



TLD Doses Investigation around Container/Vehicle Inspection System

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Key words: TLD, mobile linear accelerators, low energy doses, LiF glow curve

1. Introduction:

Figure 1: Taken from www.nuctech.com Mobile container/Vehicle Inspection System

Figure 1.



Serbia has a few 6 MeV NUCTECH MT1213LH Improvement of cross border control

2. Objectives:

NUCTECH MT1213LH_s are licensed conditionally due to lack of experience with mobile linac. Ambient dose equivalent rate has been measured with ionizing chamber Victoreen 451P, Measuring points are given at Figure 2. Measured values are in Table 1.

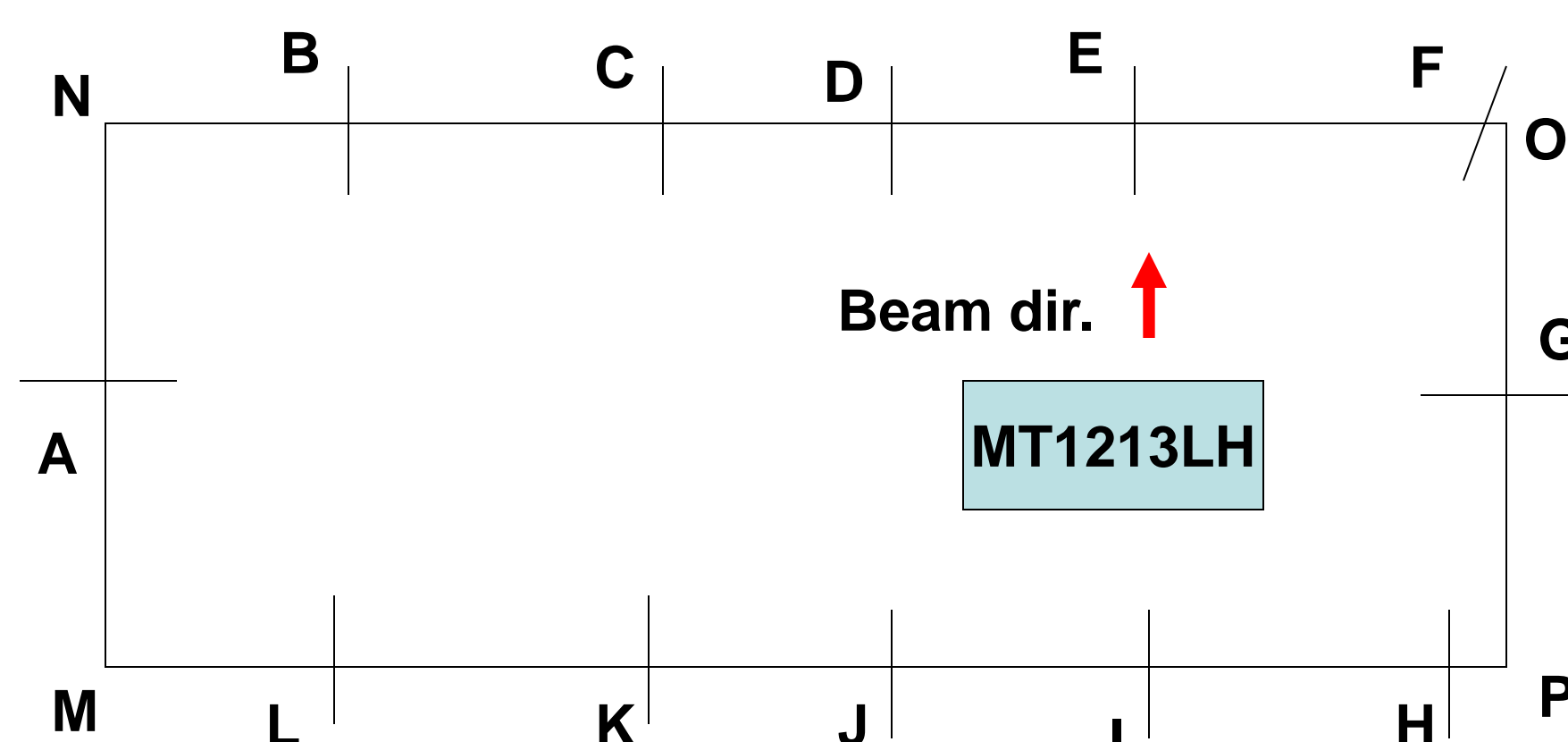


Figure 2.

Fence dimensions: PO= 15 m; PM= 35 m

	Ambient dose equivalent rate (μSv/h)									
point	B	C	E	F	G	H	I	J	L	K
value	0.15	0.6	1.2	1.1	1.3	0.8	0.2	0.09	0.08	0.08

Table 1.

Initial idea to put TLD for a month has been realized on 18th August 2011. Hanging TLDs a decision was made: to take away additional TLDs exposed in three scans that day. Dosimeters were read out four hours after irradiating. Read-out doses were low, but the glow curve shapes were interesting for further investigation.

3. Methods:

Equipment and software are identical as described in paper: Marinkovic O, Spasic Jokic V: ETAM – Method for Exposure Conditions Reconstruction, Third European IRPA Congress, 14 – 18 June 2010, Helsinki, Finland, pp 712-721, ISBN: 978-952-478-551-8 (HARSHAW TLD READER Model 6600, REMSMENU)

Irregular glow curves have been detected not at all positions. Very important fact: irregularities appeared at chip under skin equivalent filter, not at the chip under tissue equivalent filter. Glow curves of TLDs are given at Figure 3.

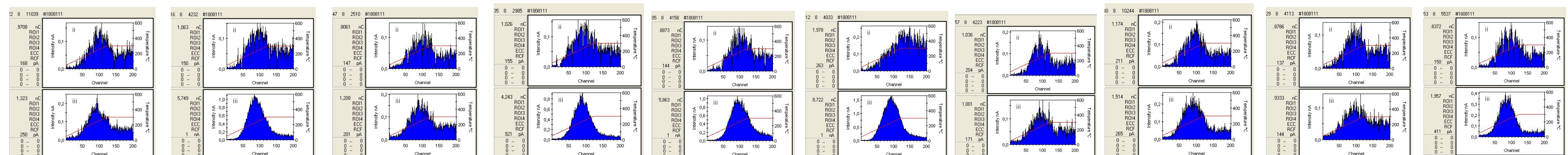


Figure 3. Date of reading:18-08-11

4. Results:

Taking into account values for PMT, RFL and photomultiplier B current for calibration exposure to Sr-90; integral value for chips (iii) were normalized according (ii) value with coefficient 1,33. Results are given in Table 2. Exposing to Sr-90 all TLDs were tested after annealing and no crystal defects has been detected.

No.	TLD bar-code	Three scans (TLD in air)		Distance from spot (different angles)	Check crystals (**)	
		(ii) (nC)	(iii) (nC) ^(*)		(ii) (nC)	(iii) (nC) ^(*)
H	11039	0.9709	1.75959	11 m right back	13.25	12.85
C	4232	1.0630	7.64617	19 m left front	13.52	13.86
D	2510	0.8061	1.60664	9 m left front	13.16	13.84
I	2985	1.0260	5.64319	9 m central back	13.60	12.85
F	4158	0.8874	7.79779	8 m right front	13.15	13.91
J	4033	1.9780	11.6002	13 m left back	14.12	14.07
E	4223	1.0360	1.33133	6 m central front (beam)	12.68	13.21
B	10244	1.1740	2.01362	25 m left front	12.37	12.74
-	5537	0.8372	2.60281	Not exposed (background)	13.35	12.40
-	4113	0.8786	1.24128	Not exposed (background)	13.74	13.54
	average	1.06572	4.324269		13.294	13.3286
	stdev	0.340241	3.628713		0.505573	0.592033

Table 2.

5.b. Discussion:

LiF low temperature peak deexcitates spontaneously. Exposing TLD card packed in plastic holder in solarium machine heats TLD and actuate deexcitation.

This paper doesn't give integral values for doses but strongly testify on intensive low energy field around linac.

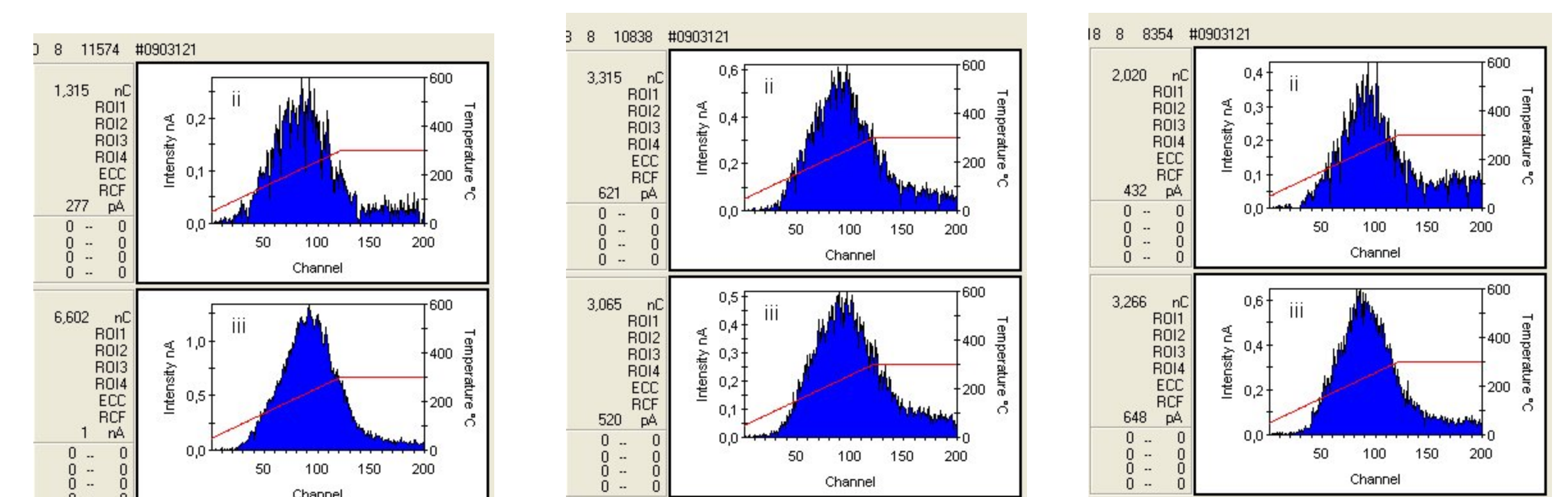


Figure 4. SUNVISION 240 – EXPOSURE 20 MINUTES

5.a. Discussion:

Intensive scattered low energy is detected around mobile linac.

Compare this results with glow curve shape of TLDs exposed to ultraviolet radiation in SUNVISION 240, Dinamic FAN solarium machine (Figure 4).

6. Conclusion:

We need more investigations regarding taking into account all possible hazards of mobile linac.