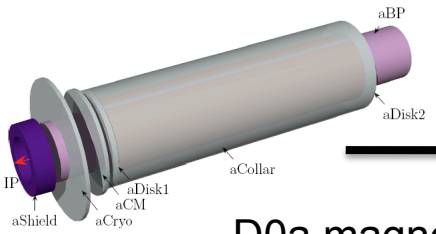
1 Machine magnets in ATLAS

- Various scenarios are being investigated for increasing the LHC luminosity, several of which require machine magnets positioned inside the ATLAS experiment. For example:

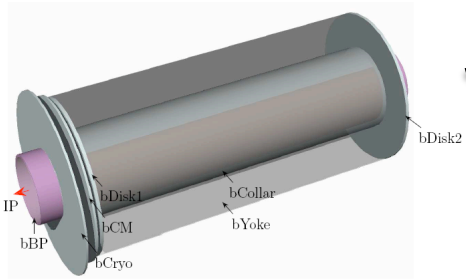
1. The early separation scheme (Sterbini et al. EDMS 848691)
2. Extra (slim) quadrupoles inside ATLAS (Wildner et al. EDMS 860277)

- We've simulated ATLAS radiation backgrounds for these two scenarios with FLUKA and GCALOR. Not clear how realistic these scenarios are today, but gives us some experience of impact of putting machine material in ATLAS regions.
- Summarised in note EDMS 932316 (Dawson and Shupe).

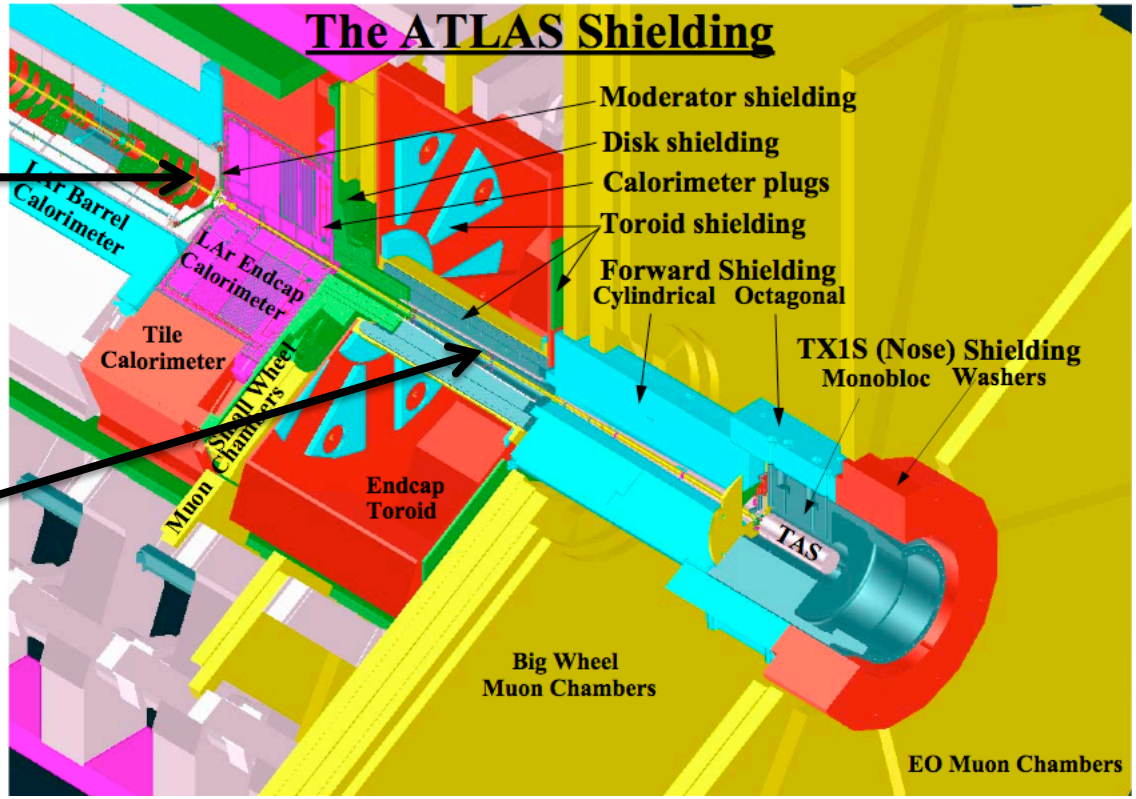
Early separation scheme



D0a magnet

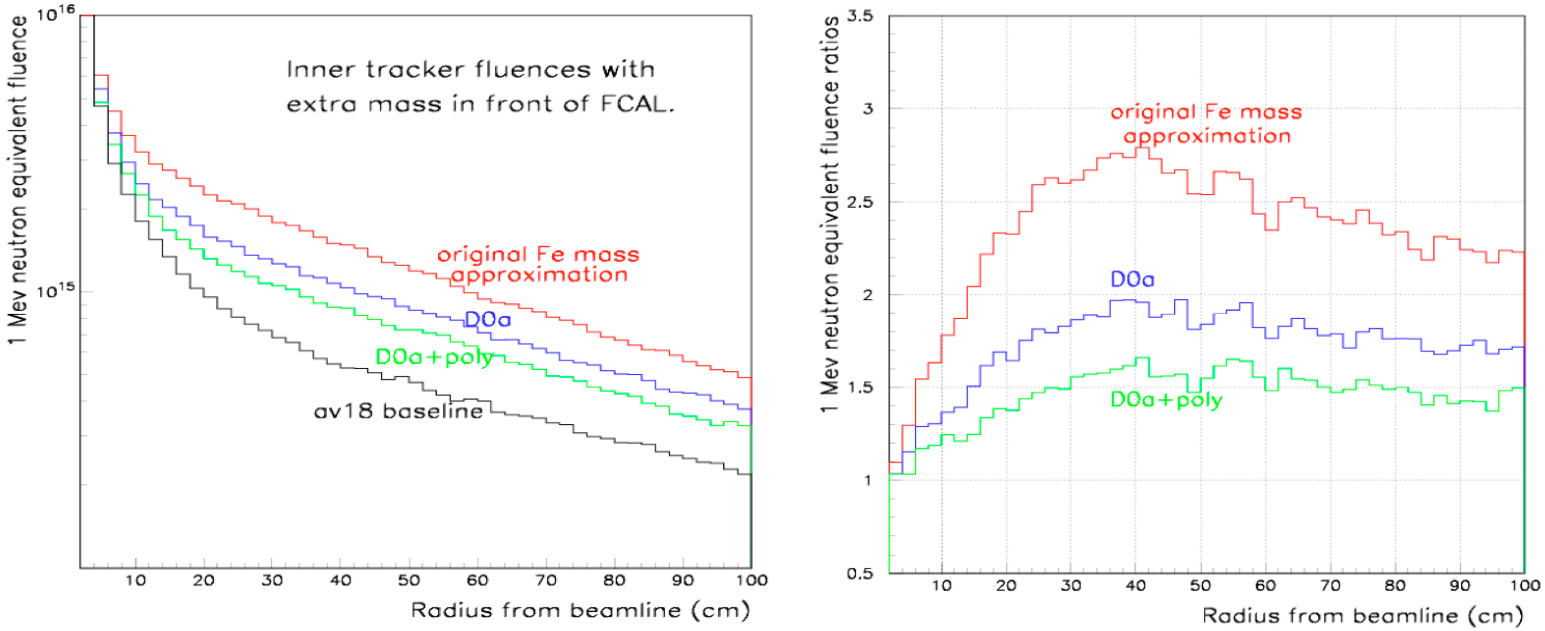


D0b magnet



Early separation scheme

- What is impact on ID fluences of D0a magnet?



The left plot shows 1 Mev equivalent neutron fluences in the inner tracker volume as a function of radius for Z=300cm. Three scenarios are compared with the av18 (no-magnet) baseline. The right plot gives the ratios.

- D0a magnet would also degrade calorimeter jet resolutions. It is also in a very “awkward” location.

Early separation scheme

Impact of D0b on muon system

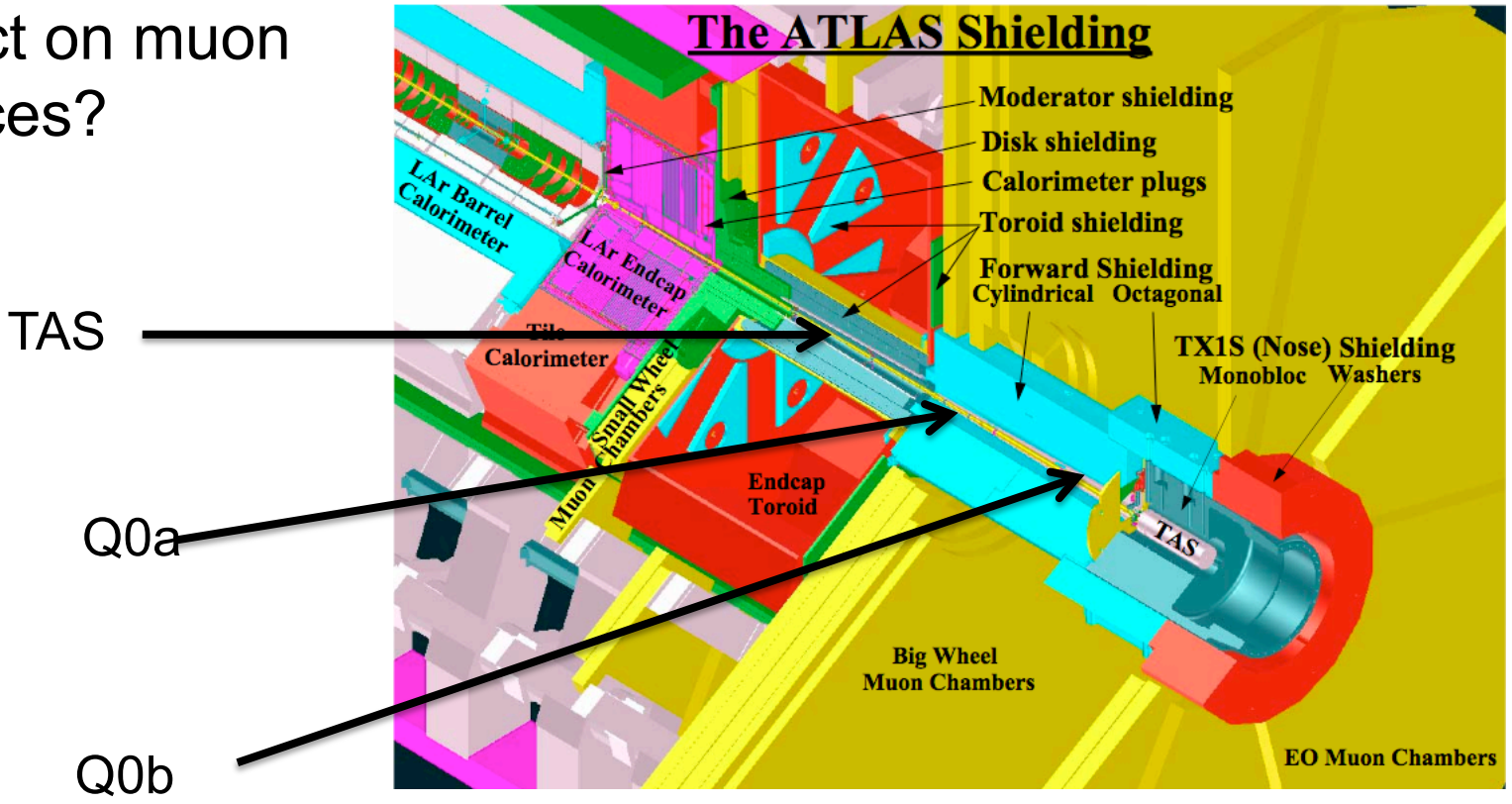
FLUX RATIO: UPG D0b 10k / Startup Base 11k

	N<100k	N>100k	Photons	Had>20M	Counts	Triggers
SW CSC	1.31	1.34	1.25	1.25	1.23	1.16
SW TGC	1.22	1.38	1.25	1.32	1.25	1.25
LW MDT In	1.07	1.00	1.01	1.03	1.01	1.01
LW MDT Out	1.15	1.08	1.05	1.04	1.07	1.14
BW MDT In	1.04	1.02	1.06	1.03	1.05	1.03
B RPC HiZMid	1.21	1.28	1.21	1.23	1.21	1.20
B RPC HiZOut	1.19	1.17	1.16	1.15	1.13	1.01

- Rates in CSC/TGC regions increase by 20%->40, elsewhere typically in 10%->20% range

Slimline quadrupole scheme

- Impact on muon fluences?



6 Slimline quadrupole scheme

Impact of standard TASJTT with standard beampipe on muon system:

FLUX RATIO: TASinJTT 15K / Startup Base 11k

	N<100k	N>100k	Photons	Had>20M	Counts	Triggers
SW CSC	1.13	1.12	0.97	1.10	1.00	1.02
SW TGC	1.21	1.31	1.34	1.33	1.31	1.28
LW MDT In	1.20	0.80	0.30	0.77	0.38	0.67
LW MDT Out	1.88	1.49	0.73	1.29	0.86	1.19
BW MDT In	2.23	1.95	1.37	1.45	1.39	1.27
B RPC HiZMid	1.90	1.90	2.04	1.96	1.96	1.78
B RPC HiZOut	2.04	2.26	2.18	2.47	2.14	2.03

- Most of muon region experiences increases by factors of 1.1 to 2.0, with the barrel region in general closer to the factor of 2.0.

Conclusions

- For the D0a magnet a factor ~2 increase in fluences is observed in the ID, although with careful poly-moderator design this could be reduced to ~1.5. A D0a magnet does not impact fluences in the muon system, but would likely impact forward calorimeter performance.
- Up to 40% increases in muon rates were observed in the CSC/TGC regions from the introduction of a D0b magnet. Increases elsewhere are typical in range 10% to 20%.
- The impact of the “TAS and slim-line quadrupole” scenario” would be to increase muon rates by up to a factor 2.
- All this needs to be put into context of safety factors etc.