



Physics programme and Step IV data taking plan



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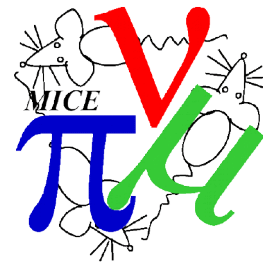


Status



- Completed all Step I publications
 - **Published:** Pion contamination in the MICE muon beam
 - **Published:** Electron-Muon Ranger: performance in the MICE Muon Beam
- **Three further publications** in progress
 - Direct measurement of emittance using the MICE scintillating fibre tracker
 - Scattering of 240 MeV/c muons with gaseous xenon in MICE
 - The MICE Demonstration of Ionization Cooling
- Plans
 - Step IV lattice
 - Step IV data taking plan

Data taking update

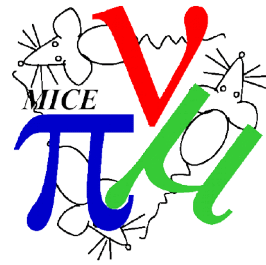


MPB
28th Oct



September 21 st – 22 nd	SSU at 1.5 T
September 25 th – 29 th	Ckov momentum scan Magnetic field remnant study Beam polarisation measurement
October 7 th	4 T in SSU
October 14 th	TOF0 alignment
December 3 rd - 7 th	FC alignment study
December 13 th - 16 th	Scattering in Xenon and empty
February 23 rd – March 24 th	Alignment studies Empty absorber data Scattering in LiH Pionic beamline studies

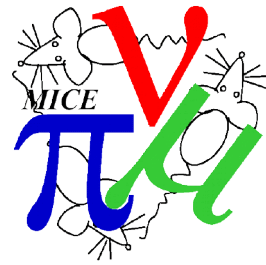
Summary of Data Analysis



Measurement	Coordinator	Data Taking	Final Analysis	Write up
Step IV				
Magnet Mapping - Axes	V. Blackmore/J. Cobb	Complete	Complete	MICE Note 481
Magnet Mapping - Coil Geometries	V. Blackmore/J. Langlands	Complete	In progress	Not started
Tracker Alignment – least squares	J. Nugent	Complete	In progress	MCS Paper
Tracker Alignment – residuals	E. Drielsma	Complete	Complete	MICE Note
PID Detector Alignment	E. Drielsma	Complete	Complete	MICE Note
Beamline Commissioning – u/s	V. Blackmore	Complete	Complete	MICE Note 476
Beamline Commissioning – d/s	V. Blackmore	In progress	In progress	Not started
Upstream detector resolution and efficiencies	V. Blackmore	Complete	In progress	Paper
	T. Mohayai/S. Wilbur	Complete	In progress	Paper
Upstream PID – cut based				
Upstream PID – log likelihood	C. Pidcott	Complete	Not started	Not started
Downstream/Global resolution and efficiencies	M. Uchida	In progress	Not started	Not started
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Magnet alignment – cycloid fit	C. Rogers	In progress	In progress	Not started
Beam quality	C. Rogers	Not started	Not started	Not started
First emittance reduction	C. Rogers	Not started	Not started	Not started
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Non-linear optics	R. Ryne	Not started	Not started	Not started
MCS - field off with Xenon	J. Nugent	Complete	In progress	Paper
MCS - field off with LiH	J. Nugent	Complete	In progress	Paper
MCS - field off with liquid Hydrogen	J. Nugent	Not started	Not started	Not started
MCS - field on	C. Pidcott	Not started	Not started	Not started
Energy loss – measurement based	R. Gardner	Not started	Not started	Not started
Energy loss – minimise residuals	D. Maletic	Not started	Not started	Not started
Beam polarisation	S. Middleton	Complete	In progress	Thesis

Magnet mapping

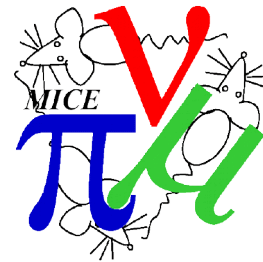
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Hardware commissioning
with **no B-field**

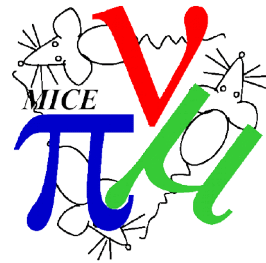
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Hardware commissioning with upstream magnets and detectors

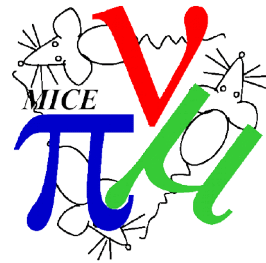
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Hardware
commissioning with
**Upstream and
downstream
magnets and detectors**

Summary of Data Analysis

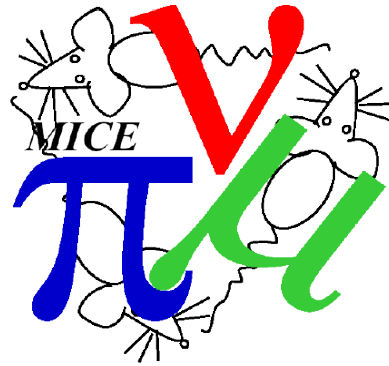


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Physics measurements



Data Taking Plan



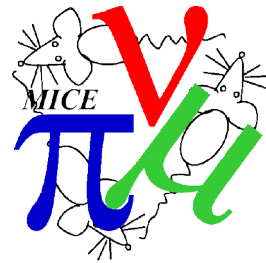
Run Plan - dates



	Start	Finish	2016										2017			Days	
			FY 2016/17														
			Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Nom.		
Cycle 2016/01	12/04/2016	20/05/2016	█														38
Cycle 2016/02	28/06/2016	29/07/2016				█											31
Cycle 2016/03	13/09/2016	28/10/2016						█									45
Cycle 2016/04	15/11/2016	16/12/2016								█							31
Cycle 2016/05	14/02/2017	31/03/2017												█			45

- Spectrometer solenoids
 - Estimated ready in June
- Liquid hydrogen absorber
 - Estimated earliest date mid-August 2016

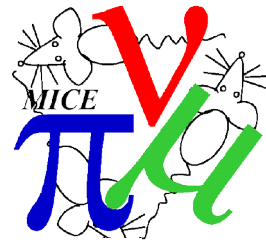
Step IV Lattice – no M1D



variable	flip, 140	flip, 200	flip, 200 ($x_4 \leq 185$)	flip, 240	sol, 140	sol, 200	sol, 240
x_1	0.83	0.72	0.72	0.80	0.80	0.77	0.89
x_2	142.56	168.13	233.49	251.62	132.76	249.89	222.69
x_3	125.55	261.81	262.59	150.98	205.79	276.14	146.06
x_4	180.83	221.55	184.91	126.80	65.21	86.61	64.09
x_5	-191.34	-233.37	-237.68	-244.00	223.01	208.29	161.48
x_6	-0.73	-0.74	-0.74	-0.70	0.73	0.74	0.70
$\Delta\epsilon/\epsilon_i$	-7.4%	-4.0%	-3.5%	-2.2%	-4.6%	-3.5%	-2.3%
T	92%	92%	93%	90%	91%	92%	90%

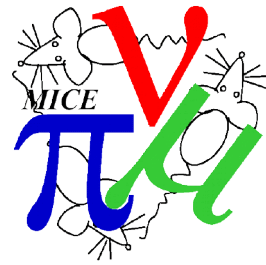
- Lattice optics defined for "no M1D" settings
 - Expect to be able to observe normalised emittance reduction
- Currently plan minimal running in solenoid mode
 - Due to lack of available time
 - Settings are prepared nonetheless

Step IV Lattice – no M1D or M2D

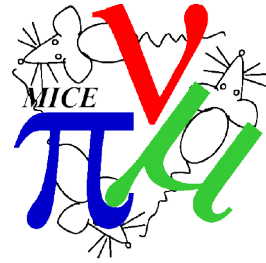


variable	flip, 140 (low T)	flip, 140 (high T)	flip, 200 (low T)	flip, 200 (high T, low x_4)	sol, 140 (low T, no high T)	sol, 200 (high T)	sol, 240 (high T)
x_1	0.71	0.77	0.89	0.70	0.65	0.76	0.65
x_2	80.00	169.49	153.19	125.73	172.39	236.83	158.43
x_3	158.14	208.96	251.15	133.93	242.20	135.21	132.32
x_4	172.05	118.23	224.99	88.85	56.15	55.98	64.11
x_5	0	0	0	0	0	0	0
x_6	-0.56	-0.53	-0.5	-0.51	0.57	0.54	0.57
$\Delta\epsilon/\epsilon_i$	12.8%	6.8%	6.3%	1%	8.2%	2.6%	2.7%
T	72%	80%	74%	85%	73%	82%	80%

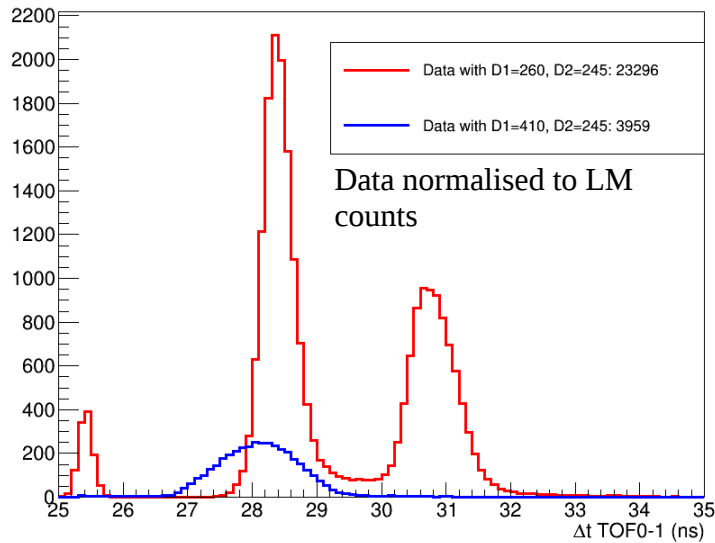
- Lattice optics defined for "no M1D or M2D" settings
 - Magnetic field in SSD marginal for measurement of emittance reduction
 - Transmission at uncomfortable level for measurement of emittance reduction



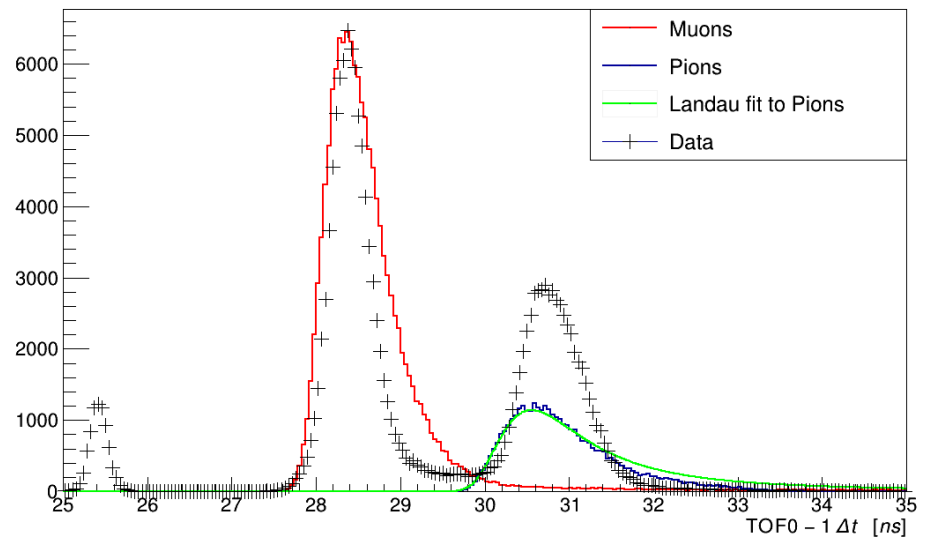
- 2016/01
 - Spectrometer development and SSD realignment
 - ~ 3 weekends of data to enhance zero absorber data set
 - Depending on water chiller availability
- 2016/02 (32 days)
 - Beamline commissioning
 - Magnet and channel commissioning
 - Baseline measurements for LiH scattering and energy loss
- 2016/03 (45 days)
 - Liquid absorber empty and full measurements
 - Decision to power M2 in SSD needs to be made
 - Places risk on further data taking
 - Unlikely absorber will be reinstalled
- 2016/04 (31 days)
 - Lithium Hydride absorber measurements



TOF0-1 Δt

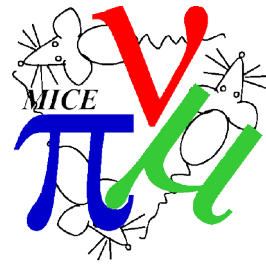


TOF deltaT (MC vs Data)



- Use of a pion beamline gives much better rate
- MC studies indicate very good purity from simple TOF cut
- Looks very promising
 - Need to reoptimise beamline optics

Summary



- Step I publications are complete
- Three further collaboration publications are in progress
- Redefined optics have been developed without M1D
- Redefined optics have been developed without M1D and M2D
 - Uncertainty as to whether an emittance reduction measurement can be delivered in this configuration
- MICE collaboration continues to track construction and update run plan appropriately