



DOSE MEASUREMENTS ON BOARD THE ISS WITH THE PILLE TLD SYSTEM

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Outline

- The Pille TLD system
- Pille on board ISS
- Position of the dosimeters
- Results of Exp. 27-30



The Pille thermoluminescent dosimeter system

Space qualified, on-board TLD system

Dosimeters and the reader device

Dosimeters	
Type:	bulb
Material:	$\text{CaSO}_4:\text{Dy}$
Dimensions:	$\phi 20 \text{ mm} * 60 \text{ mm}$
Mass:	70 g (with carrying case)



Reader	
Measuring range ($s < 10\%$):	$3 \mu\text{Gy} \div 10 \text{ Gy}$ ($\text{CaSO}_4:\text{Dy}$)
TLD Efficiency ($\varepsilon = 1 \pm 10\%$):	$\text{LET}_{\infty}(\text{H}_2\text{O}) < 10 \text{ keV}/\mu\text{m}$
Accuracy (above 10 μGy):	$\delta < 5\%$



High sensitivity

Even hourly read-outs are possible

On board every space station since Salyut-6

More than 30 000 comparable read-outs from different space stations



Pille on board ISS

DOSMAP project

Service dosimetry system on Zvezda since 2003 (Exp. 8).

- Dose mapping
- Personal dosimetry during CME-s
- Personal dosimetry during EVA-s
- Automatic read-out in every orbit

New dosimeters carried to ISS

Results presented on WRMIS 2012:
Exp. 27-30





Dosimeter locations after Nov. 16, 2010

- A0301: At detector DB-8 No. 1, behind panel No. 410
- A0302: Starboard crew quarters, left side of Panel 444 parallel to the sensor located under the valve "K7"
- A0304: Port crew quarters, left side of window
- A0305: In the saloon of large diameter on Panel No. 327
- A0306: Inside the reader, *dedicated for automatic measurements*
- A0307: Starboard crew quarters, on the lower storage unit located under the valve "K7"
Dedicated for EVA reference measurement inside ISS
- A0309: Right board, beside the cabin, on ceiling of the lavatory, in ASU (automatic control system) on panel 457
Dedicated for EVA personal measurements
- A0310: Behind panel 447 at detector DB8 No. 3
Dedicated for EVA personal measurements
- A0311: In the Pirs docking compartment, hemisphere, on Plane III
- A0312: MIM2 (Small Research Module Poisk), cylindrical part on Plane III
- A0313: MIM1 (Small Research Module Rassvet), on Plane III
- A0314: MIM2 (Small Research Module Poisk), cylindrical part on Plane III



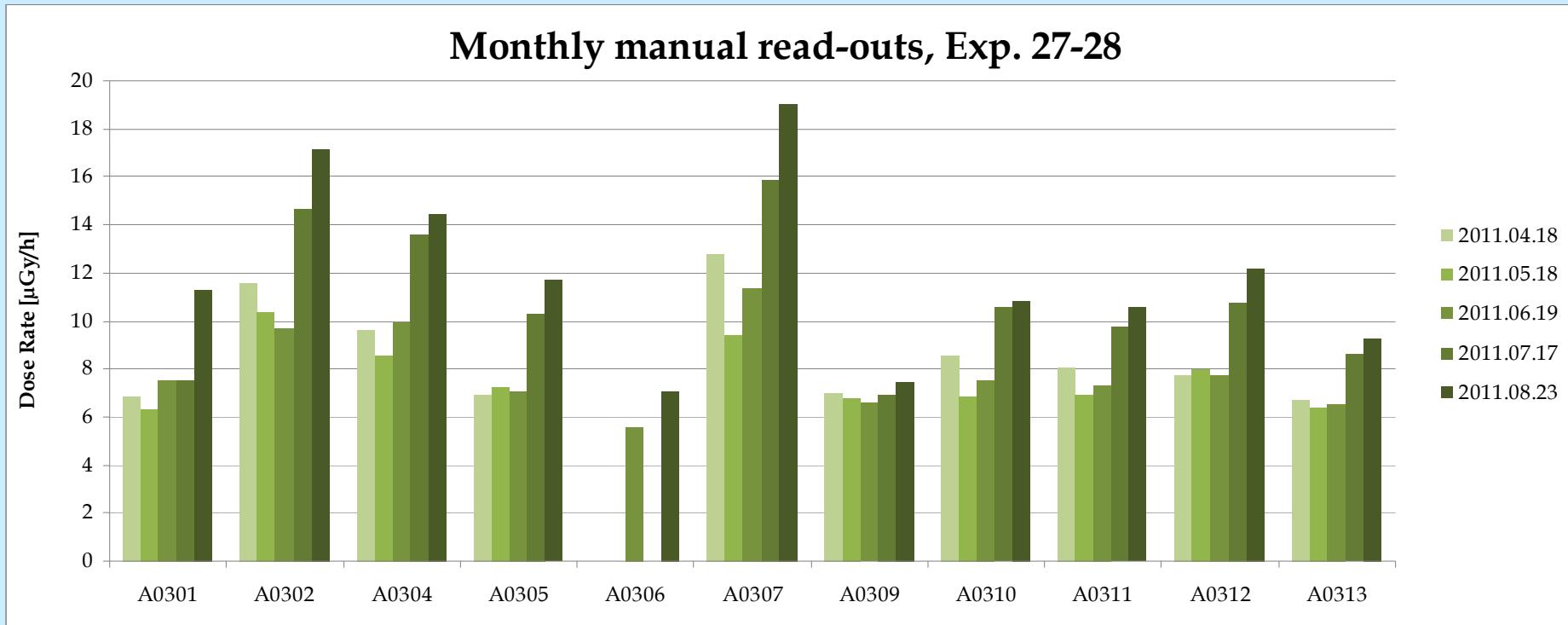
History

- № A0306 for automatic measurements
- 2012.03.05 Big CME reaching the Earth, but missing data in the automatic measurements:
2012.03.05, 14:20 – 2012.03.21, 11:00

- 2 EVAs:
 - 2011.08.03
 - 2012.02.16

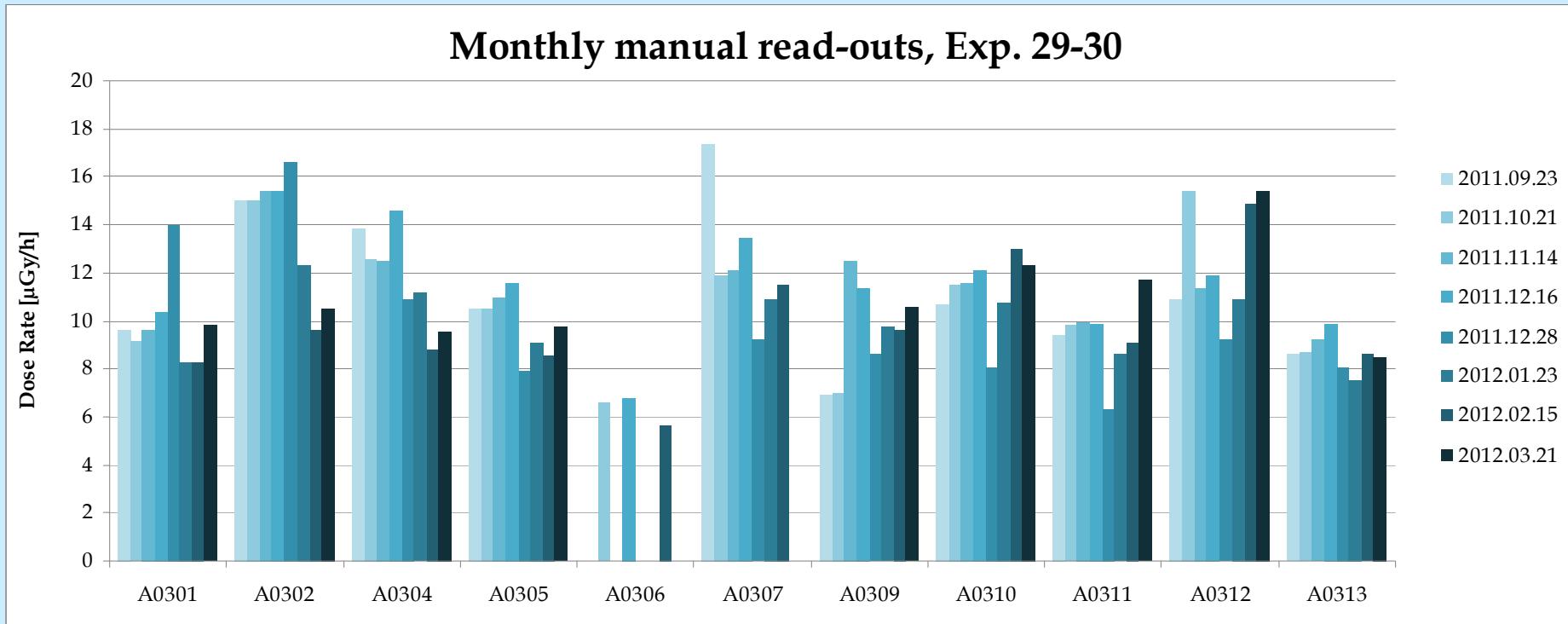


Monthly manual read-outs, Exp. 27-28



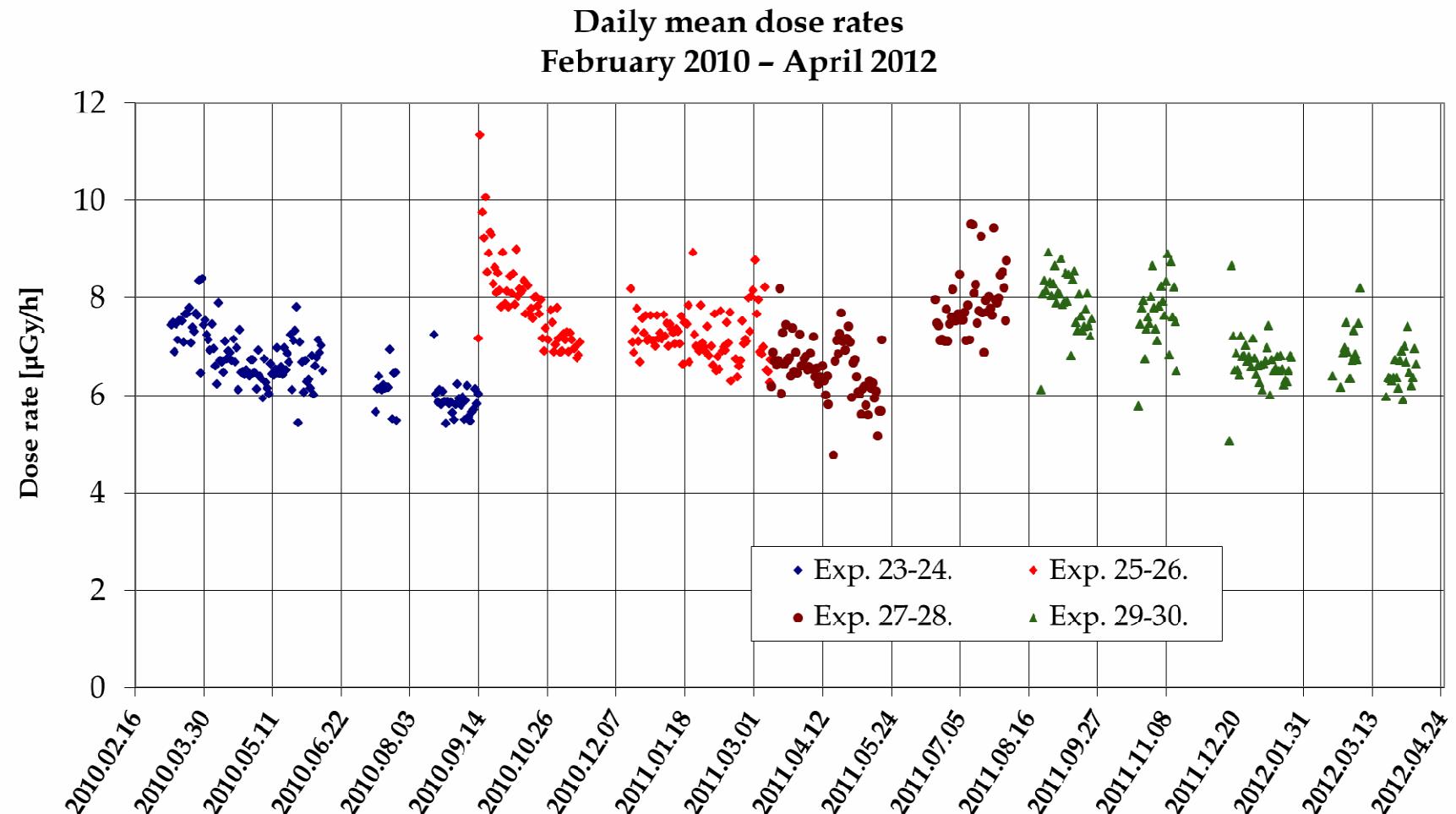


Monthly manual read-outs, Exp. 29-30



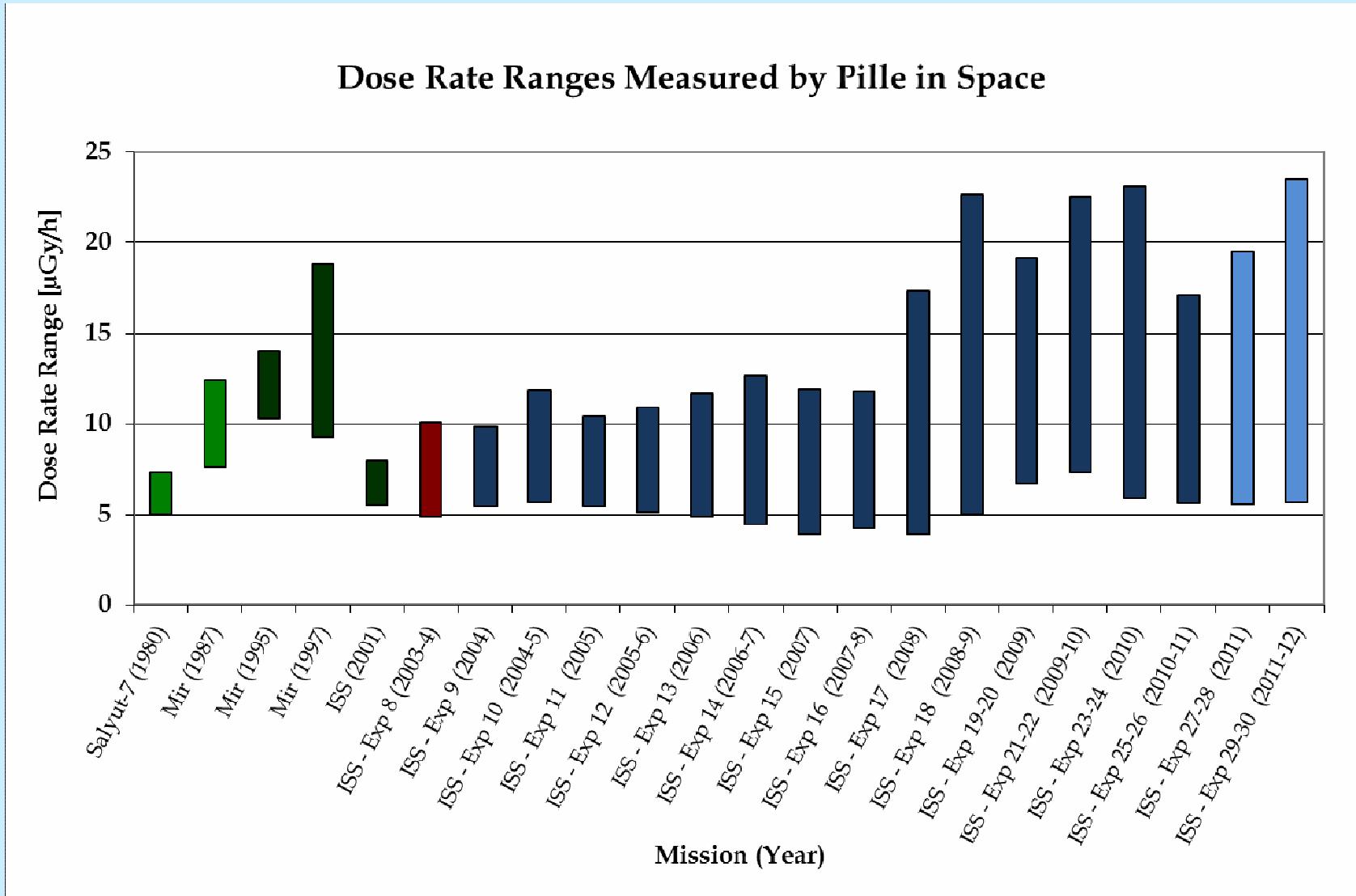


Daily average dose rates, Exp. 23-24, 25-26, 27-28, 29-30





Dose rate ranges measured by Pille





EVA measurements

EXP. 27-28

1 EVA was measured (no post readout for the EVA on 2011.08.03)

- Dosimeter A0307 was used as reference

EVA date	Extra dose [μGy]	Extra dose rate [$\mu\text{Gy} / \text{h}$]	Extra dose [μGy]	Extra dose rate [$\mu\text{Gy} / \text{h}$]
2011. 08. 03	614	96.2	604	94.7

EXP. 29-30

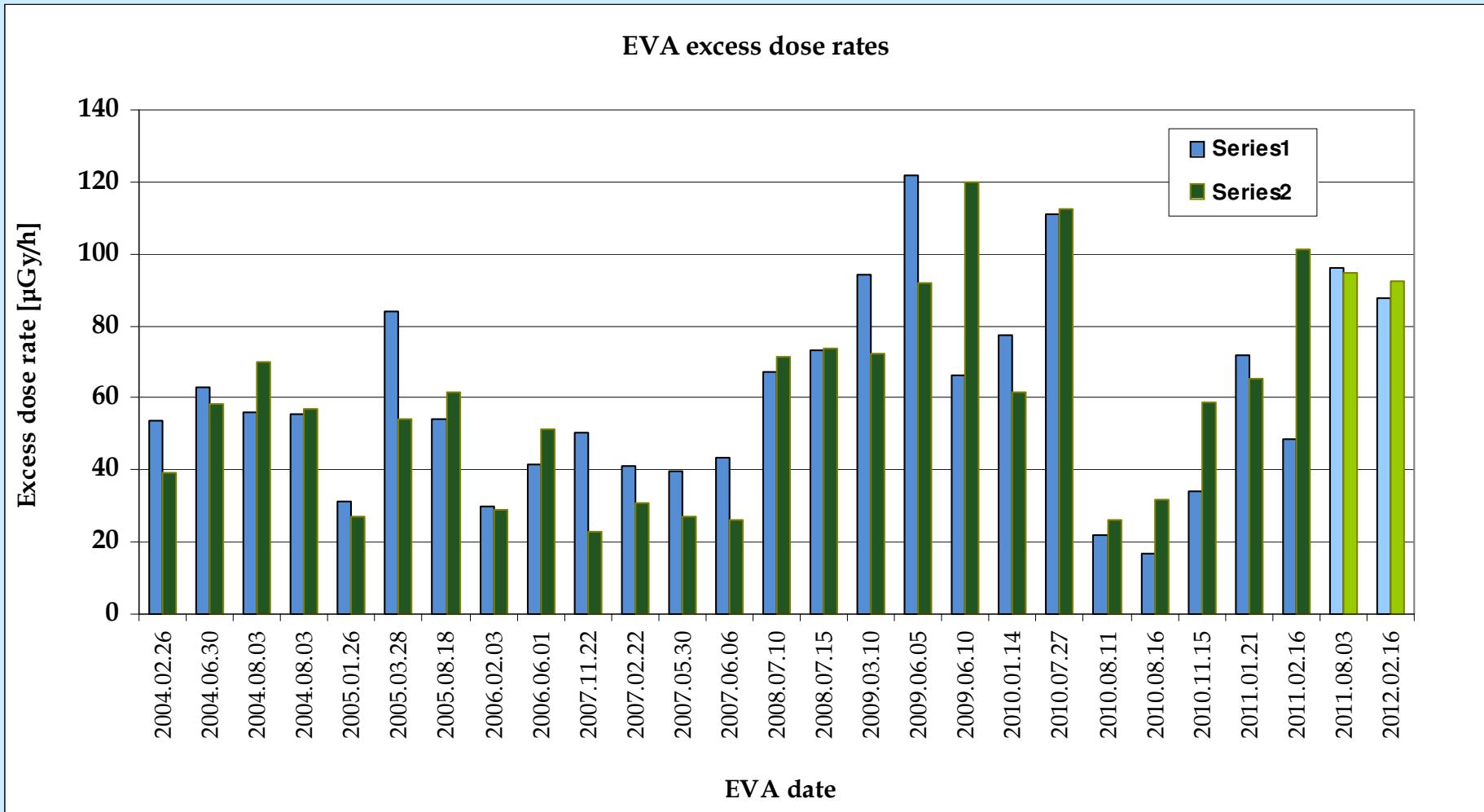
1 EVA was measured

- Dosimeter A0307 was used as reference

EVA date	Extra dose [μGy]	Extra dose rate [$\mu\text{Gy} / \text{h}$]	Extra dose [μGy]	Extra dose rate [$\mu\text{Gy} / \text{h}$]
2012. 02. 16	547	87.5	577	92.3



EVA excess dose rates





Thank you for your attention!

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