

SuperNEMO @ LSM in 2020 and 2021

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for the SuperNEMO collaboration

LSM Users Annual Meeting, remote, December 14th, 2020



Scientific and technical summary of LSM activities in 2020

- Calorimeter commissioning with data taking
- Gas tightness, some overpressure seen in Tracker
- Gas system installation at final location
- Calibration systems commissioning with data taking (LI and ADS)
- Simulation and analysis work during lockdown periods
- Two students at LSM in Spring 2020 (Will, Matteo)
- Magnetic field review : May 15, 2020
- Clean up for arrival of DAMIC
- **Tracker lifting** : September 7 to 18, 2020 (see next slides)
- Radon factory review : October 22, 2020
- Two remote collaboration meetings
- Yves Lemière on site for one year, left in July \rightsquigarrow Emmanuel Chauveau will make longer stays

Scientific and technical summary of LSM activities in 2020

The gas system



Clean up the DAMIC area



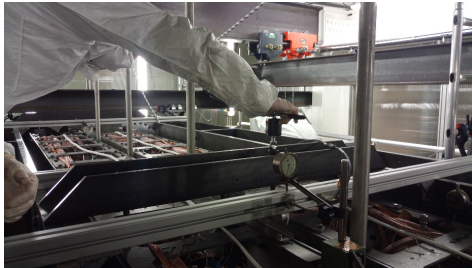
Tracker lifting

- July 2019 : observe a 6 mm sagging of the center of the tracker top beam shortcuts on many field wires at the center of the tracker (hundreds of affected cells) \leadsto make the detector **non operating**
- Fall 2019 : review and diagnose, procedure + tools
- April 2020 : lifting operation schedules
 \leadsto delayed up to September 2020
- September 2020 : dedicated team working at LSM
 \leadsto successfull operation

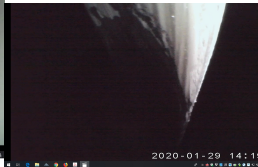


Scientific and technical summary of LSM activities in 2020

Top beam and jauges



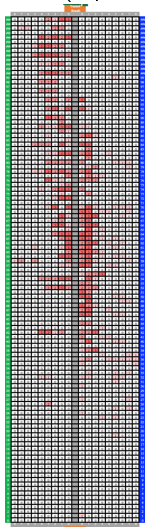
Electrical tests



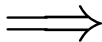
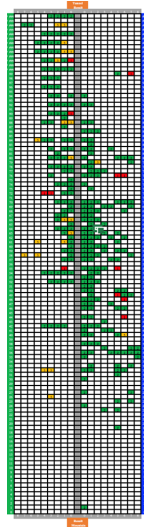
Wires and source foils endoscopy

Scientific and technical summary of LSM activities in 2020

Before (top view)



After 4 mm lifting



The tracker lifting team



- Covid health crisis : Travel issues for collaborators (UK...)
- Man power : critical issue, need support
- Official request for special support from IN2P3 labs (IN2P3, October 2020) :
 - 5 task cards published
 - support from LSM (mechanics; JL, Ch.), under consideration at LAPP (from mid-2021)
- End of 3 theses in France (Cloé, Axel, Hichem)
- Start of 2 theses in France (Malak, Xalbat)

Calorimeter commissioning data analysis in 2020

A muon through the italian calorimeter wall :

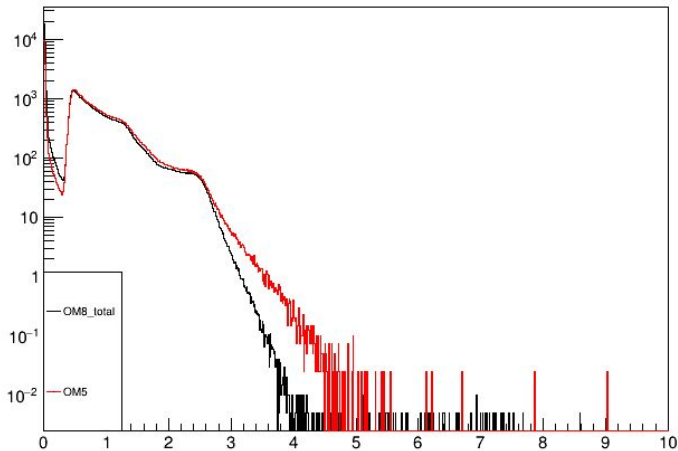
ITALY

		G:0.15	G:0.14	G:0.13	G:0.12	G:0.11	G:0.10	G:0.9	G:0.8	G:0.7	G:0.6	G:0.5	G:0.4	G:0.3	G:0.2	G:0.1	G:0.0						
X:0.1.15	X:0.1.15	M:0.18.12	M:0.18.12	M:0.17.12	M:0.16.12	M:0.15.12	M:0.14.12	M:0.13.12	M:0.12.12	M:0.11.12	M:0.10.12	M:0.9.12	M:0.8.12	M:0.7.12	M:0.6.12	M:0.5.12	M:0.4.12	M:0.3.12	M:0.2.12	M:0.1.12	M:0.0.12	X:0.0.15	X:0.0.15
X:0.1.14	X:0.1.14	M:0.18.11	M:0.18.11	M:0.17.11	M:0.16.11	M:0.15.11	M:0.14.11	M:0.13.11	M:0.12.11	M:0.11.11	M:0.10.11	M:0.9.11	M:0.8.11	M:0.7.11	M:0.6.11	M:0.5.11	M:0.4.11	M:0.3.11	M:0.2.11	M:0.1.11	M:0.0.11	X:0.0.14	X:0.0.14
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X:0.1.7	X:0.1.7	M:0.18.4	M:0.18.4	M:0.17.4	M:0.16.4	M:0.15.4	M:0.14.4	M:0.13.4	M:0.12.4	M:0.11.4	M:0.10.4	M:0.9.4	M:0.8.4	M:0.7.4	M:0.6.4	M:0.5.4	M:0.4.4	M:0.3.4	M:0.2.4	M:0.1.4	M:0.0.4	X:0.0.7	X:0.0.7
X:0.1.6	X:0.1.6	M:0.18.3	M:0.18.3	M:0.17.3	M:0.16.3	M:0.15.3	M:0.14.3	M:0.13.3	M:0.12.3	M:0.11.3	M:0.10.3	M:0.9.3	M:0.8.3	M:0.7.3	M:0.6.3	M:0.5.3	M:0.4.3	M:0.3.3	M:0.2.3	M:0.1.3	M:0.0.3	X:0.0.6	X:0.0.6
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X:0.1.4	X:0.1.4	M:0.18.1	M:0.18.1	M:0.17.1	M:0.16.1	M:0.15.1	M:0.14.1	M:0.13.1	M:0.12.1	M:0.11.1	M:0.10.1	M:0.9.1	M:0.8.1	M:0.7.1	M:0.6.1	M:0.5.1	M:0.4.1	M:0.3.1	M:0.2.1	M:0.1.1	M:0.0.1	X:0.0.4	X:0.0.4
X:0.1.3	X:0.1.3	M:0.18.0	M:0.18.0	M:0.17.0	M:0.16.0	M:0.15.0	M:0.14.0	M:0.13.0	M:0.12.0	M:0.11.0	M:0.10.0	M:0.9.0	M:0.8.0	M:0.7.0	M:0.6.0	M:0.5.0	M:0.4.0	M:0.3.0	M:0.2.0	M:0.1.0	M:0.0.0	X:0.0.3	X:0.0.3
X:0.1.2	X:0.1.2																					X:0.0.2	X:0.0.2
X:0.1.1	X:0.1.1																					X:0.0.1	X:0.0.1
X:0.1.0	X:0.1.0																					X:0.0.0	X:0.0.0



Calorimeter commissioning data analysis in 2020

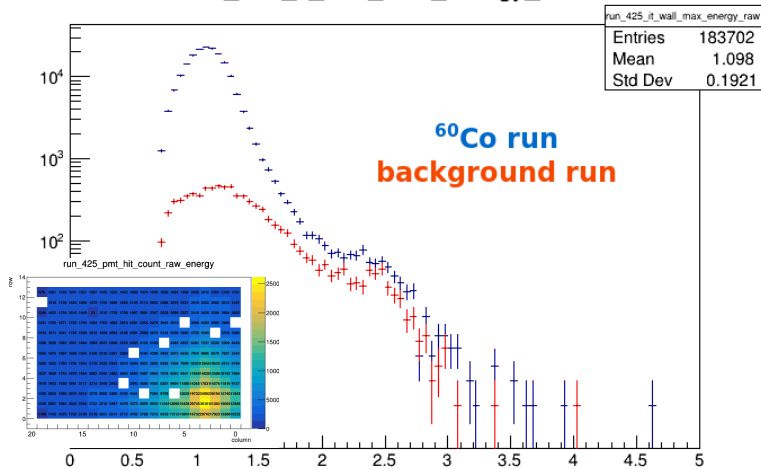
Background measurements :



Calorimeter commissioning data analysis in 2020

^{60}Co calibration runs :

run_425_it_wall_max_energy_raw



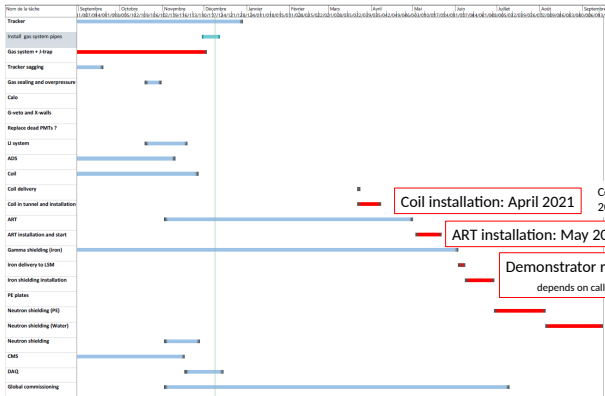
Scientific and technical plans for LSM activities 2021

- Tracker tightness (in progress)
- Ventilation of PMT boxes (air flushing of accumulated He)
- Coil installation
- Anti-radon-tent (ART) installation
- Call of tender for gamma shielding
- Purchase of neutron shielding
- Installation of shielding
- Tracker commissioning (partial tracker comm. will start before)



General calendar for LSM in 2021

In red, the operations involving LSM staff



Coil installation: April 2021

Could be moved forward to February 2021 if gas tightness achieved

ART installation: May 2021

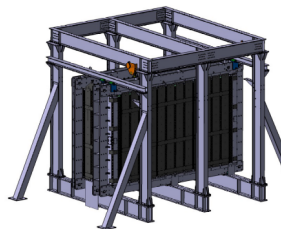
Demonstrator ready for shielding: June 2021
depends on call of tender, probably September



Critical periods and/or activities at LSM in 2021, special requirements

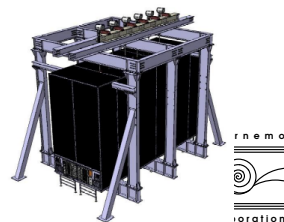
1 Coil installation :

- Transport of coil from IJCLab to LSM and storage at Trivero; then transport into tunnel in 2 shipments
- Installation and crane manipulation of 12 large panels and structure



2 ART installation :

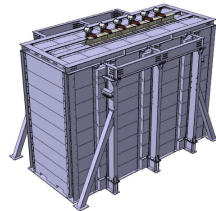
- Material already in Freney
- Need to transport into tunnel, probably 1 shipment
- Installation and crane manipulation of panels and structure



Critical periods and/or activities at LSM in 2021, special requirements

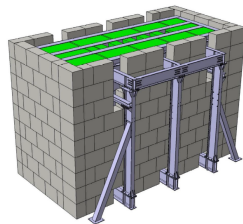
3 Gamma shielding installation :

- 240 tons of Iron in pieces of several tons
- Storage strategy needed
- Transport into tunnel, around 12 shipments
- Installation and crane manipulation of panels and structure



4 Neutron shielding :

- Combination of water tanks and Polyethylene plates



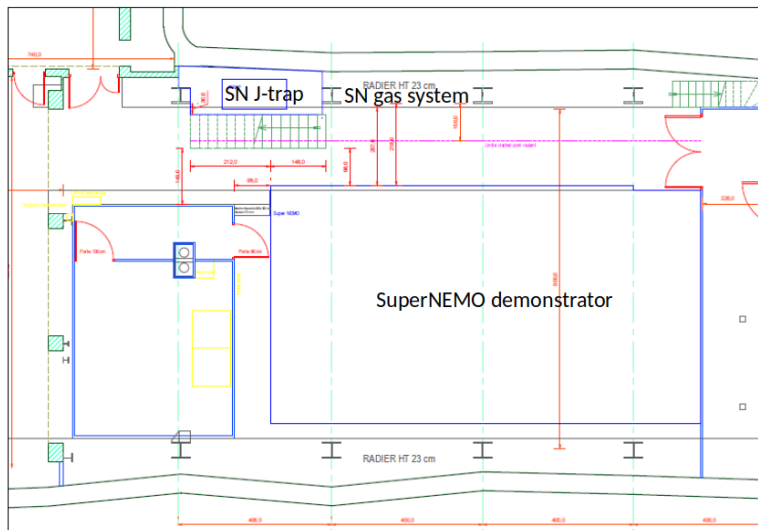
Critical periods and/or activities at LSM in 2021, special requirements

Other tasks and requirements :

- Gas system commissioning
- J-trap installation and restarting NEMO3 piping
- Gas and alcohol consumption (LSM orders)
- And also consumption one frame of 9 He Alphagaz bottles and ethanol "chemical" ou "absolute" >99% (can of 25 L per week)
- Requirements for deradonized air : $180 \text{ m}^3/\text{h}$ @ $10 \text{ mBq}/\text{m}^3$
- Dedicated control room, improvement of the underground working conditions.



Critical periods and/or activities at LSM in 2021, special requirements



Conclusion

- 2020 :
 - A strange year, many things delayed ... but at least the tracker looks in a far better shape now
 - Calorimeter commissioning runs were done (analysis in progress, calibration procedures...)
 - Lot of work done on the tracking chamber's tightness (calorimeter + tracker)
- 2021 :
 - Big operations on SuperNEMO external structures, non parallel : strong impact on LSM activities and demand on staff expertise and logistics,
 - Final big demanding steps : installation of the gamma and neutron shieldings, needs approval of the water shielding space requirement,
 - In parallel, continue commissioning runs on the calorimeter, calibration systems, partial tracker...



collaboration