



MuCol

Study News



Nadia reelected at ICB chair

Progress on the technologies and design

- Will be part of ESPPU report
- Short study update at PECFA meeting

<https://indico.cern.ch/event/1361604/>

Now have a second detector study

Started initial siting studies for demonstrator and collider at CERN

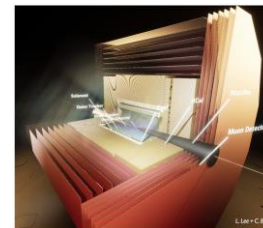
- Also some work at FNAL

Working on the timeline

US is starting to join

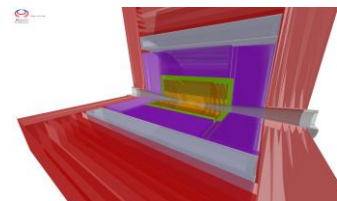
MAIA

(Muon Accelerator Instrumented Aperature)



MUSIC

(MUon System for Interesting Collisions)



Preliminary parameters

Presentation of cooling cell conceptual design

Mini-Workshop on pulsed magnets

Release of simplified detector performance model (DELPHES card or/and similar format)

Tentative design of the interaction region

Tentative optics of the collider ring and pulsed synchrotrons



IMCC Collaboration Development



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New partners joining

- From different regions
- Interest expressed by other potential partners in Japan

In particular US partners are joining/plan to join

- US Muon Collider Inauguration Meeting beginning of August at FNAL showed the strong interest (again)
- Full integration with US planned and started CERN-DoE agreement in preparation

Need to move forward with US, while US is still getting organised

In particular R&D plan has to be common plan

Also added some other experts from outside the collaboration

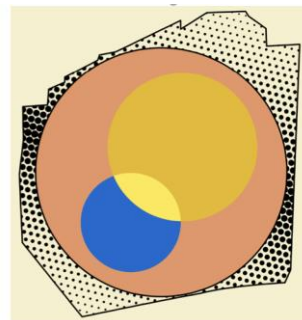
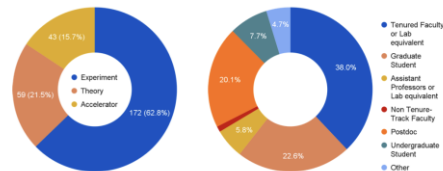
Use Organization Committee of FNAL and additional members as de facto US organisation

- Contributing authors of ESPPU report

“Open” publications rules are now very important during the transition

Anyone can send papers for IMCC endorsement to IMCC-PSC@cern.ch

- In early August, held an open meeting of the US community
 - 274 (+25 virtual) participants



- Michael Bege (BNL)
- Pushpa Bhat (Fermilab)
- Philip Chang (University of Florida)
- Sarah Cousineau (ORNL)
- Nathaniel Craig (University of California, Santa Barbara)
- Sridhara Dasu (University of Wisconsin)
- Karri DiPetrillo (University of Chicago)
- Spencer Gessner (SLAC)
- Tova Holmes (University of Tennessee)
- Walter Hopkins (ANL)
- Sergo Jindariani (Fermilab)
- Donatella Lucchesi (University of Padova/INFN)
- Patrick Meade (Stony Brook University)
- Isobel Ojalvo (Princeton University)
- Simone Pagan Griso (LBNL)
- Dikys Stratakis (Fermilab)

And Mark Palmer, Stephen Gourlay, Kevin Black, Lawrence Lee



IMCC Partners



IEIO	CERN
FR	CEA-IRFU
	CNRS-LNCMI
	<i>Mines St-Etienne</i>
DE	DESY
	Technical University of Darmstadt
	University of Rostock
	KIT
UK	RAL
	UK Research and Innovation
	University of Lancaster
	University of Southampton
	University of Strathclyde
	University of Sussex
	Imperial College London
	Royal Holloway
	University of Huddersfield
	University of Oxford
	University of Warwick
	University of Durham
	University of Birmingham
	University of Cambridge

IT	INFN
	INFN, Univ., Polit. Torino
	INFN, LASA, Univ. Milano
	INFN, Univ. Padova
	INFN, Univ. Pavia
	INFN, Univ. Bologna
	INFN Trieste
	INFN, Univ. Bari
	INFN, Univ. Roma 1
	<i>ENEA</i>
	INFN Frascati
	INFN, Univ. Ferrara
	INFN, Univ. Roma 3
	INFN Legnaro
	INFN, Univ. Milano Bicocca
	INFN Genova
	INFN Laboratori del Sud
	INFN Napoli
Mal	Univ. of Malta
EST	Tartu University
PT	LIP

Signed MoC (58), requested MoC, contributor

SE	ESS
	University of Uppsala
NL	University of Twente
FI	Tampere University
LAT	Riga Technical University
CH	PSI
	University of Geneva
	EPFL
BE	Univ. Louvain
AU	HEPHY
	TU Wien
ES	I3M
	CIEMAT
	ICMAB
China	Sun Yat-sen University
	IHEP
	Peking University
	Inst. Of Mod. Physics, CAS
KO	Kyungpook National University
	Yonsei University
	Seoul National University
India	CHEP

US	Iowa State University
	University of Iowa
	Wisconsin-Madison
	<i>University of Pittsburgh</i>
	Old Dominion
	Chicago University
	Florida State University
	RICE University
	Tennessee University
	<i>MIT Plasma science center</i>
	Pittsburgh PAC
	Yale
	<i>Princeton</i>
	<i>Stony Brook</i>
	Stanford/SLAC
	...
DoE labs	FNAL
	LBNL
	JLAB
	BNL
Brazil	CNPEM



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ESPPU



Goals for ESPPU is to provide document with

- **Assessment of muon collider** concept, technologies and work progress
- An **R&D plan** for the next 5 and 10 years
- **Implementation considerations** (including site, timeline, ...)

Many contributors for the different parts, also from the US:

Core editorial team: Federico Meloni (chair), Chris Rogers (deputy chair), **Kevin Black**, Christian Carli, **Steve Gourlay**, **Sergo Jindariani**, Roberto Losito, Donatella Lucchesi, **Patrick Meade**, Elias Metral, **Simone Pagan Griso**, Nadia Pastrone, Daniel Schulte, **Diktys Stratakis**, Taylor, Andrea Wulzer

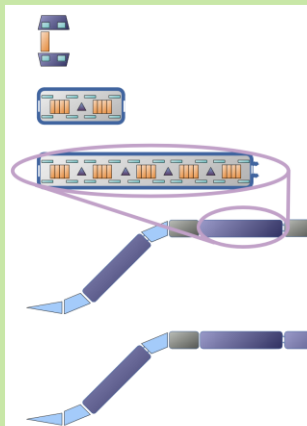
LDG plans to submit a report as well

- Will review our progress February 24 (3-day meeting), chair is N. Holtkamp
- See Dave's presentation at <https://indico.cern.ch/event/1361604/>

Please let us know about national events to prepare the ESPPU

Ultimate 6D cooling technology integration

- Components: Magnets, RF systems, absorbers, vacuum, instrumentation, cryogenics, ...
- Integration, operation, performance with beam
- Gradual upgrades as cell design evolves, confidence grows
- Will be important part of commissioning preparation after the decision to build the muon collider



Staged implementation

- Components
- RF test stand (high magnetic field)
- Module test with power
- Module test with beam
- Improved module string



Detailed studies of site at CERN ongoing, considering TT7 tunnel
US plan to start detailed study at FNAL

Effort **ramp-up** in several stages

Modular plan will allow quickly moving forward

- adjust to developments in Europe and the US



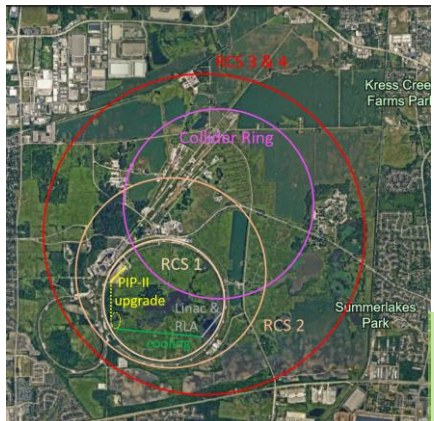
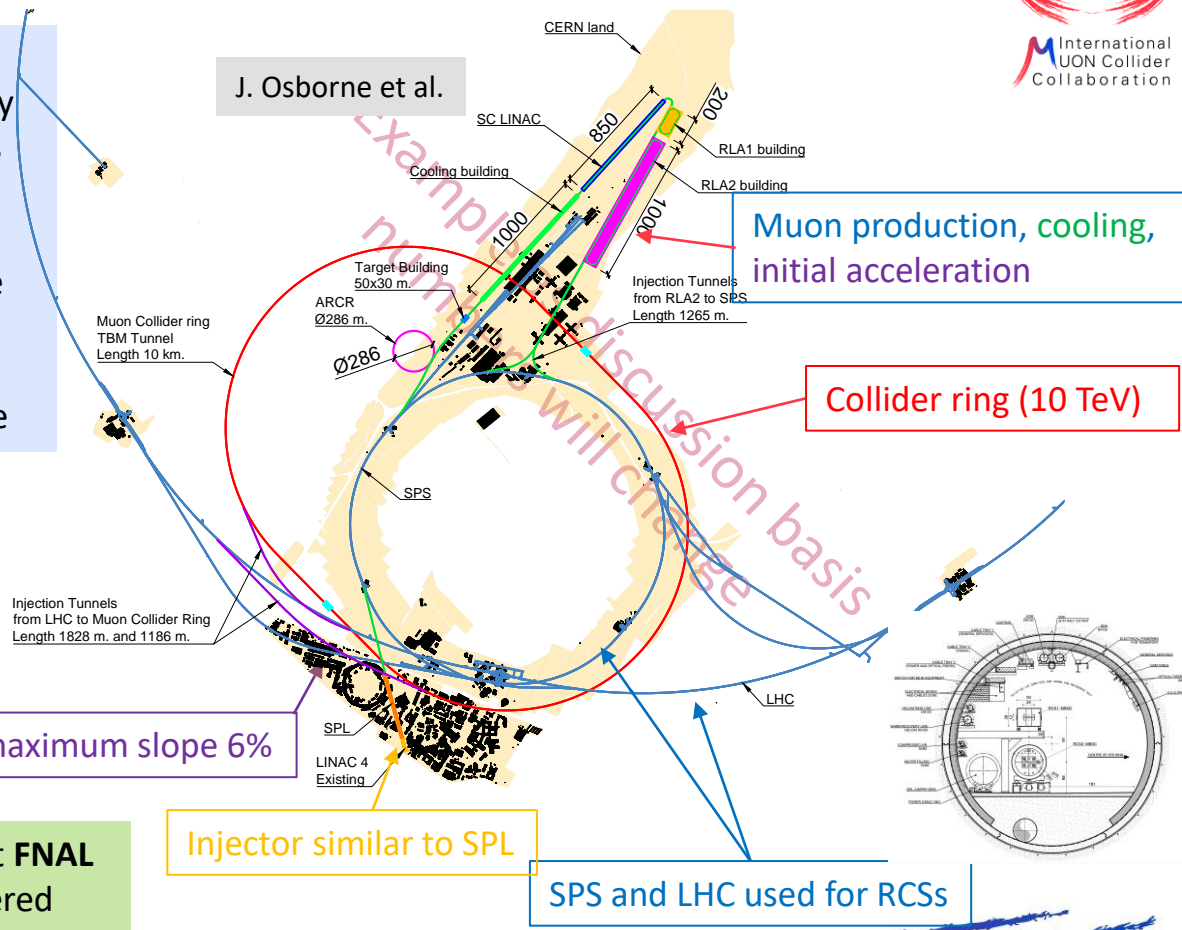
Exploratory Site Studies



At CERN, first look is promising:

- First collider ring site identified that largely **mitigates neutrino flux from experiments**
 - Some more work required
- SPS and LHC tunnels reused
- All construction on CERN land (maybe one experiment not)
- Energy stages maybe 2.5 and 8 TeV
- More studies will be required in the future

J. Osborne et al.



Initial concepts at **FNAL** are being considered

Reserve

Expect to be ready for implementation in 15 years

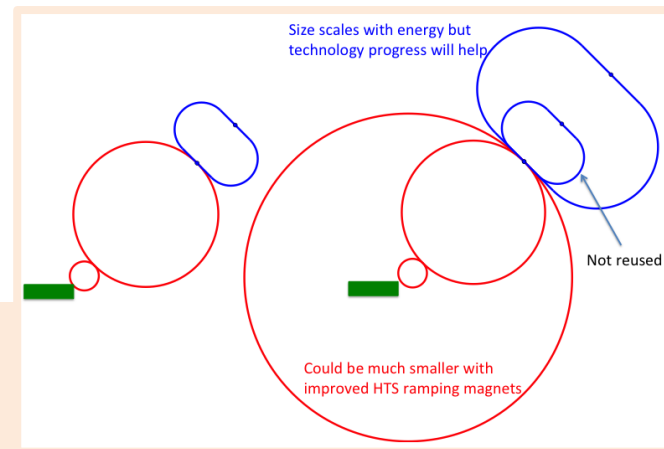
- **Detector**
- **Muon cooling technology**
- **HTS solenoid technology**
- **Nb₃Sn dipoles** for collider ring, maybe lower field HTS
- High field HTS dipoles for collider ring are likely later

Energy staging

- Current 3 TeV, design takes lower performance into account
- Cost split over two stages, little increase in integrated cost

Luminosity staging

- Longer collider ring arcs and less performant interaction region lead to less luminosity in first stage
- Can later upgrade interaction region (as in HL-LHC)
- Full cost at first stage



Parameter	Unit	3 TeV	10 TeV	10 TeV	10 TeV
L	$10^{34} \text{ cm}^{-2}\text{s}^{-1}$	1.8	20	tbd	13
N	10^{12}	2.2	1.8	1.8	1.8
f_r	Hz	5	5	5	5
P_{beam}	MW	5.3	14.4	14.4	14.4
C	km	4.5	10	15	15
	T	7	10.5	7	7

Potential Timeline (Fast-track 10 TeV)

Only a basis to start the discussion, being reviewed

