RADSYNCH09, May 2009, ELETTRA, Trieste

Radiation Protection Concept and Commissioning of the PETRA III Storage Ring

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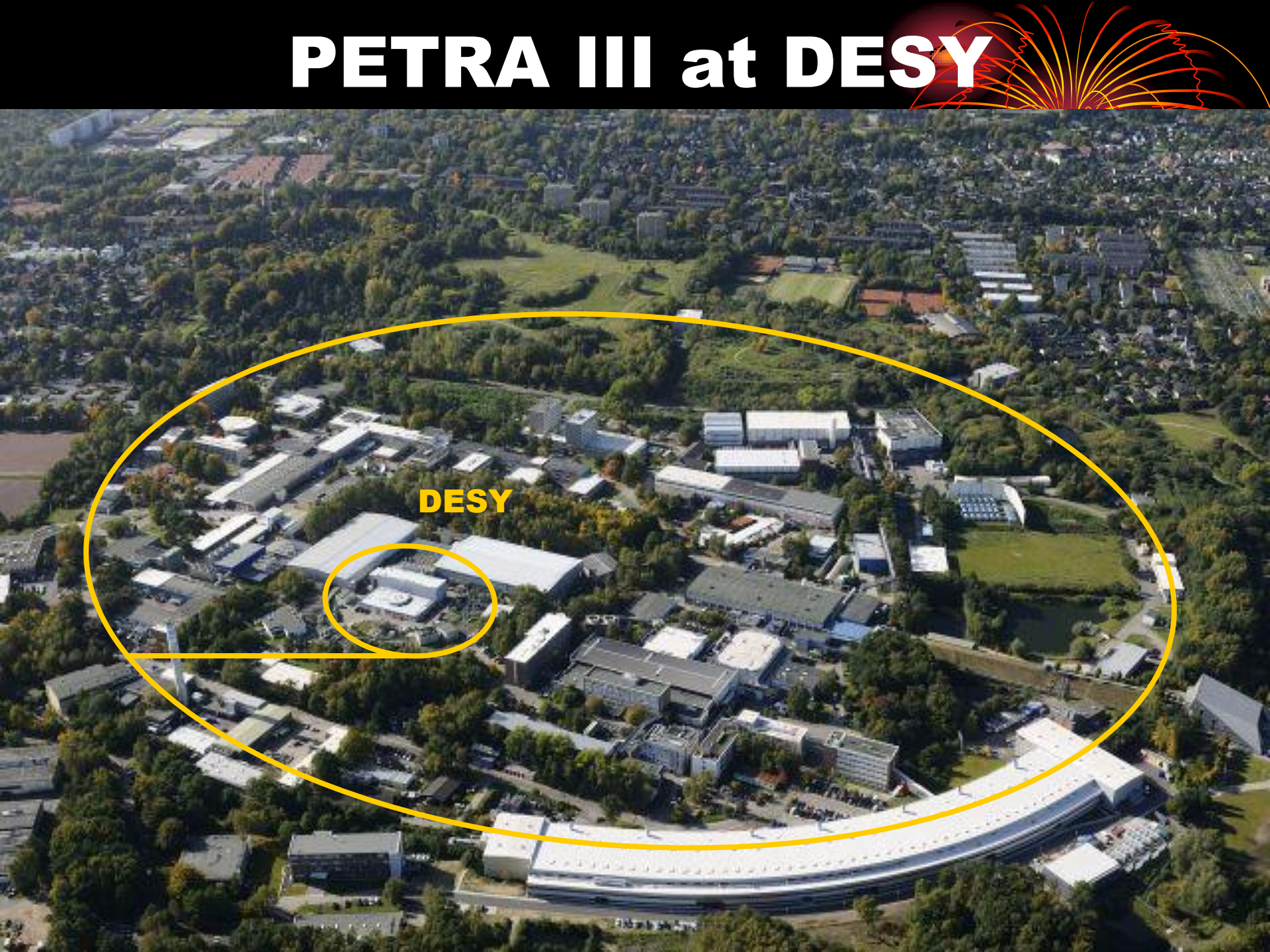
PETRA III Milestones

May 23, 2005	Signing of Agreement for the Construction of PETRA III
June 18, 2007	Construction equipment marched up
Sept. 14, 2007	The foundation stone for the PETRA III experimental hall was laid
May 20, 2008	The reassembly of all magnets in the "old" tunnel was completed
April 16, 2009	Clear the ring for PETRA III , first beam

PETRA III at DESY



Experimental hall

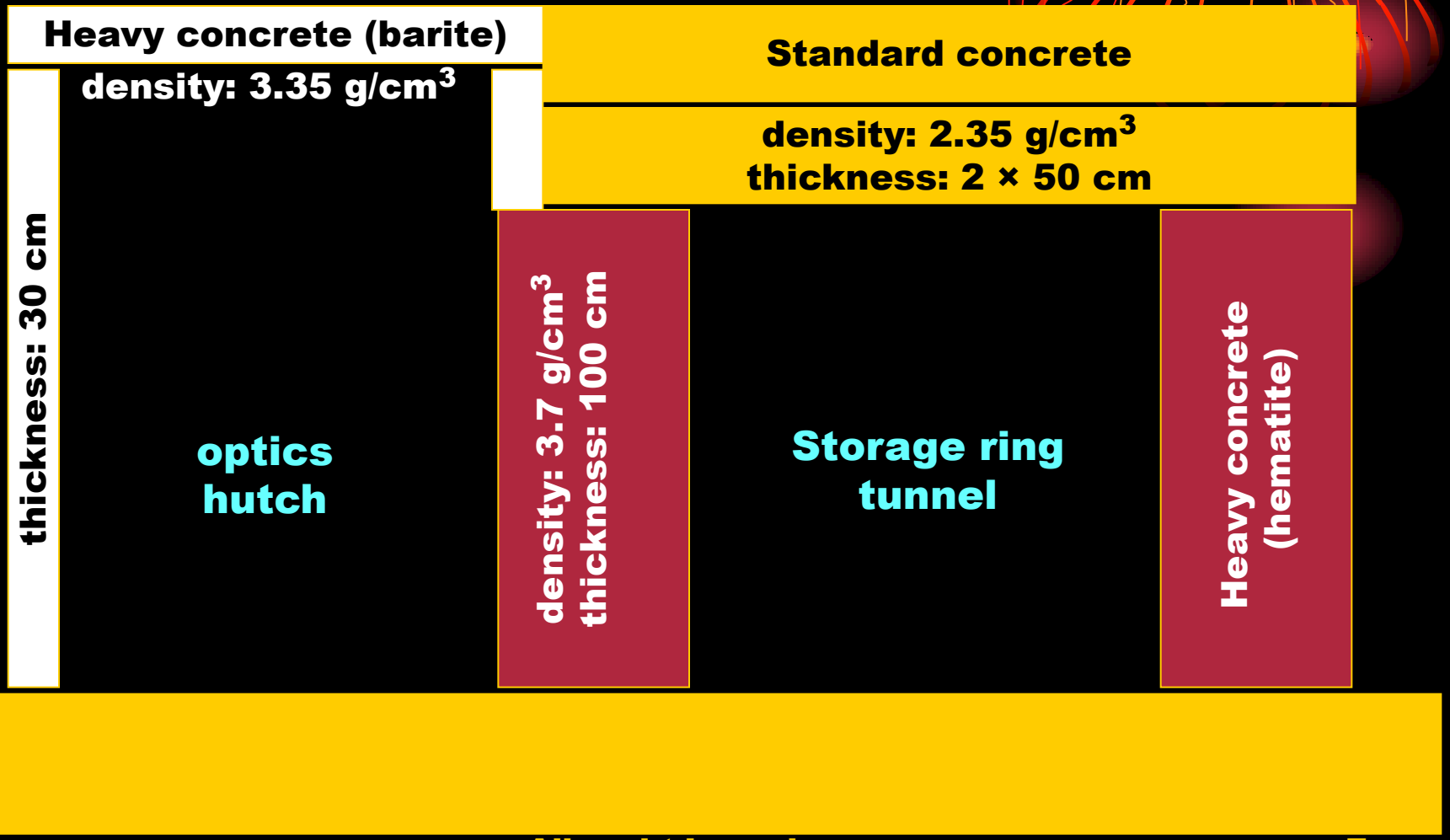
PETRA III among other sources

facility	circum. [m]	energy [GeV]	current [mA]	# e in ring	injected e in 2000 h
ESRF	840	6	200	$3.7 \cdot 10^{12}$	$1.7 \cdot 10^{15}$ operation 1999-2003
SPring8	1436	8	100	$3.0 \cdot 10^{12}$	$0.7 \cdot 10^{15}$ Top-up @ τ = 10 h
PETRA-III	2304	6	100	$5.0 \cdot 10^{12}$	$6.0 \cdot 10^{15}$ Top-up @ τ = 2 h
DIAMOND	562	3	300	$3.7 \cdot 10^{12}$	$0.9 \cdot 10^{15}$ Top-up @ τ = 10 h
DORIS-III	289	5	800	$5.0 \cdot 10^{12}$	$2.0 \cdot 10^{15}$ permission @ τ = 5 h

Corset

facility	injected e in 2000 h	Loss per standard cell	Dose Limit [mSv]	Lateral Shield status	Lateral Shield formula
ESRF	$1.7 \cdot 10^{15}$ operation 1999-2003	$0.8 \cdot 10^{14}$ 5 %	1	1.0 m HC	0.7 m HC
SPring8	$0.7 \cdot 10^{15}$ Top-up @ τ = 10 h	$1.5 \cdot 10^{14}$ 20 %	12	1.0 m SC	0.6 m SC
PETRA-III	$6.0 \cdot 10^{15}$ Top-up @ τ = 2 h	$3.0 \cdot 10^{14}$ 5 %	1	1.0 m HC	1.0 m HC
DIAMOND	$0.9 \cdot 10^{15}$ Top-up @ τ = 10 h	$0.9 \cdot 10^{14}$ 10 %	1	0.95 m HC	0.6 m HC
DORIS-III	$2.0 \cdot 10^{15}$ permission @ τ = 5 h	$0.6 \cdot 10^{14}$ 3 % 9m / 300m	1	0.8 m SC	0.8 m SC

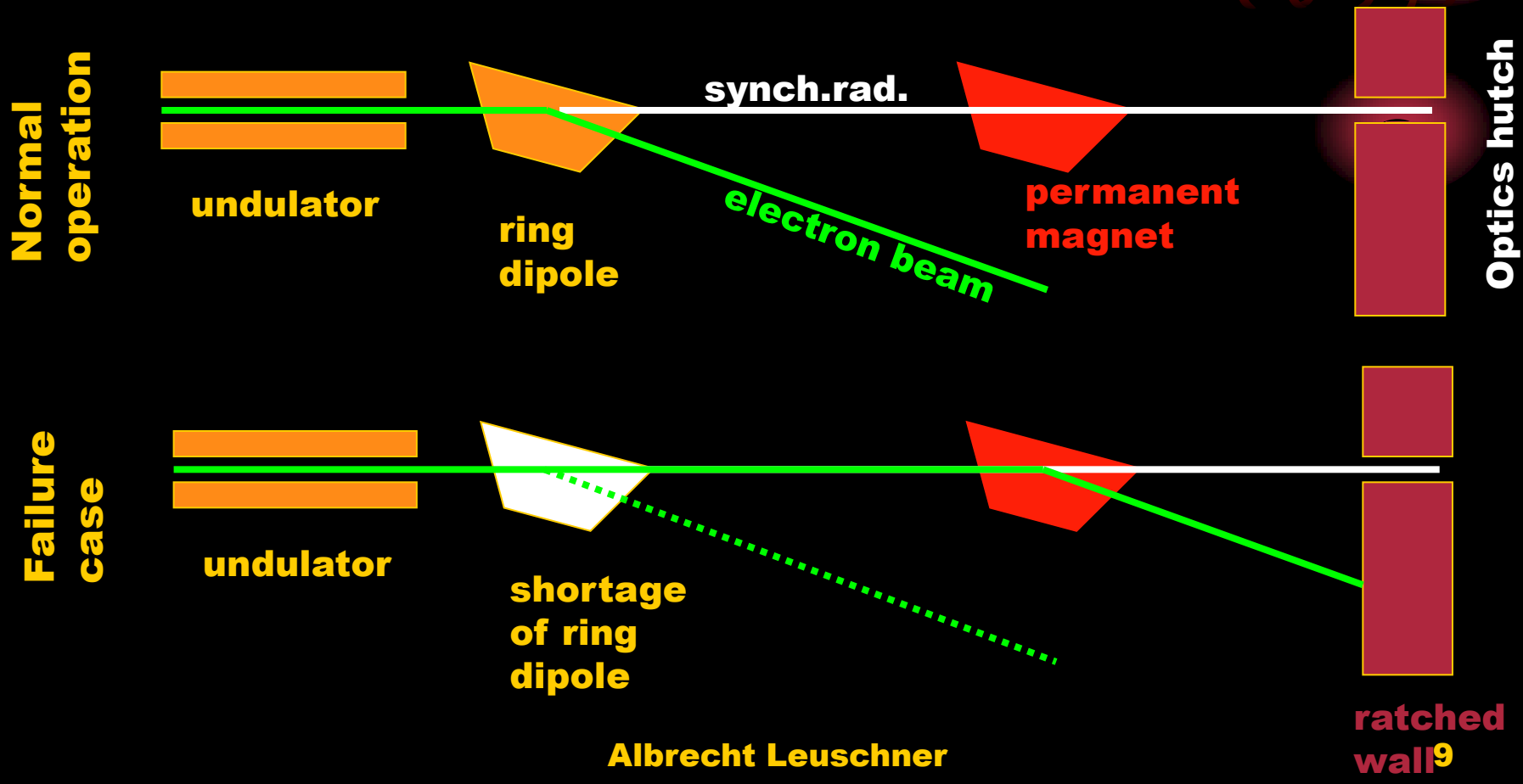
Storage ring shielding

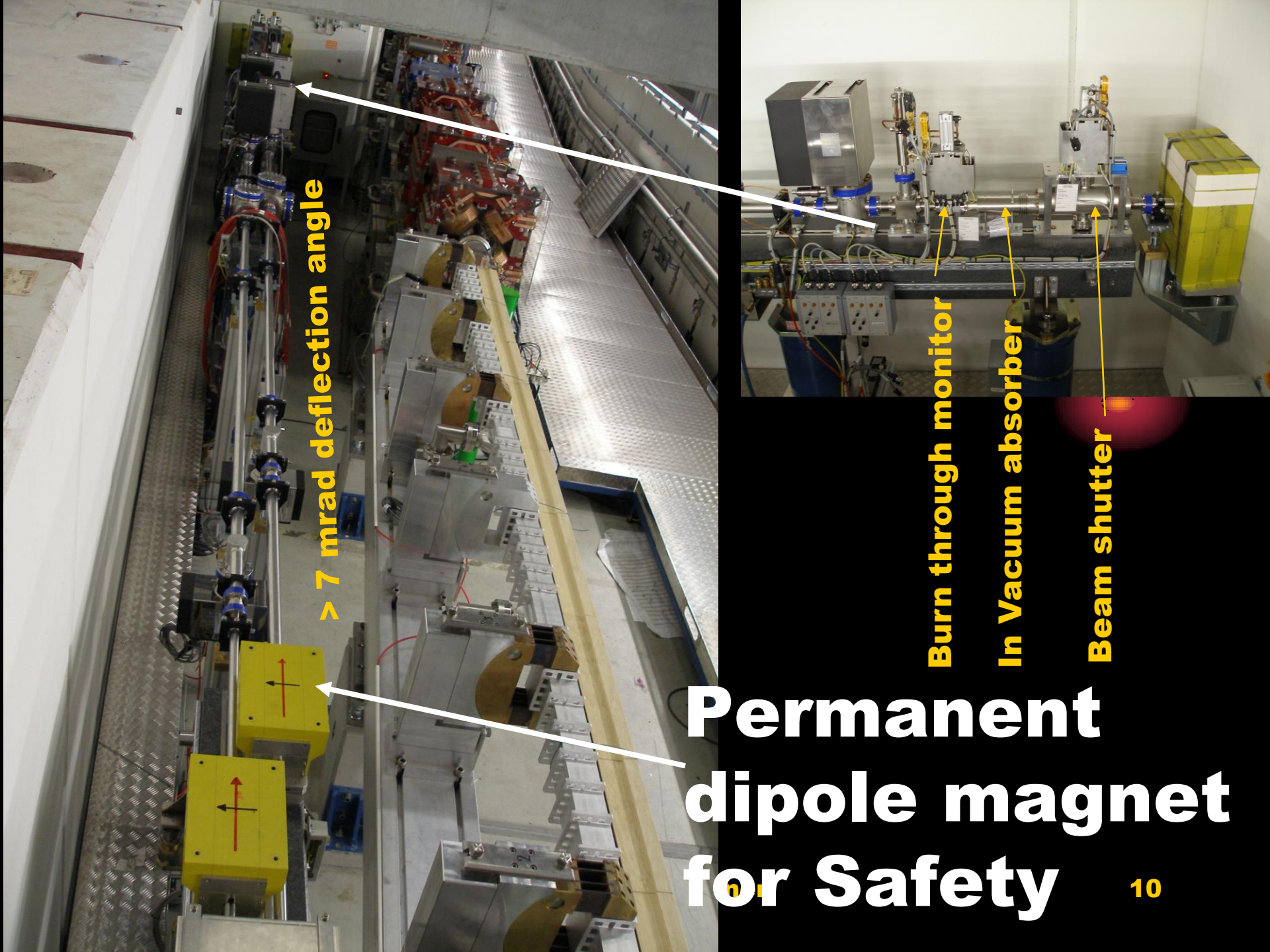


Beam Losses in Sector 2 from Injections in PETRA III

Primary electron beam confinement

A permanent magnet in the photon beam line guaranties that no primary electron can reach the optics hutch



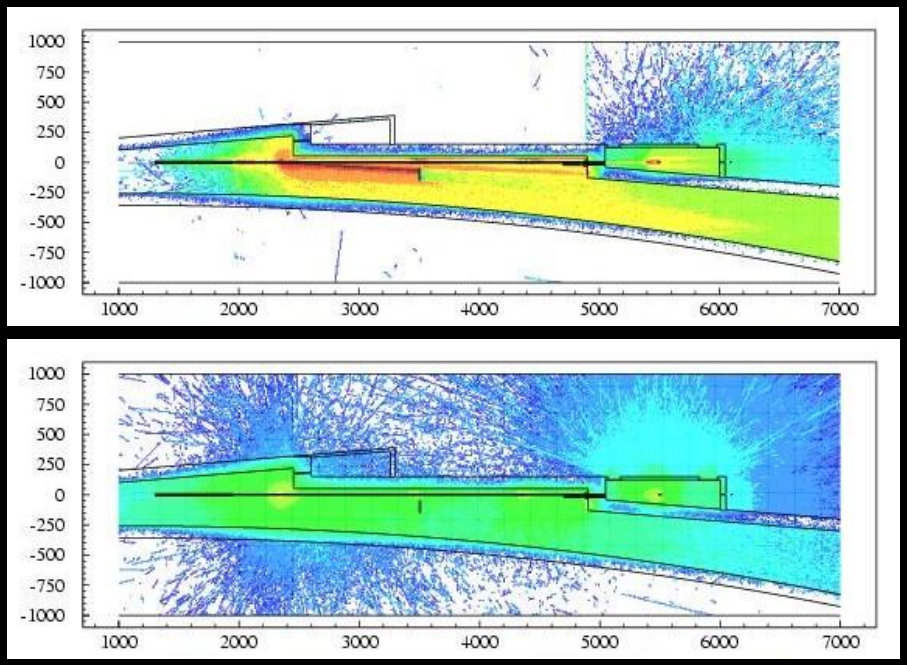


Permanent dipole magnet for Safety

Shielding calculations Optics hutch

FLUKA – 2005:
Bremsstrahlung, Neutrons

Few bunch mode: 100 mA
Loss: 10^{15} electrons per year



STAC8 v.2.3:
Synchrotron radiation calculations by Asano-san

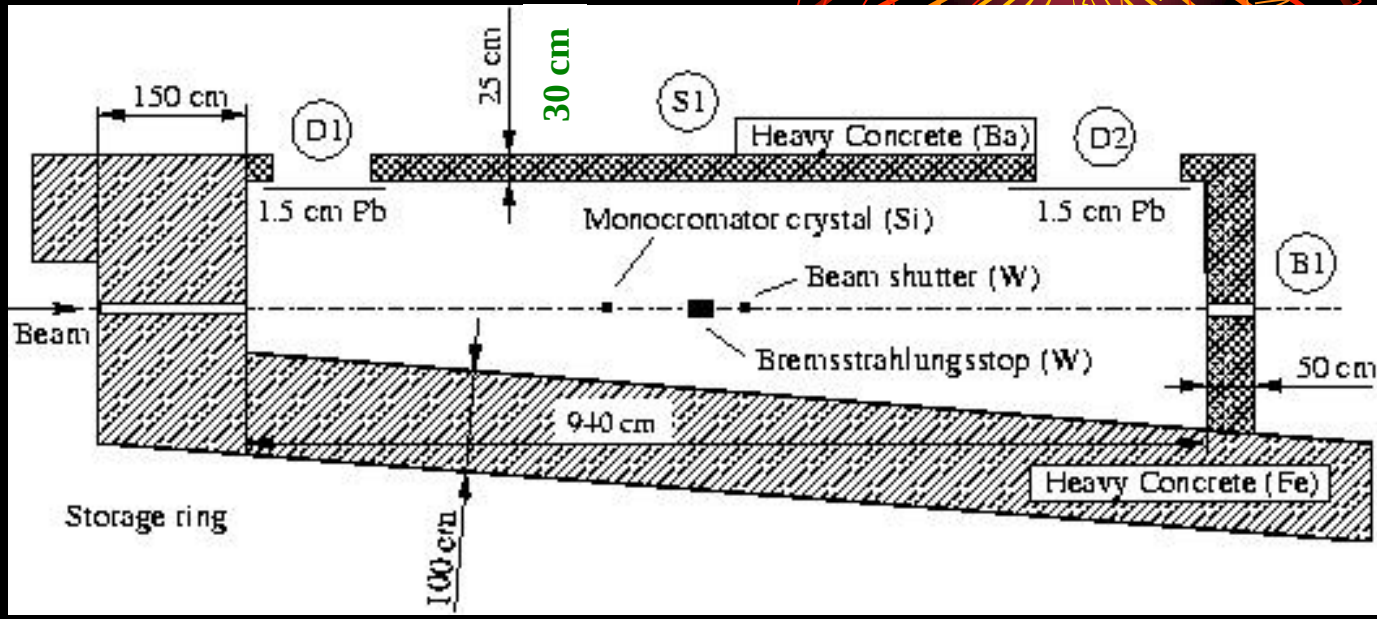
Spectroscopy beam line
Multi bunch mode: 200 mA
Power: 20 kW

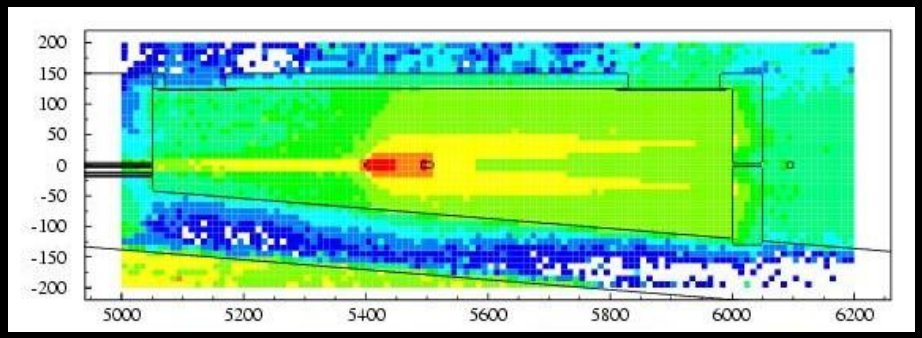
Optics hutch shielding
- bremsstrahlung + neutrons -

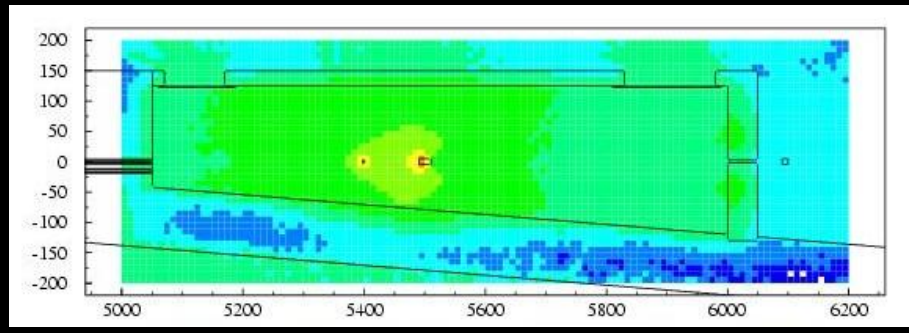
Loss:
1×10^{15} electrons

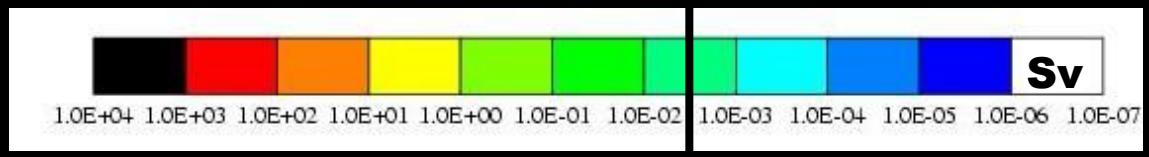
equivalent to

100 mA × 6000 h
14.5 m straight
3.5×10^{-08} mbar air









PLANNING GOAL: 3 mSv

No Safety Measurements for the Permanent Magnet yet

Further commissioning will be done in the next few months.

Thank you for your attention !