

Report by the Review Panel of the SPS M2 beam line

141st SPSC Meeting – 14th April 2021

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Jun					Jul					Aug					Sep				Oct				Nov		
Week	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	
Machine																									
North Area	M2 option 1				SPS & TT20 Setup 7	NA Setup 7	NA58 COMPASS 126																		
	M2 option 2				SPS & TT20 Setup 7	NA Setup 7	NA58 COMPASS 65										Amber 21			NA64 21		MUON-e 19			

- COVID continues to seriously impact planning of 2021 (and beyond) running
- review status of experiments in April (or even June) and potentially adjust pilot-run schedule
- general question to Committee on how to deal with COVID-related delays and run shortenings and corresponding requests for beam time that came (and were approved) before the pandemic
 - ★ often enough the scientific motivation did not change and delays out of control of proponents
 - ★ one approach: simply carry over these programs to 2022 (maybe with adjustment of overall lengths)
 - ★ concerns not only EHN2 but also, e.g., NA61, NA62, NA65

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Eva Barbara Holzer at SPSC:

Experimental facility	Start Physics	End Physics	Duration [weeks]
ISOLDE	21.06.2021	15.11.2021	21
SPS North Area p ⁺	12.07.2021	15.11.2021	18

▪ Conflicting requests for SPS M2 beamline → SPSC working group

- **NA58 COMPASS:** SPS M2, 15 weeks requested
- **NA64mu:** SPS M2 (test-beam), 2 weeks requested
- **MUonE:** SPS M2 (test-beam), 3 weeks requested
- **AMBER:** SPS M2 (test-beam), 3 weeks requested



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AMBER

AMBER counts on 20 days pilot run in 2021.

Crucial to validate the TPC design and to prepare for the physics run. Synergies or optimization are possible with COMPASS run. TPC already at CERN, being refurbished. Tracking based on already existing ALPIDE silicon trackers. Aggressive schedule. Design tracking (Si + SciFi) and upgraded DAQ likely not ready (only parasitic tests).

Goals: Measurement of beam ionization noise at different intensities.

Measurement temperature and pressure influence on the drift time.

Evaluation of new anode segmentation layout (energy resolution, proton tracking and event matching).

Test new readout system, high-level trigger and slow control.

Test gas circulation-system and finalize safety procedures.

Aug					Sep				
31	32	33	34	35	36	37	38	39	
ATLAS FCAL PULSE 7	STORMKLEVER 7	CMS HGAL 7	NA61 SHINE 7	ATLAS ZDC 7	NA61 SHINE 7	NA61 SHINE 7	NA61 SHINE 7	NA61 SHINE 7	
CAL 18	NA64e 28			GIF 7	LHCf 14				

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NA64mu

NA64mu counts on 1+1 week pilot run in 2021.

Crucial to understand the beam parameters and background in preparation of the 2022 physics run. Main equipment expected to be at CERN in June (but potential delays due to COVID unpredictable). Backup solution is to move (part of) the H4 equipment to the M2 beam line just after the electron run (on a pretty tight schedule).

- Goals:
- Study and optimisation of the M2 beam and beam halo.
 - Trigger and accidental trigger rates measurement running at $10^6 \mu/\text{spill}$.
 - Hadron contamination in the M2 beam.
 - Hermeticity study and background level with at least $\sim 10^9$ MOT and cross-check with simulations.

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MuonE

MUonE would like to keep part of the foreseen 3 weeks in 2021.

It has downscoped its aims for 2021 to a test run with one single station (6 tracking modules, a 2-3 metres long installation). The aim would be to start commissioning the experimental apparatus in real conditions of beam, environment, etc. Measurements related to angular precision will not be possible in such a downscoped and shortened 2021 test run.

MUonE will need to request beam time in early 2022

to run with the 2+1 stations (18 tracking modules initially foreseen). This is needed to evaluate angular precision and efficiencies, enabling them to proceed toward the preparation of the Proposal of Experiment.

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Pilot run readiness and schedule

All experiments beyond schedule, but most significant impact on MuonE.

NA64 μ and AMBER pilot runs are instrumental to prepare the upcoming physics runs. Their preparatory plans anticipate backup solutions to secure the crucial goals.

MuonE would anyway need a pilot run in 2022 to meet an essential validation.

To be explored if a downscoped test could be possibly run as parasitic downstream of COMPASS.

Competing requests resulted in a crowded schedule with no contingency and risk of inefficiency.

2021 schedule maintains a degree of flexibility: could possibly be re-arranged by making COMPASS run longer.