John Adams Institute for Accelerator Science

Imperial College London

Royal Holloway University of London

UNIVERSITY OF OXFORD

Energy deposition studies for new triplet

Jose L. Abelleira on behalf of the JAI-FCC team

9 October 2017

Thanks to CERN FLUKA team

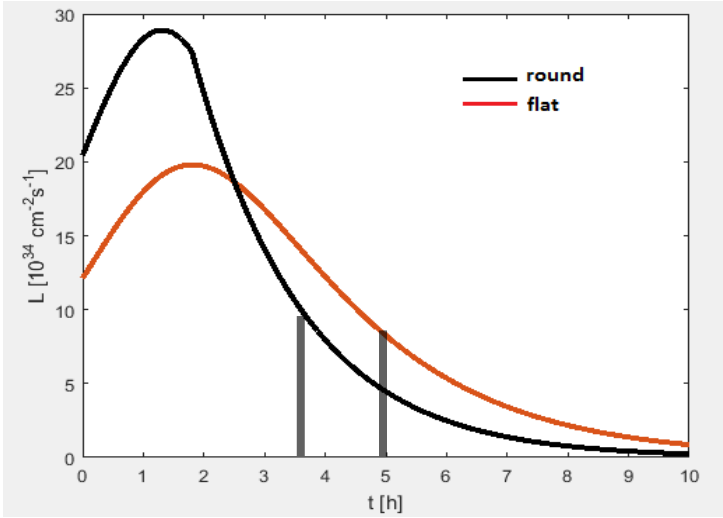
EuroCirCol

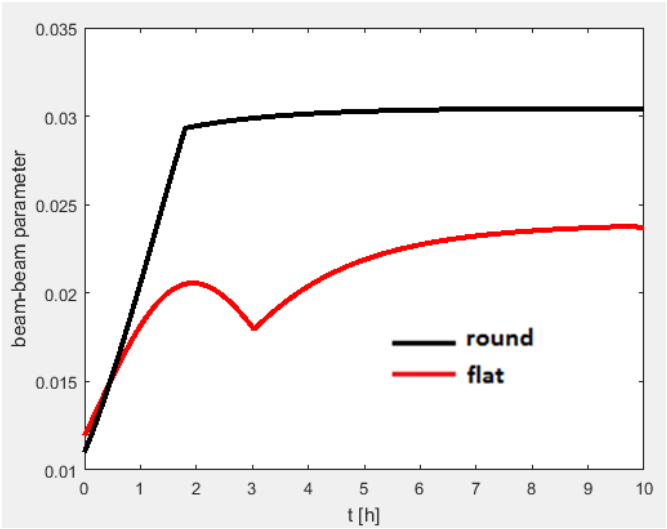
A key to New Physics

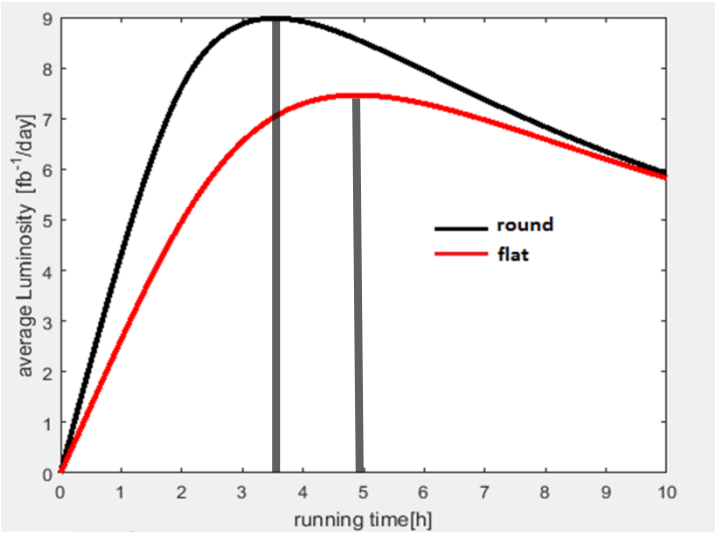
- **Flat beam parameter choice**
- **Energy deposition studies for the alternative FF triplet**
- **Energy deposition in D1/D2**

Flat beam parameter choice

	Optics		
	nominal (round)	ultimate (round)	alternative (flat)
N[$\cdot 10^{11}$]		1.0	
ϵ_N[μm]		2.2	
n_b		10600	
σ_s [cm]		8	
β_x^* [m]	1.1	0.3	1.2
β_y^* [m]	1.1	0.3	0.15
θ [μrad]	92	176	114.4
ϕ	0.55	2.0	0.65
S	0.88	0.45	0.84
ξ[$\cdot 10^{-3}$]	10	11	12
L[$\cdot 10^{34}$cm^{-2}s^{-1}]	5	20	12
L_{peak}[$\cdot 10^{34}$cm^{-2}s^{-1}]	16	30	20
L_{int}[fb^{-1}/day]	6	9	7.5



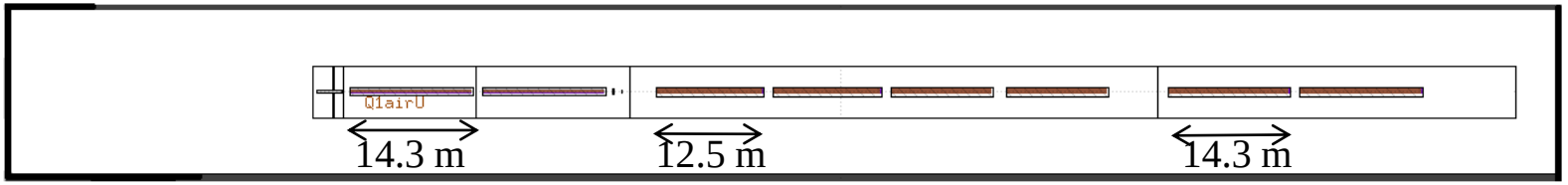




Triplet comparison

L*=40 m

Nominal



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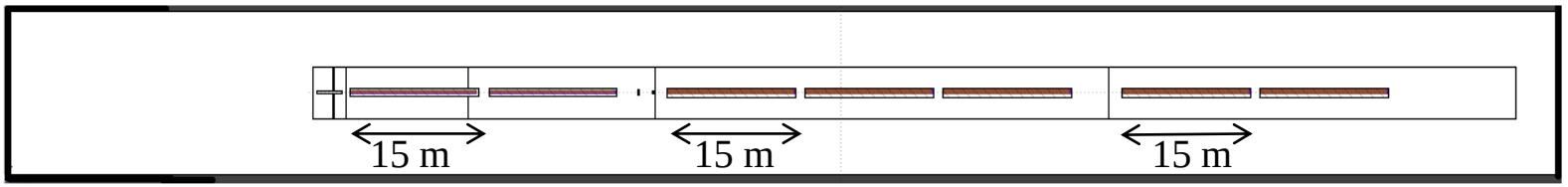
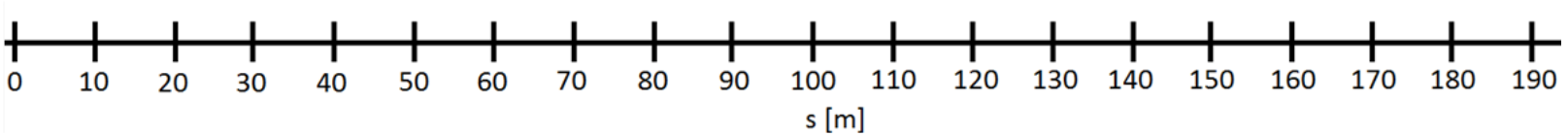
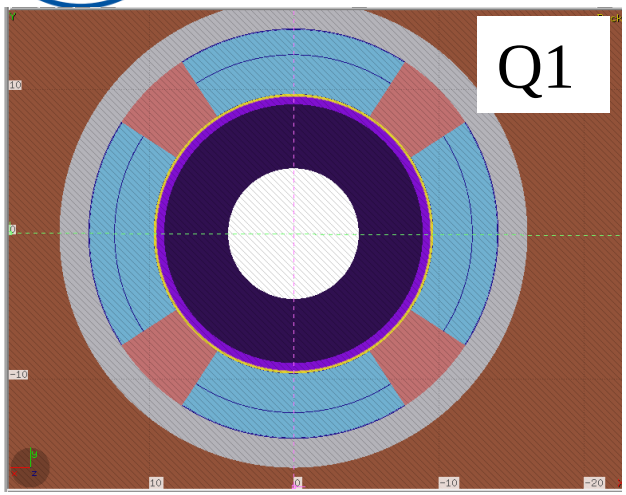
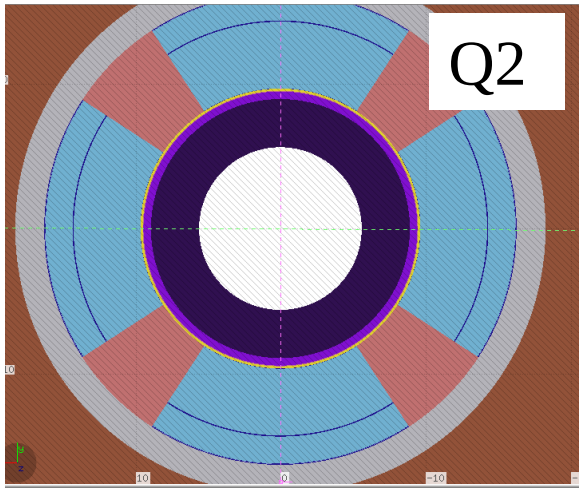


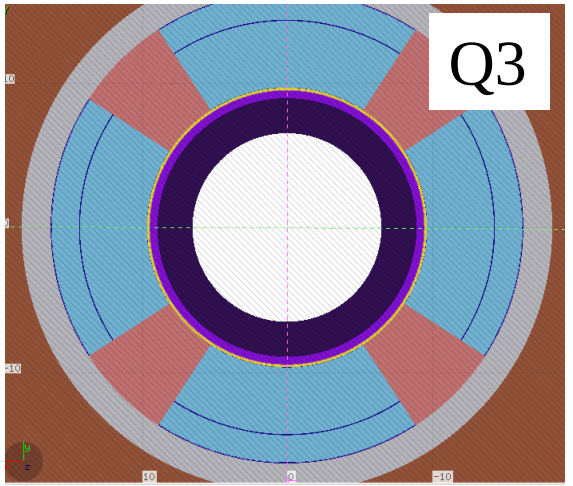


↔ 4 m shorter

Triplet parameters







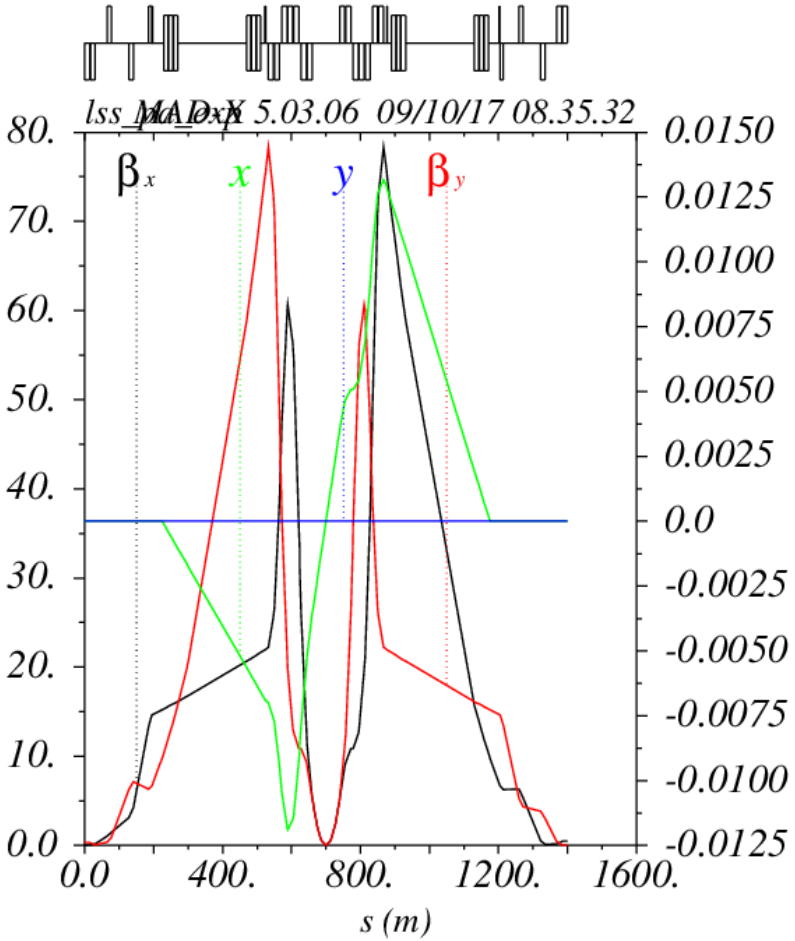
	g [T/m]	coil, r [cm]	free aper, r [cm]	Abs thickness [cm]
Q1	108	19.33	9.02	8.84
Q2	112	19.33	11.22	6.64
Q3	98.5	19.33	13.02	4.84

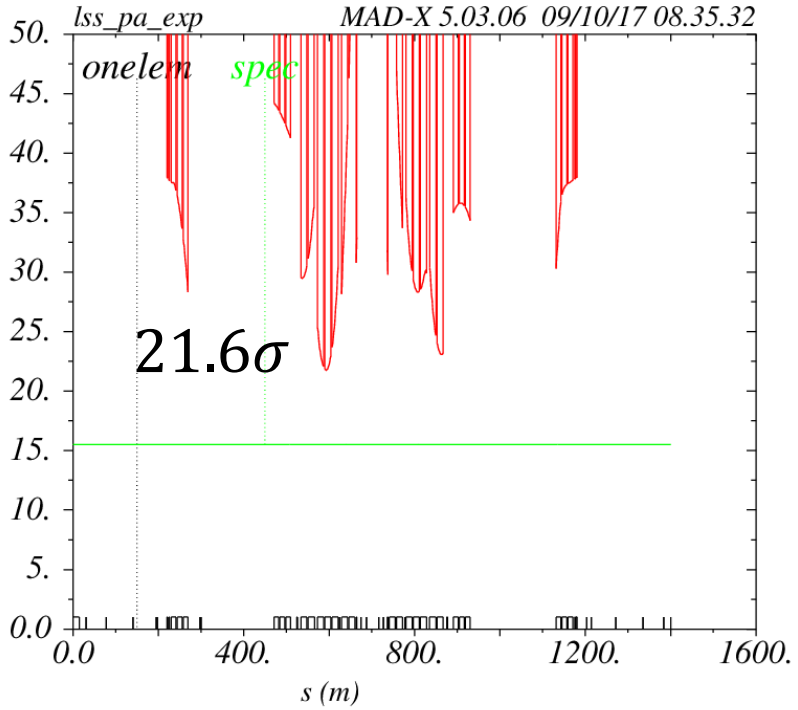
Comparison nominal triplet

g [T/m]
127
102
100

Leon Van Riesen-Haupt ‘New triplet and EIR optics’

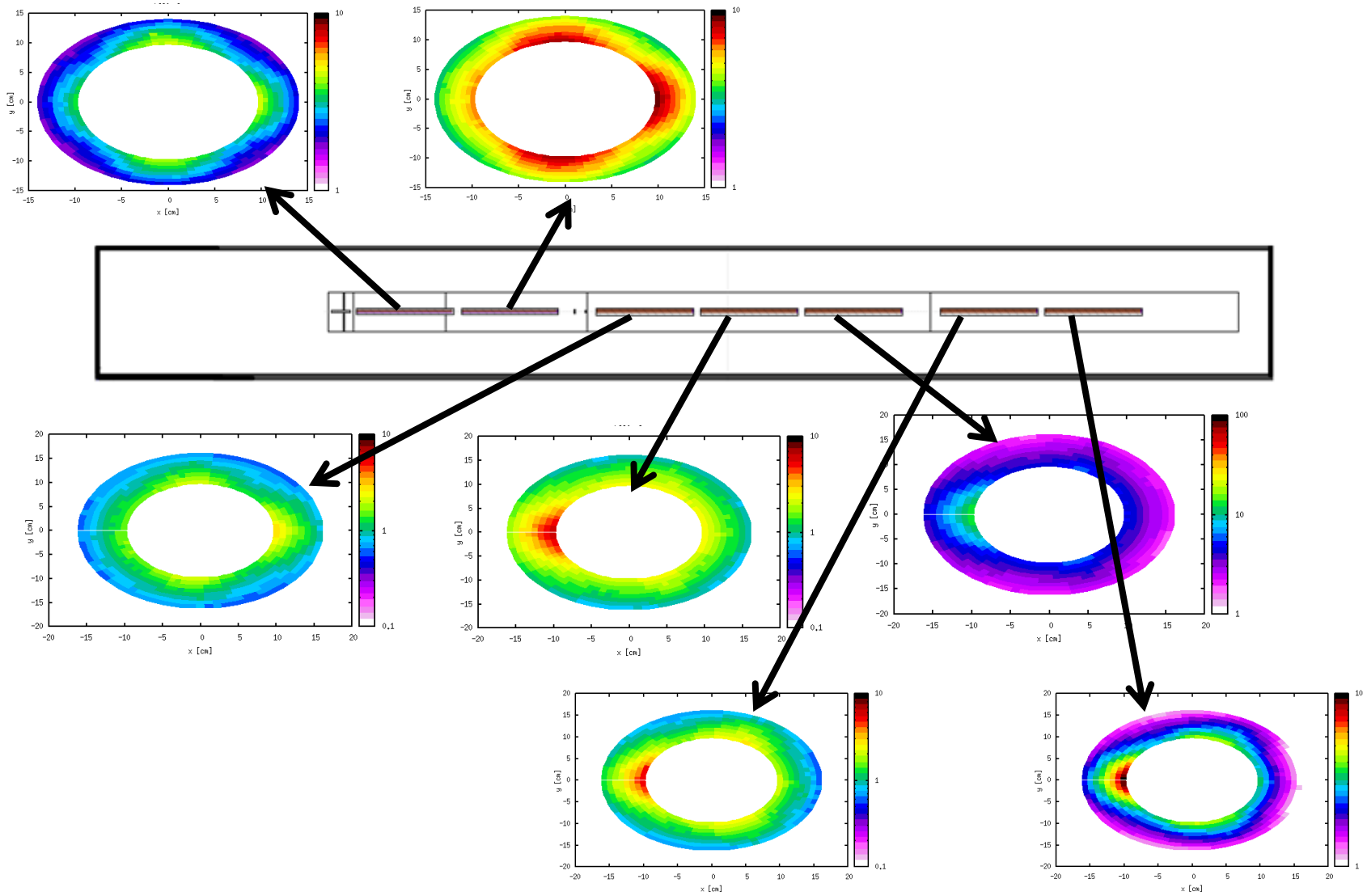
Optics for beta*=0.3 m



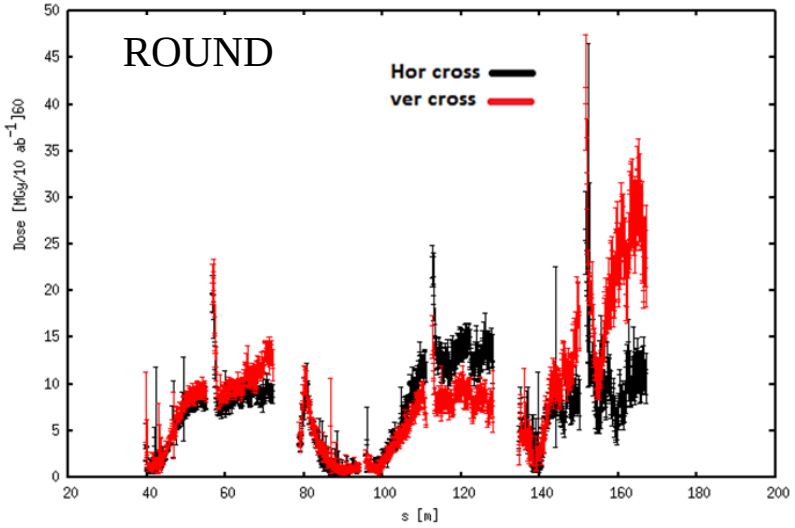


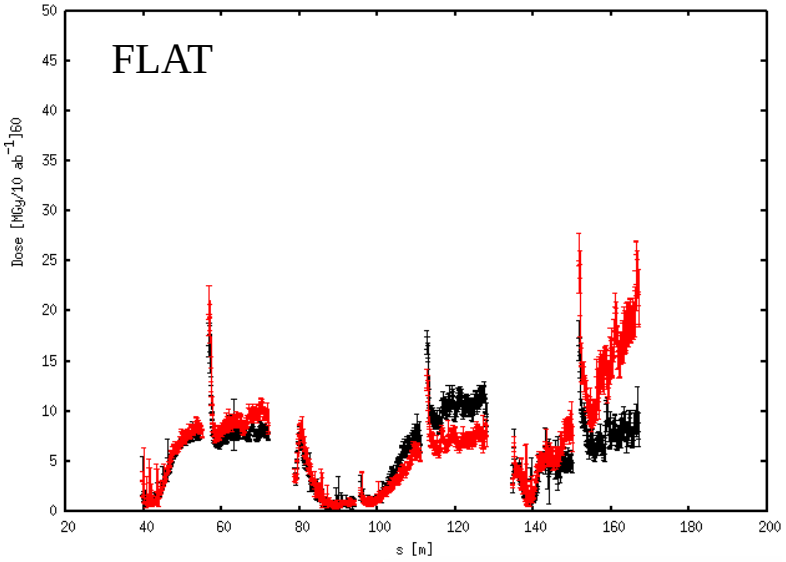
n Van Riesen-Haupt 'New triplet and EIR optics'

Energy deposition

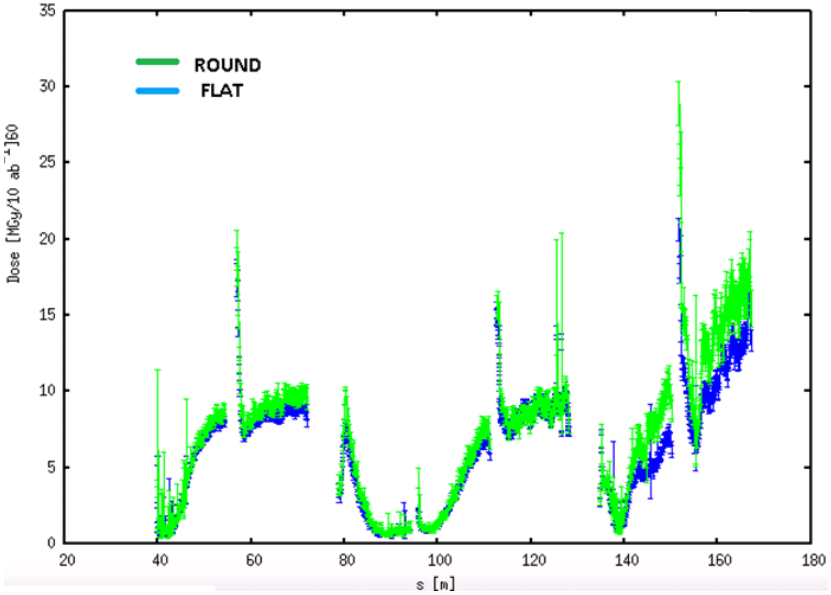


Energy deposition



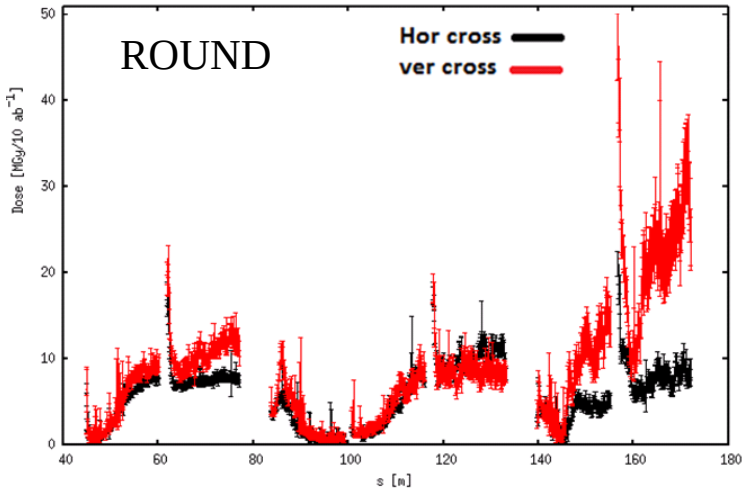


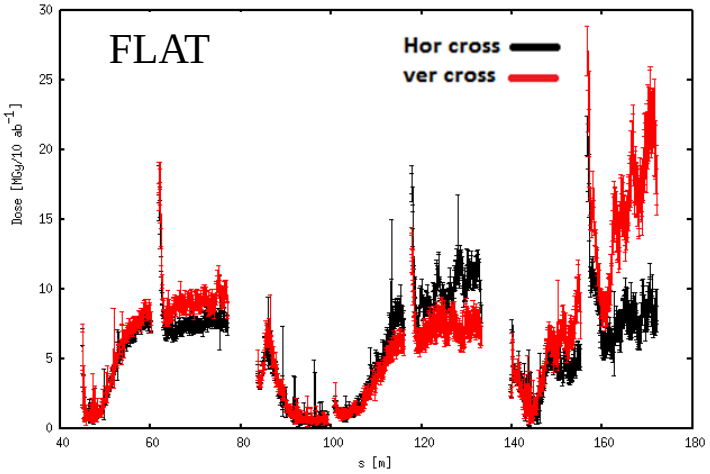
50% VERTICAL CROSSING
50 % HORIZONTAL CROSSING



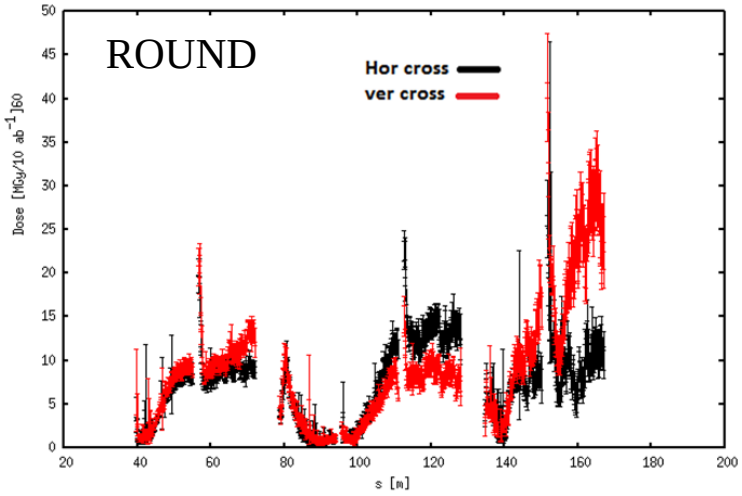
Energy deposition, L* 45m vs 40m

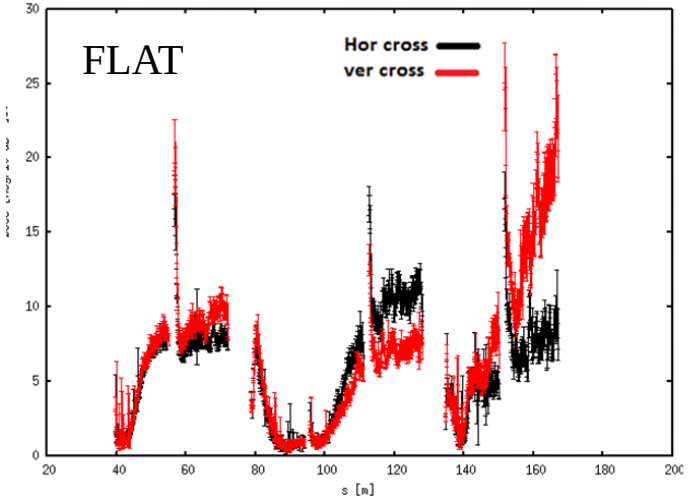
L*=45 m





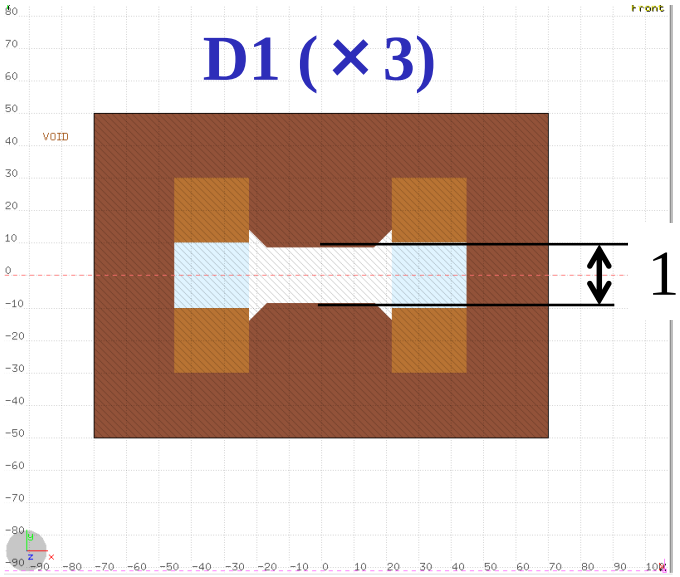
L*=40 m

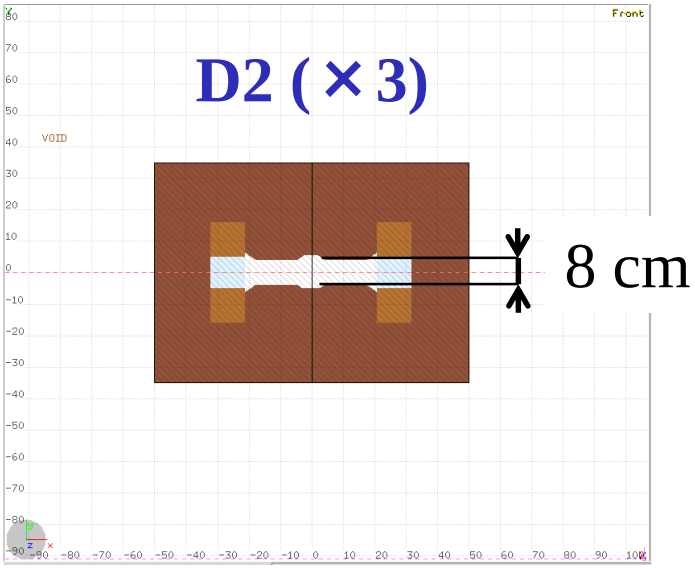


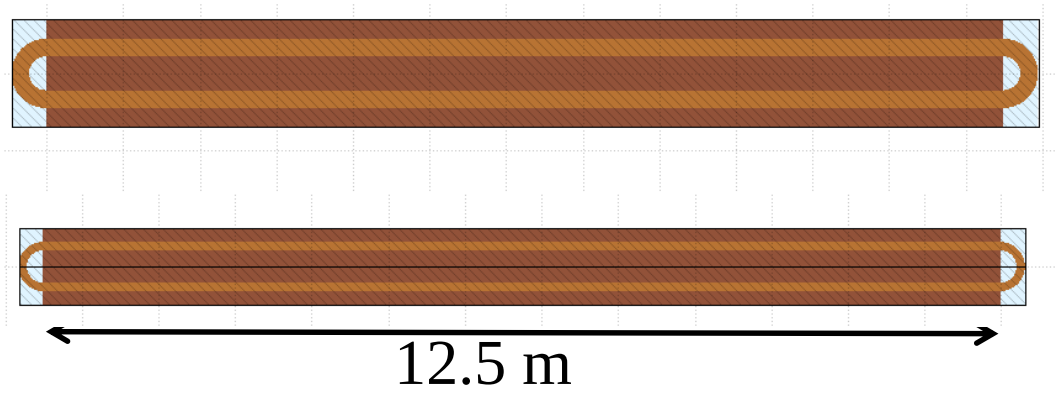


Separation magnets.

- **Model developed at JAI-Oxford**





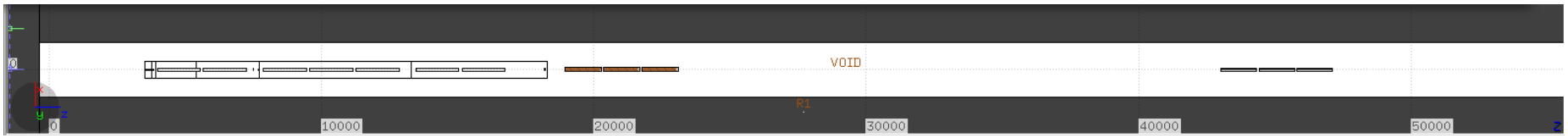


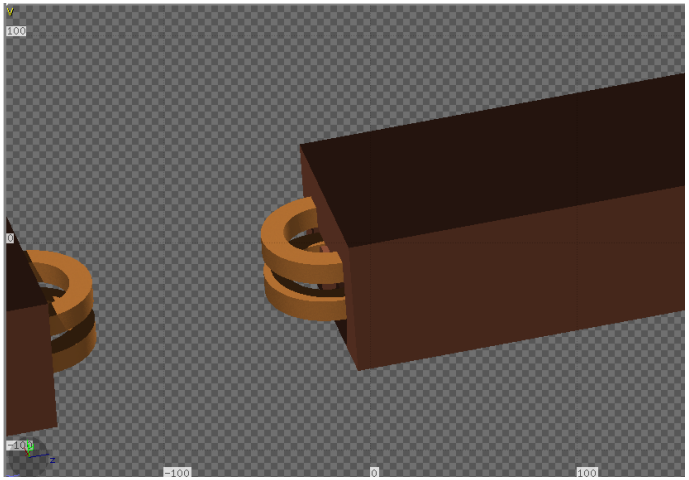
Separation magnets.

Alternative triplet

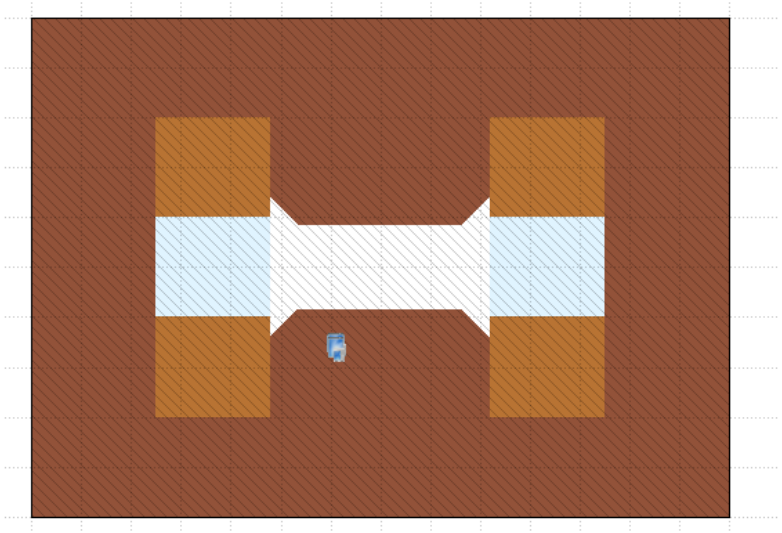
D1 (x3)

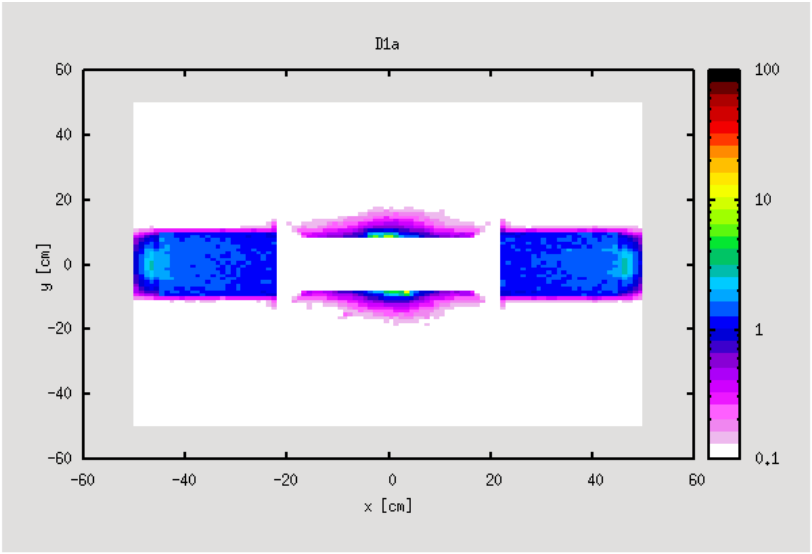
D2 (x3)

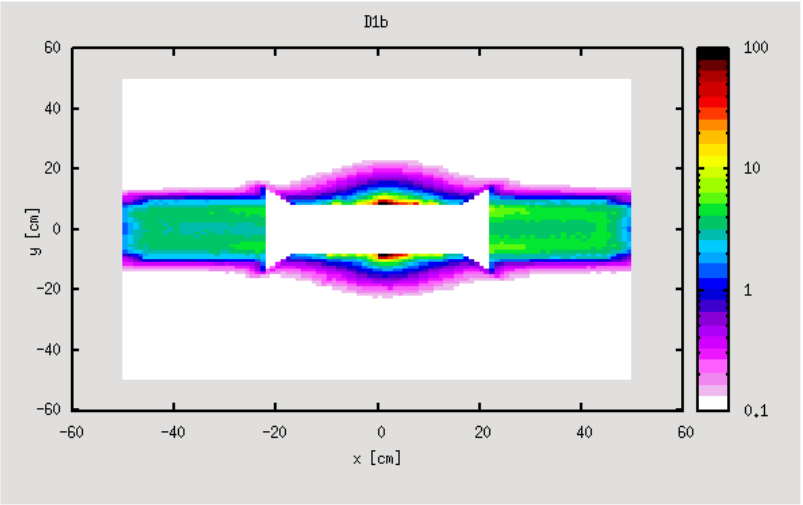


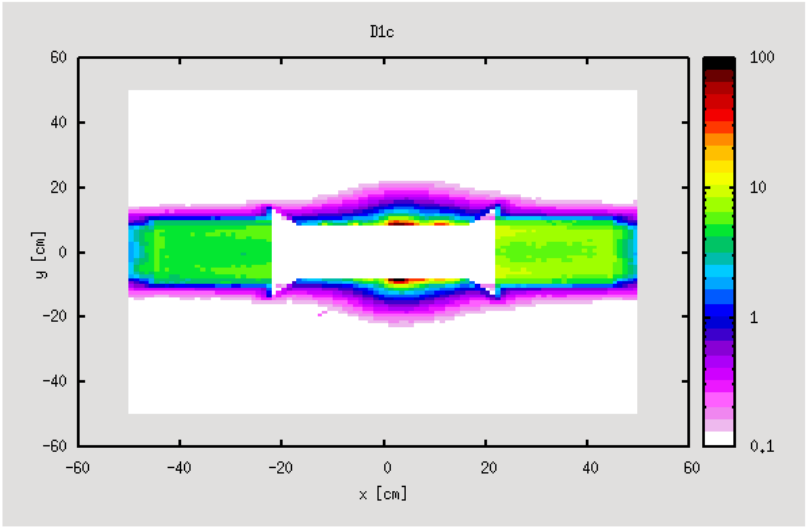


D1

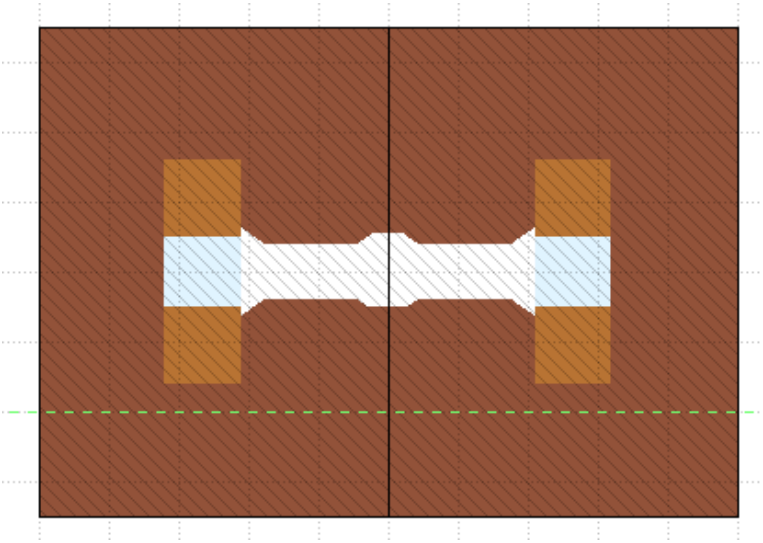


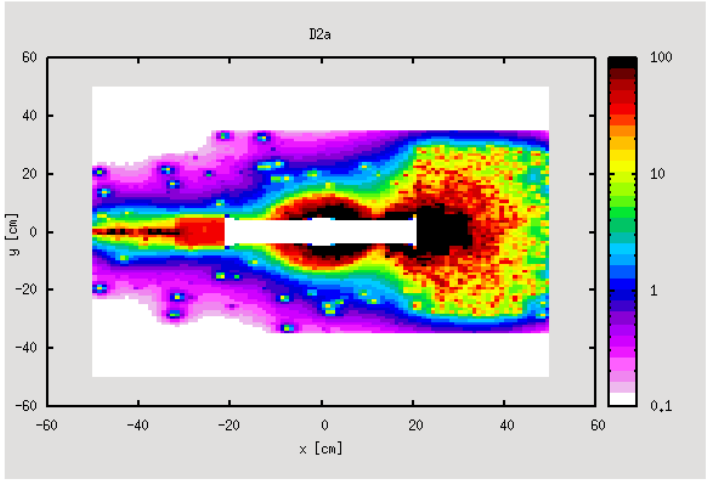

D1a
y [cm]
x [cm]
60
40
20
0
-20
-40
-60
100
10
1
0.1

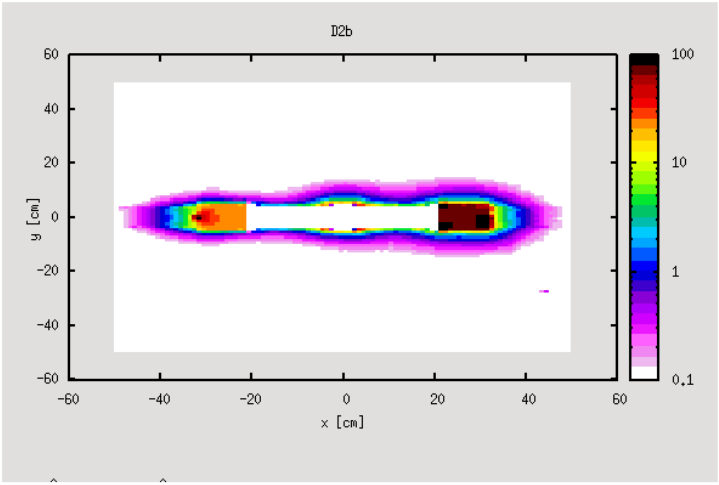

D1b
y [cm]
x [cm]
60
40
20
0
-20
-40
-60
100
10
1
0.1

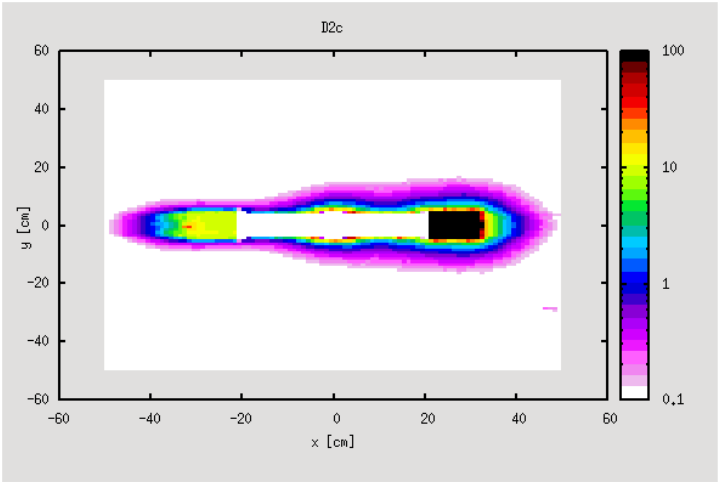

D1c
y [cm]
x [cm]
60
40
20
0
-20
-40
-60
100
10
1
0.1

D2

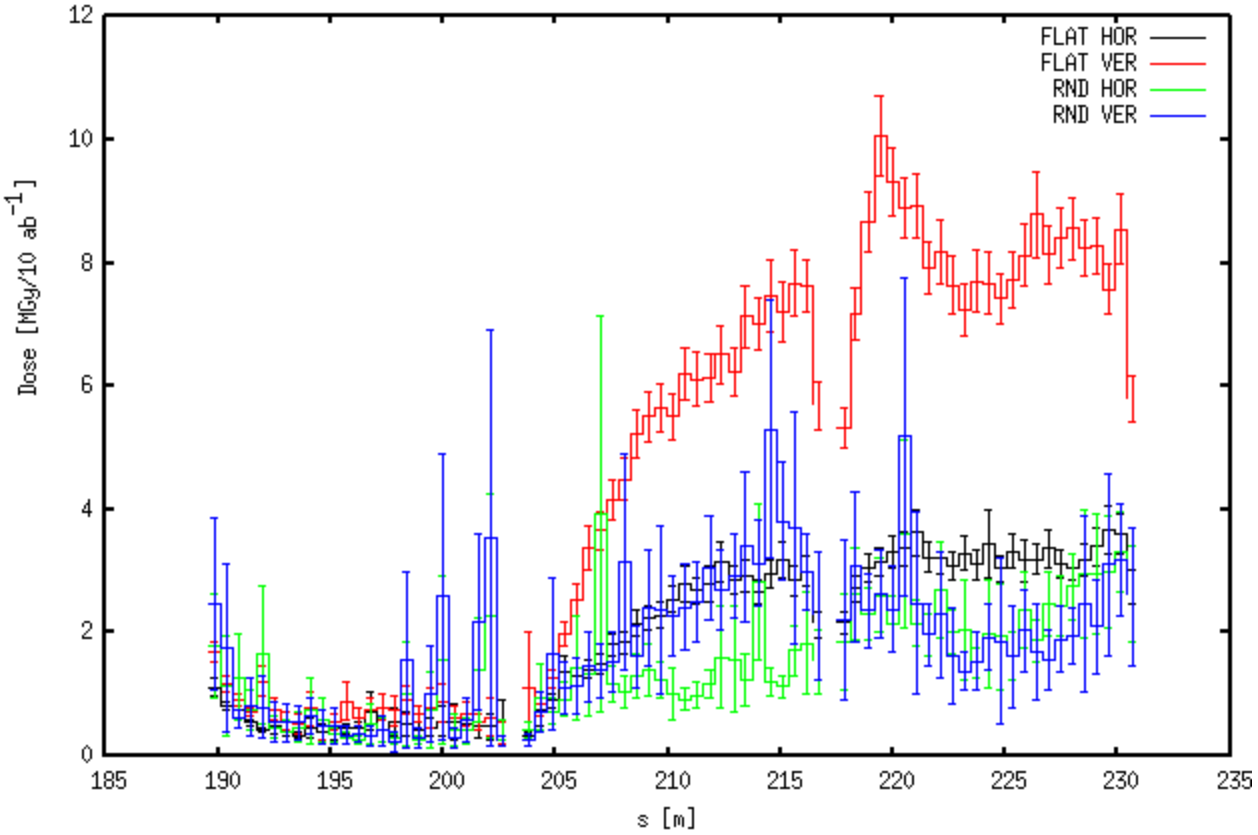



D2a
y [cm]
x [cm]
60
40
20
0
-20
-40
-60
100
10
1
0.1

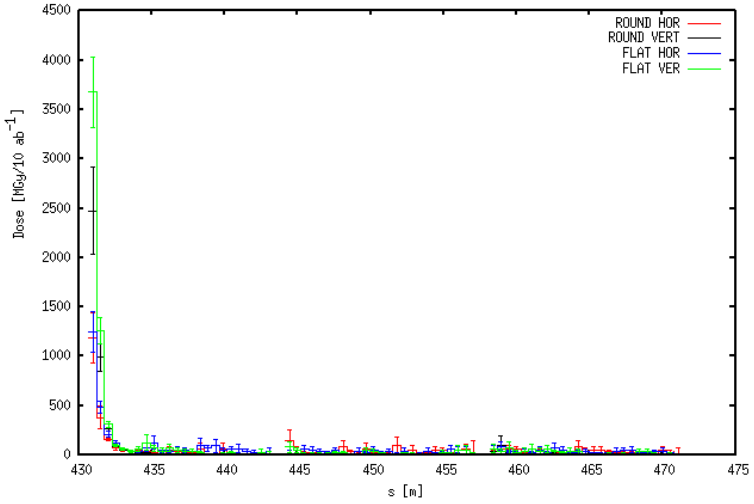

D2b
y [cm]
x [cm]
60
40
20
0
-20
-40
-60
100
10
1
0.1

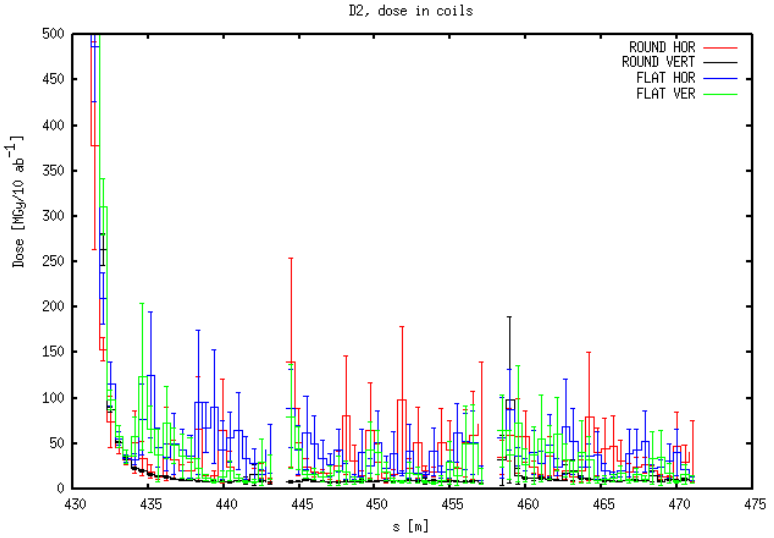

D2c
y [cm]
x [cm]
60
40
20
0
-20
-40
-60
100
10
1
0.1

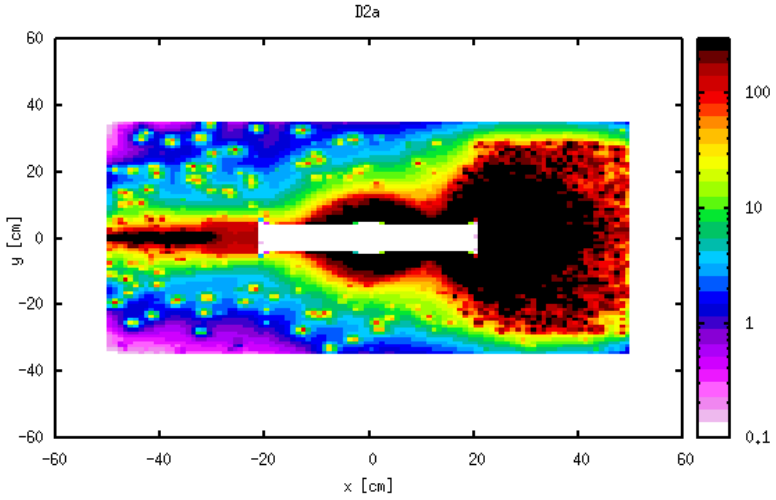
D1, Peak dose in coil

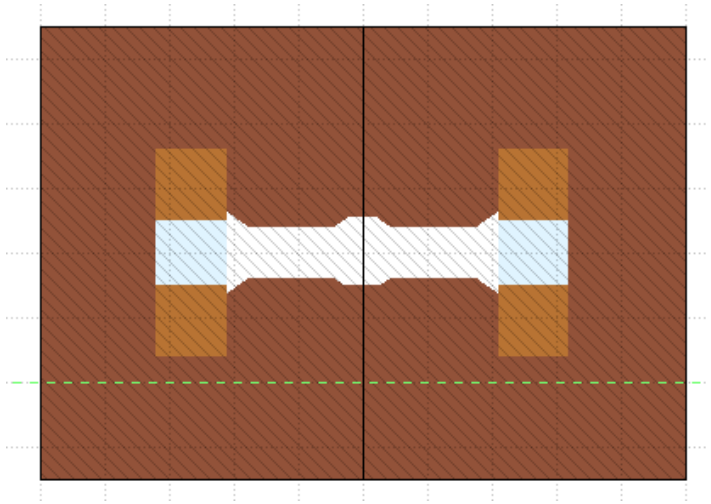


D2, peak dose in coil









Conclusions

- A new triplet 'JAI November 2017' has been designed, with L*=40 m.
- This triplet is more compact that the nominal one.
- After some iteration with optics, one version is proposed
- No energy deposition issues with L*40
- A model for D1 and D2 normal conducting model is presented
- First energy deposition simulations done with triplet and separation magnet.
- Work will continue on the magnet model and energy deposition simulations.