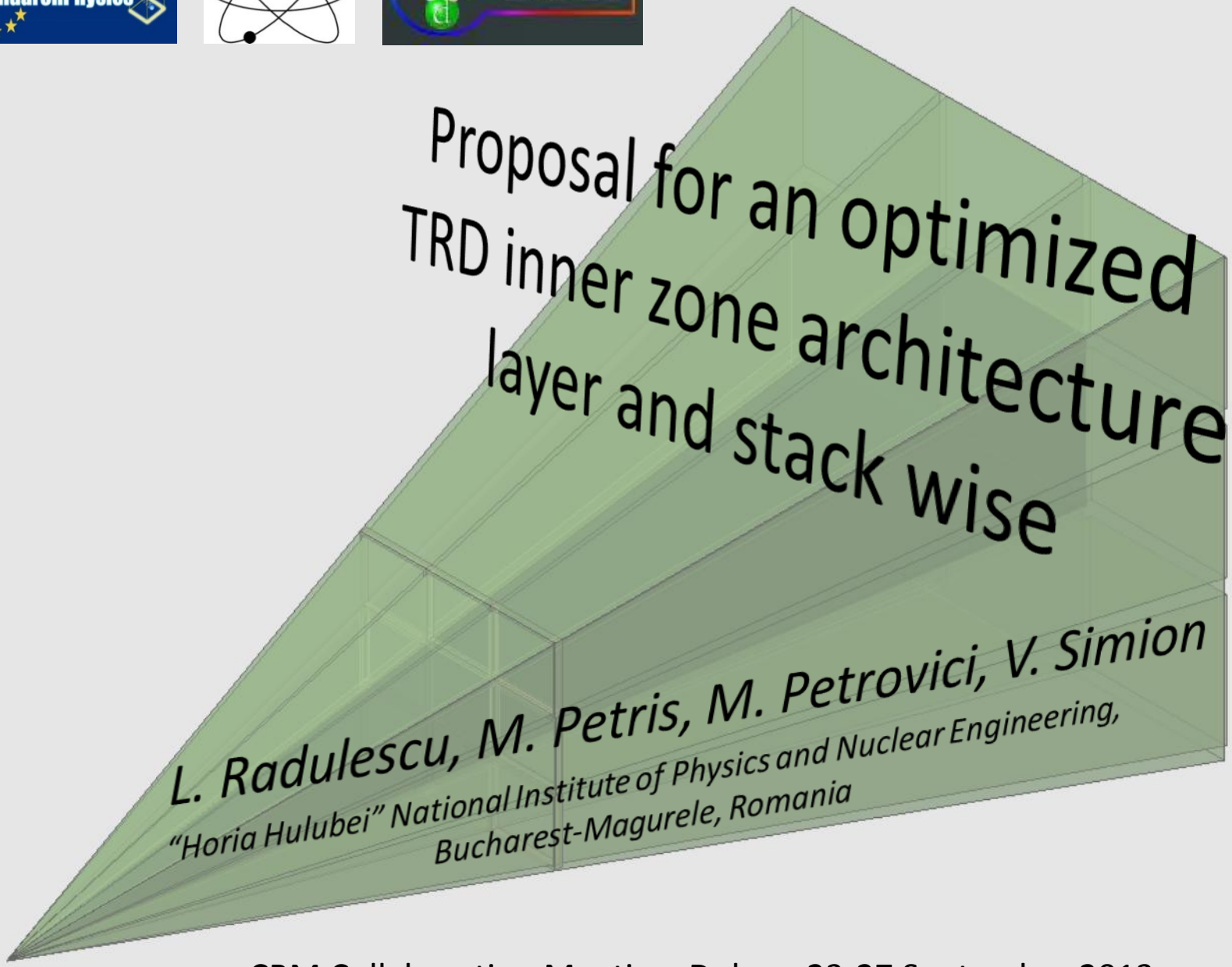


Proposal for an optimized TRD inner zone architecture layer and stack wise

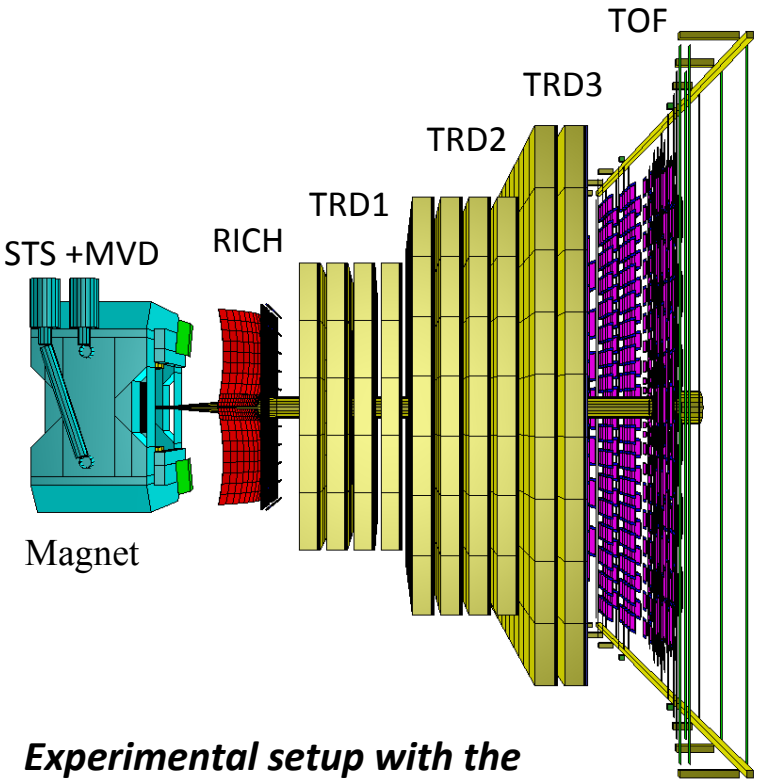
L. Radulescu, M. Petris, M. Petrovici, V. Simion

"Horia Hulubei" National Institute of Physics and Nuclear Engineering, Bucharest-Magurele, Romania

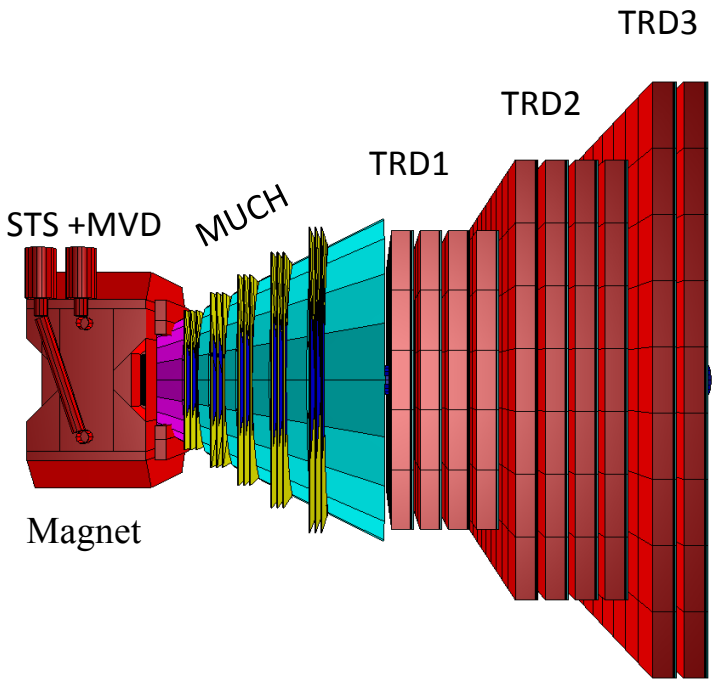
CBM Collaboration Meeting, Dubna, 23-27 September 2013

SIS300 – Current geometry of the CBM-TRD subsystem

3 station (TRD1, TRD2, TRD3) , 10 layers



Experimental setup with the electron identification system

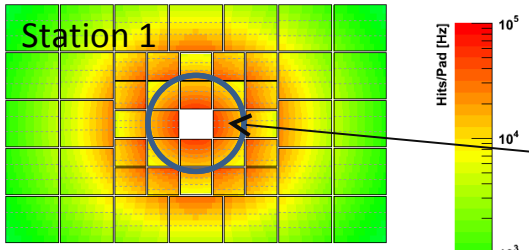


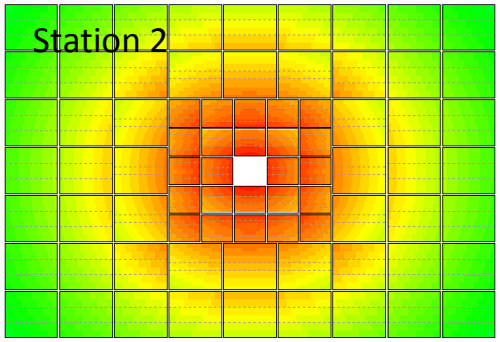
Experimental setup with the muon identification system

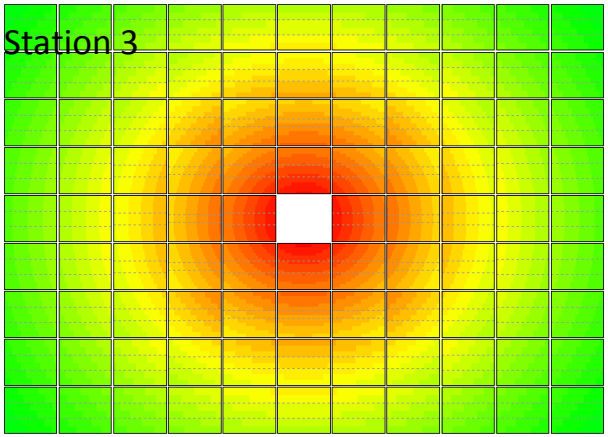
David Emschermann

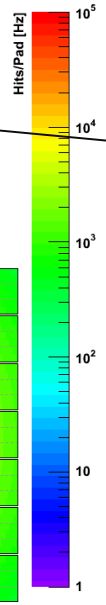
The prototype and the arrangement of the modules on a layer

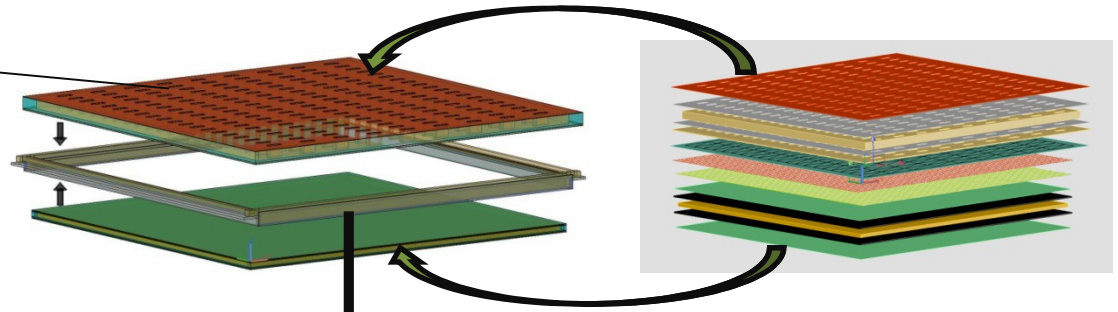
For the inner zone of the station 1 was developed the prototype 2012



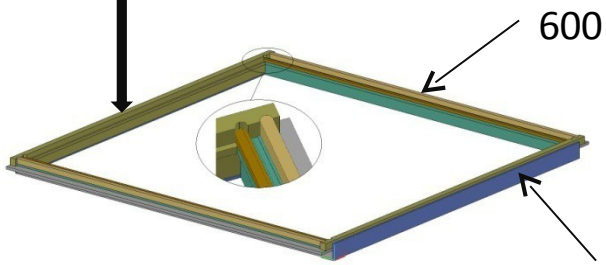




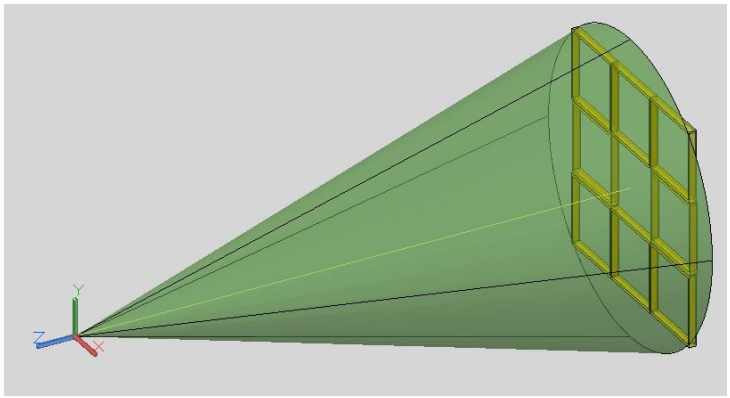


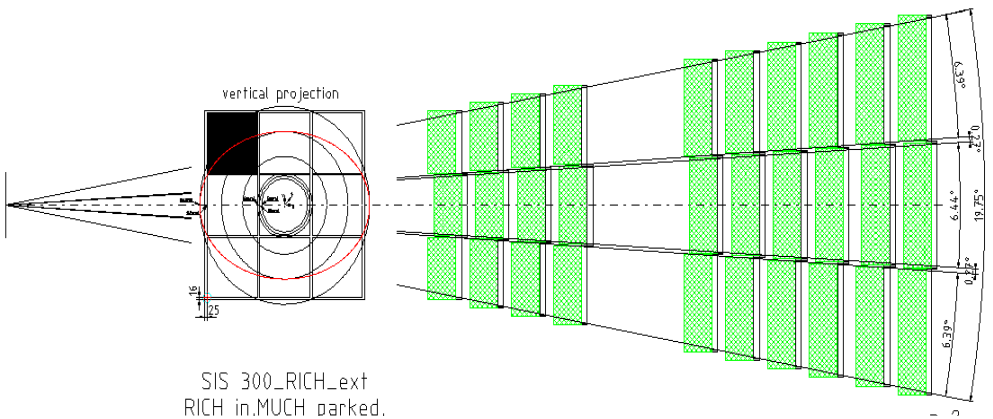


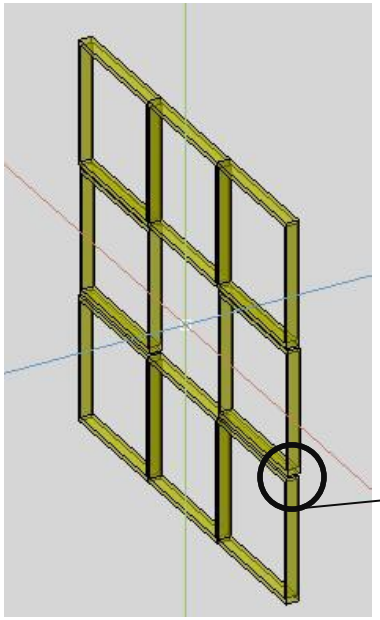
See Madalina's presentation



The prototype and the arrangement of the modules on a layer

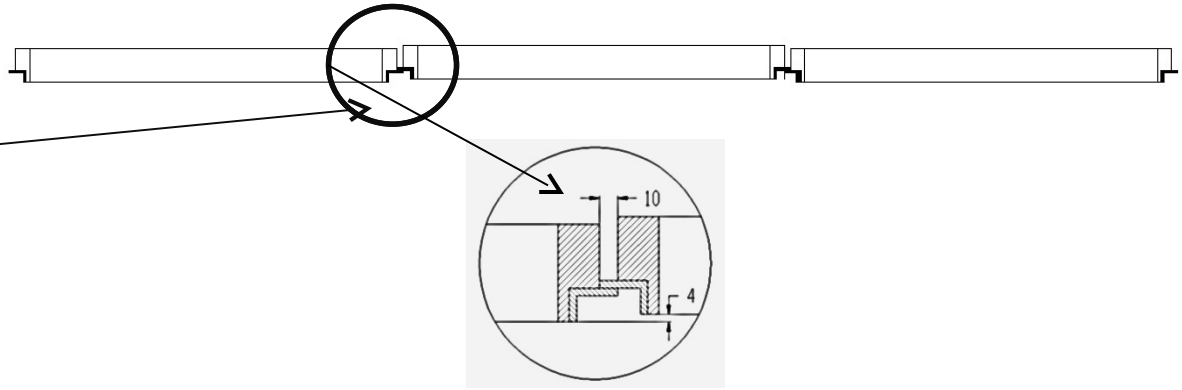






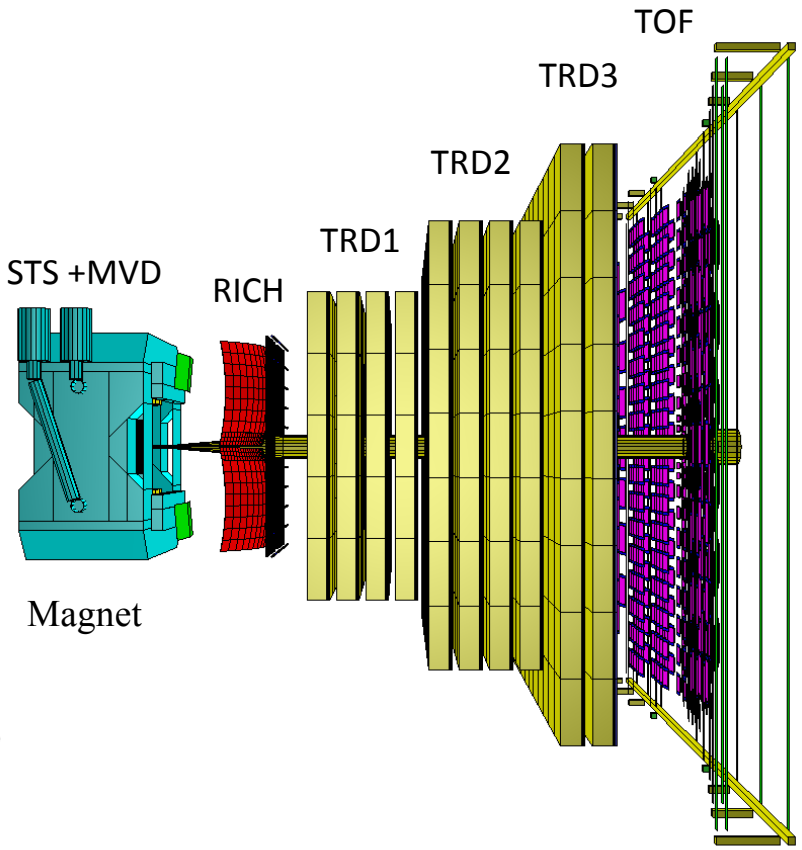
The frames of the modules from inner zone

The side view of the frames of the modules from inner zone



SIS300 – Current geometry of the CBM-TRD subsystem

3 station (TRD1, TRD2, TRD3) , 10 layers

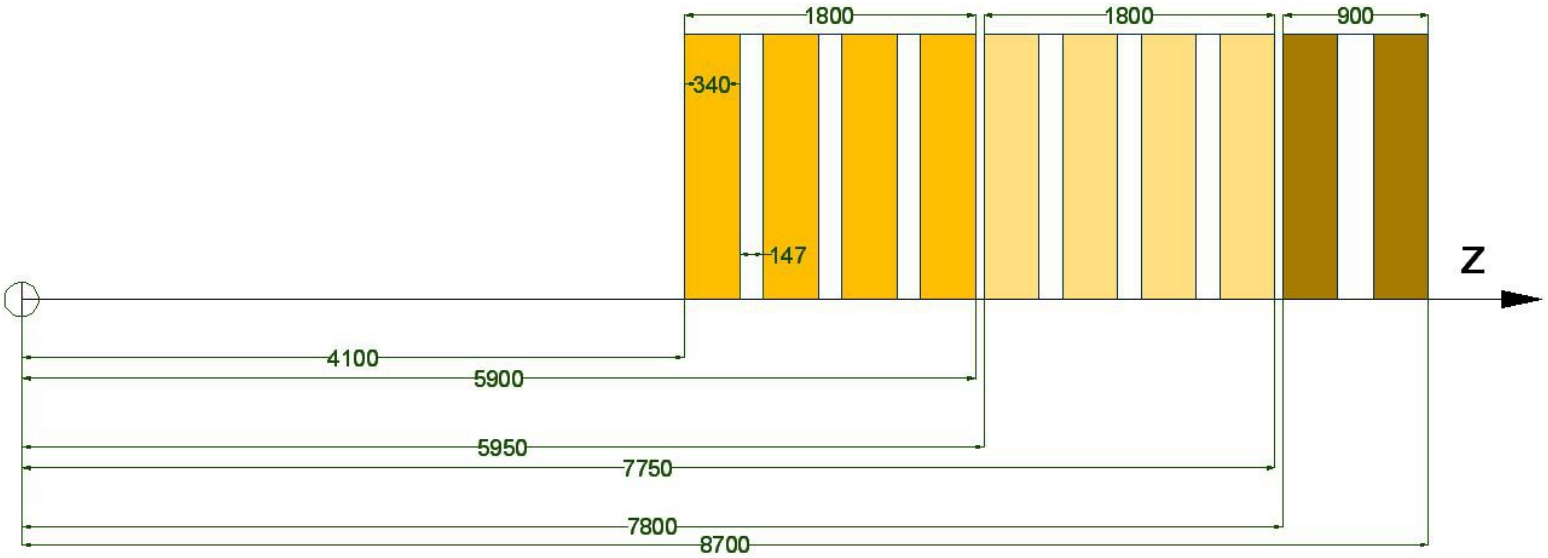


David Emschermann

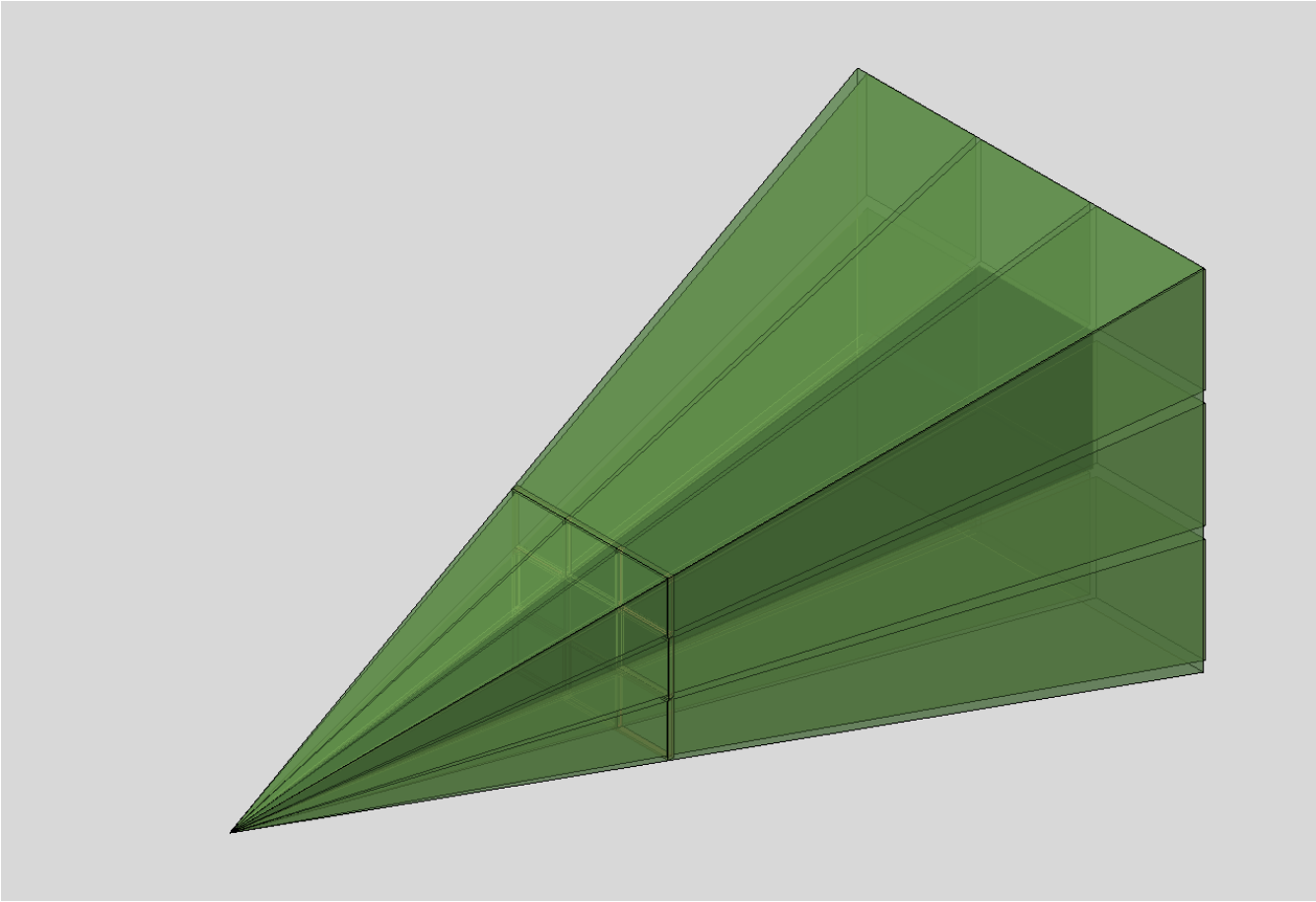
Experimental setup with the electron identification system

SIS-300: RICH compact	*RICH in, MUCH parked*		
Part	**Z-start**	**Z-extent**	**Z-end**
STS-Box			1200
Magnet			1600
Clearance	1600	200	1800
RICH	1800	2200	4000
Clearance	4000	100	4100
TRD 1 – 4 layers	4100	1800	5900
Clearance	5900	50	5950
TRD 2 – 4 layers	5950	1800	7750
Clearance	7750	50	7800
TRD 3 – 2 layers	7800	900	8700
Clearance	8700	100	8800
ToF	8800	1200	10000
Clearance	10000	300	10300
PSD	10300	1500	11800

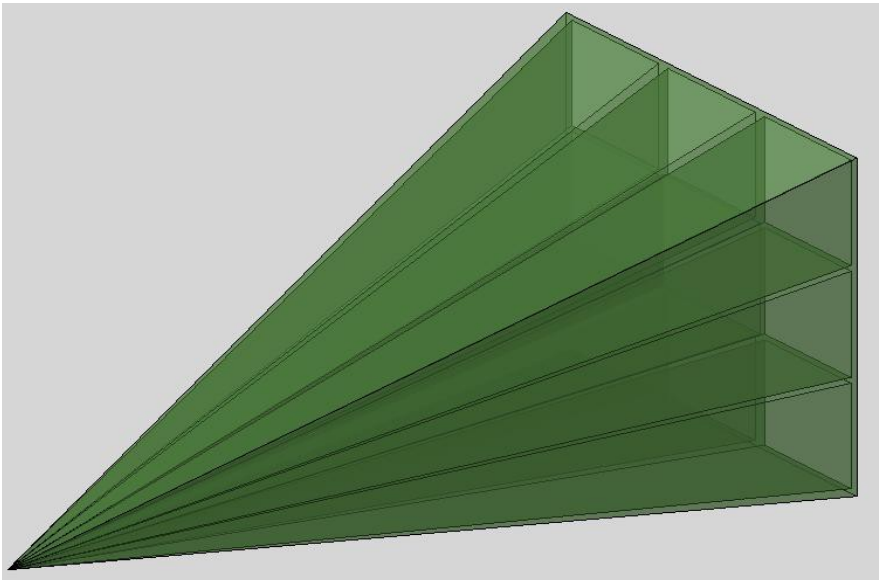
The positions of the layers for SIS 300_RICH_compact

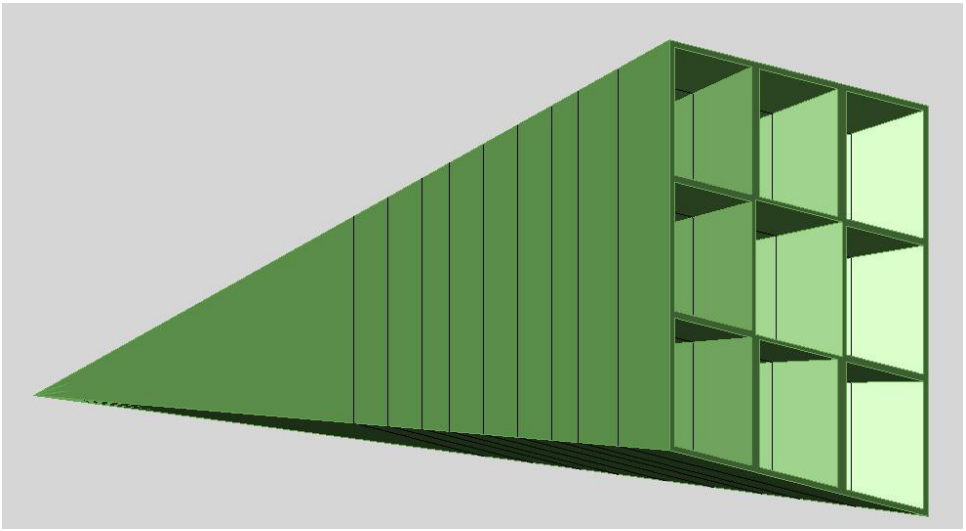


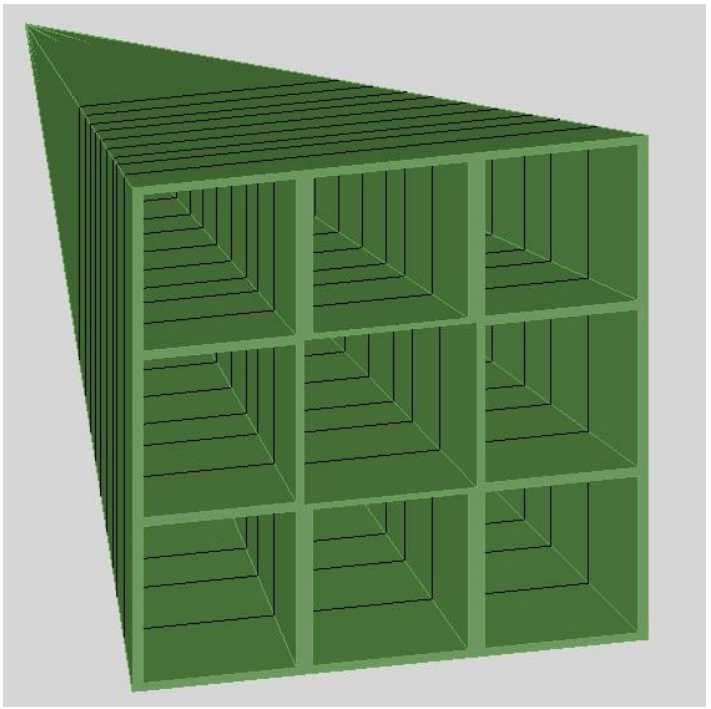
Propagation of the frames shadows



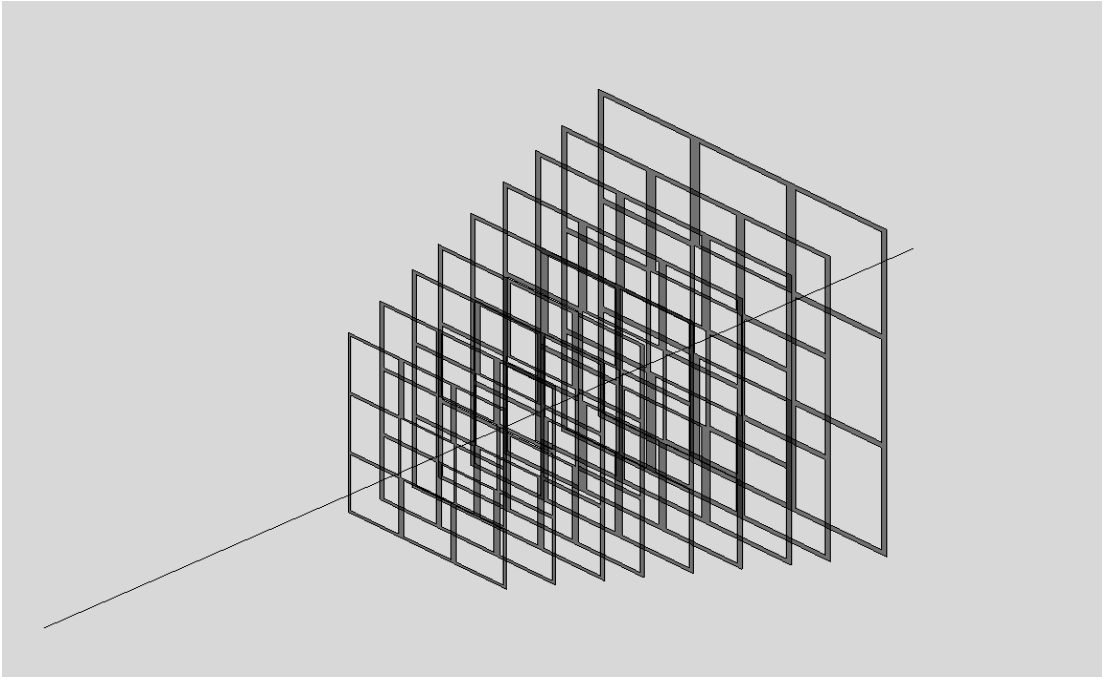
Propagation of the frames shadows



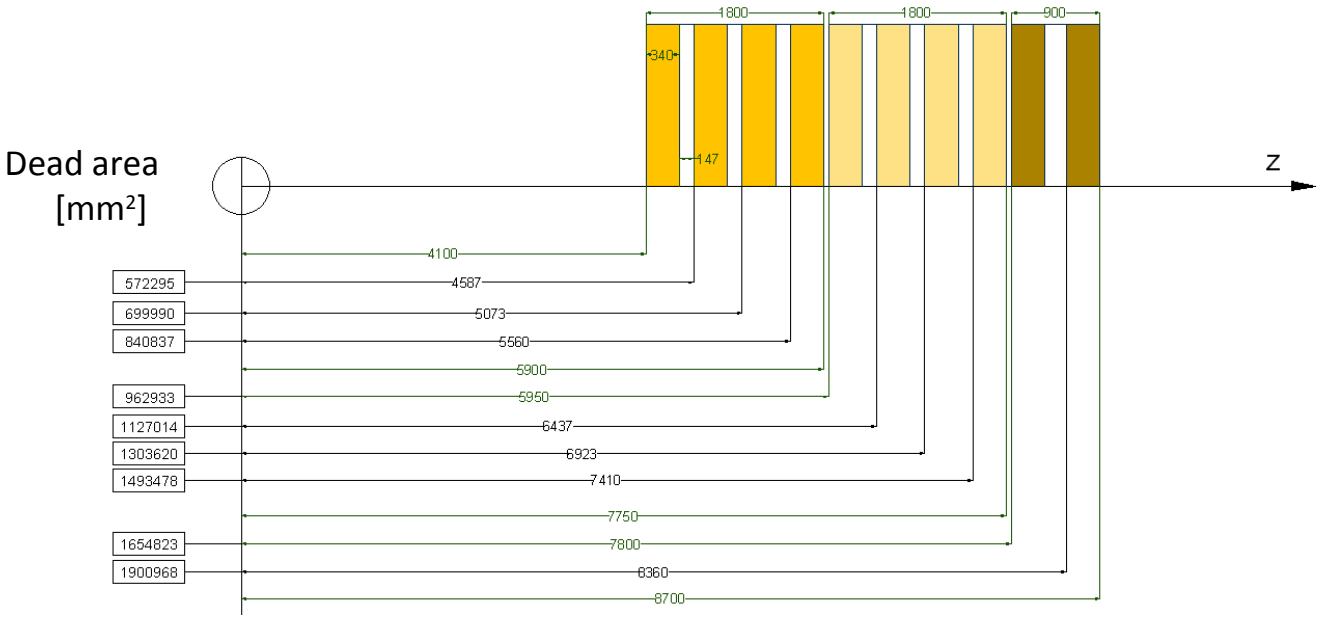




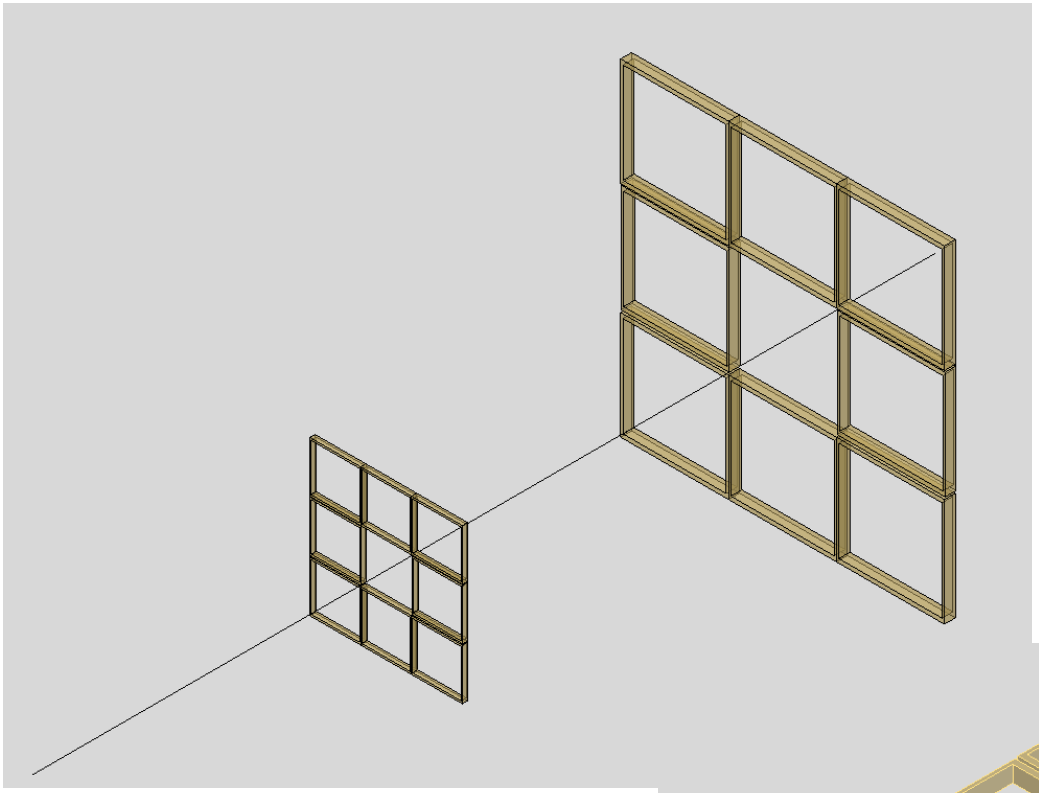
The shadows dimensions

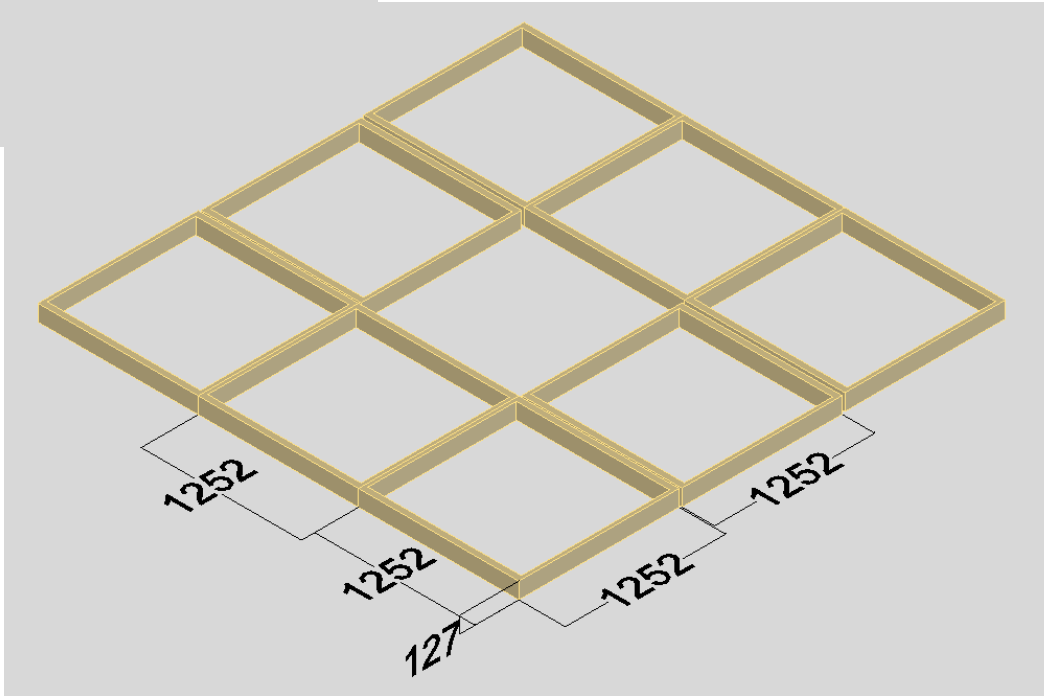


The percentage of dead area relative to total area in section is 14.4%.



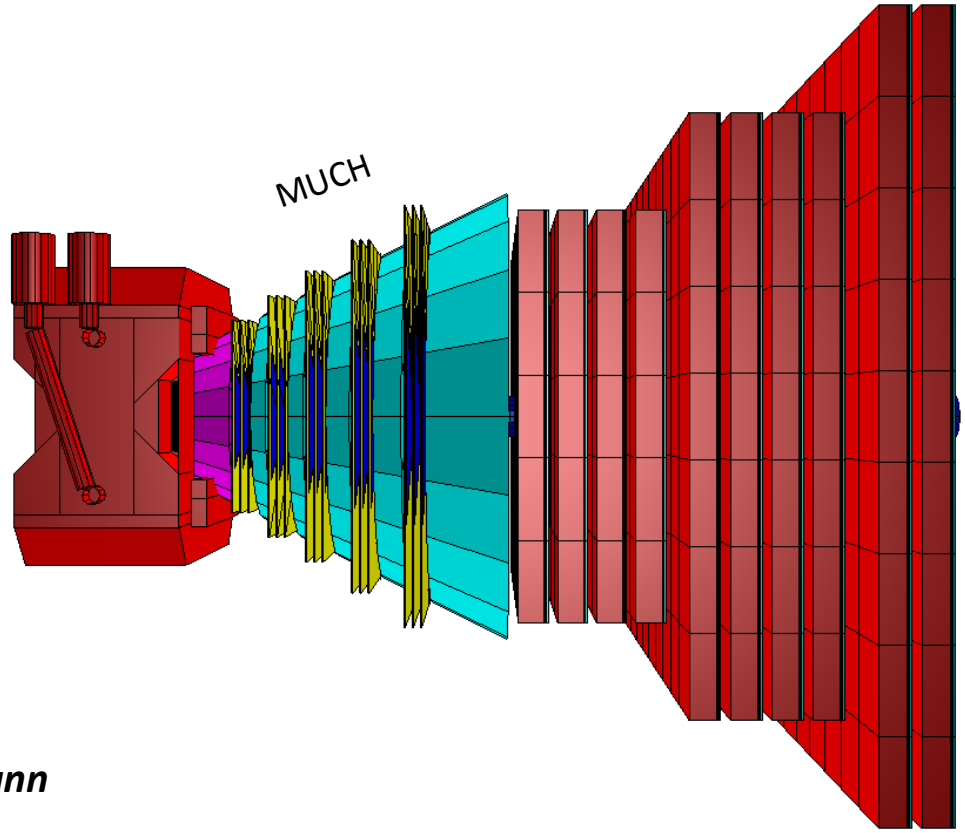
The frames dimensions





SIS300 – Current geometry of the CBM-TRD subsystem

3 station (TRD1, TRD2, TRD3) , 10 layers

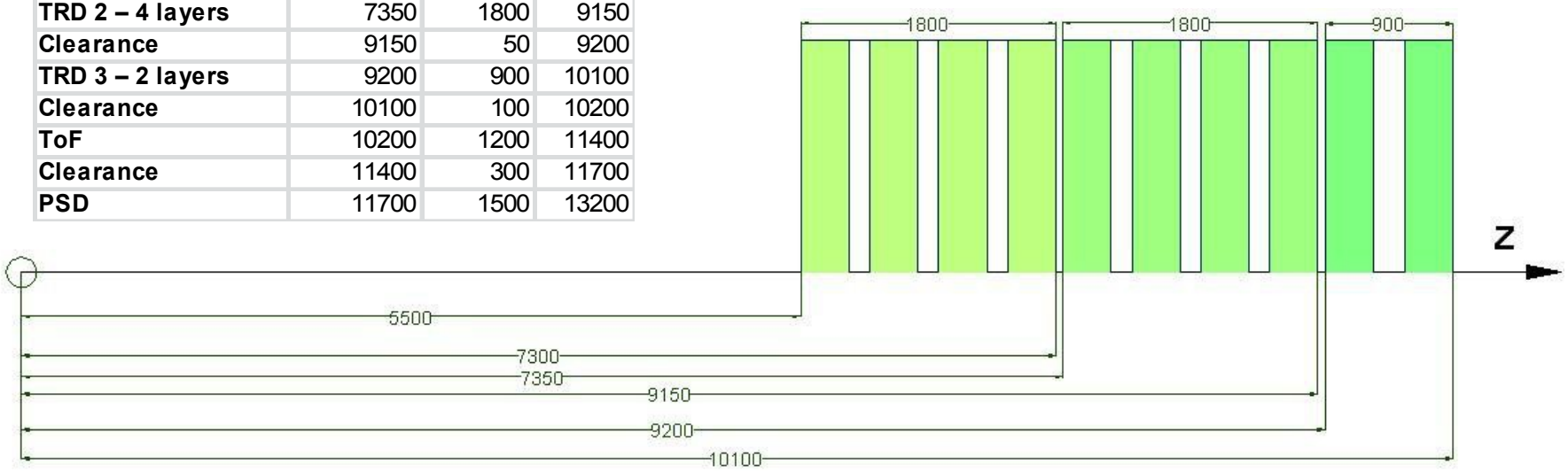


David Emschermann

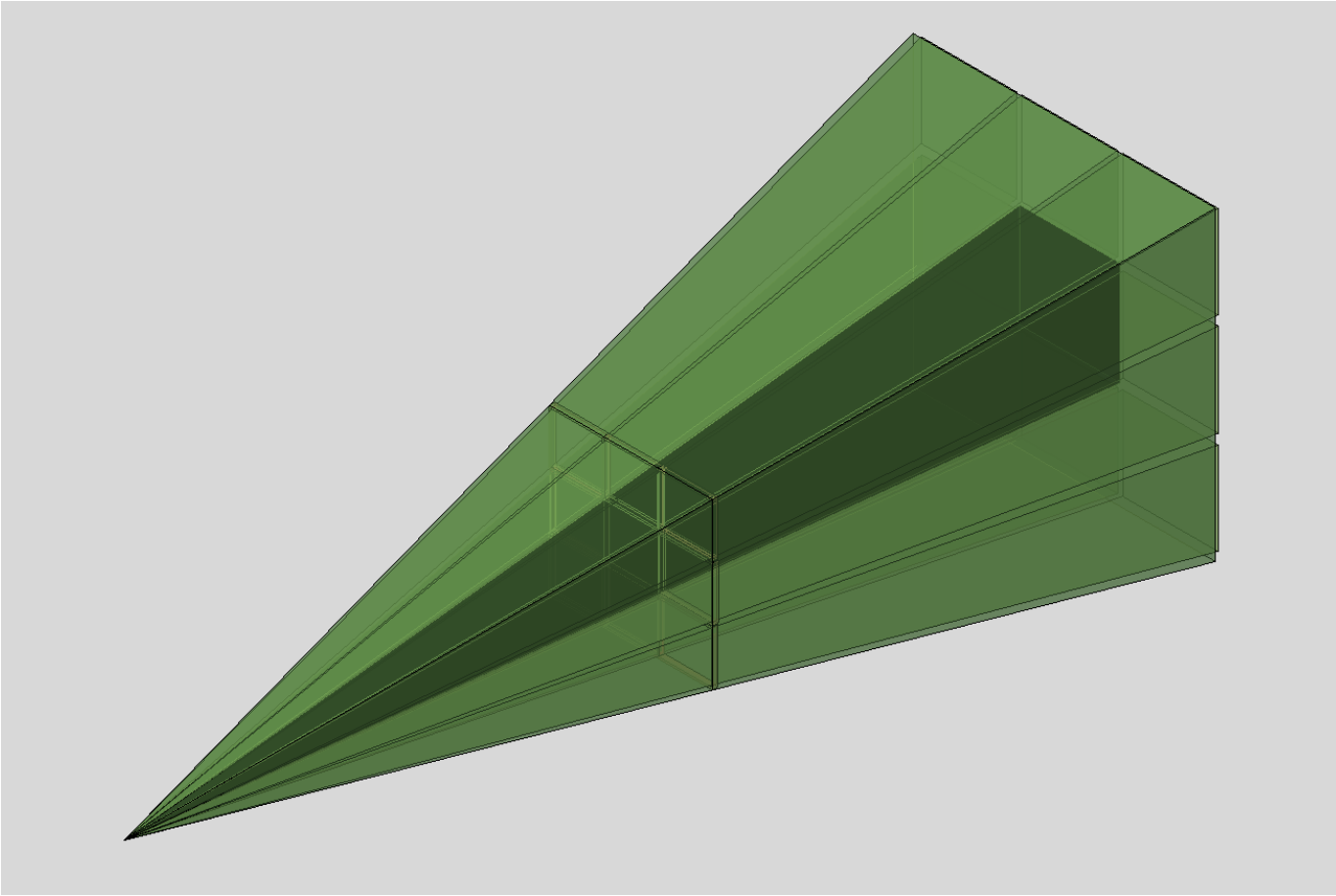
Experimental setup with the muon identification system

SIS-300: full MUCH	*RICH out, MUCH in*		
Part	**Z-start**	**Z-extent**	**Z-end**
STS-Box			1200
Clearance	1200	50	1250
C Absorber 1	1250	600	1850
Detector station 1	1850	300	2150
Fe Absorber 2	2150	200	2350
Detector station 2	2350	300	2650
Fe Absorber 3	2650	200	2850
Detector station 3	2850	300	3150
Fe Absorber 4	3150	300	3450
Detector station 4	3450	300	3750
Fe Absorber 5	3750	350	4100
Detector station 5	4100	300	4400
Fe Absorber 6	4400	1000	5400
Clearance	5400	100	5500
TRD 1 – 4 layers	5500	1800	7300
Clearance	7300	50	7350
TRD 2 – 4 layers	7350	1800	9150
Clearance	9150	50	9200
TRD 3 – 2 layers	9200	900	10100
Clearance	10100	100	10200
ToF	10200	1200	11400
Clearance	11400	300	11700
PSD	11700	1500	13200

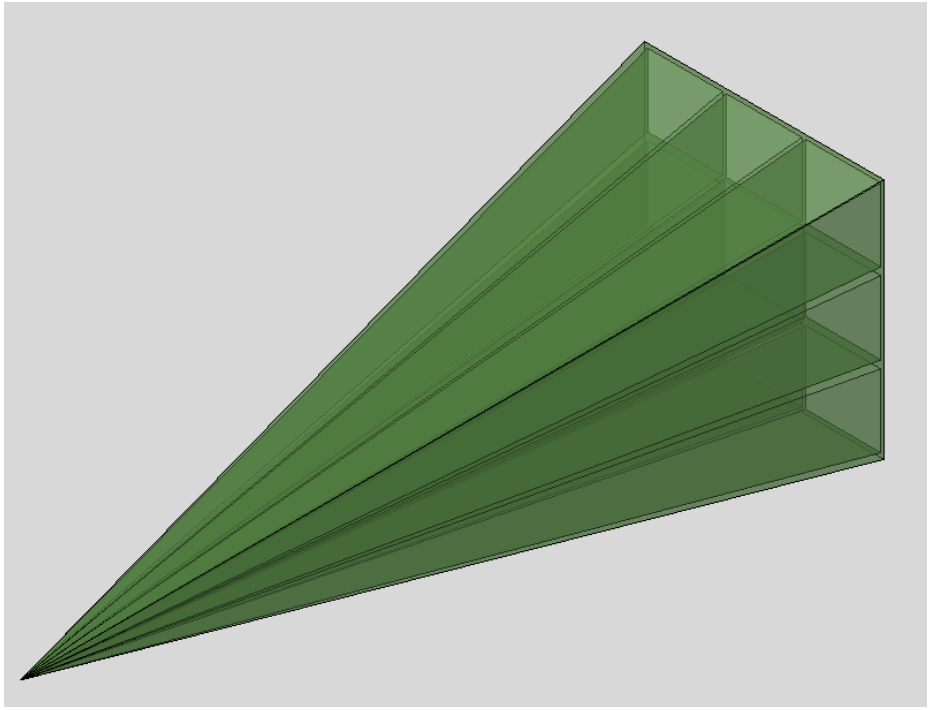
The positions of the layers for SIS 300_MUCH

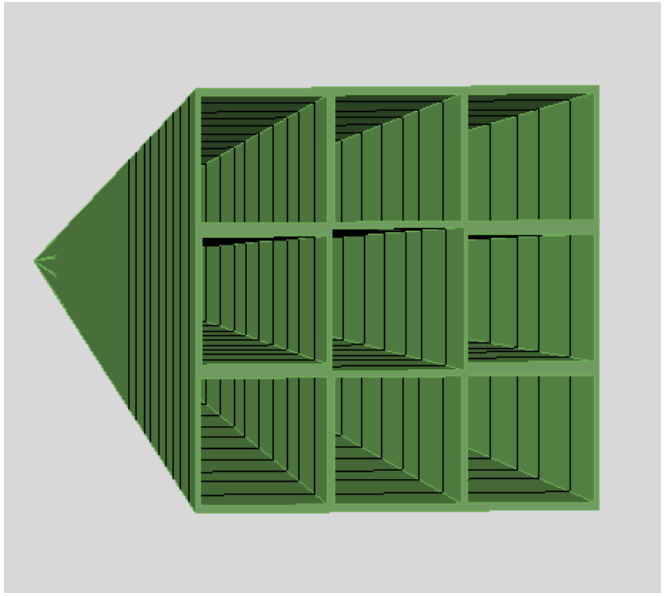


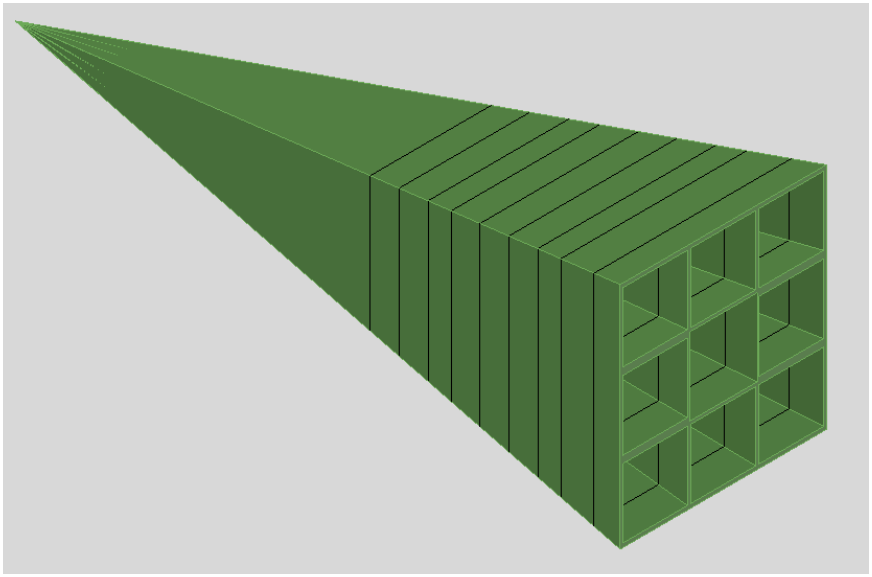
Propagation of the frames shadows



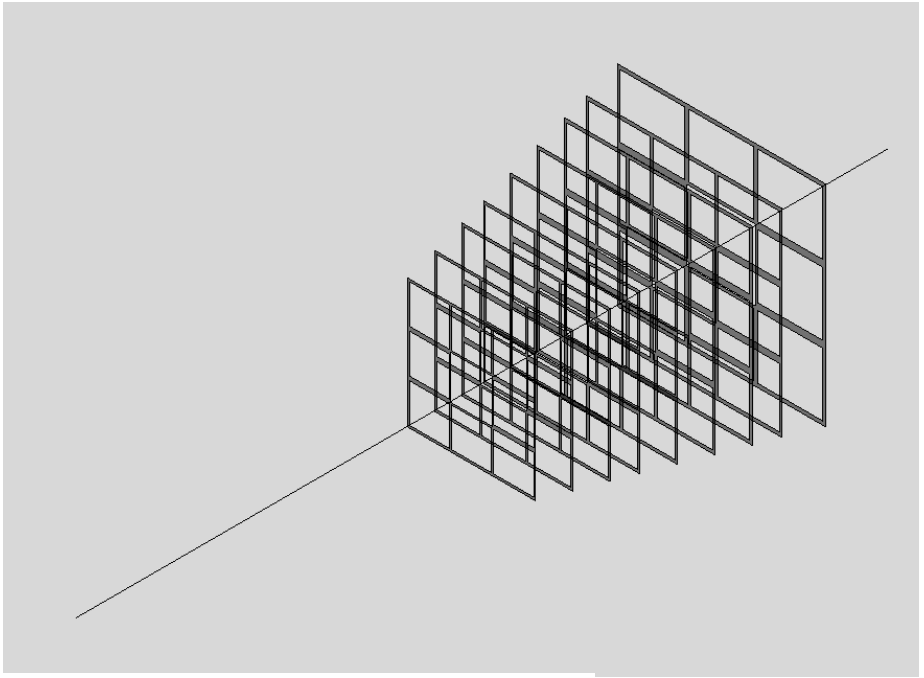
Propagation of the frames shadows



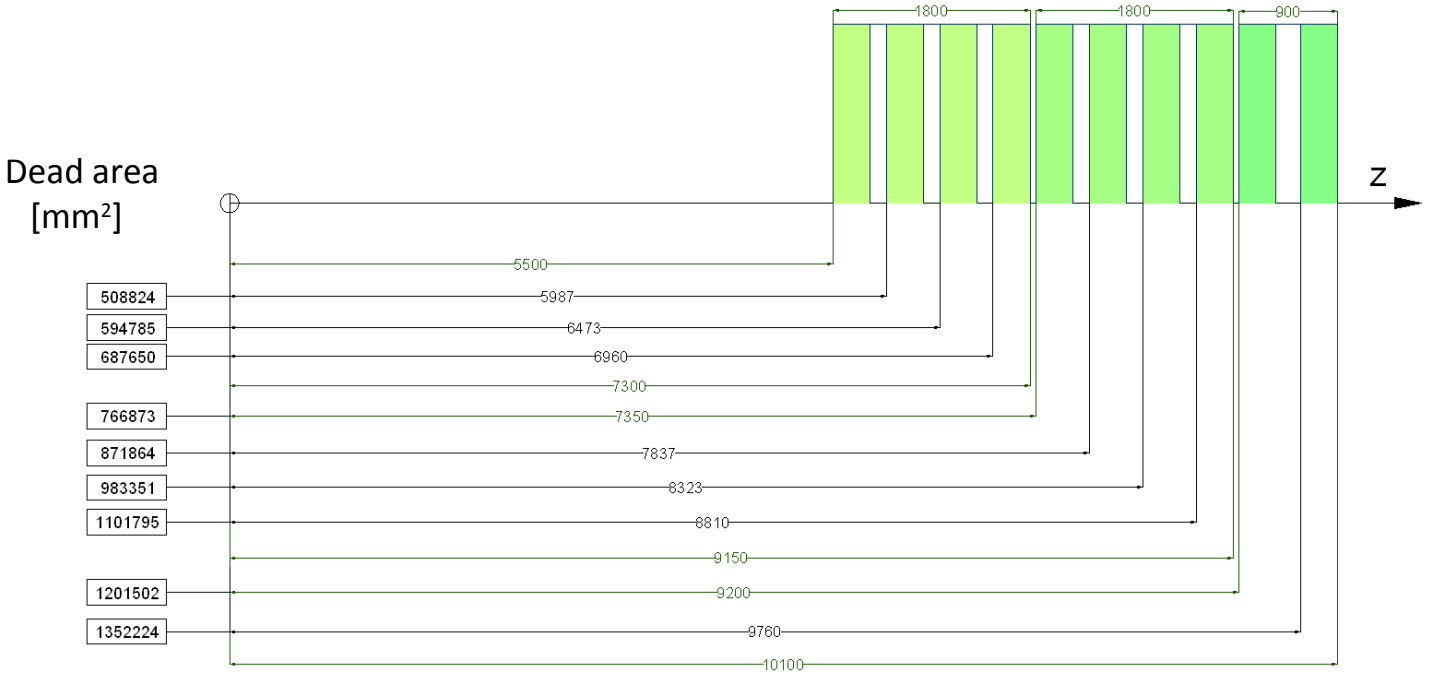




The shadows dimensions



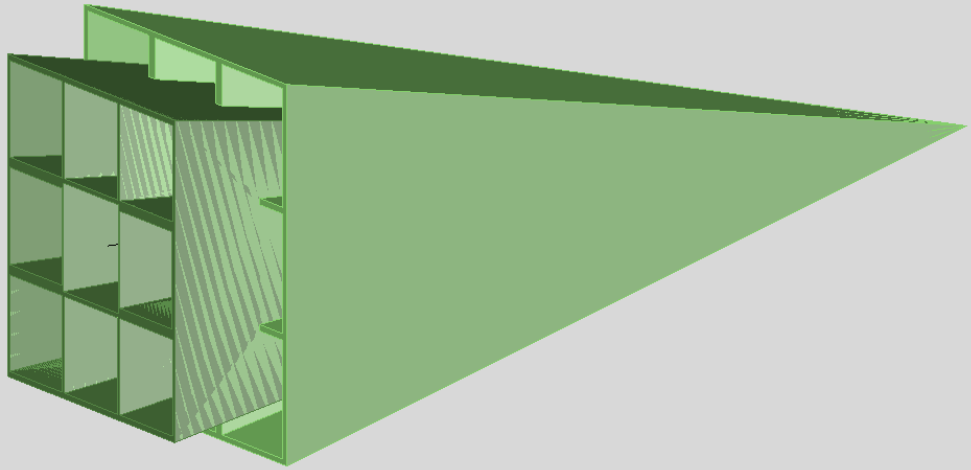
The percentage of dead area relative to total area in section is 13.5%.



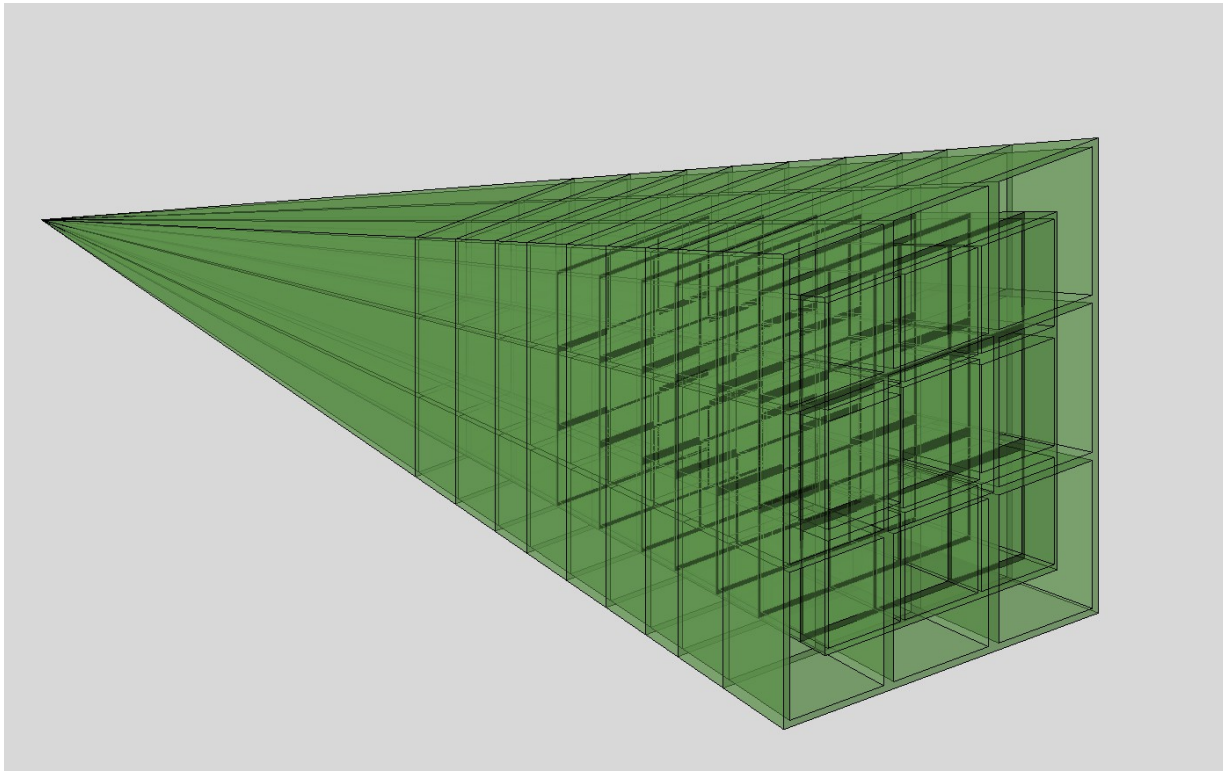
What happens when the TRD position is translated?

TRD 1 – 4 layers	5500	1800	7300
Clearance	7300	50	7350
TRD 2 – 4 layers	7350	1800	9150
Clearance	9150	50	9200
TRD 3 – 2 layers	9200	900	10100

TRD 1 – 4 layers	4100	1800	5900
Clearance	5900	50	5950
TRD 2 – 4 layers	5950	1800	7750
Clearance	7750	50	7800
TRD 3 – 2 layers	7800	900	8700



Optimized for SIS 300_MUCH (TRD position at 5500) and moved in SIS 300_RICH_compact (TRD position at 4100)

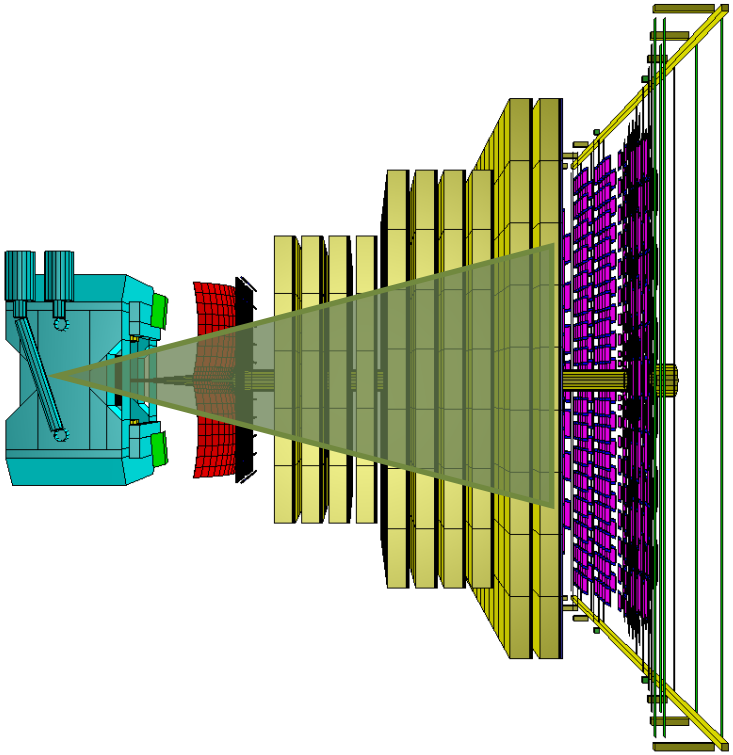


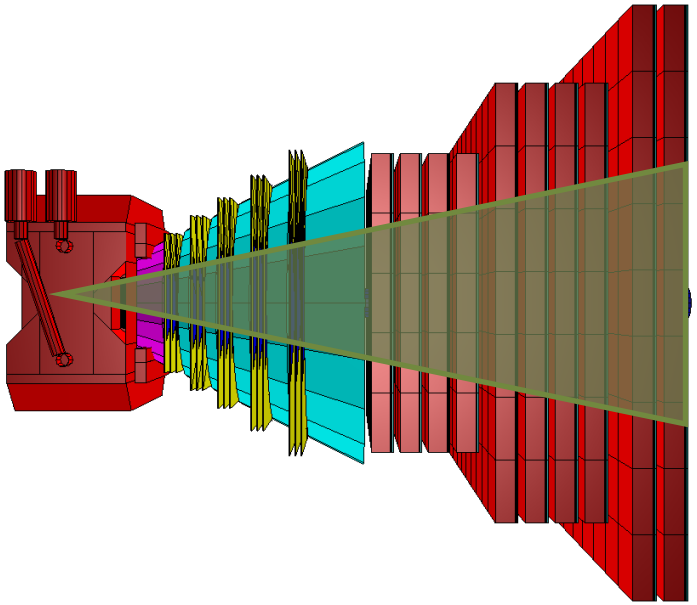
The percentage of dead area relative to total area in section is 21.5%.

Dead zone propagation

For SIS 300 RICH compact (TRD(1) = 4100 mm) the percentage of dead area relative to total area in section is 14.4%.

For SIS 300_MUCH (TRD(1)=5500 mm) the percentage of dead area relative to total area in section is 13.5%.

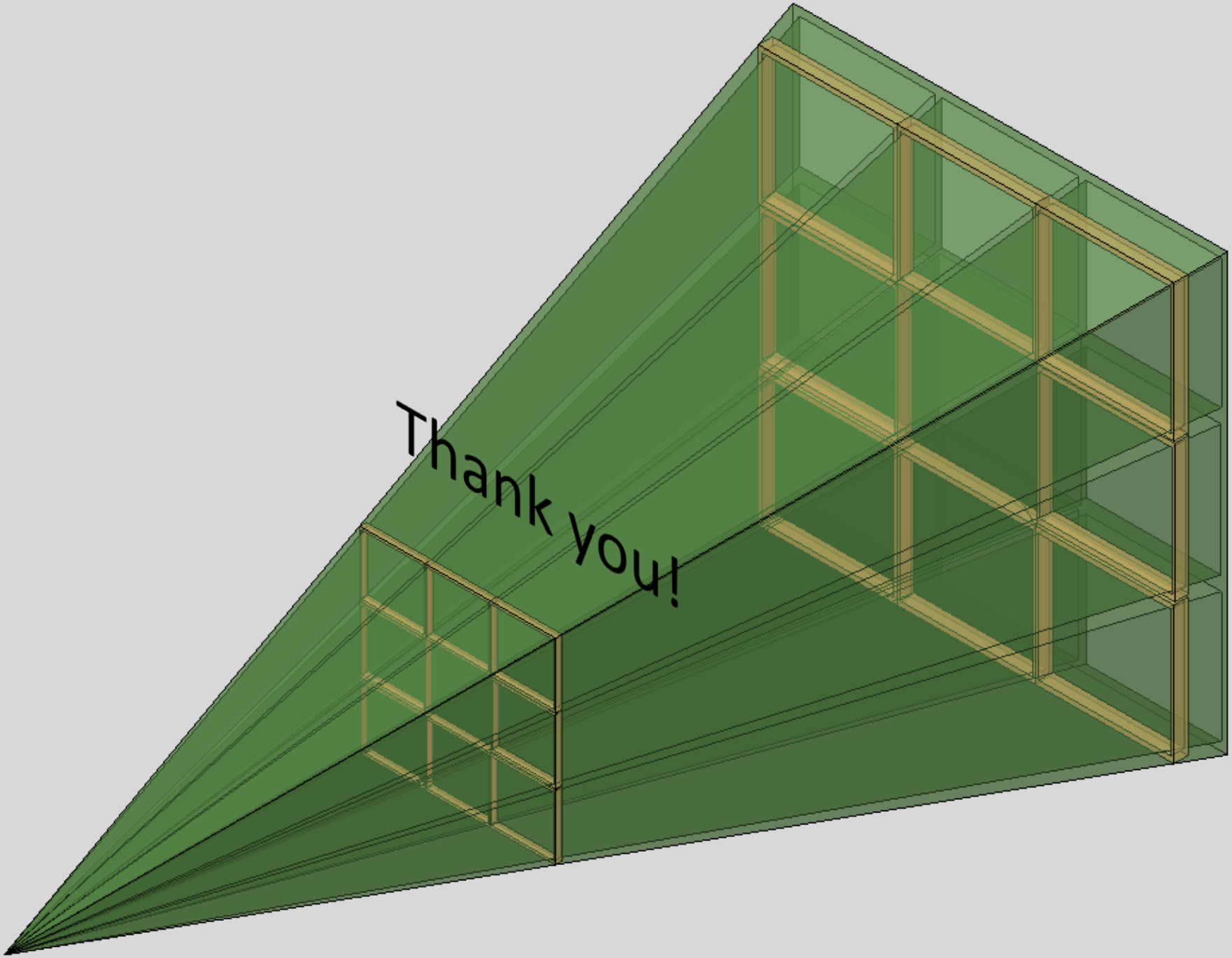




The percentage of dead area is 21.5% when the optimized TRD version @ 5500 mm is translated to 4100 mm.

Conclusions

- A method for optimization of the geometric efficiency of the TRD inner zone, for a given distance to the target, was presented;
- Once the optimized geometry is translated to an other position relativ to the target, the dead zone increases;
- The maximum size of a chamber could be obtained by this method, but which is the maximum size which is affordable from the point of view of construction & counting rate performance is under investigation;
- The possibility of applying of this method to the outer part of the TRD layers should be discussed;


Thank you!