Gamma Blocker NCBJ

Understanding of System & Scope

Karol Szymczyk Nov. 09, 2016

National Centre for Nuclear Research:

- One of the biggest scientific institutes in Poland
- 1000+ team

Accelerator activity:

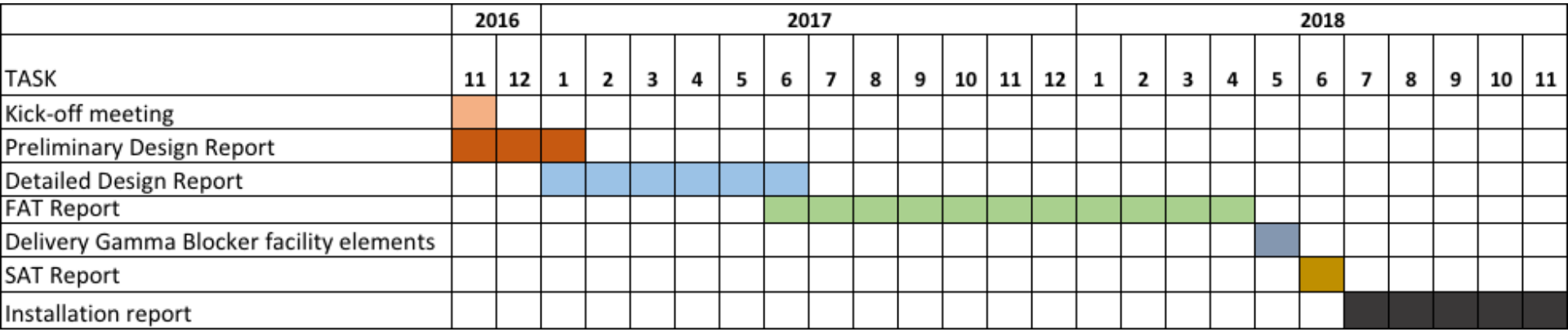
- calculations,
- design,
- Advanced technologies
- Manufacturing
- Installations
- service&maintenance

Collaboration with ESS from the begining of ESS

Gamma Blocker Time Line

Lp.	Task	Beginning	End	Months
1	Preliminary Design Report	01.10.2016	13.01.2017	2,5
2	Detailed Design Report	13.01.2017	01.06.2017	4,5
3	FAT Report	01.06.2017	30.03.2018	10
4	Delivery Gamma Blocker facility elements	30.03.2018	29.04.2018	1
5	SAT Report	29.04.2018	01.06.2018	1
6	Installation Report	01.06.2018	30.11.2018	6
7	SUM			25

Gamma Blocker Time Line



Our Team

Karol Szymczyk:

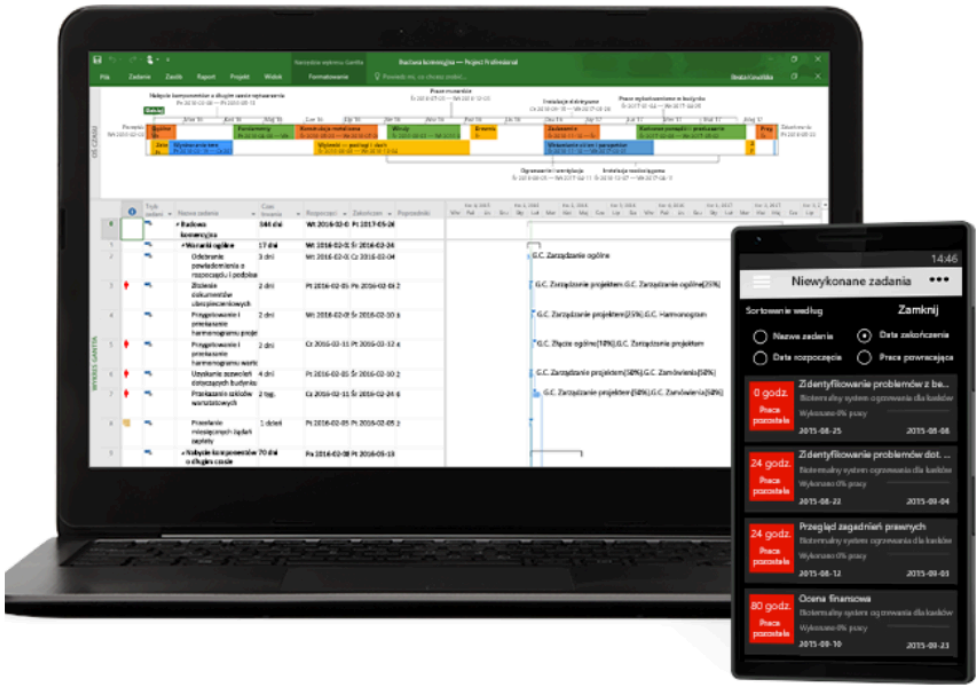
- Work-Unit Coordinator for the Partner
- Fluka simulations

Marcin Wojciechowski:

- Technical design

Sławomir Wronka:

- supervisor



Preliminary Risk Analysis

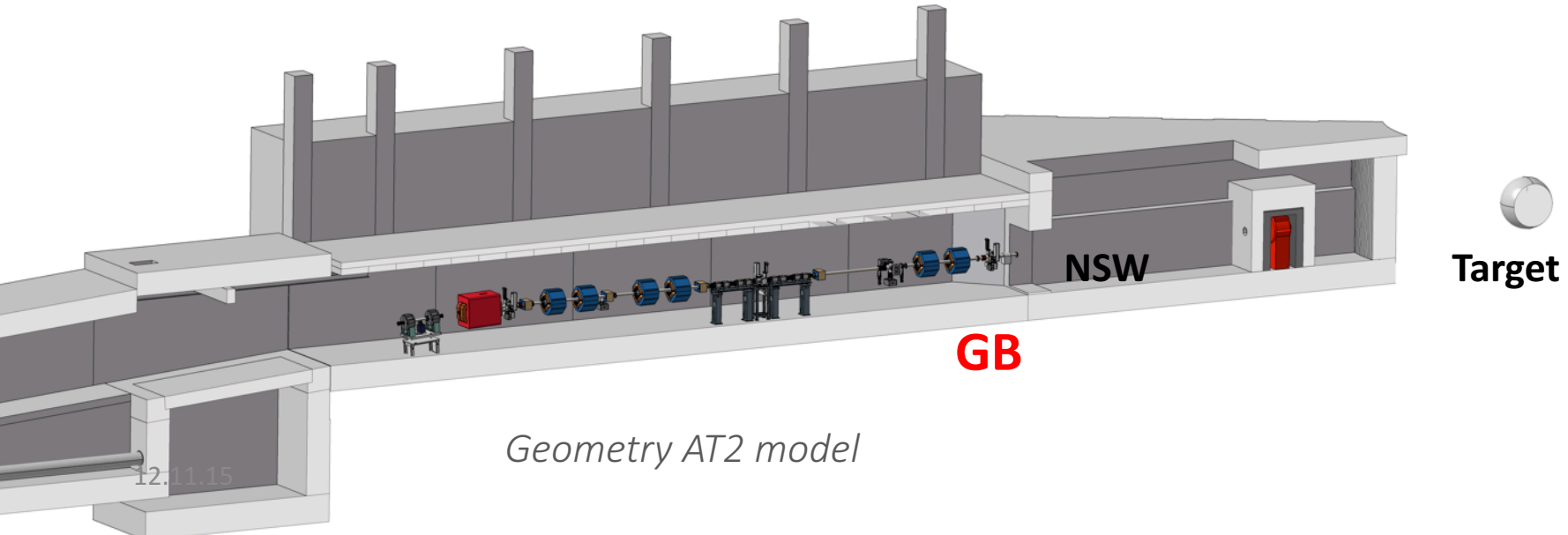
Risk	Solution
Misunderstandings	Kick off Meeting
	Contact with Inigo
	Account on Chess
	PDR & CDR acceptance
	Account on Atlassian
Euro exchange rate	good financial planning
	Precise cost analysis
Delays	time reserve
	reserved resources at NCBJ
	many suppliers common standards
Elements quality	Careful control
	many suppliers

Preliminary hazard Analysis

- mechanical
- dosimetric
- electrical
- other

Gamma Blocker -what is it

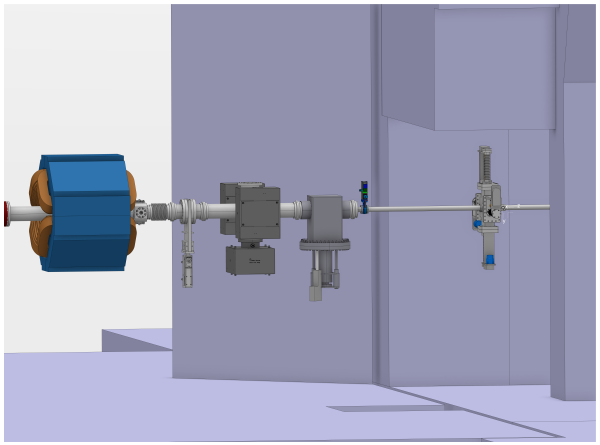
- *"Absorb gamma radiation from the target or beam dump, during maintenance periods."*
  - Gamma blocker consists of: shield plate, movement mechanism, vaccum chamber, CF beam line flanges, actuator(s),



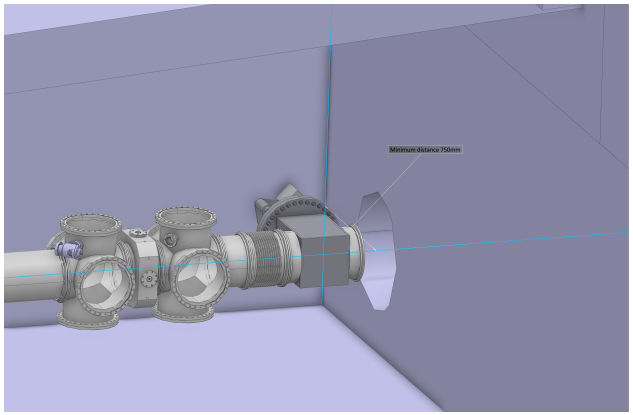
Geometry AT2 model

Gamma Blocker

Two Gamma Blockers:



In the A2T section 30 zm before NSW



In the Dump Line section, in front of the Tuning Dump

Gamma radiation calculations

In 2015/2016 GB design has started.

Simulations prepared in FLUKA program.

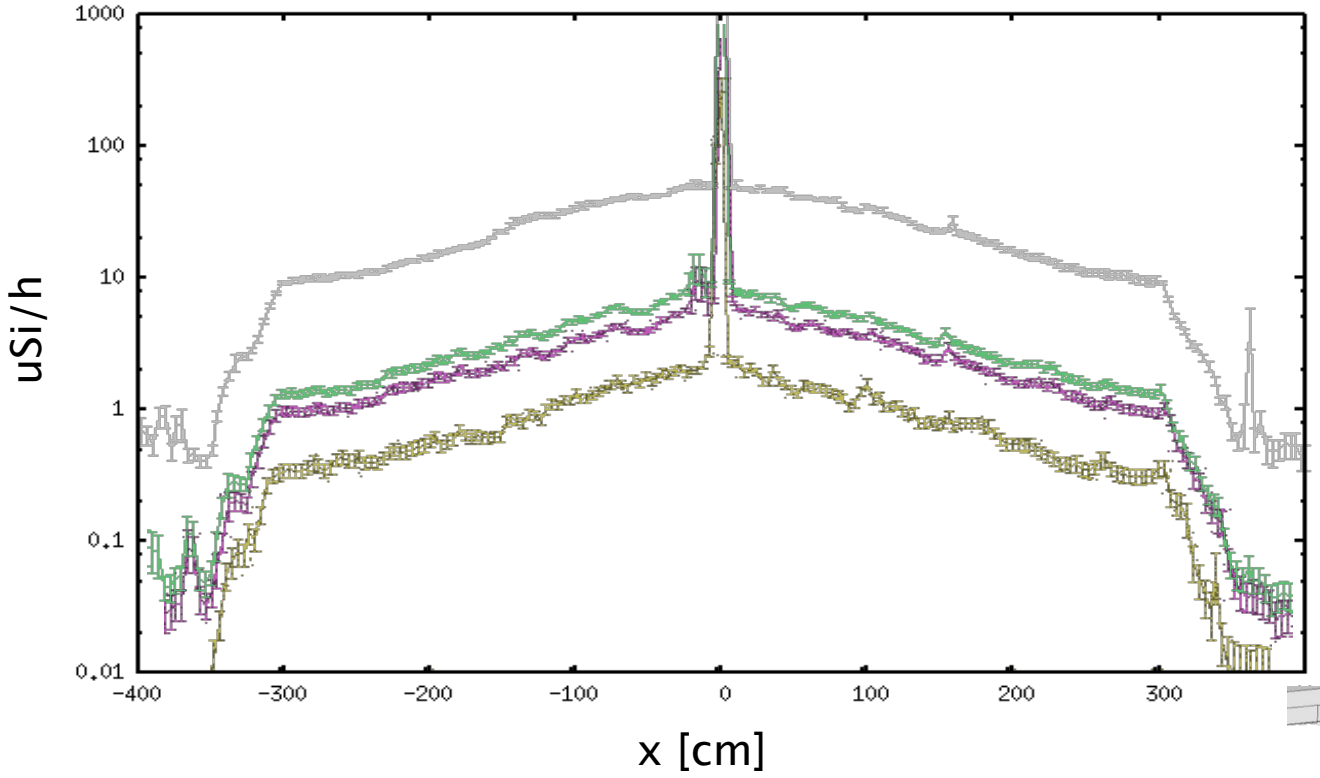
Material to simulate:

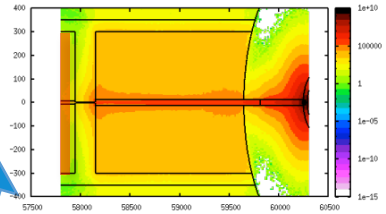
- Iron
- Tungsten

Results after 5 years of exposure and 4 cooling times:

- 0 second
- 1 hour
- 4 hours
- 1 month

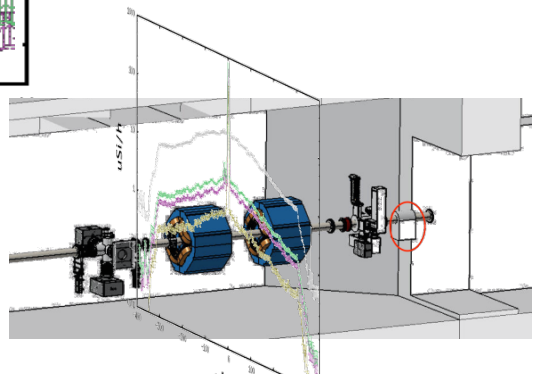
Residual dose equivalent rate
After 5 years of exposure



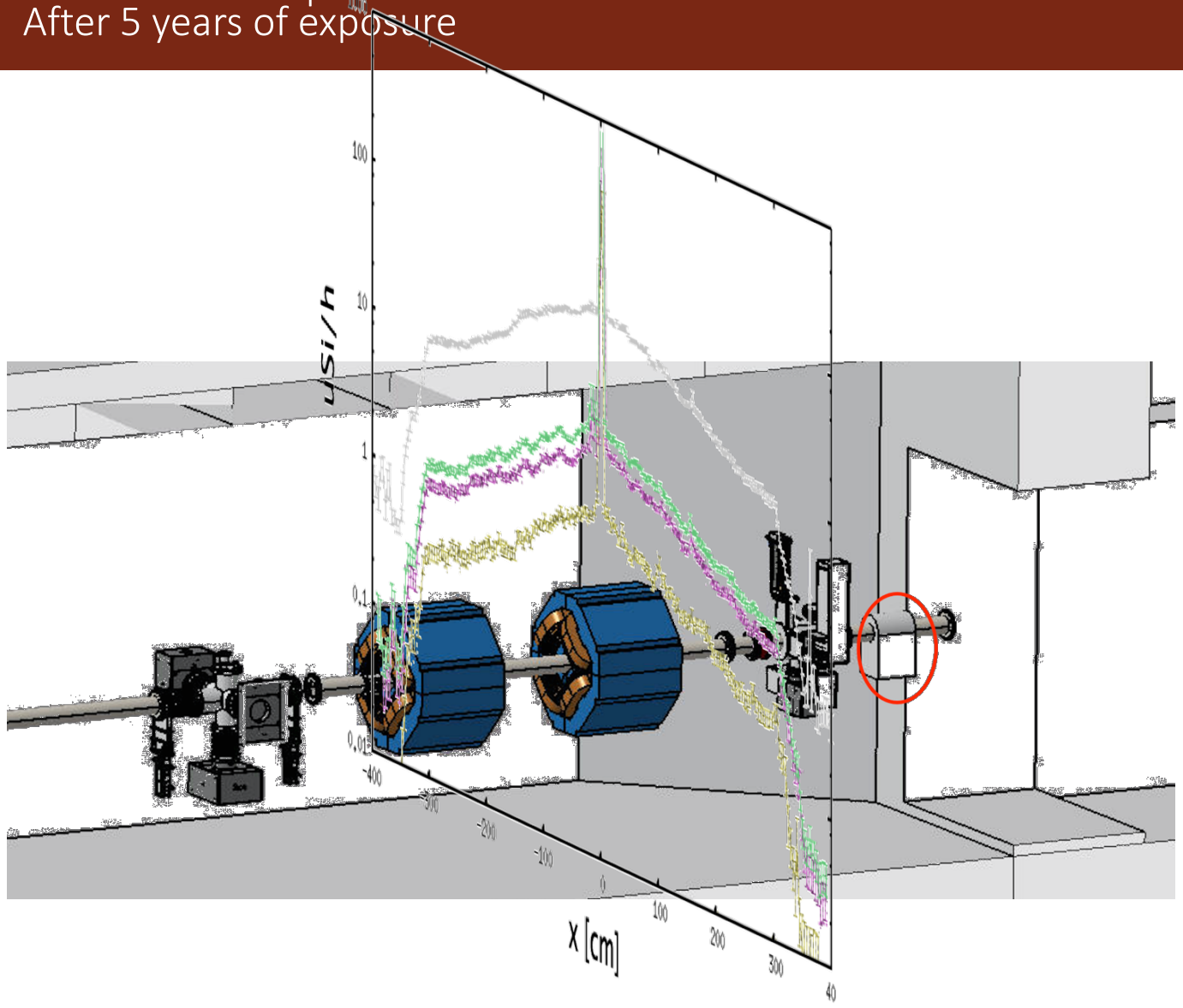


Cooling time:

- 0s
- 1h
- 4h
- 1month



Residual dose equivalent rate
After 5 years of exposure



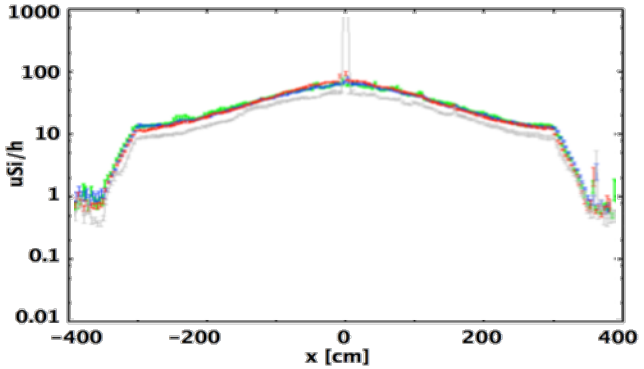
Cooling time:

- 0s
- 1h
- 4h
- 1month

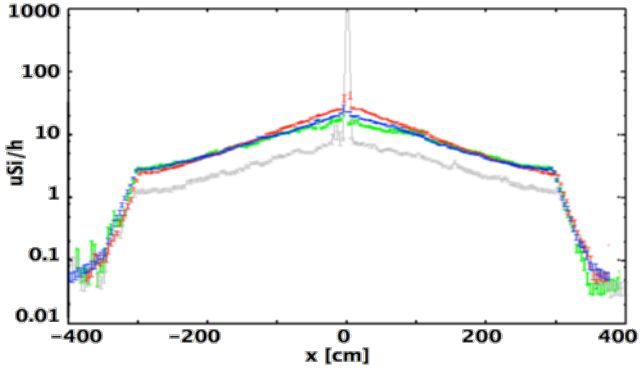
Gamma Blocker: Residual dose equivalent rate

Gamma radiation dose rate versus distance from the beam pipe, 1 m upstream the NSW

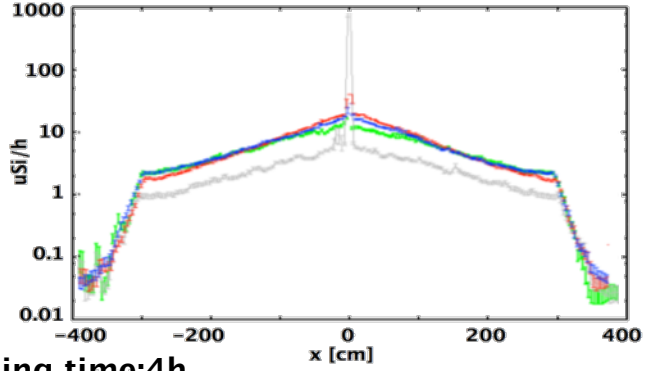
26
Fe
Iron
55.845
2
8
14
2



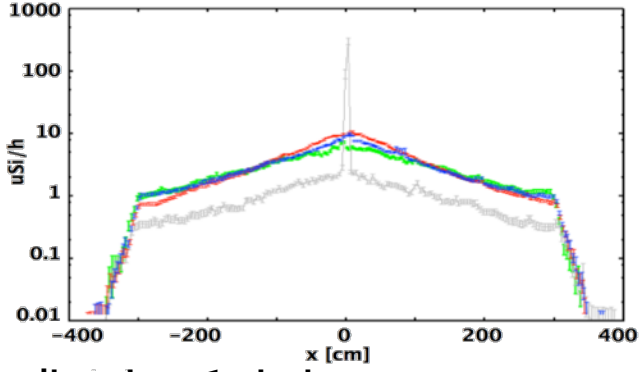
Cooling time: 0s



Cooling time: 1h



Cooling time:4h



Cooling time: 1miesiąc

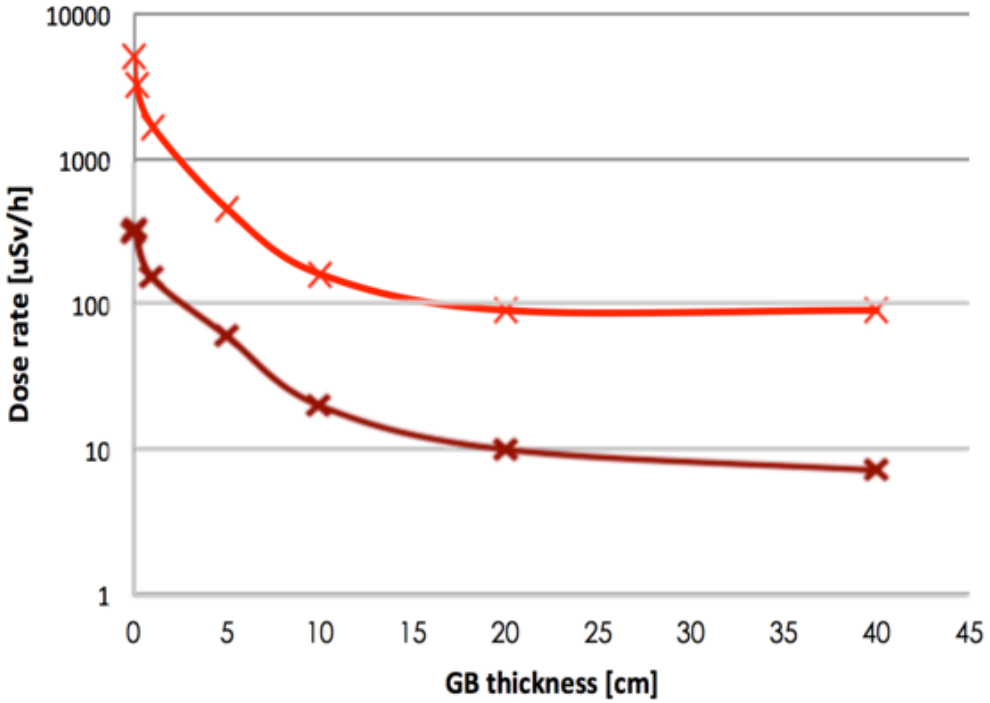
GB thickness:

- **without GB**
- **10 cm**
- **20 cm**
- **40 cm**

Gamma Blocker : Residual dose equivalent rate

Iron: Cooling time 0s

Iron: Cooling time 1month



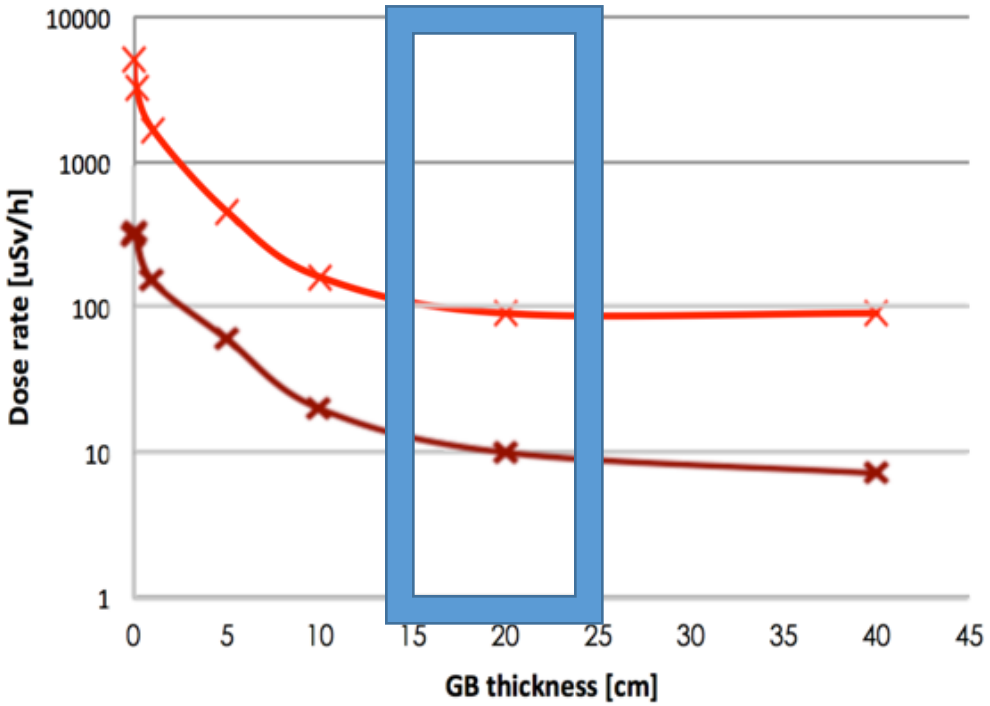
26
Fe
Iron
55.845
2
8
14
2

Residual dose equivalent rate after 5 years of exposure, 0s cooling time (red), and 1 month cooling time (dark red) inside the 'beam pipe' as a function of GB thickness – material : FE and W

Gamma Blocker : Residual dose equivalent rate

Iron: Cooling time 0s

Iron: Cooling time 1month



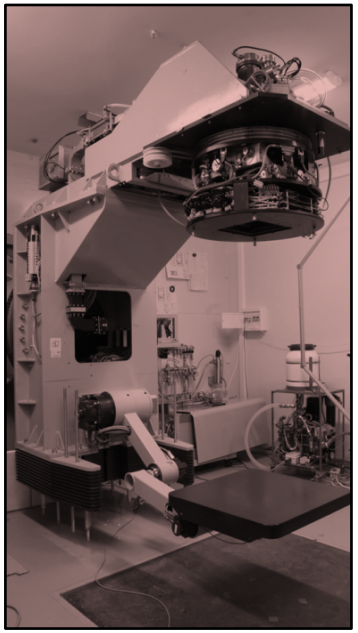
26
Fe
Iron
55.845
2
8
14
2

Residual dose equivalent rate after 5 years of exposure, 0s cooling time (red/blue), and 1 month cooling time (dark red/dark blue) inside the 'beam pipe' as a function of GB thickness – material : FE and W

GB

- Kick-off meeting - very useful for our work

Thank you

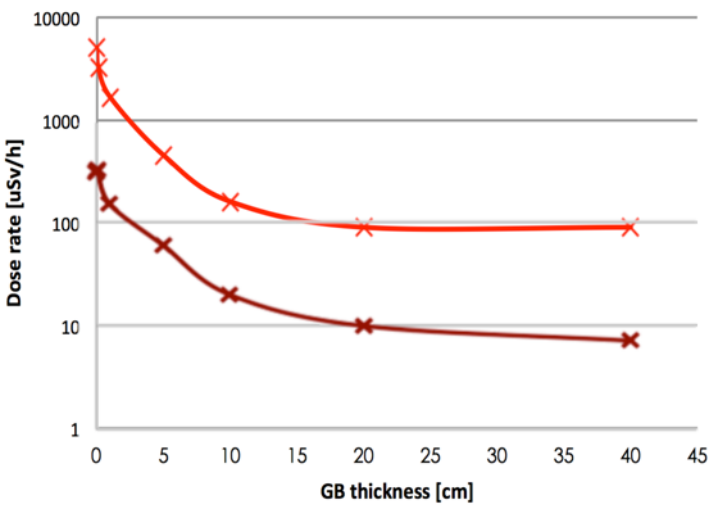


Gamma Blocker : Residual dose equivalent rate

Iron: Cooling time 0s

Iron: Cooling time 1month

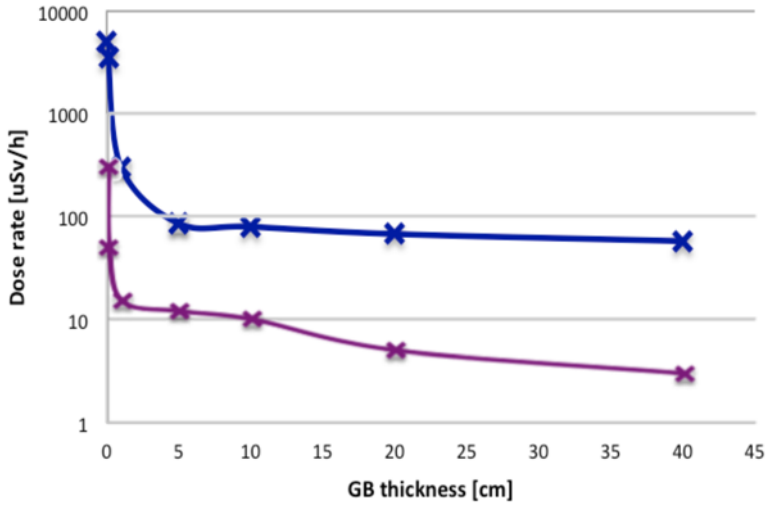
26
Fe
Iron
55.845
2
8
14
2



Tungsten : Cooling time 0s

Tungsten : Cooling time 1month

74
W
Tungsten
183.84
2
8
18
32
12
2



Residual dose equivalent rate after 5 years of exposure, 0s cooling time (red/blue), and 1 month cooling time (dark red/dark blue) inside the 'beam pipe' as a function of GB thickness – material : FE and W