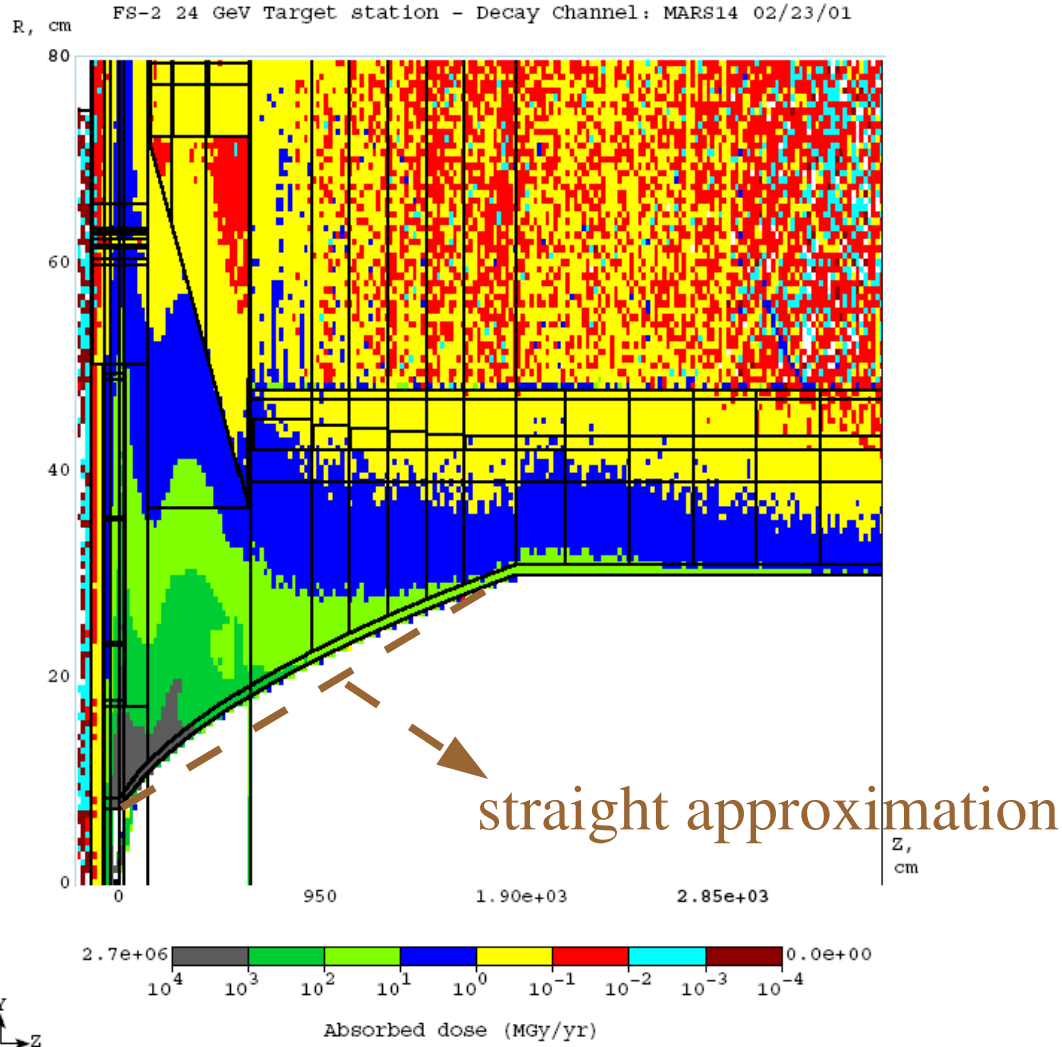


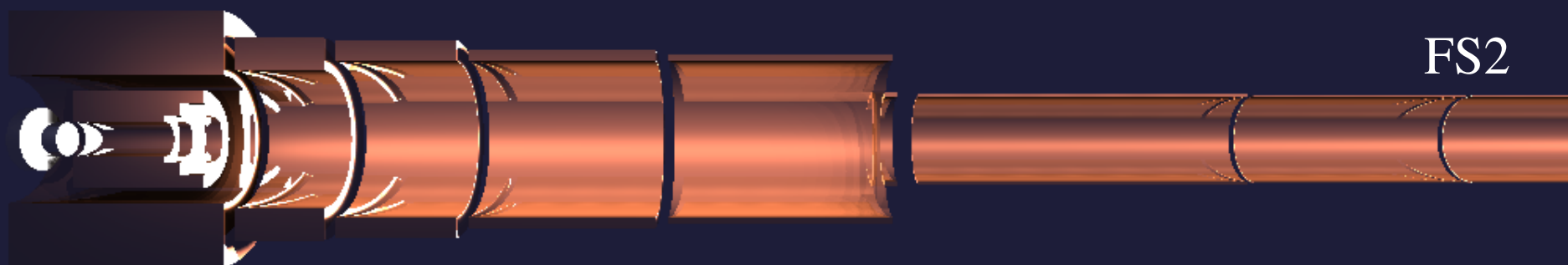
Pion Capture Region



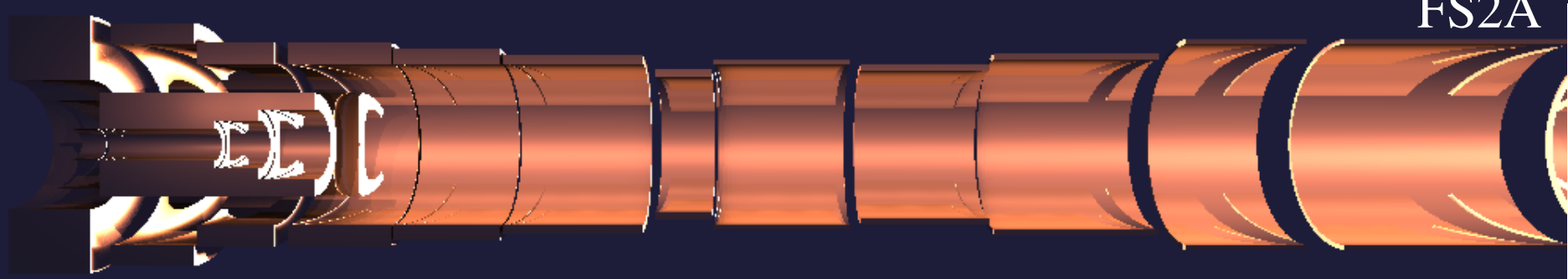
- Comparison of pion capture from FS2 vs FS2A
 - Simulated in my GEANT4 code G4MICE
- FS2 has more reasonable coil currents
 - Assume low current density, rad-hard superconductor
- FS2A claims better capture rate
 - Argument ito keeping field lines in the solenoid bore or something
- Details
 - Approximate curved opening cone by a straight cone
 - I can do the curved cone in G4MICE if I know the functional form
 - Use beam generated in MARS by Harold Kirk
 - Possibly not using optimal beam->Hg set-up
 - I can do this in G4MICE but need to check appropriate physics models are switched on
 - Coils are all copper, apertures are all Tungsten

Pion Capture Region

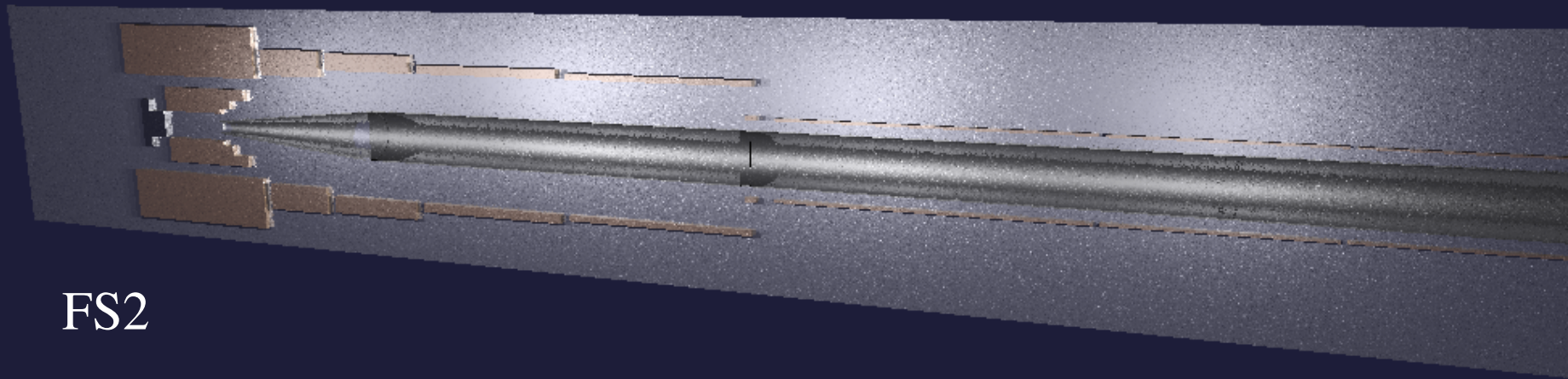




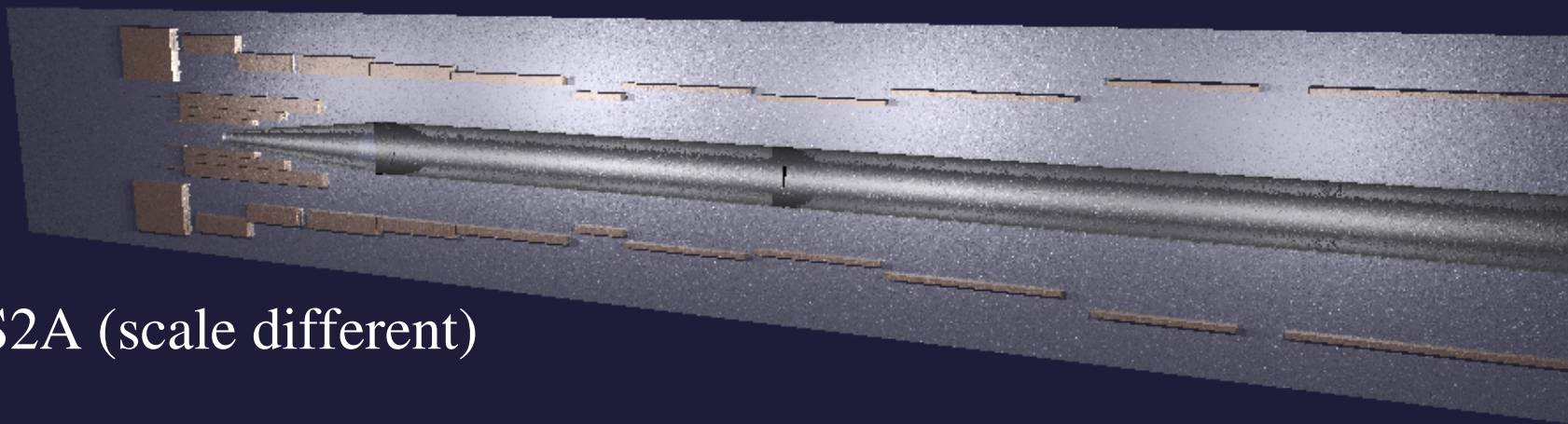
FS2



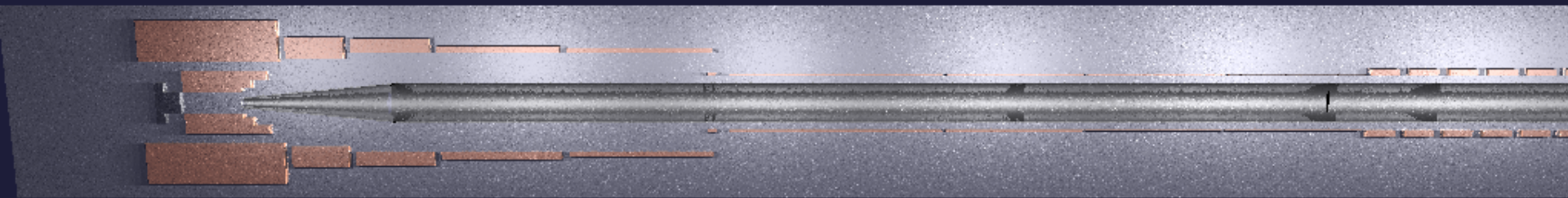
FS2A



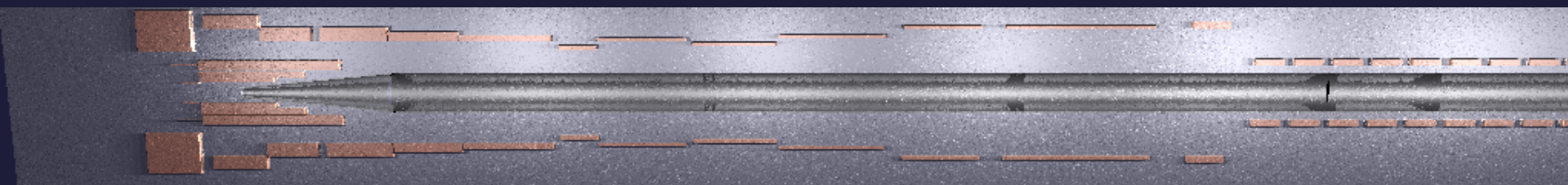
FS2



FS2A (scale different)



FS2



FS2A

FS2 Coils (Suppressed Repeats)



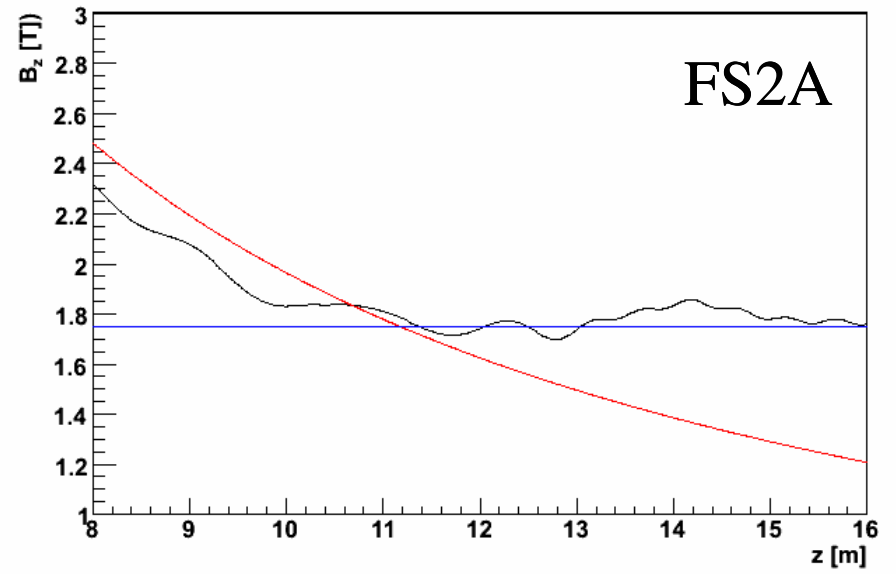
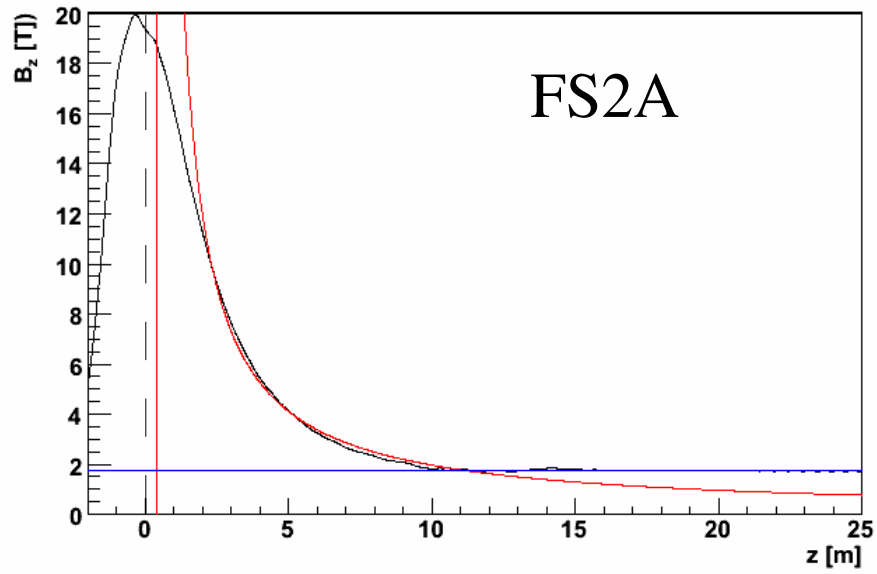
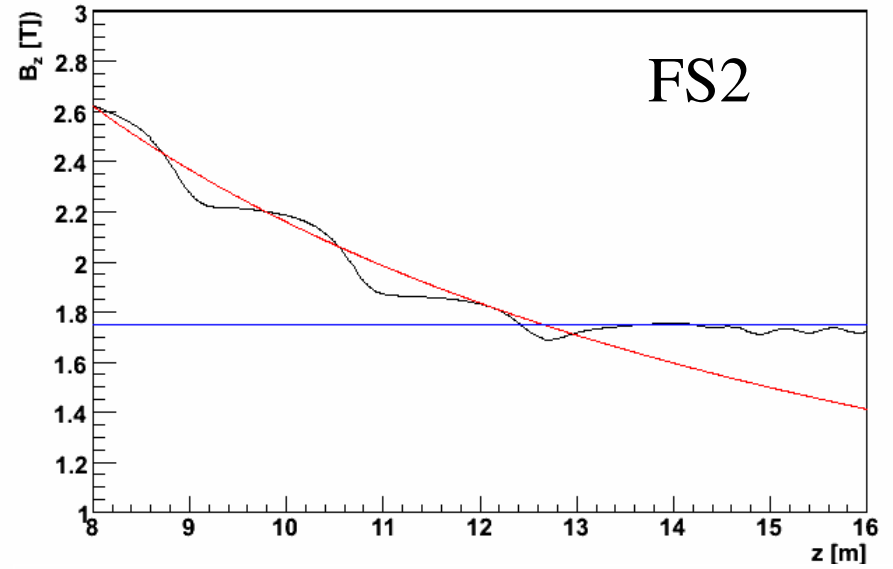
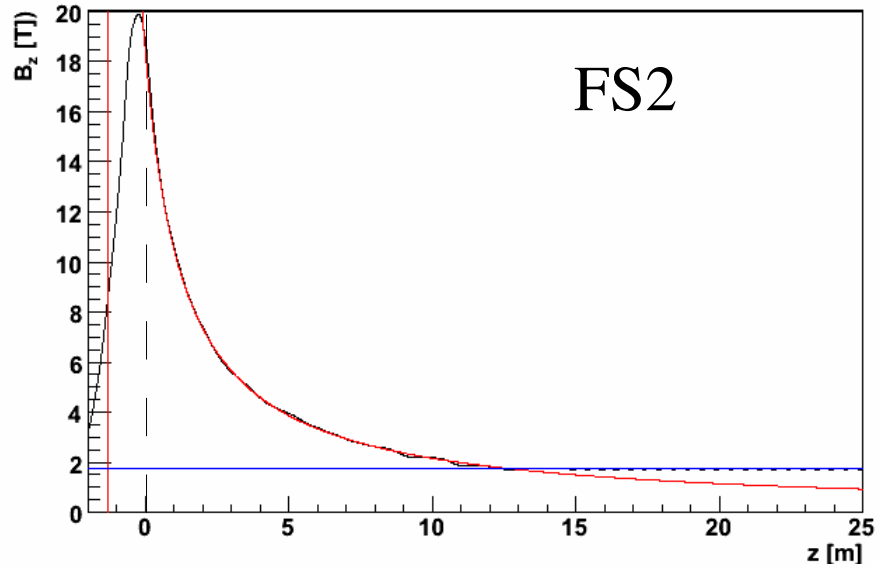
	Length [mm]	Inner Radius [mm]	Radial Thickness [mm]	Outer Radius [mm]	Central Z [mm]	Upstream Z [mm]	Downstream Z [mm]	Current [A/mm ²]
Cu {	749.00	178.00	54.00	232.00	-337.50	-712.00	37.00	24.37
	877.00	231.00	122.00	353.00	-273.50	-712.00	165.00	19.07
	1073.00	353.00	137.00	490.00	-175.50	-712.00	361.00	14.87
	1781.00	636.00	642.00	1278.00	-362.50	-1253.00	528.00	23.39
	729.00	686.00	325.00	1011.00	992.50	628.00	1357.00	25.48
	999.00	776.00	212.00	988.00	1956.50	1457.00	2456.00	29.73
	1550.00	776.00	107.00	883.00	3331.00	2556.00	4106.00	38.26
	1859.00	776.00	66.00	842.00	5135.50	4206.00	6065.00	49.39
	103.00	416.00	51.00	467.00	6051.50	6000.00	6103.00	68.32
	2728.00	422.00	29.00	451.00	7639.00	6275.00	9003.00	69.27
Added by CR {	1749.00	422.00	23.00	445.00	9927.50	9053.00	10802.00	75.62
	1750.00	422.00	19.00	441.00	11727.00	10852.00	12602.00	77.37
	1749.00	422.00	17.00	439.00	13526.00	12651.50	14400.50	81.00
	360.00	430.00	100.00	530.00	14650.00	14470.00	14830.00	19.40
	360.00	430.00	100.00	530.00	15150.00	14970.00	15330.00	19.40
	360.00	430.00	100.00	530.00	16150.00	15970.00	16330.00	19.22
	360.00	430.00	100.00	530.00	37150.00	36970.00	37330.00	18.76
	355.00	450.00	100.00	550.00	37610.00	37432.50	37787.50	20.39
	364.00	377.00	100.00	477.00	38100.00	37918.00	38282.00	18.67
	389.00	352.00	100.00	452.00	38610.00	38415.50	38804.50	19.16
360.00	320.00	100.00	420.00	39150.00	38970.00	39330.00	18.91	

FS2A Coils (Suppressed Repeats)

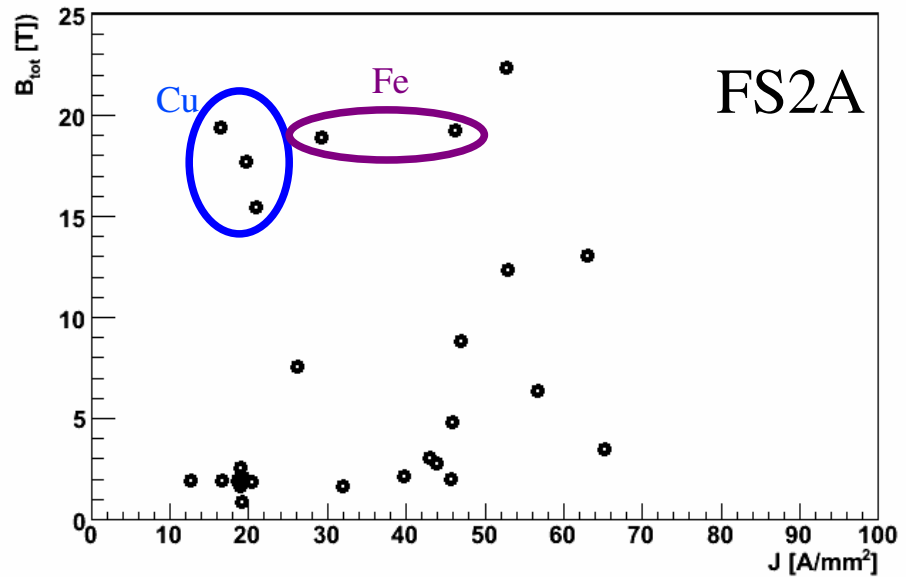
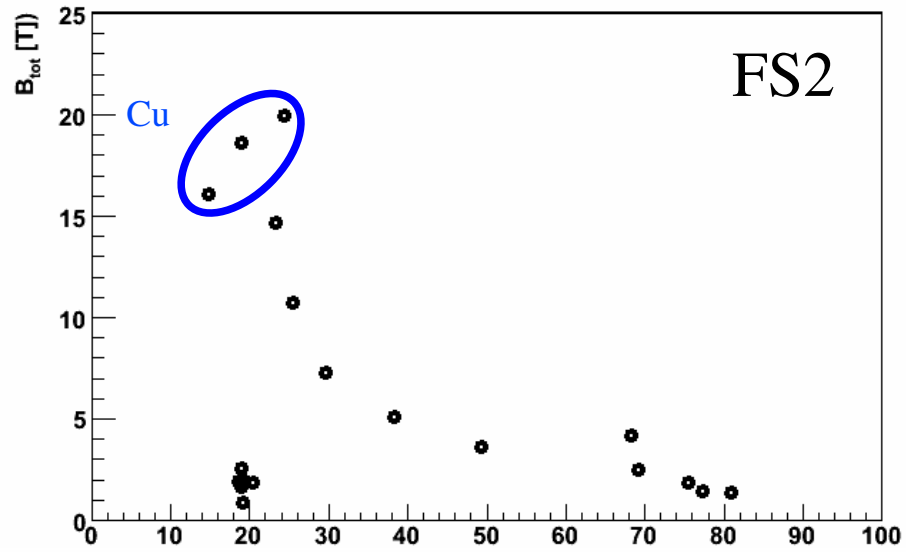


	Length [mm]	Inner Radius [mm]	Radial Thickness [mm]	Outer Radius [mm]	Central Z [mm]	Upstream Z [mm]	Downstream Z [mm]	Current [A/mm ²]
	683.00	640.00	640.00	1280.00	-910.50	-1252.00	-569.00	52.87
Fe {	326.00	430.00	10.00	440.00	-683.00	-846.00	-520.00	29.29
	206.00	150.00	10.00	160.00	-623.00	-726.00	-520.00	46.36
	690.00	1000.00	210.00	1210.00	-55.00	-400.00	290.00	26.23
Cu {	948.00	160.00	70.00	230.00	-26.00	-500.00	448.00	16.52
	1320.00	240.00	100.00	340.00	160.00	-500.00	820.00	19.69
	1791.00	350.00	160.00	510.00	395.50	-500.00	1291.00	20.96
	640.00	800.00	210.00	1010.00	630.00	310.00	950.00	52.95
	850.00	800.00	210.00	1010.00	1495.00	1070.00	1920.00	63.02
	880.00	800.00	150.00	950.00	2380.00	1940.00	2820.00	47.09
	1160.00	800.00	90.00	890.00	3420.00	2840.00	4000.00	56.74
	470.00	673.00	70.00	743.00	4335.00	4100.00	4570.00	45.97
	1127.00	800.00	50.00	850.00	5153.50	4590.00	5717.00	65.18
	1070.00	740.00	50.00	790.00	6338.00	5803.00	6873.00	44.00
	1360.00	849.00	50.00	899.00	7590.00	6910.00	8270.00	39.77
	990.00	1000.00	50.00	1050.00	8995.00	8500.00	9490.00	45.69
	1900.00	1000.00	50.00	1050.00	10750.00	9800.00	11700.00	32.01
	470.00	1000.00	100.00	1100.00	12415.00	12180.00	12650.00	42.96
	360.00	430.00	100.00	530.00	13180.00	13000.00	13360.00	12.63
	360.00	430.00	100.00	530.00	13680.00	13500.00	13860.00	16.74
	360.00	430.00	100.00	530.00	14180.00	14000.00	14360.00	19.42
	360.00	430.00	100.00	530.00	14680.00	14500.00	14860.00	19.06
	360.00	430.00	100.00	530.00	15180.00	15000.00	15360.00	18.84
	360.00	430.00	100.00	530.00	16180.00	16000.00	16360.00	19.22
	360.00	430.00	100.00	530.00	37180.00	18410.00	37360.00	18.76
	355.00	450.00	100.00	550.00	37640.00	18642.50	37817.50	20.39
	364.00	377.00	100.00	477.00	38130.00	18883.00	38312.00	18.67
	389.00	352.00	100.00	452.00	38640.00	19125.50	38834.50	19.16

Field on axis



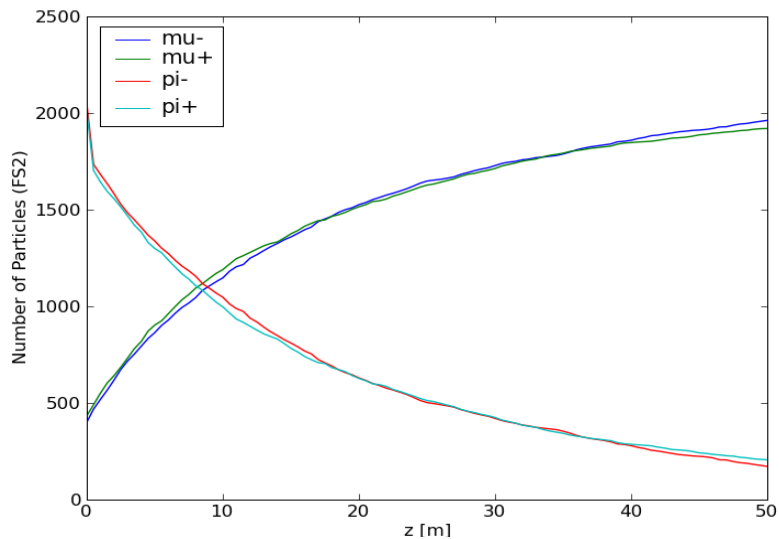
J/B Plots



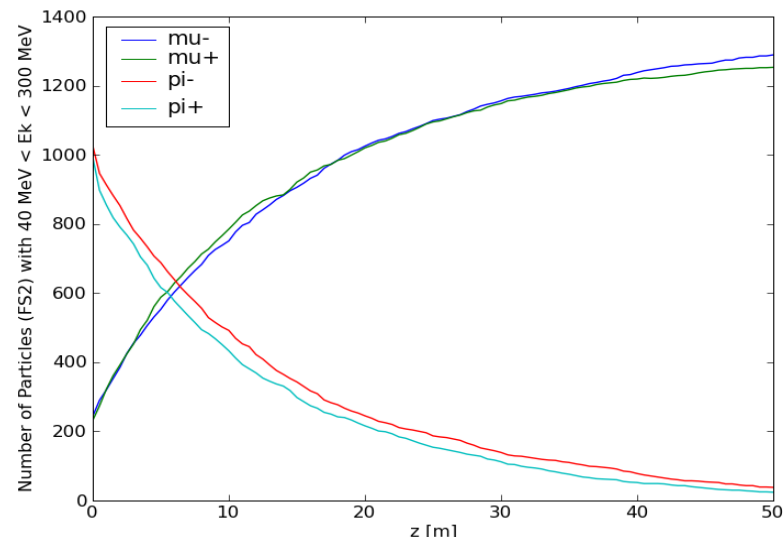
Transmission (No Apertures, 5k)



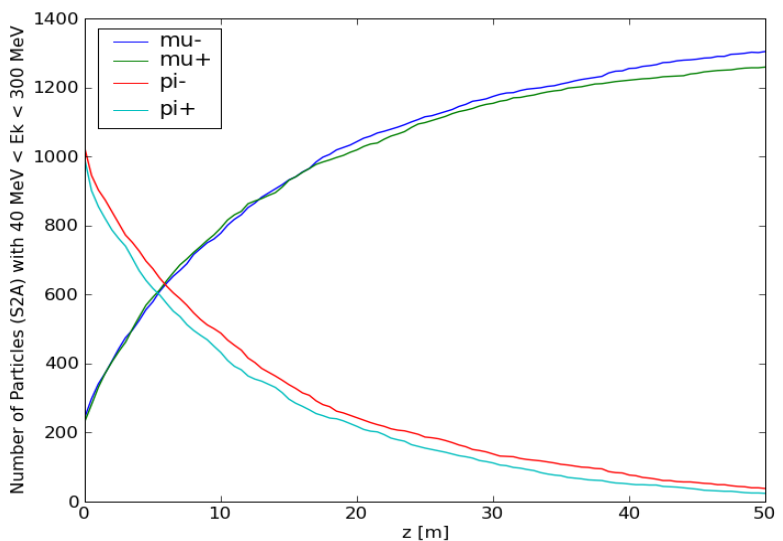
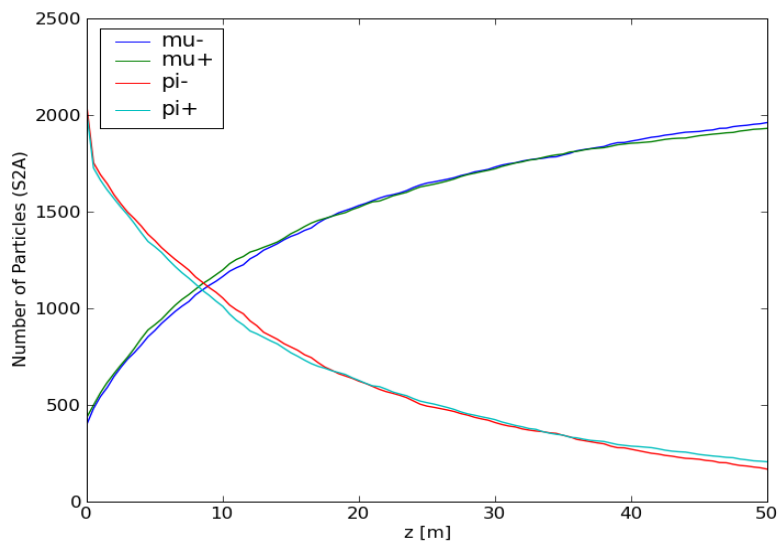
No Cut



$40 < KE < 300$

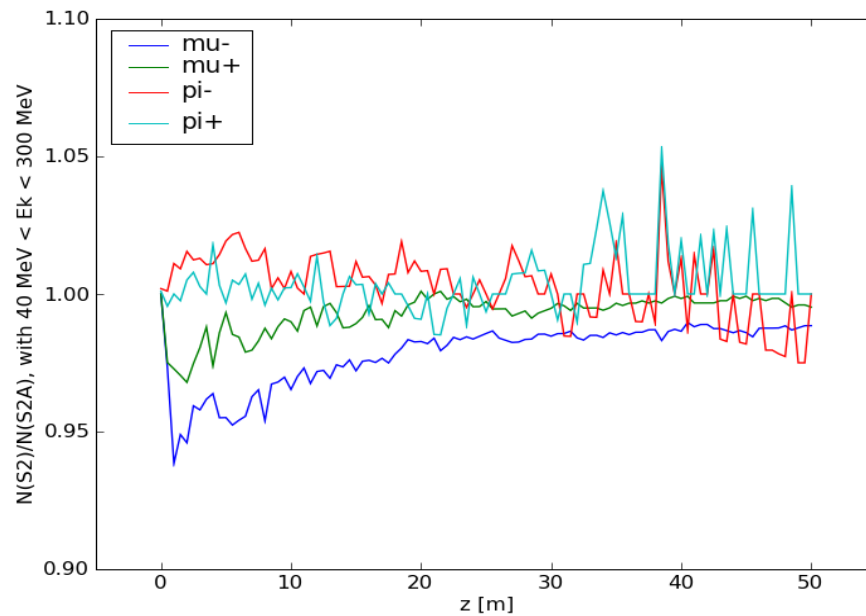
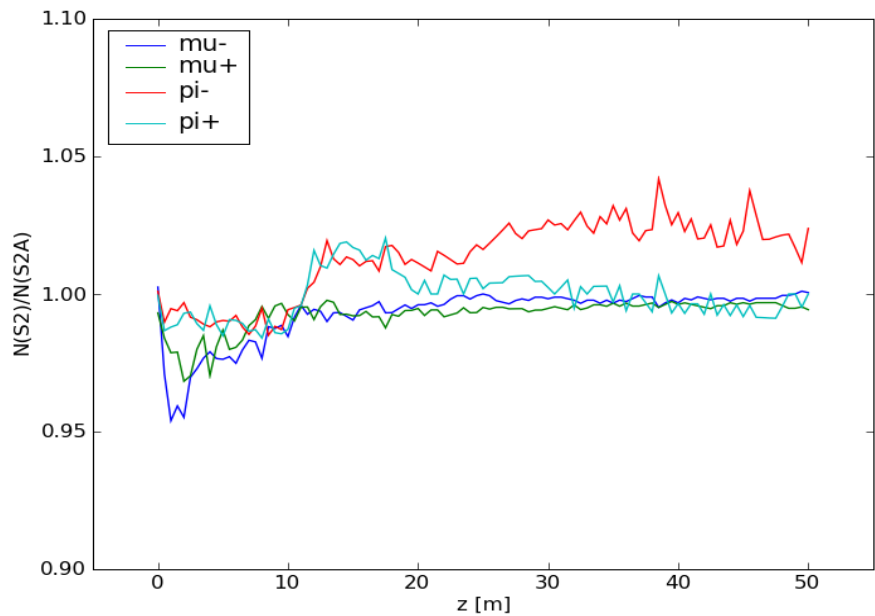


FS2

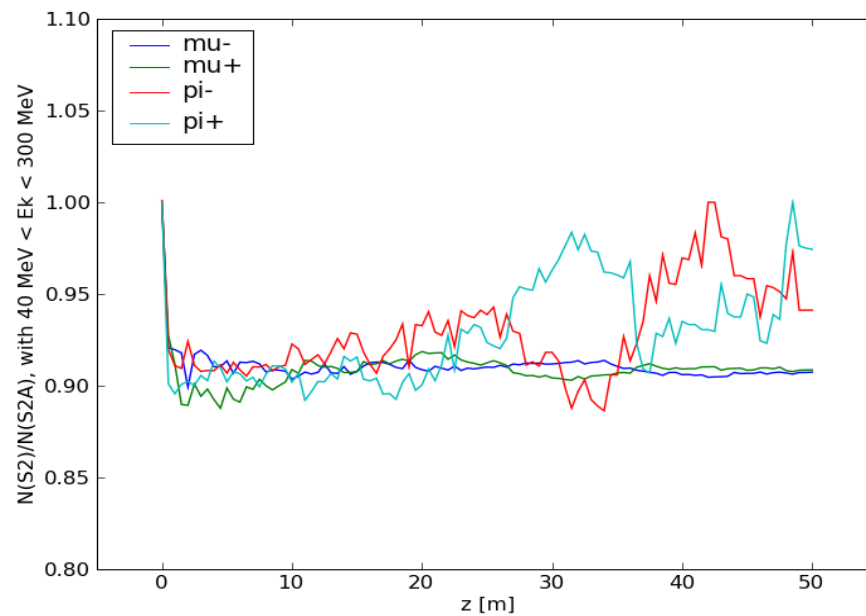
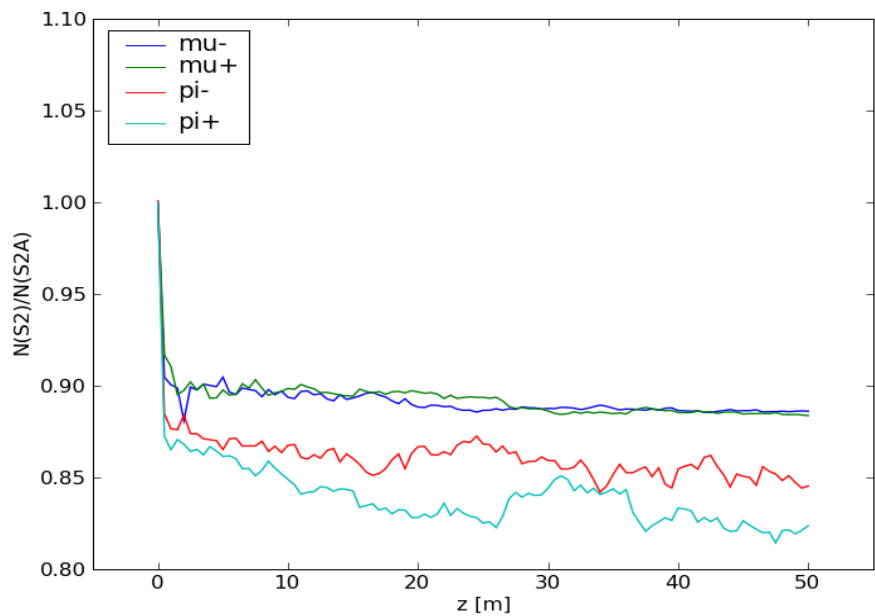


FS2A

Transmission - Ratio (No aperture)



Transmission Ratio (with aperture)



Summary

- Reasonable model of pion capture region implemented in geant4
- Compared muon capture of FS2 and FS2A
- Looks like FS2A captures about 10% more muons
- But losses in FS2 are in the region just next to the target
- We can probably do better by either
 - Enlarging the opening cone
 - Increasing length of high field region
 - E.g. longer copper coils as in S2A