

# **On-board TL dosimetry: possibilities and limitations**

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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

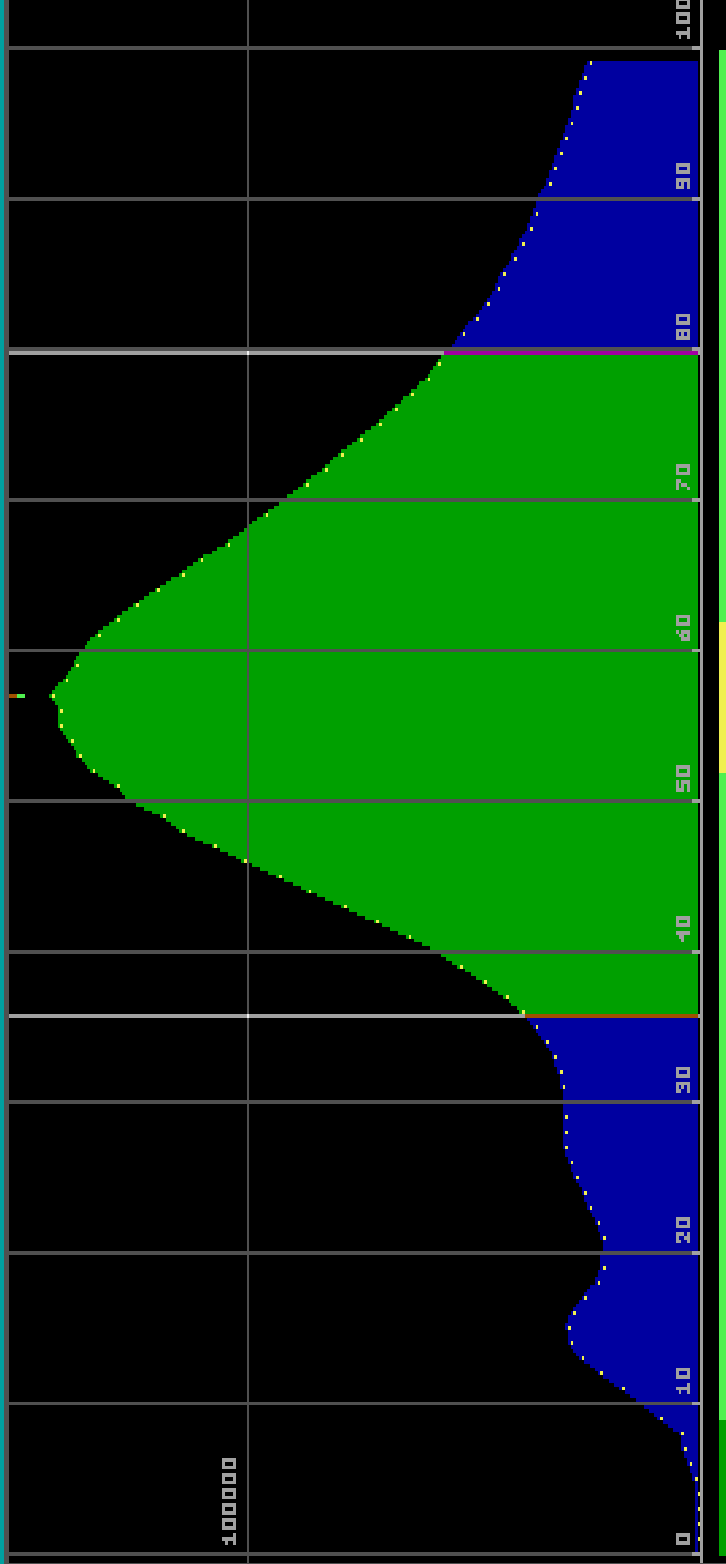
## **Advantages of on-board evaluation**

- 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**

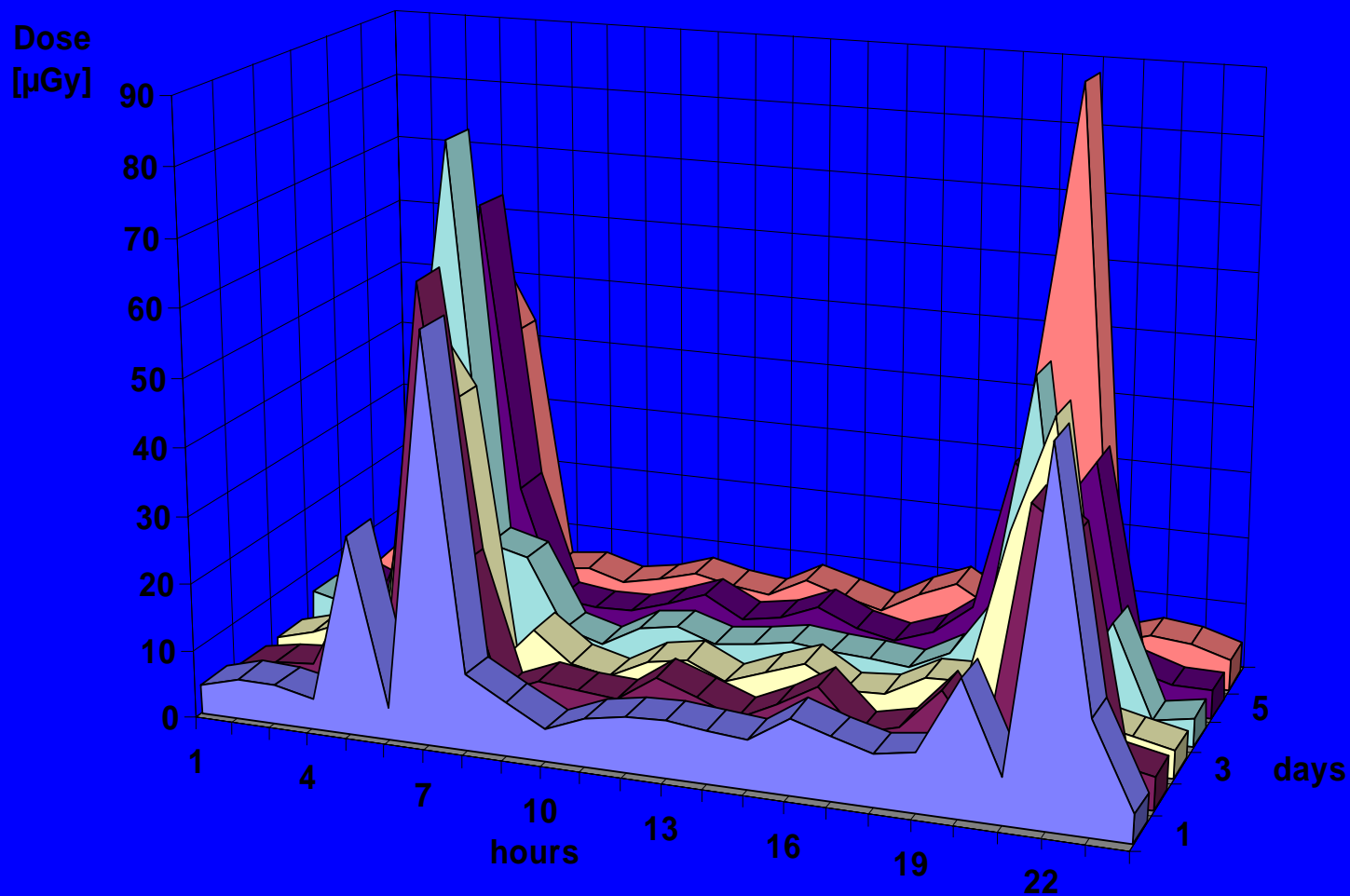
- 1. Excess mass, volume, power and astronaut time consumption**
- 2. Limited number, form and read-out/annealing profile of the applied dosimeters**
- 3. Limited reliability in case of a single reader**
- 4 Higher thermal/radiation background**

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

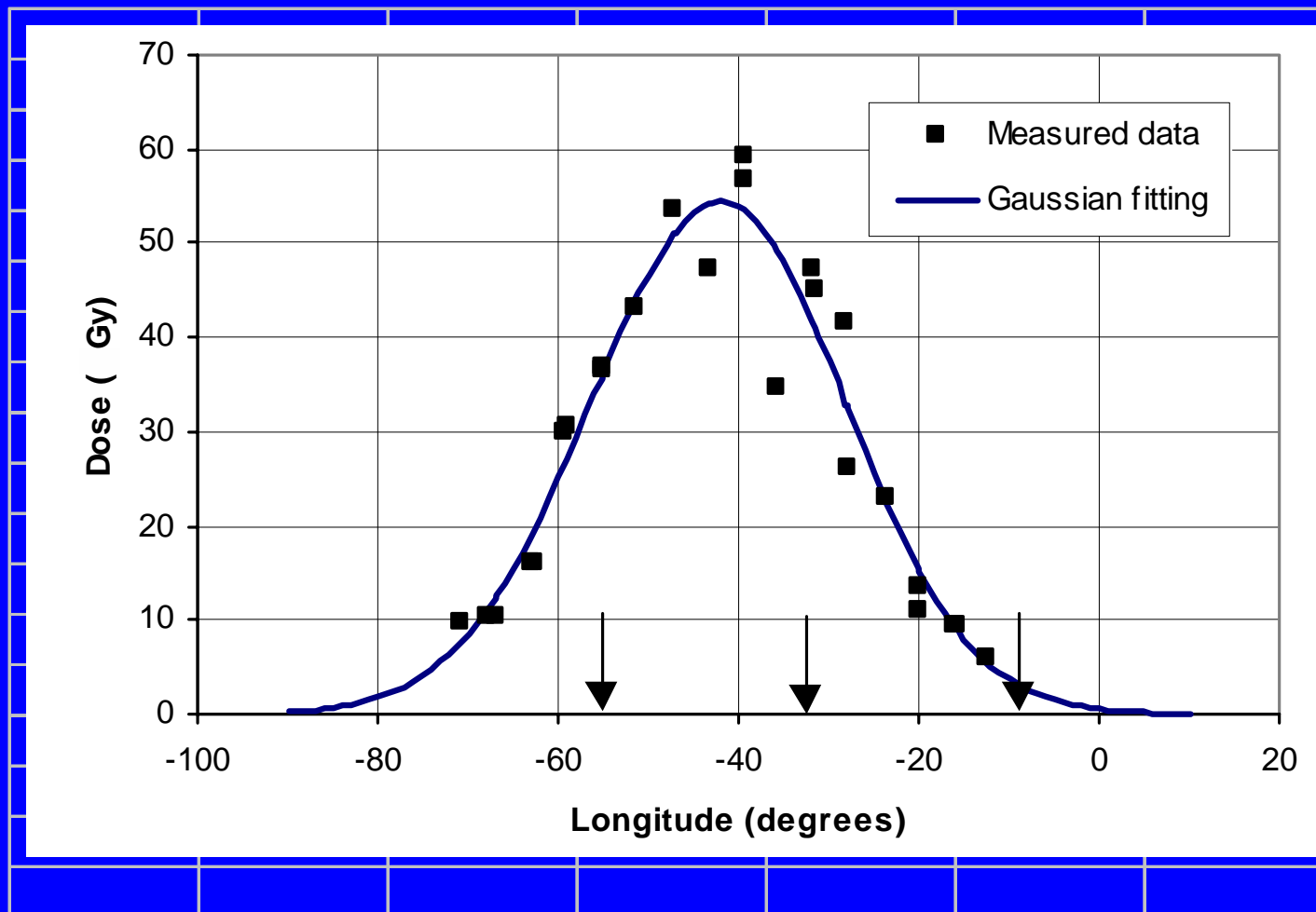


EvalStart: 36  
 EvalS.(20C): 37  
 EvalTFact.: 0.196  
 LeftPercent: 27.4%  
 Peak: 57  
 CurPos.: 57  
 EvalLength: 44  
 EvalL.(20C): 44  
 EvalTFact.: 0.079  
 RightPercent: 40.4%  
 PeakValue: 143360  
 CursorValue: 143360/100.0%  
 NormFact.: 5240.0  
 NormF.(20C): 5328.1  
 NormFTFact.: 0.003673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

# One hour automatic read-out (Euromir'95)



# Extra dose due to SAA crossing





## EVA absorbed doses

<b>User</b>	<b>Readout</b> [ $\mu$ Gy] [ $\mu$ Gy]	<b>Corrected</b> <b>Backgr.</b> [ $\mu$ Gy]	<b>Corrected</b> <b>Bgr+SAA</b> [ $\mu$ Gy]
<b>C</b>	<b>415</b>	<b>349</b>	<b>386</b>
<b>A</b>	<b>373</b>	<b>307</b>	<b>341</b>
<b>Control</b> <b>(Backgr.)</b>	<b>144</b>		

# **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.  ${}^6\text{LiF}$ ,  ${}^7\text{LiF}$ ,  $\text{Al}_2\text{O}_3:\text{C}$ )**
- 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**