

AP30 Resonant Extraction Shield Calculation Status

T. Leveling

1/8/15

outline

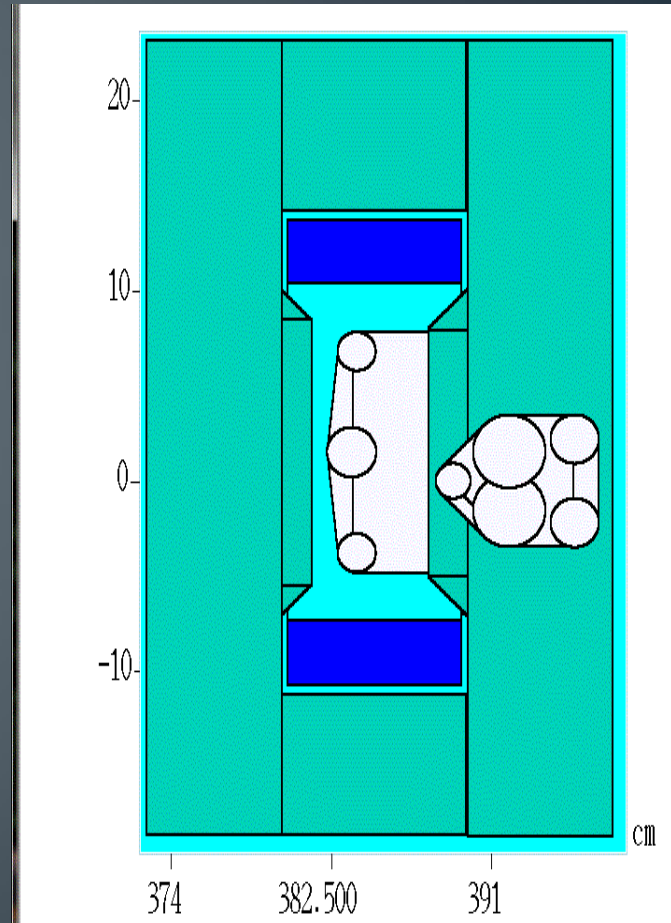
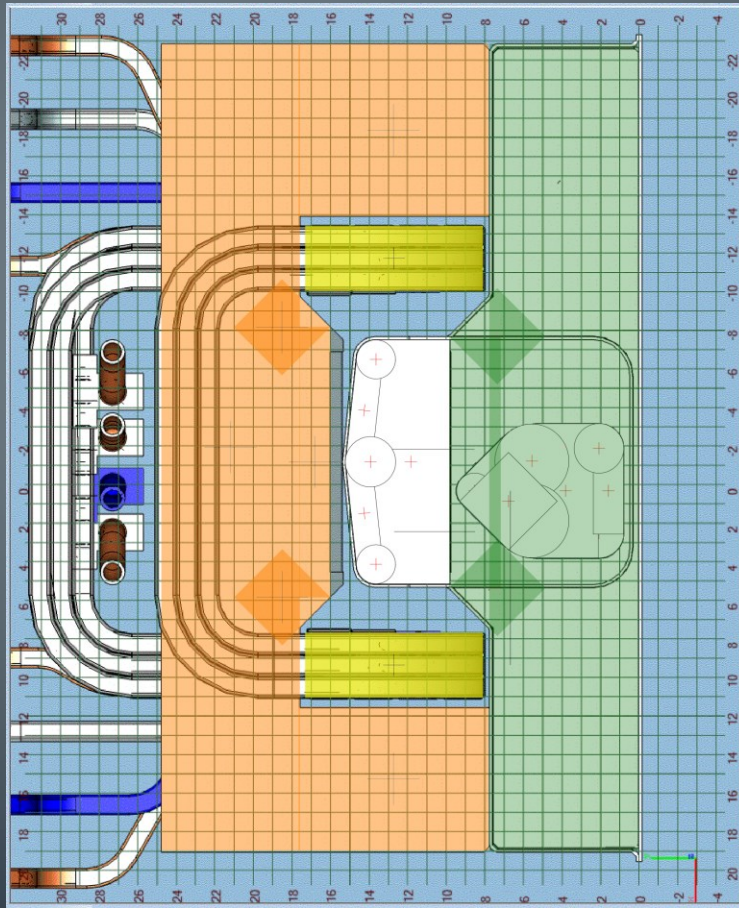
- Motivation
- Model inputs
- Vetting the model
 - MAD vs. MARS model
 - DUSAF file versions
- Preliminary results
- Remaining steps

motivation

- Radiation shielding & skyshine calculation was completed December 2013
- Things have changed:
 - Outside/in extraction
 - New D2Q5 magnet
 - New Lambertson design
 - New C magnet design
 - New extraction and circulating beam profiles
 - Added sagitta to D207 & D208
 - Cleaned up modeling of pitched/rolled/yawed components
 - Verified quad positions from previous
 - New generic TLM model can be placed anywhere in the model
 - Need to predict TLM response at extraction region

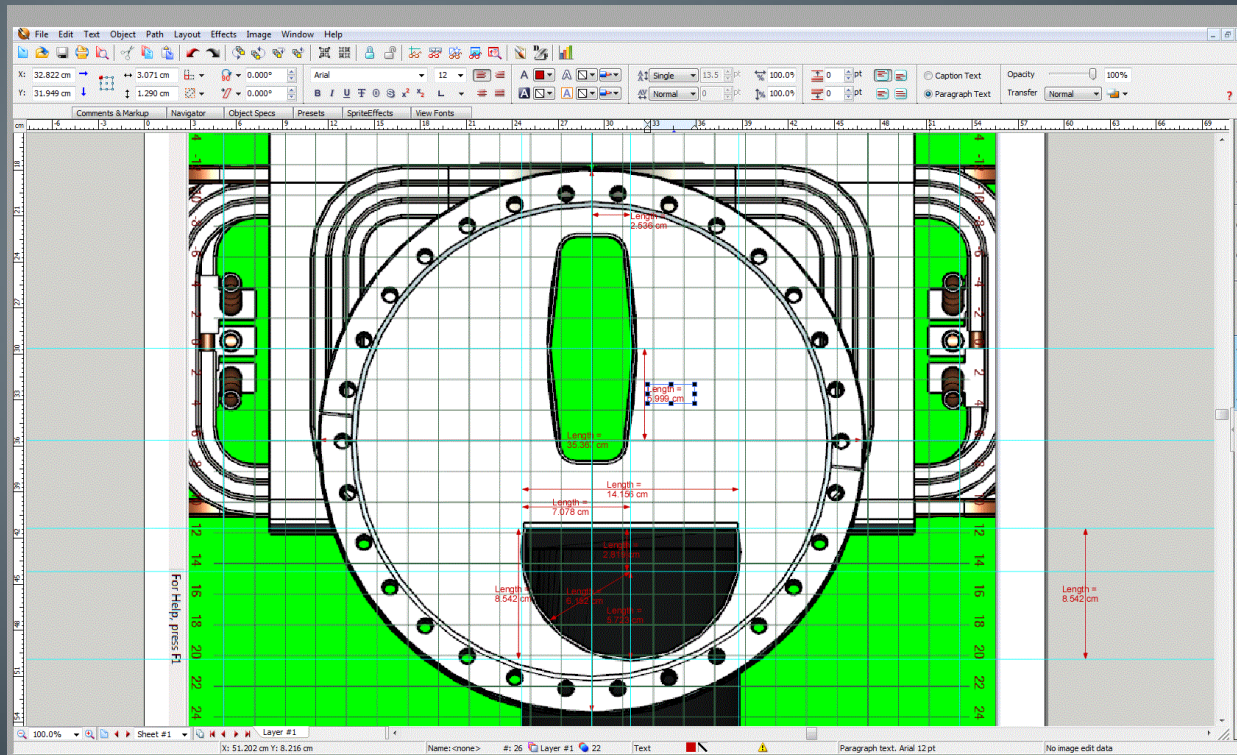
Model inputs

- New Lambertson (JPM) modelled in detail



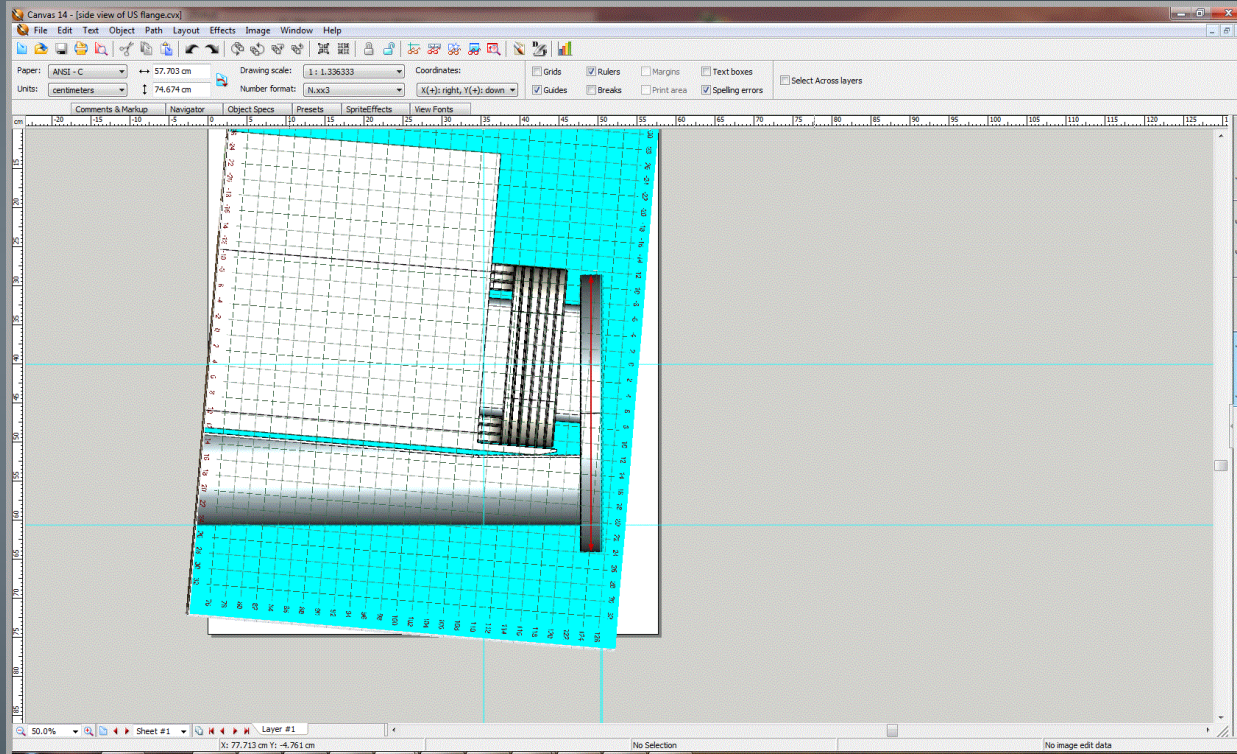
Model inputs

- C magnet (JPM)



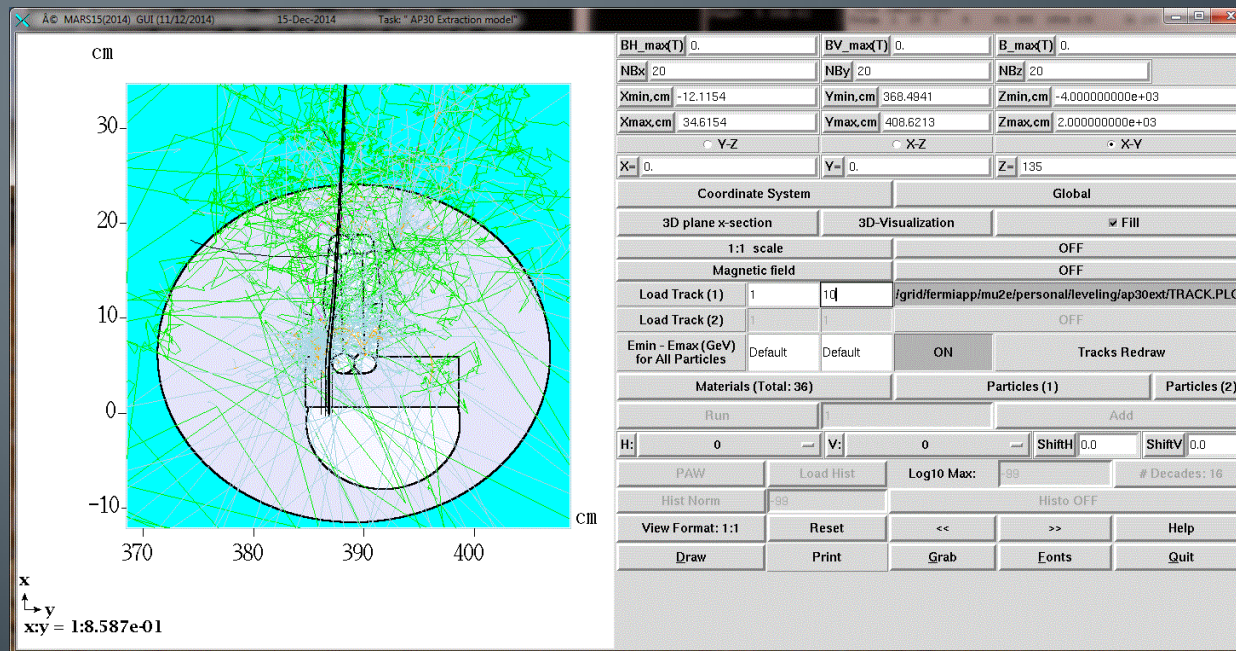
Model input

- C magnet



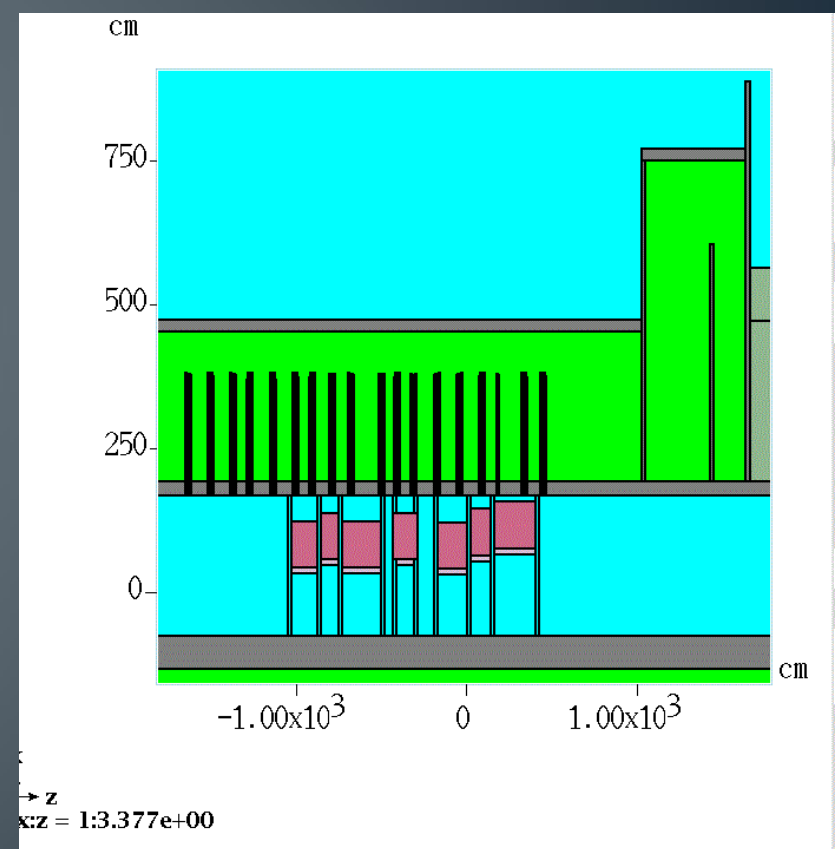
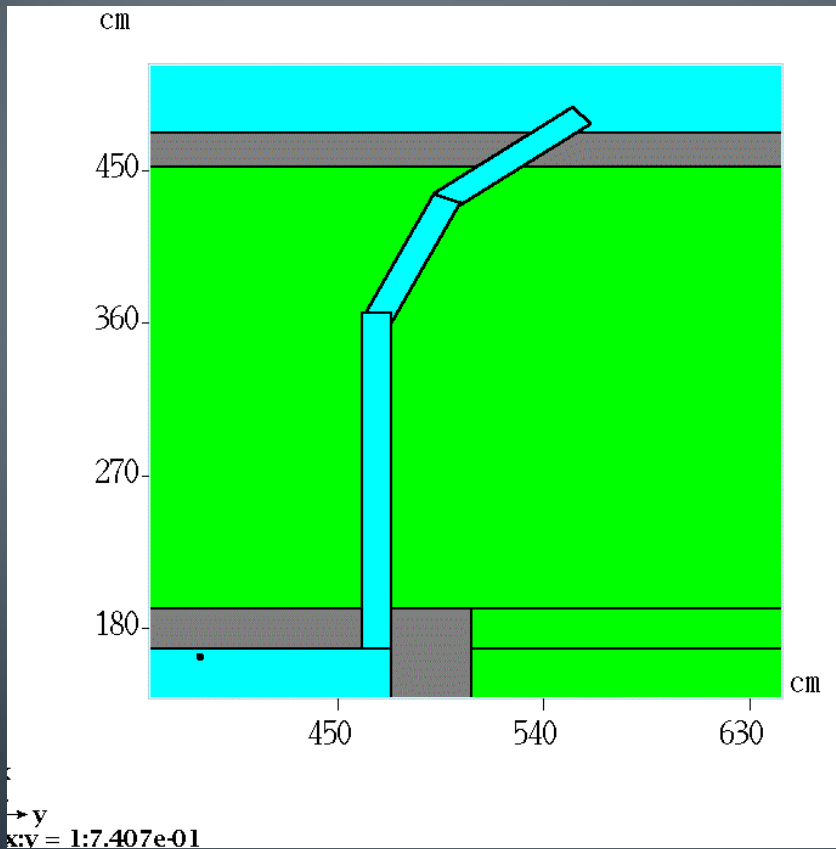
Model input

- C magnet US flange



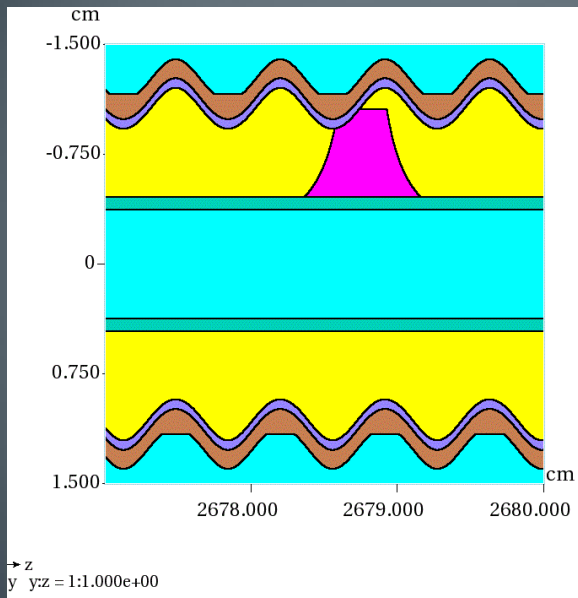
Model input

- 35 Soda straw penetrations from JB

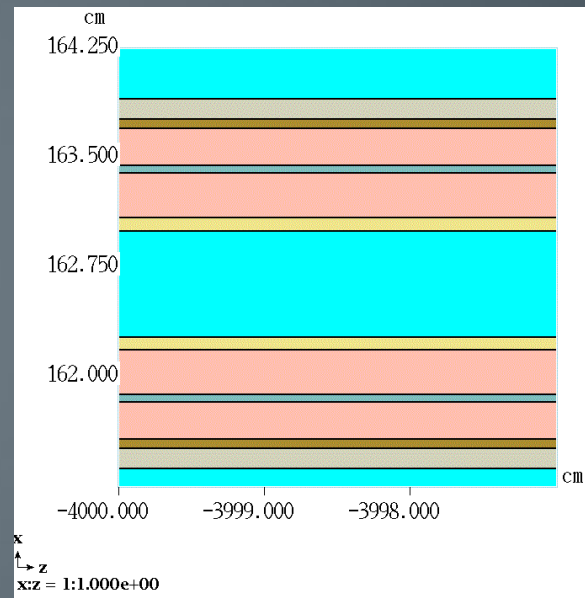


Model input

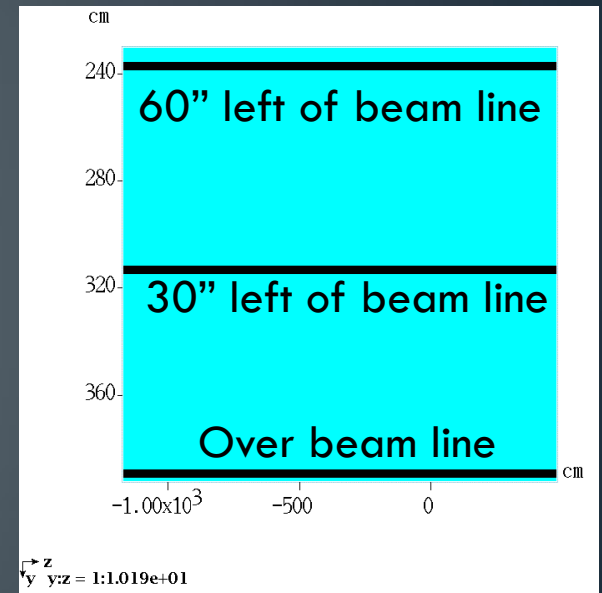
- TLM



Original model



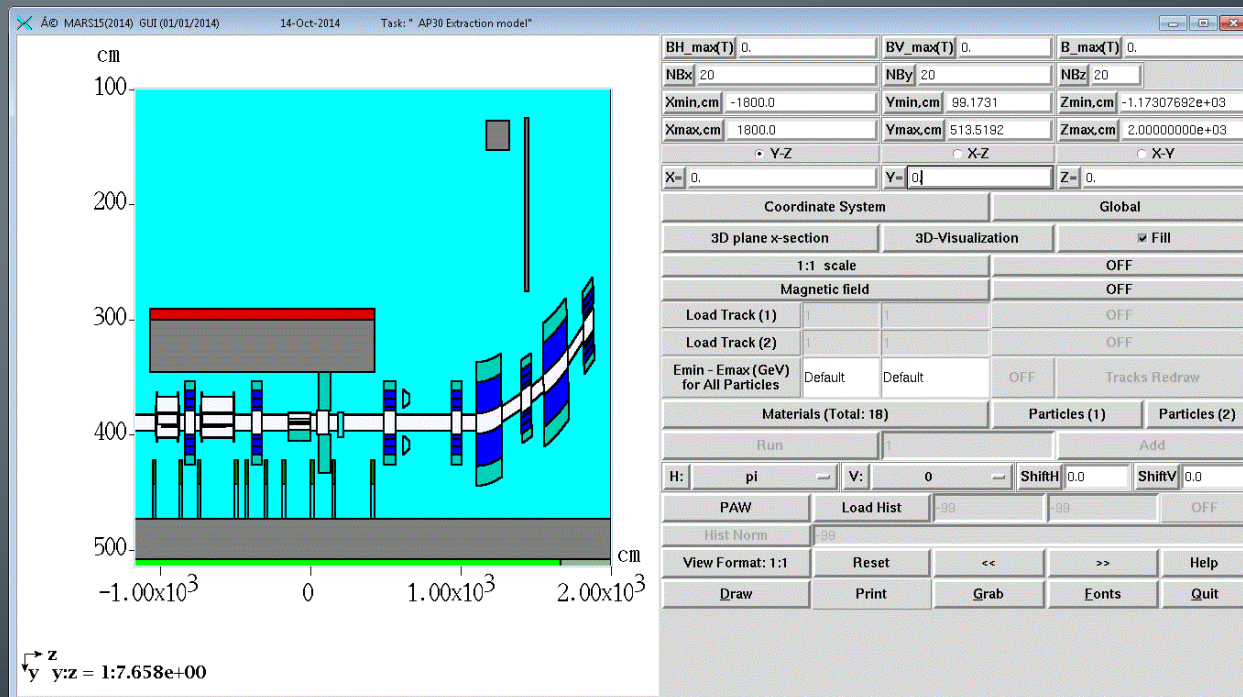
simplified model



Three locations

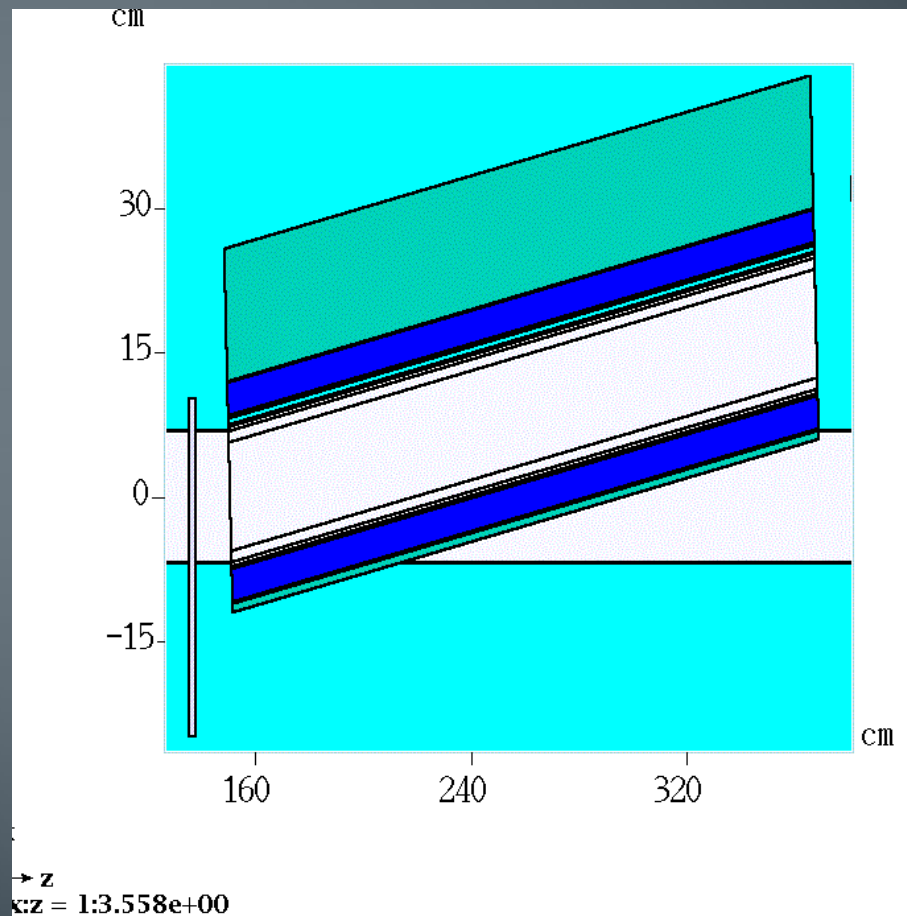
Model input

- Obtained drawings from Ollie to create D207&D208 with Sagitta
- Beam pipes have not been correctly modeled yet



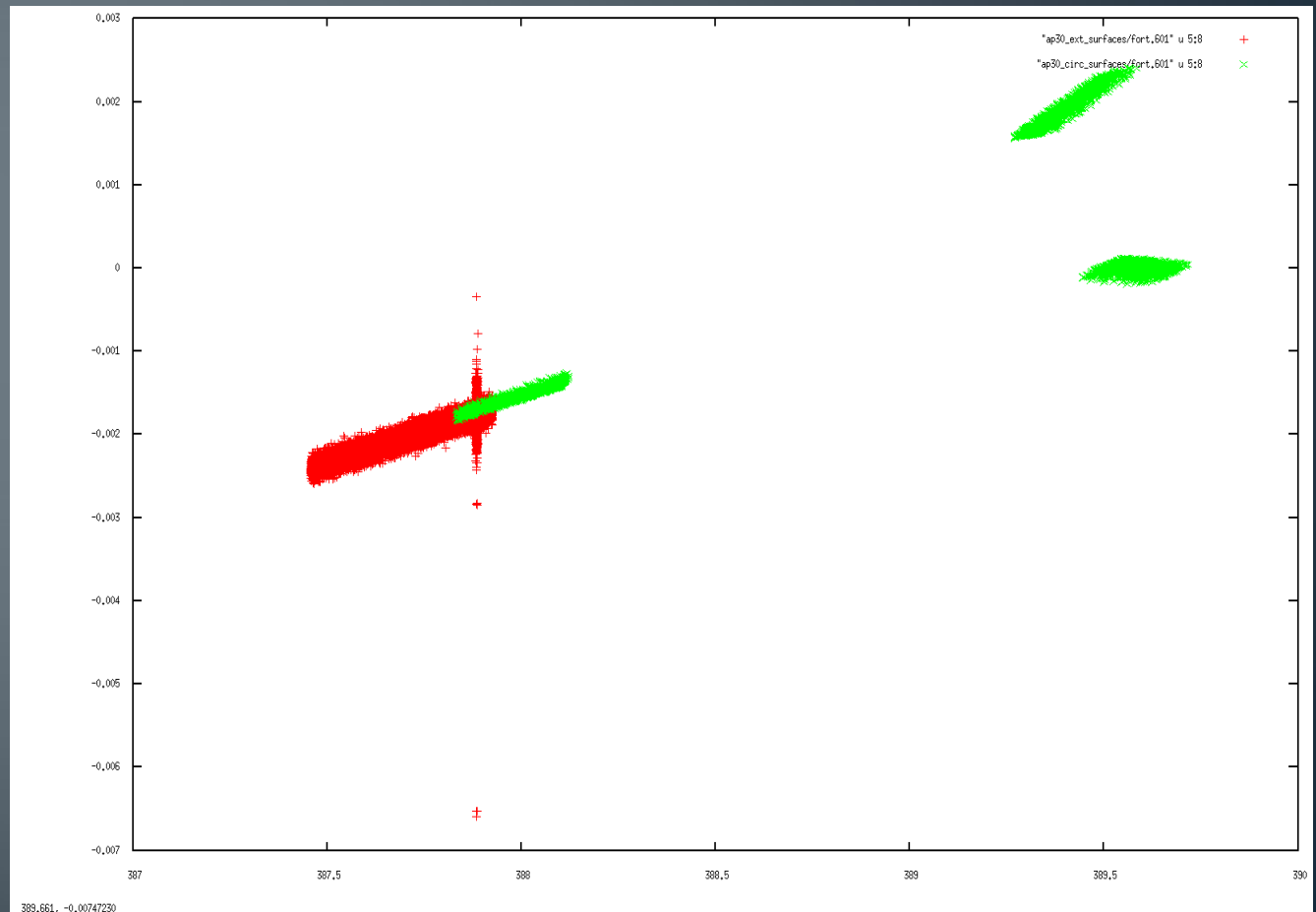
Model Input

- Cmagnet is model with US flange (not in final vertical position!)



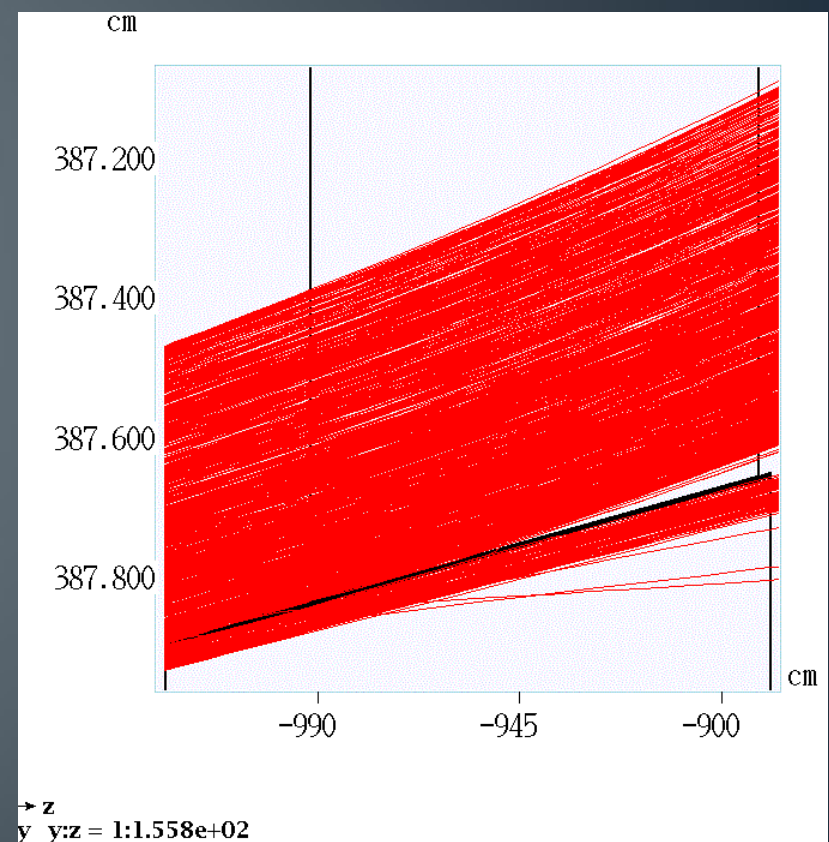
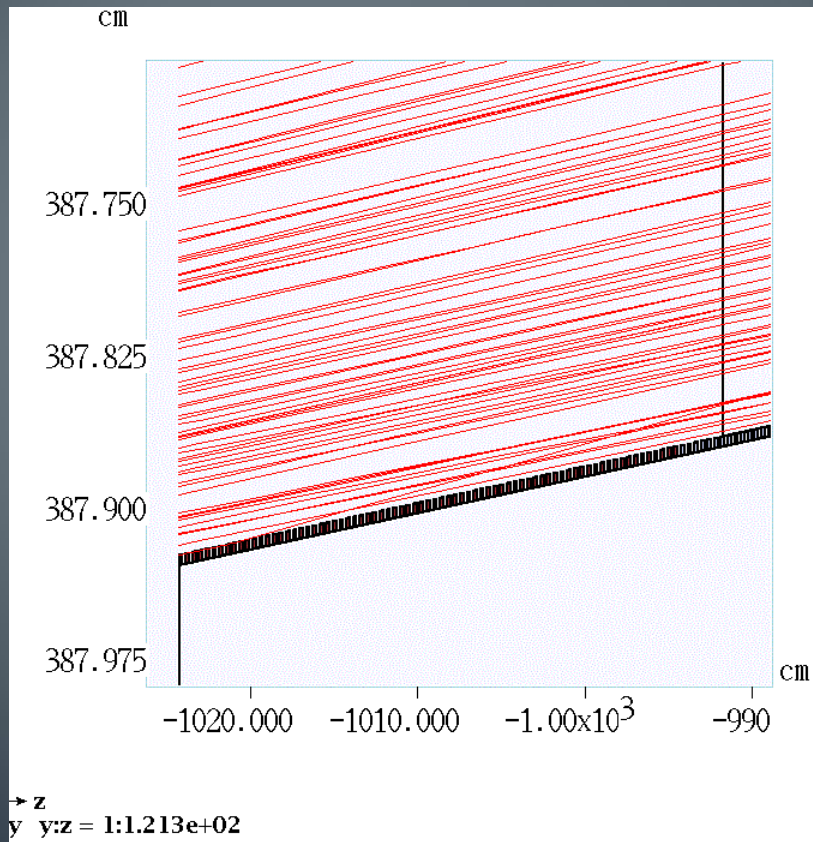
Model input

- GNUPLOT of **circulating** and **extraction** samples used in simulation



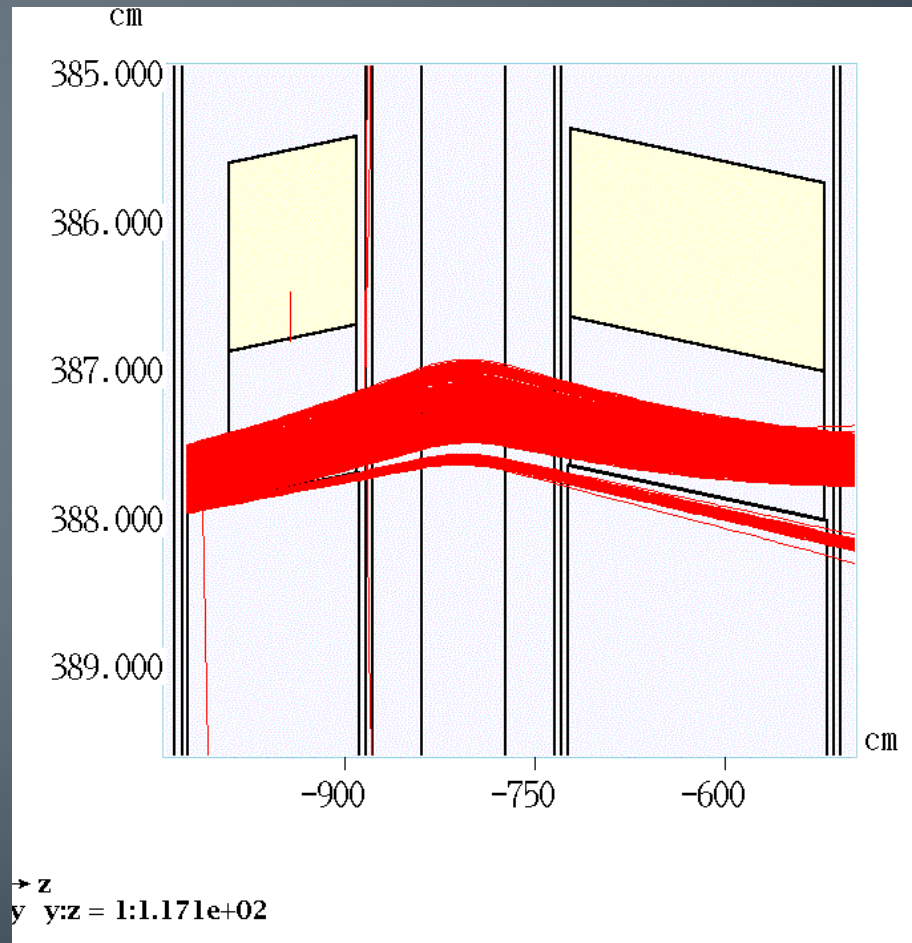
Model input

- Circulating and extraction beam samples from Vladimir



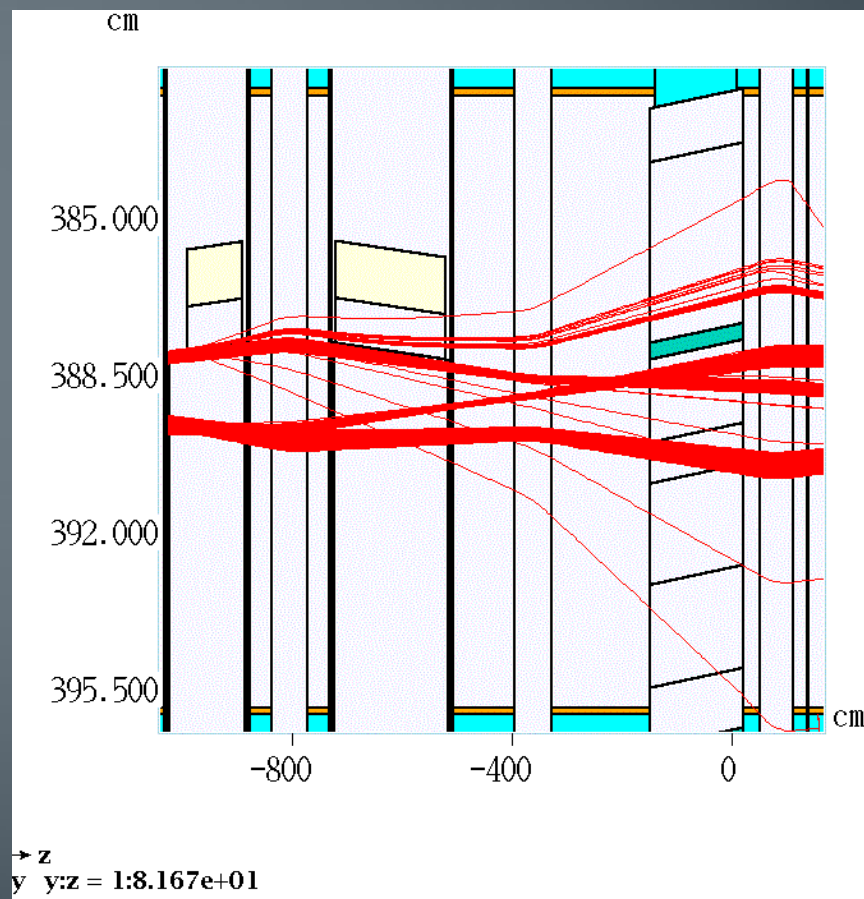
Model input

- Present septa alignment



Lambertson

- Needs a yaw angle from MARS simulation - 0.15 degrees



Vetting the model – work in progress

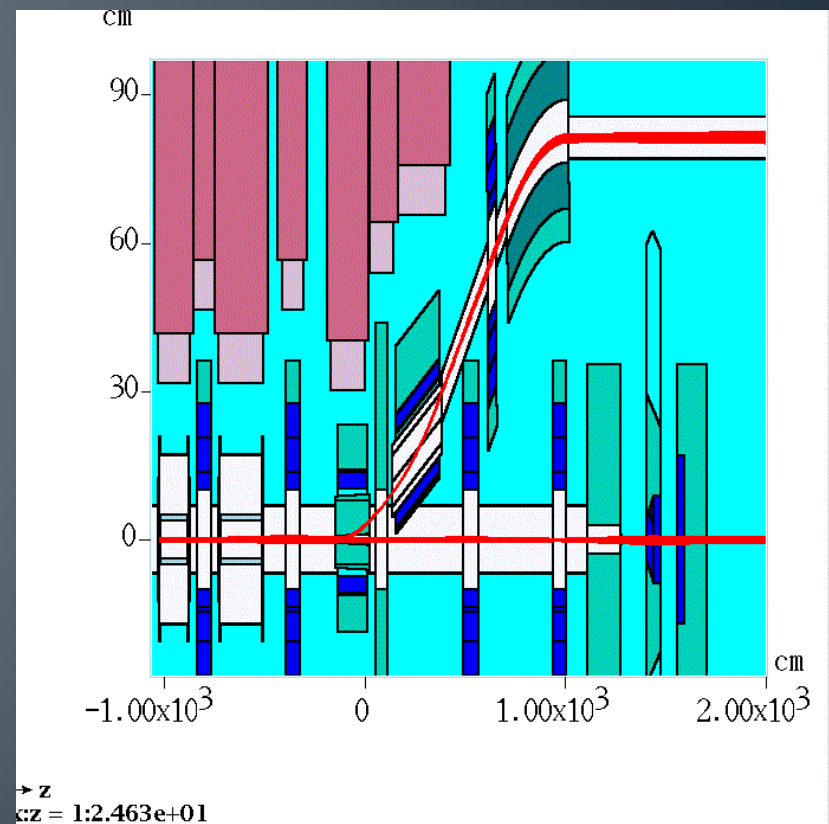
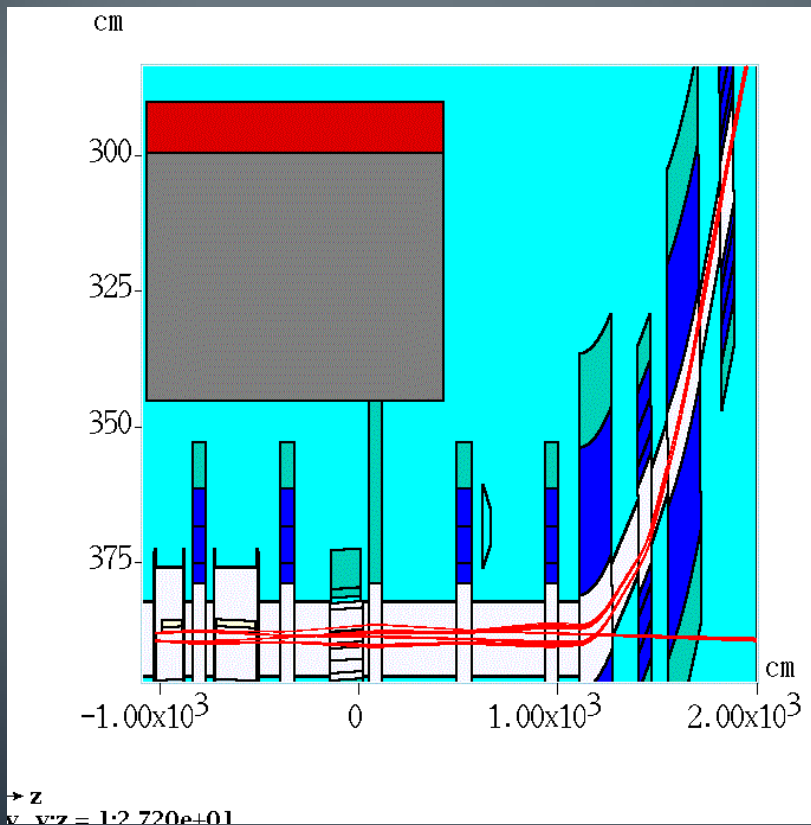
- Compared MAD positions with the present MARS model
- Debuncher quads are in agreement with MAD locations
- C magnet, Q901, and V901 are off:
 - Cmagnet is 30.7 cm US of MAD position and is not rolled
 - Q901 is 13.6 cm DS of MAD position
 - V901 is 14.1 cm DS of MAD position
- It remains to check horizontal offsets
- Is there a yaw angle for Lambertson in MAD?

MAD/MARS coordinate comparison

MAD	D3Q0 reference elevation 0 m, reference z position 0 m						MAD	MARS	delta
	x	y	z	length	z position	elevation (m)	MAD horizontal offset from 30 straight (cm)	z midpoint (m)	delta z (cm)
D3Q0	30055.456706	222.005097	30456.274864		0.000	0.000	0.00000	0.0000	
D2Q2	30058.9934	222.005097	30454.23243	4.084	4.084	0.000	0.00000		
D2Q2	30059.6004	222.005097	30453.88184	0.701	4.785	0.000	0.00000	4.4346	4.43457
ESS1	30061.7176	222.005097	30452.65916		7.230	0.000	0.00000		
ESS1	30062.583573	222.005097	30452.159061	1.000	8.230	0.000	0.00000	7.7299	7.519919735
D2Q3	30062.8342	222.005097	30452.01432		8.519	0.000	0.00000		
D2Q3	30063.441291	222.005097	30451.663724	0.701	9.220	0.000	0.00000	8.8699	8.86990137
ESS2	30063.818208	222.005097	30451.446053		9.656	0.000	0.00000		
ESS2	30065.550142	222.005097	30450.445852	2.000	11.656	0.000	0.00000	10.6557	10.71485787
D2Q4	30066.6676	222.005097	30449.80054		12.946	0.000	0.00000		
D2Q4	30067.274640	222.005097	30449.449945	0.701	13.647	0.000	0.00000	13.2966	13.29657137
LAM	30068.900124	222.005097	30448.511220		15.524	0.000	0.00000		
LAM	30070.199075	222.005097	30447.761069	1.500	17.024	0.000	0.00000	16.2742	16.2681251
D2Q5	30070.5015	222.005097	30447.58643		17.373	0.000	0.00000		
D2Q5	30071.117347	222.005097	30447.230762	0.711	18.085	0.000	0.00000	17.7290	17.72895637
cmag	30071.6211	222.116142	30446.91493		18.679	0.111	2.1564		
cmag	30073.61147	222.314001	30445.77628	2.293	20.972	0.309	1.2223	19.8253	19.51793637
Q901	30075.26353	222.530749	30444.83178		22.875	0.526	0.3933		
Q901	30075.65789	222.582489	30444.60632	0.454	23.329	0.577	0.1955	23.1019	23.23834137
V901	30076.13553	222.645154	30444.33325		23.879	0.640	0.00000		
V901	30078.77735	222.817898	30442.82288	3.043	26.922	0.813	0.00000	25.4007	25.54178137

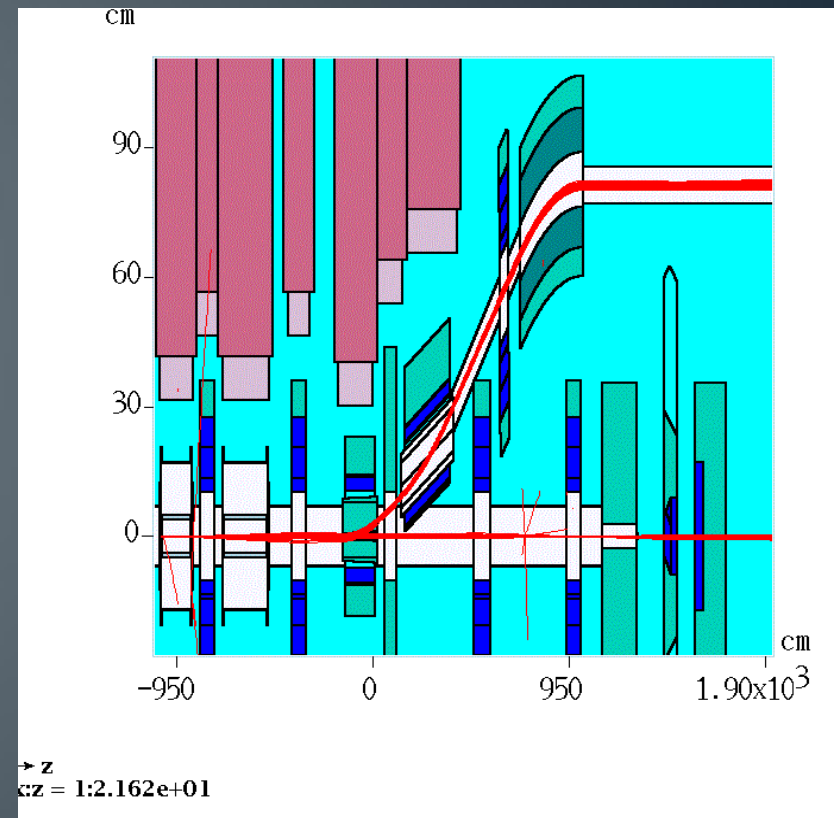
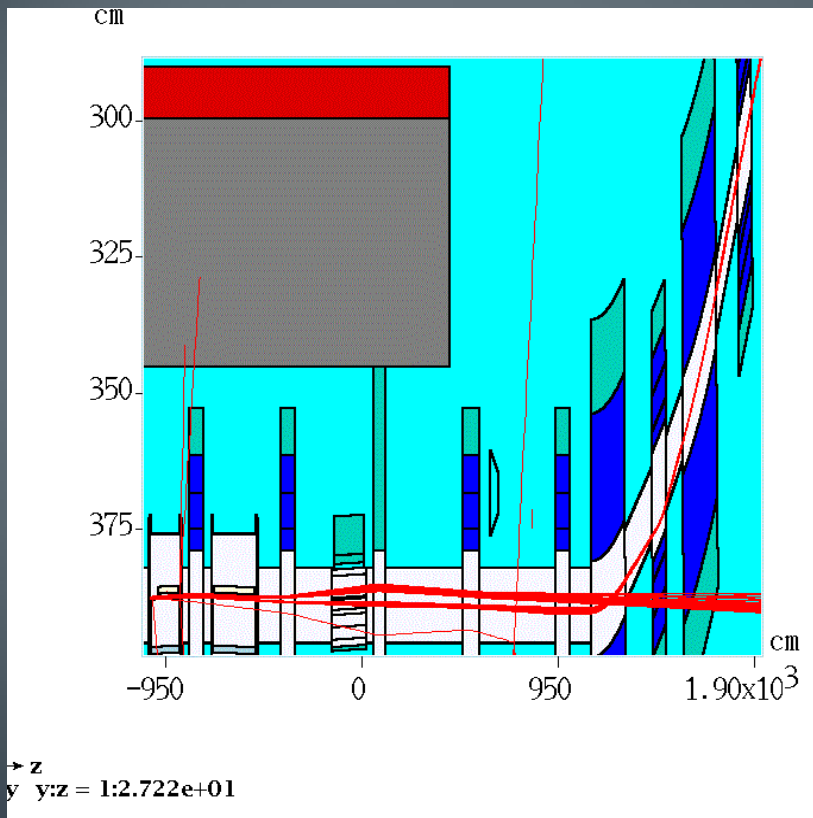
Simulation – alignment check

- Plan and elevation view, proton tracks for circulating sample
- Septa wires modelled as black holes to eliminate extraction noise



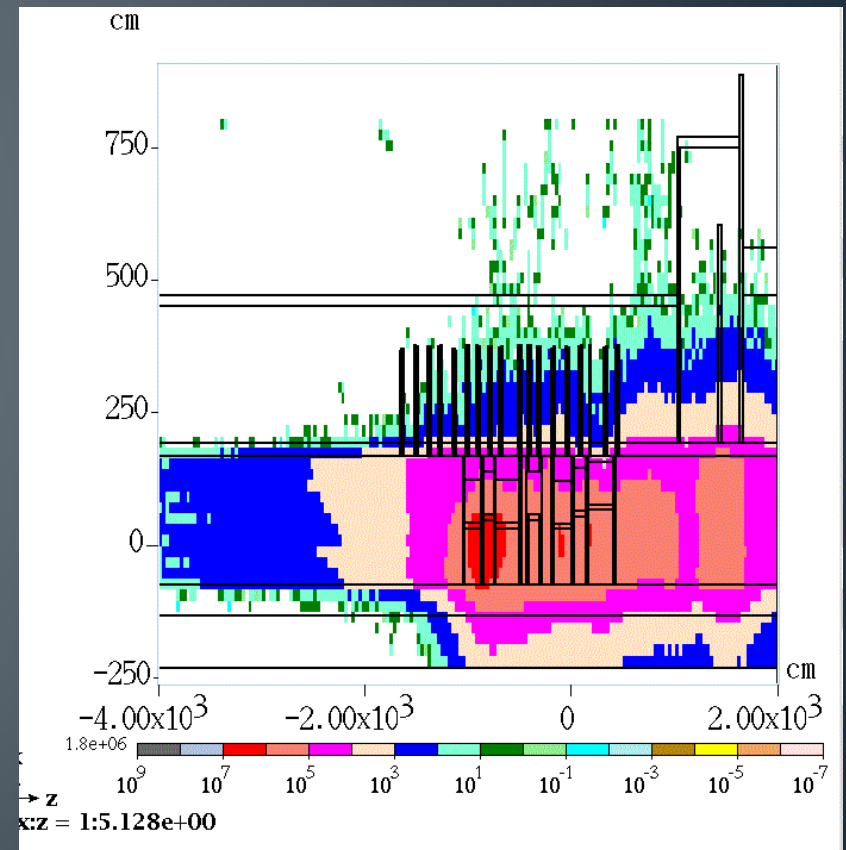
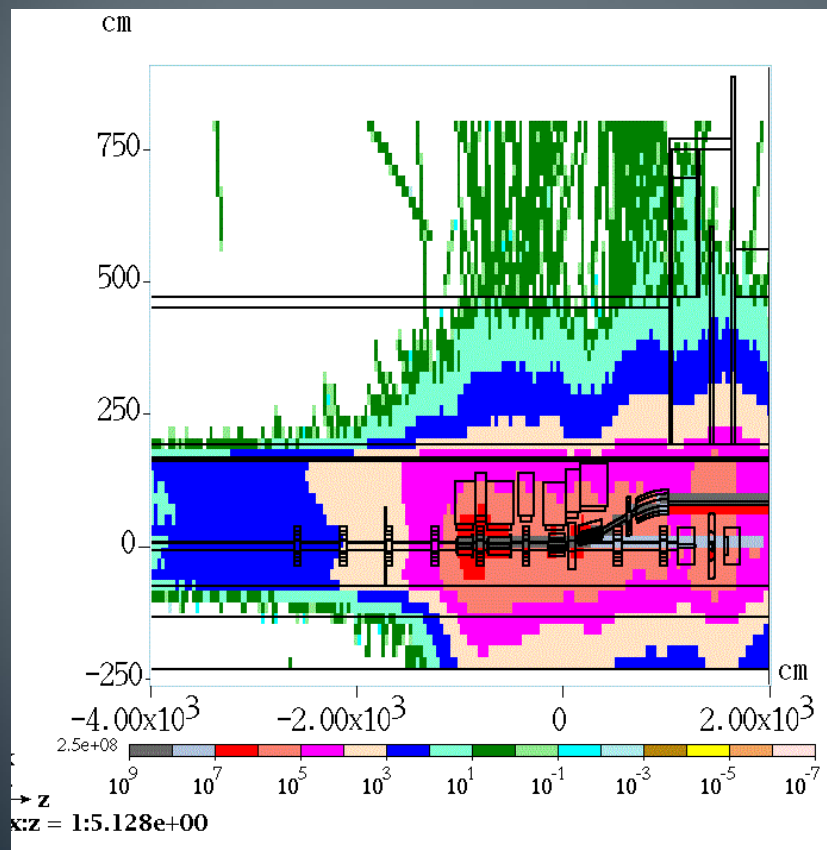
Simulation – alignment check

- Plan and elevation view, proton tracks for extraction sample



Simulation result

- Total flux through beam elevation and penetration elevation



Remaining Steps

- Move cmag (and roll), Q901, and V901
- Move columns to accommodate new c magnet length and position
- Add voids to model to accommodate required power cables for extraction region components