

Radiological Situation of the Current PSB Beam Dump

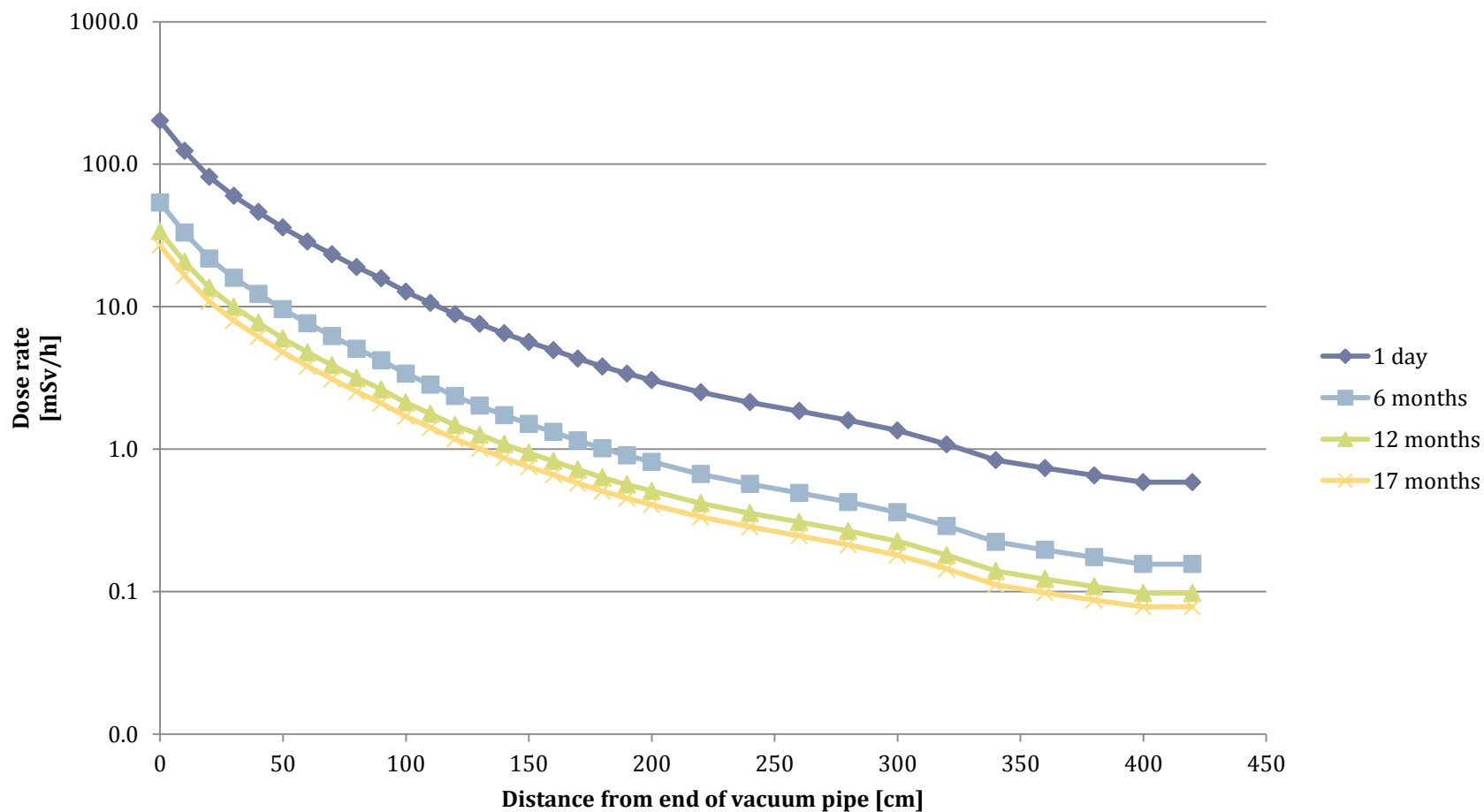
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Content

- ▶ **Available data**
 - ▶ Dose rate profile in the pipe
 - ▶ Dose rate at contact on the outermost concrete ring
 - ▶ In-situ gamma spectrometry
- ▶ **Estimated dose rates**
 - ▶ Approximation of history of Booster dump usage
 - ▶ Dump core
 - ▶ Last two concrete shielding rings

Available Data – Dose Rate Profile in the Pipe

Booster dump - Dose rate profile



Available Data – Dose Rate Outermost Ring

- ▶ Dose rates measured during TS2 (27/06/2012)
 - ▶ 40 $\mu\text{Sv/h}$ at contact on the outermost concrete ring
 - ▶ 70 $\mu\text{Sv/h}$ at the exit of the bottom rail
 - ▶ 285 $\mu\text{Sv/h}$ at contact on the pipe
(in line of sight of the dump itself)

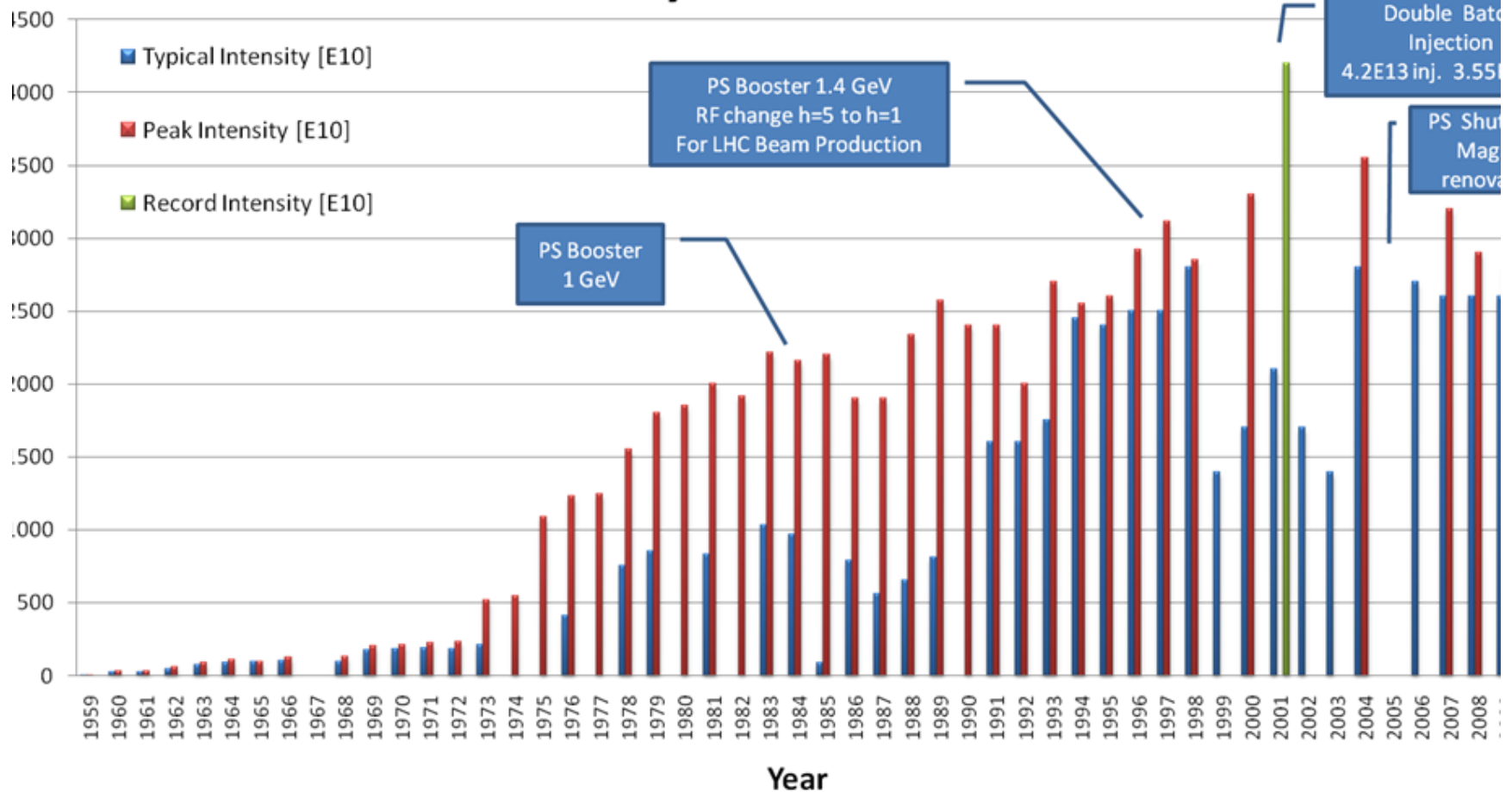
Available Data – Gamma Spectrometry

- ▶ Jan 26th 2012
 - ▶ 2 months cool down
- ▶ Dominated by
 - ▶ Mn-54
 - ▶ γ :
 - 0.835 MeV (100%)
 - ▶ 312d half-life
 - ▶ Co-60
 - ▶ β : 317.8 keV max (99.9 %)
 - ▶ γ :
 - 1.1732 MeV (99.90 %)
 - 1.3325 MeV (99.98 %)
 - ▶ 5.27y half-life

Isotope	Activity (uCi/unit)	Error
Na-22	10	12%
Cr-51	39	17%
Mn-54	1070	7%
Co-57	59	9%
Co-60	92	6%
Zn-65	74	8%
Rh-105	20	18%
Sb-124	57	11%

Estimated Dose Rates - History

PS Proton Intensity Evolution Over 50 Years



Estimated Dose Rates - History

- ▶ Dump usage 2011
 - ▶ 1.141E19 p @1.4 GeV
- ▶ Dump usage 2010
 - ▶ 1.003E19 p @1.4 GeV
- ▶ Scaled the data from the history plot to usage factor of 6%

Estimated Dose Rates

- ▶ FLUKA simulation with history as discussed
 - ▶ Rough order of magnitude
- ▶ Impurities according to Material Guidelines Catalogue
 - ▶ 3ppm Europium in concrete
 - ▶ 0.15 mass-% Cobalt in Steel 316L
- ▶ Beta and Gamma dose rate

Estimated Dose Rates

		Simulated Dose Rate (mSv/h)				
		1d	30d	180d	1y	2y
Core	10cm	1700	940	450	300	200
	50cm	190	100	48	31	20
Last concrete ring	10cm	52	18	16	14	12
	50cm	14	5	4	3.7	3.1
Next to last concrete ring	10cm	34	10	9	8.2	7.3
	50cm	10	2.9	2.6	2.5	2.2

Backup

Backup

Shielding

- ▶ Required shielding will highly depend on the extraction and storage procedures
 - ▶ Storage at ISR ⇒ Intra-site transport
 - ▶ EDMS 1107233 for transport
- ▶ For discussion, some typical shielding materials and their associated lengths

Shielding lengths (cm)

Reduction	Fe		Pb	
	Mn-54	Co-60	Mn-54	Co-60
1/2	3.9	4.3	1.4	2
1/10	8.6	9.9	3.4	5