

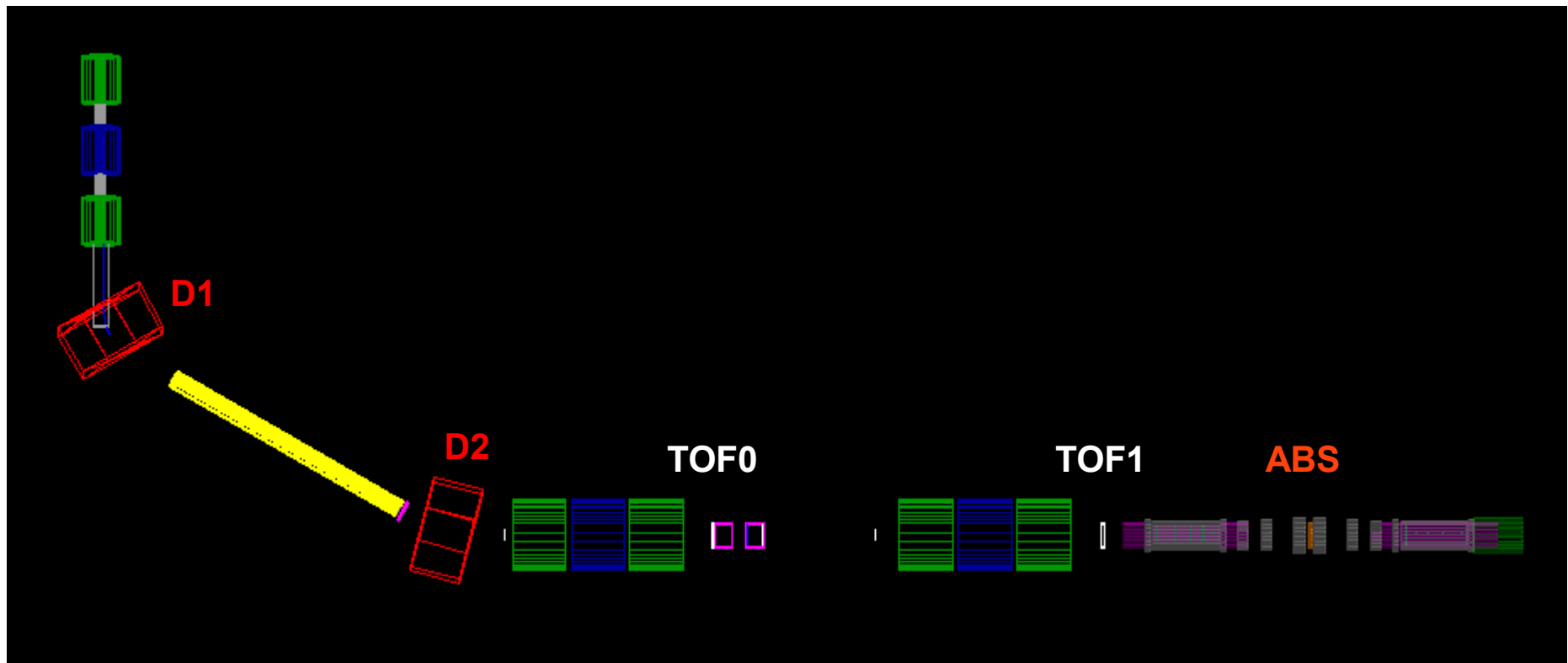
Pionic beam line settings

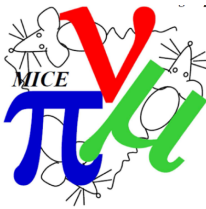
P. Franchini

15th June 2016

Beamline simulation

- G4BL simulation of all the beam line + cooling channel





Scan of D1

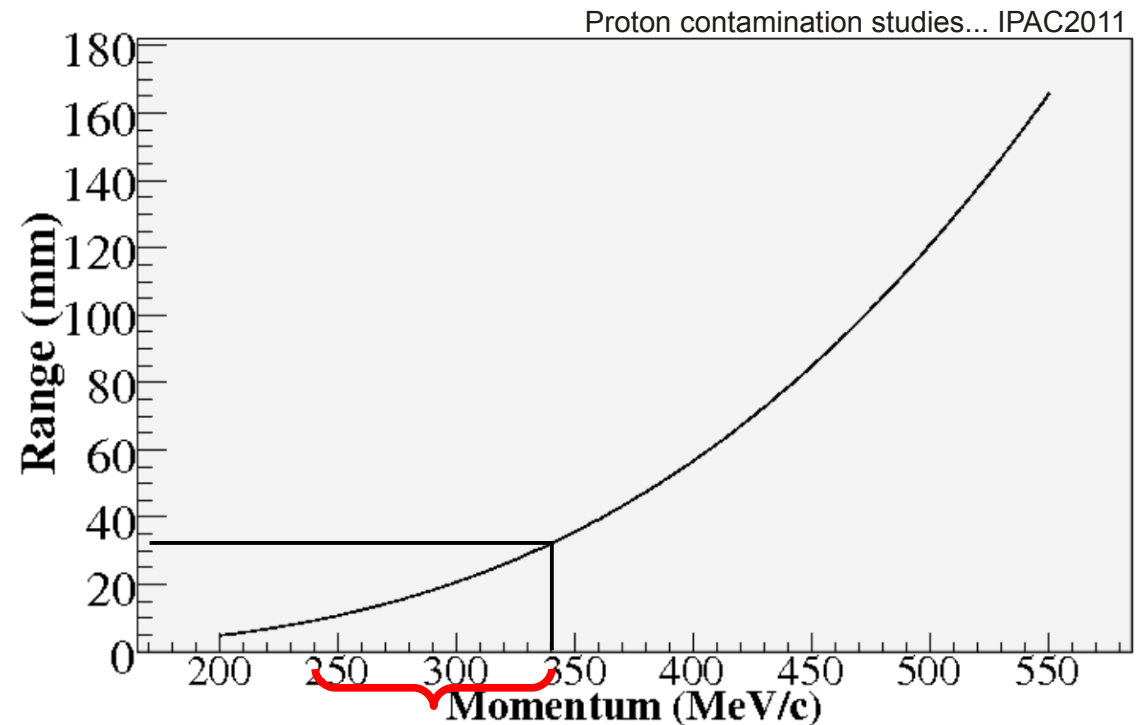
- Simulated a pionic beam: $P(D1) \sim P(D2)$ using the Magic Spreadsheet
- Match the nominal momentum value just before the absorber upstream face:
 - 140/170/200/240 MeV/c
- No diffuser: 3 mm rad
- Removed GVA1 from the beamline

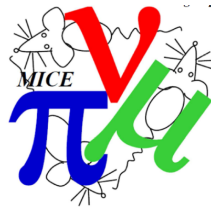


Proton absorber

Beam	Peak after D1 (MeV/c)	Range (mm)	PA (mm)
140	247	10	15
170	274	15	29
200	304	20	29
240	340	30	29

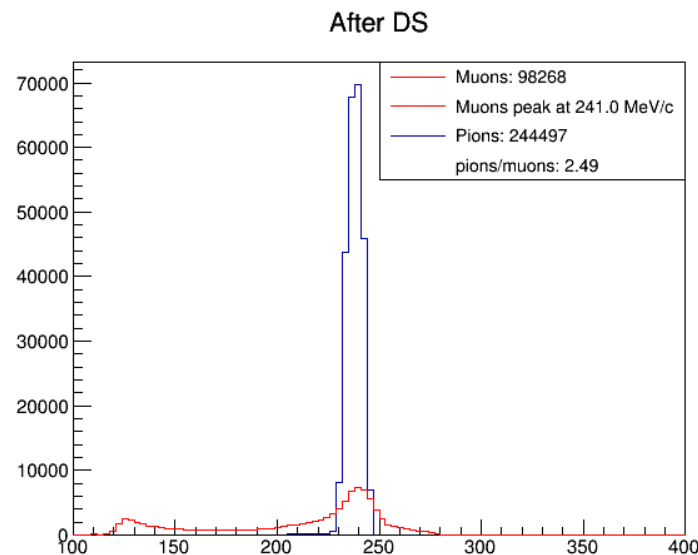
- Selected PA=29mm for the simulation
- Rate to be studied with data





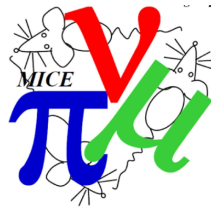
D2 selection

- Narrow momentum distribution after D1 and DS:
 - Poor adjustment of the momentum selection using D2
 - Few effects in the TOF1/D1 yields



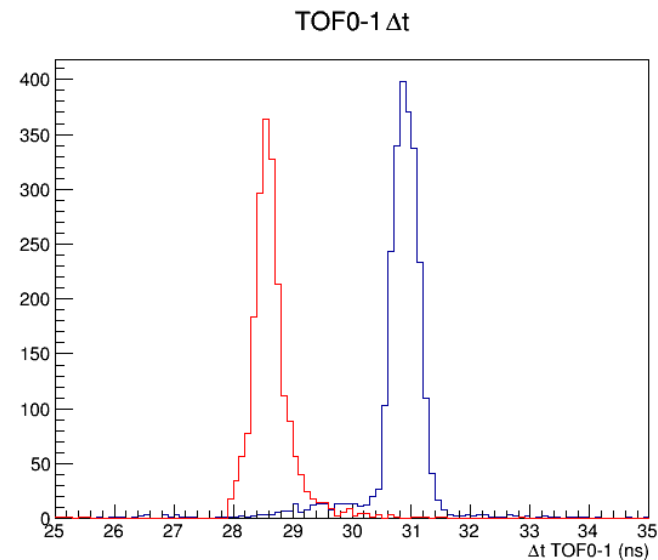
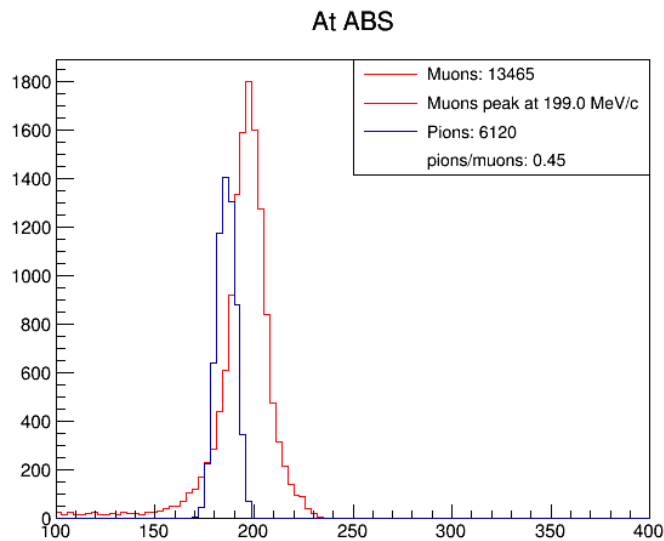
D2		240	242	244	246	248	250	252
Muons after D1		999674	932297	944584	937385	939777	941702	940836
Muons after ToF1		22072	20661	21019	20775	20560	20264	20121
Before ABS	Muons	13857	12946	13465	13211	13140	12887	12813
	Muons norm	1.39%	1.39%	1.43%	1.41%	1.40%	1.37%	1.36%
	Pions	6462	6006	6120	6068	6175	5955	5818
Pions fraction		46.63%	46.39%	45.45%	45.93%	46.99%	46.21%	45.41%
Muon peak (MeV/c)		199	199	199	199	199	199	199

200 MeV/c
beam:



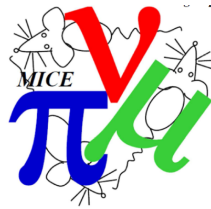
Chosen settings

200 MeV/c
beam:



Beam	D1 selection - P(0)	D2 selection - P(sol)
140	198	198
170	220	220
200	246	244
240	286	284

...always speaking in term of the magic spreadsheet values



Match in the tracker

- Match in the center of USCenter assuming **3T**:

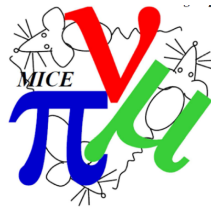
	140	170	200	240
P_z [MeV/c]	150	170	200	245
$\text{Th}(\beta_\perp)$ [cm]*	33.3	37.8	44.4	54.4

- Using Ao's cooling channel currents (for a 200 MeV/c beam):

β_\perp [cm]	72.0	34.1	25.2	35.8
--------------------	------	-------------	------	------

- Playing with the quads get some effects:

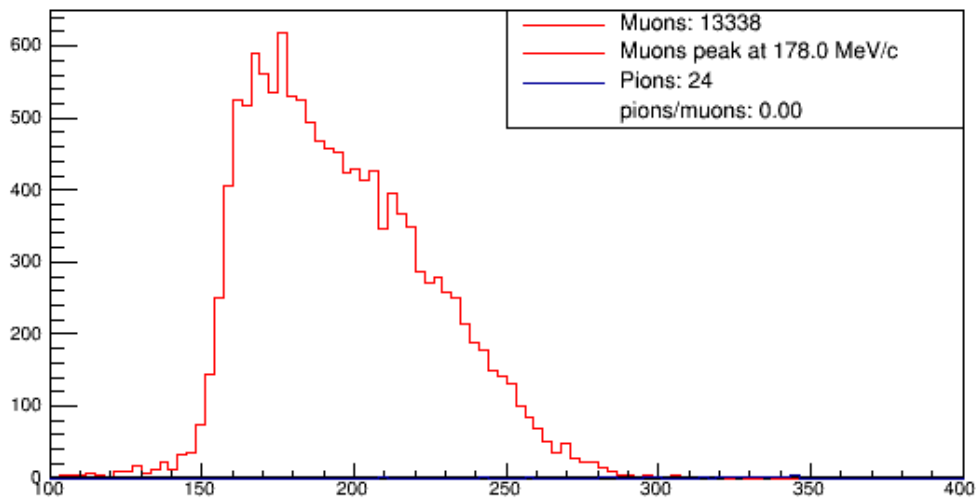
β_\perp [cm]	67.2 (+40%)		33.0 (-50%)	52.9 (+50%)
--------------------	-------------	--	-------------	--------------------



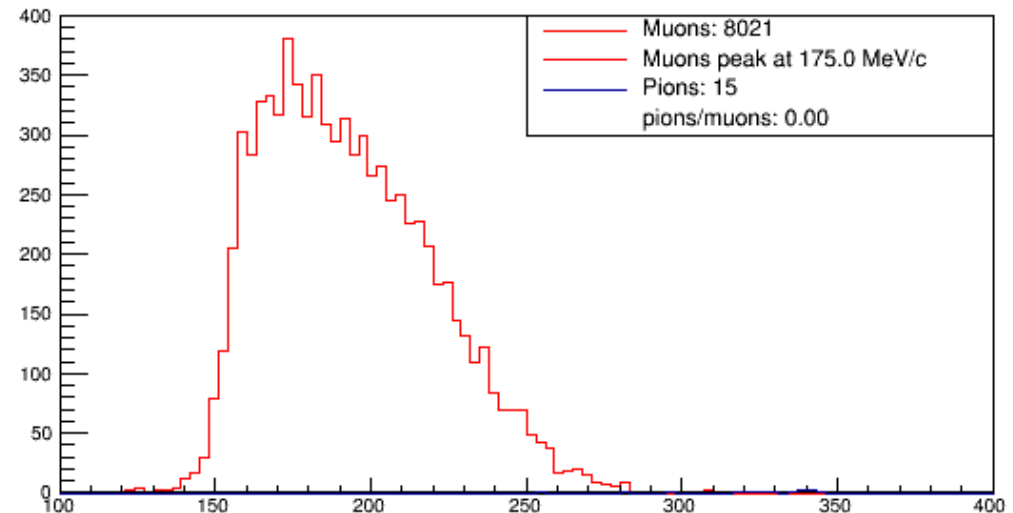
Comparison with muon beam

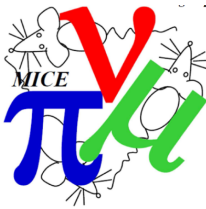
- TAG: **3-200+M0**
- PA=83 mm, DS ON
- Magic Spreadsheet: $P(0)=390/P(\text{sol})=231$
 - $P(\text{diffuser})=190.4 \text{ MeV/c}$
- Peak after TOF1 $\sim 178 \text{ MeV/c}$
- Peak before ABS $\sim 175 \text{ MeV/c}$

After TOF1



At ABS





Run plan

- Optimizing the optics using the proposed settings
- Run with every setting and different PA values
 - Comparison with G4BL
 - Rate at TOF0 vs PA
 - If we change the PA we need to redefine the momentum selection (same for the diffuser I guess)
 - Rate comparison with the nominal muon beams
- Pion contamination with SSU ON