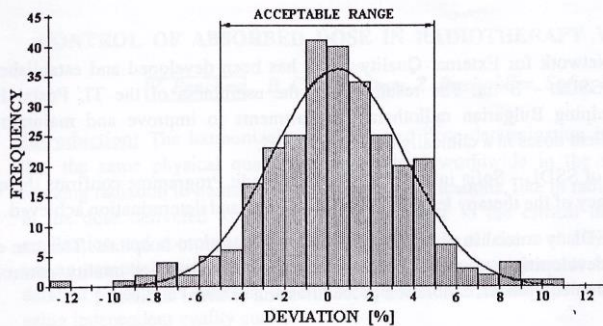
**Table 1.** Data for fifteen runs of SSDL – Sofia programme

Run No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
Year	'75	'76	'77	'78	'79	'80	'82	'83	'85	'87	'89	'92	'94	'97	'99	–
Number of participants	7	8	9	8	9	9	9	9	10	11	12	9	11	11	11	143
Number of beams	14	16	18	16	18	18	18	18	19	22	24	18	22	22	22	285
Participants outside acceptance limits	2	1	0	2	2	2	0	1	1	4	1	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	-0.3	0.4 ± 3.4



## DQA IN BULGARIA

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:



**Figure 2.** Frequency distribution of audit results for radiotherapy centres in Bulgaria

- about 20 intercomparison runs were made by 2005



## 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  $\pm 3.5\%$

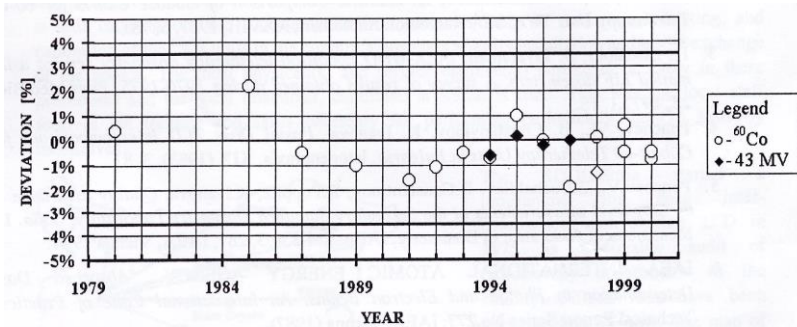
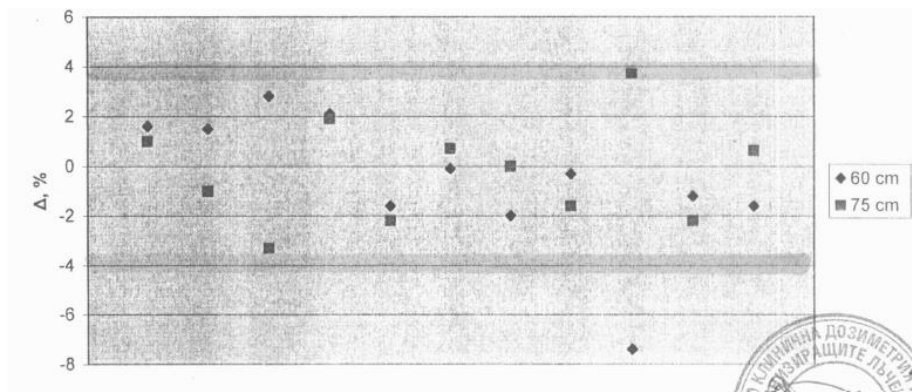


Figure 3. Plot of the deviations relative to the IAEA dose



## POSTAL DQA OF TGTU – 2006 г. SSDL-Sofia

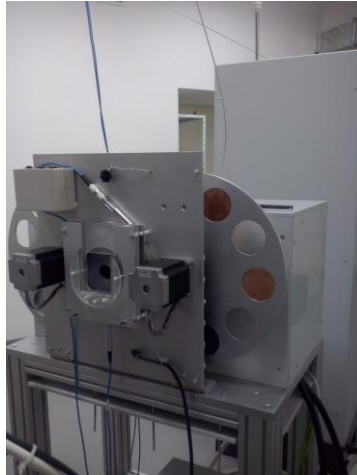


Acceptable deviation:  $\Delta$  до  $\pm 3.5\%$  (IAEA)



## 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

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## 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 ( $\delta=1.634\%$ )
  
- \* *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 2017 IAEA POSTAL DQA IN BULGARIA

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

Beam	Radiation unit	Set #	User stated dose [Gy]	IAEA (measured) dose [Gy] <sup>+</sup>	IAEA mean dose [Gy]	% deviation relative to IAEA mean dose <sup>**</sup>	IAEA mean dose / User stated dose
10 MV	Varian/BrainLab TrueBeam STx 2.0 #HJ92393	2IR28001	2.00 2.00	2.01 2.00	2.01	-0.3	1.00

- \* *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.*



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**THANK YOU FOR YOUR ATTENTION!**

