

On-board TL dosimetry: possibilities and limitations

Sándor Deme, István Apáthy and Tamás Pázmándi
KFKI Atomic Energy Research Institute Budapest, Hungary

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Application of TLDs for dosimetry on ISS

- Personal dosimetry (monitoring, EVA dosimetry)
- Phantom measurements (spherical, antropomorf)
 - ↘
 - Effective dose
 - ↗
- Equivalent dose measurement (HTRM)
- Mapping (dose distribution by locations)
- Monitoring (time profile)
- Neutron dosimetry (thermal neutron measurements)
- Depth dose distribution outside ISS (thin layers)

On-board/ground evaluation TL dosimetry

	On board	Ground
Mass (kg)	1...2	>10
Volume (liters)	1...2	>20
Power (W)	<10	>100
Dosimeter form	bulb	any
Heating profile	current	temperature
Filters	fixed	changeable
Cooling	no	yes
Annealing	in-reader	in-reader, oven
Read-out period	≥10 min	>1 month

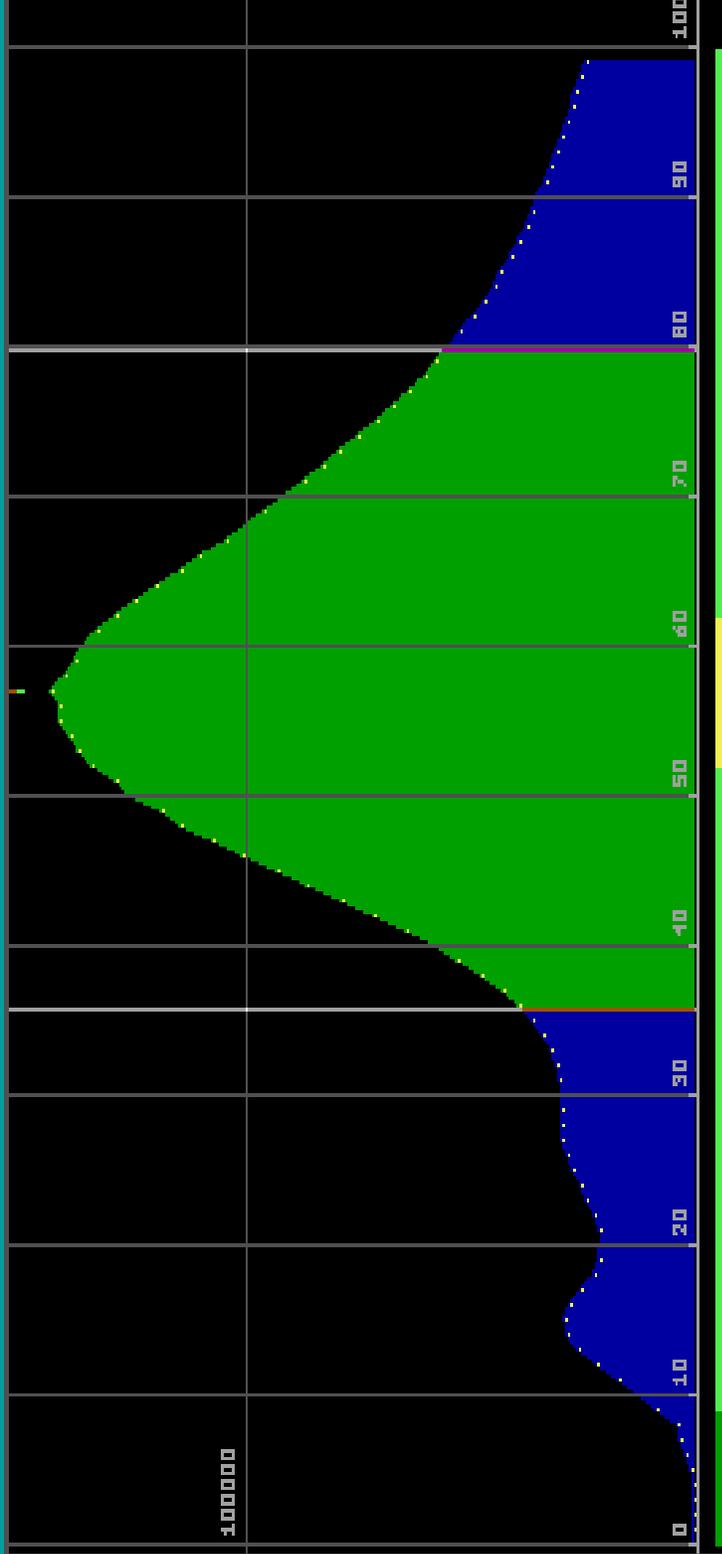
Advantages of on-board evaluation

- 1. Regular read-out (personal dosimetry) - dosimetry service as on the ground**
- 2. Arbitrary read-out (mapping for different orientations of the ISS, measurement of the dose rate profile - one loop, one day etc.)**
- 3. Flexibility of the measuring program (possibility to change the program during the flight due to available results)**
- 4. No transport dose correction**

Disadvantages of on-board evaluation

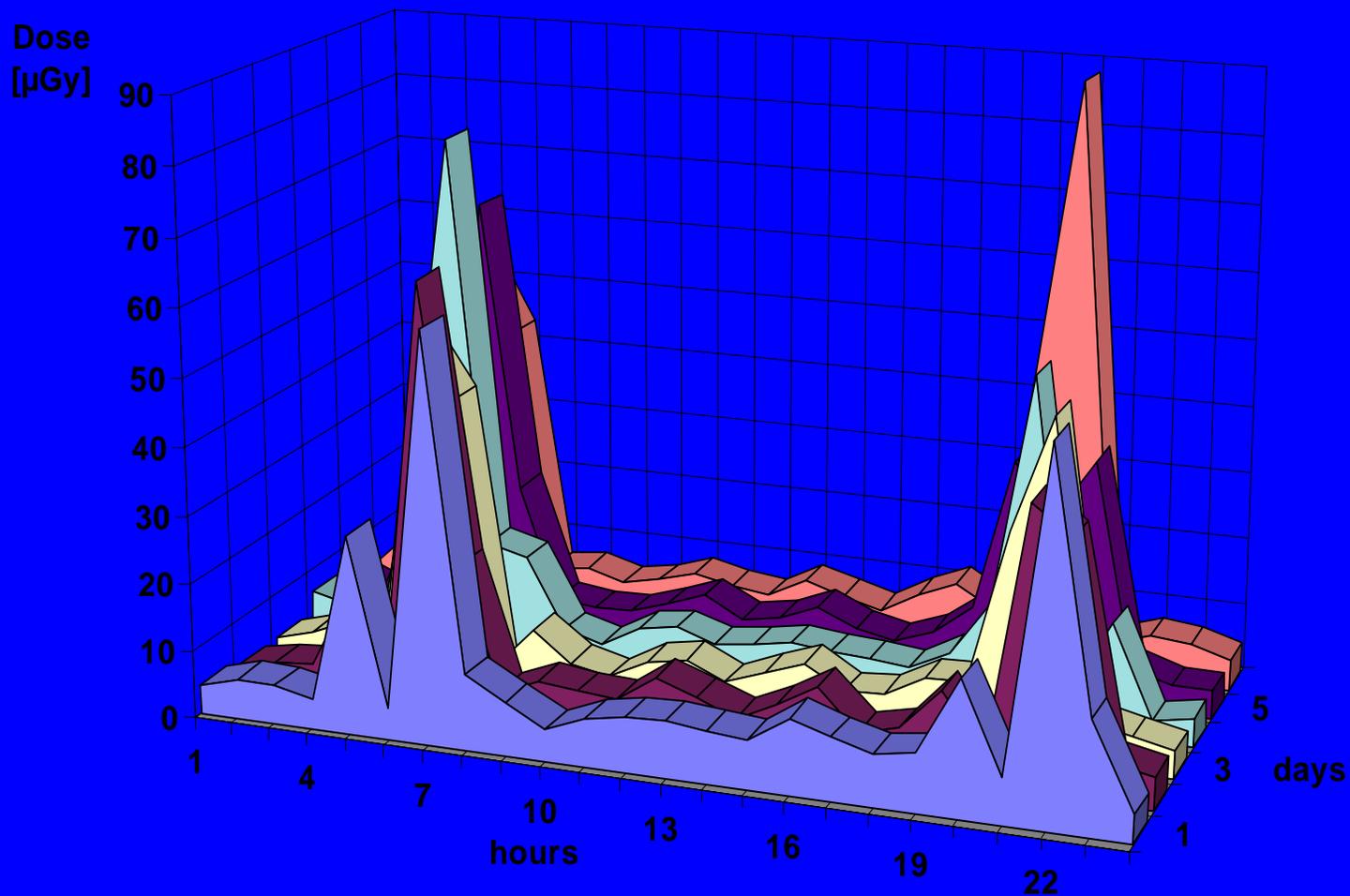
- 1. Excess mass, volume, power and astronaut time consumption**
- 2. Limited number, form and read-out/annealing profile of the applied dosimeters**
- 3. Limited reliability in case of a single reader**
- 4 Higher thermal/radiation background**

Source: PILL.E.DAT
 AvailableBlocks: 407
 BlockNumber: 105
 BulbID: 000000084B1B (0098)
 ErrorCodes: **E_BG**
 Date: 02/03/1999 10:44
 Points: 106
 DeviceID: 6
 SamplingSpeed: 100 ms
 Temperature: 24.5 C
 MeasuredDose: 8.30E3 uGy

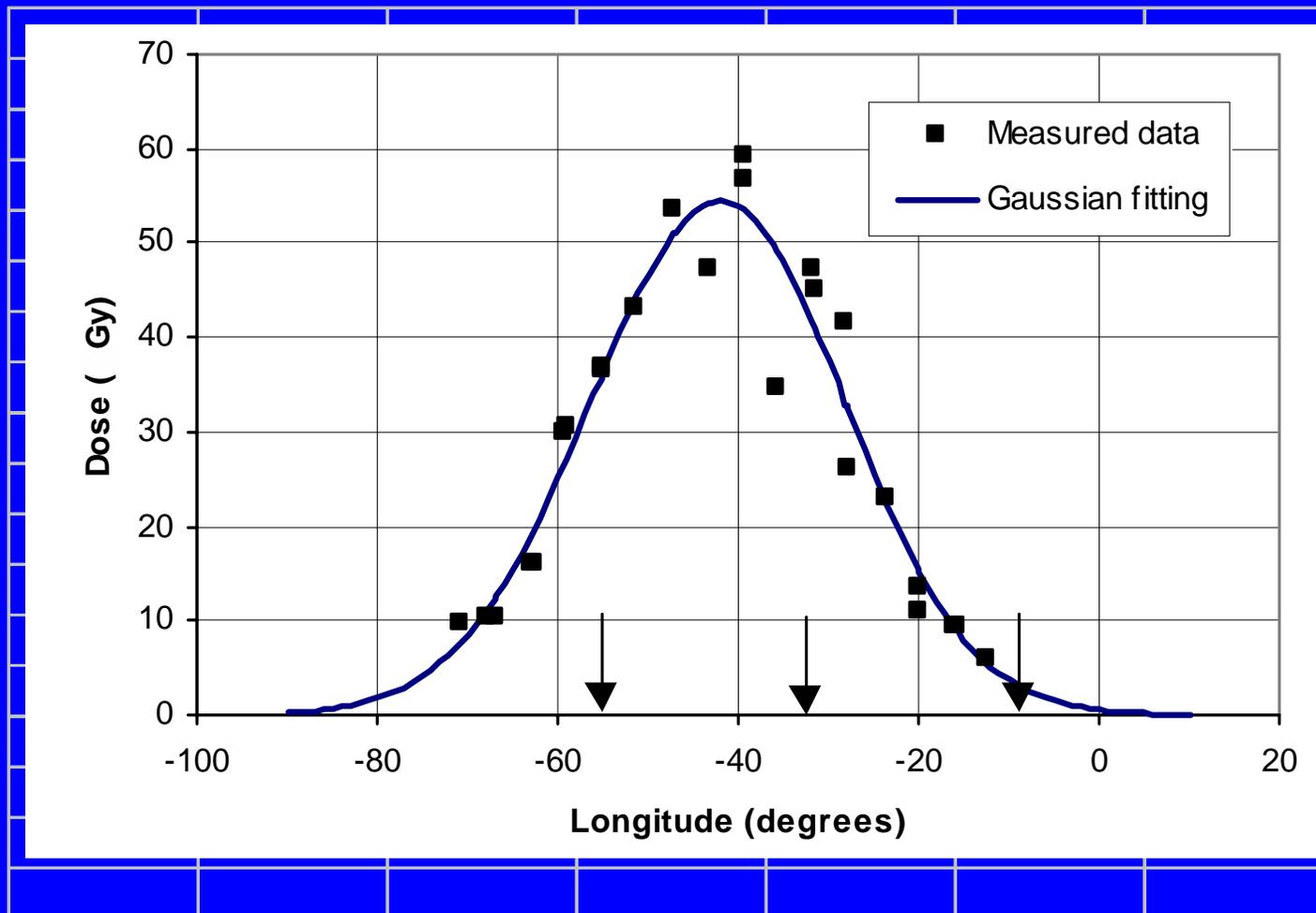


EvalStart: 36
 EvalS.(20C): 37
 EvalTFact.: 0.196
 LeftPercent: 27.4%
 Peak: 57
 CurPos.: 57
 EvalLength: 44
 EvalL.(20C): 44
 EvalTFact.: 0.079
 RightPercent: 40.4%
 PeakValue: 143360
 CursorValue: 143360/100.0%
 NormFact.: 5240.0
 NormF.(20C): 5328.1
 NormFTFact.: 0.003673
 ROI: 4352512
 Dose: 8306.32 u
 Cur sorTemp.:

One hour automatic read-out (Euromir'95)



Extra dose due to SAA crossing



EVA absorbed doses

User	Readout [μ Gy] [μ Gy]	Corrected Backgr. [μ Gy]	Corrected Bgr+SAA [μ Gy]
C	415	349	386
A	373	307	341
Control (Backgr.)	144		

Future improvements of the Pille system

- 1. RS485 interface for data transfer**
- 2. Introduction of smaller dosimeters (capsules)**
- 3. Manufacturing of bulbs with different TLDs (e.g. ^6LiF , ^7LiF , $\text{Al}_2\text{O}_3:\text{C}$)**
- 4. More user-friendly display (80 characters)**
- 5. Internal memory instead of memory card**
- 6. Optimization of the light filter**
- 7. Improved dosimeter evaluation (glow curve fit), cold/radiation background subtraction**