

SND Project: A letter of intent

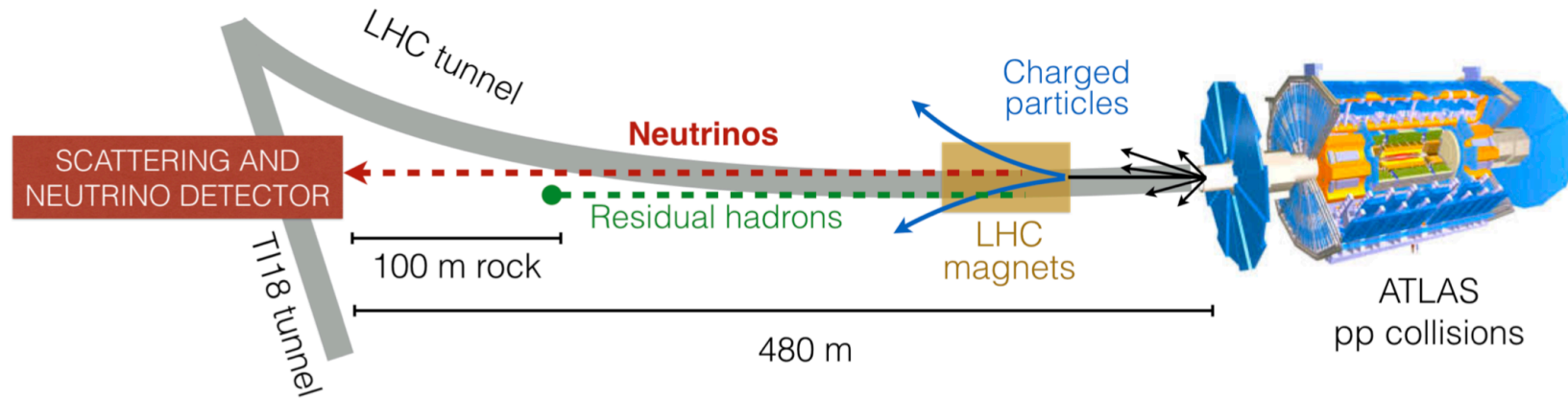
1st collaboration meeting last week: <https://indico.cern.ch/event/959255/>

SND LoI

Letter of Intent

Scattering and Neutrino Detector

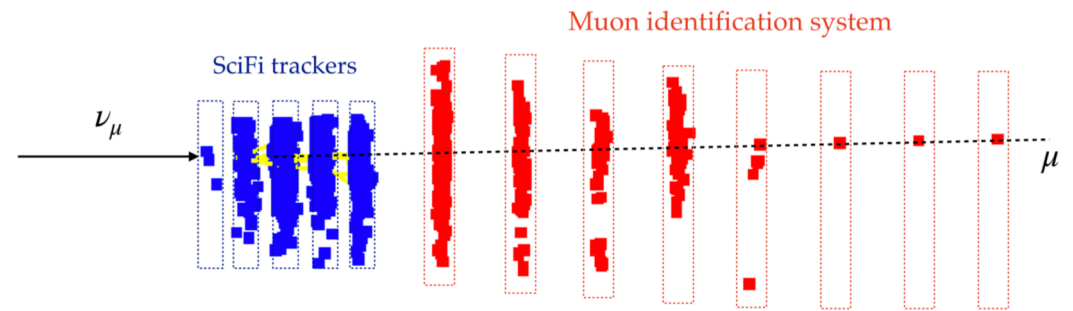
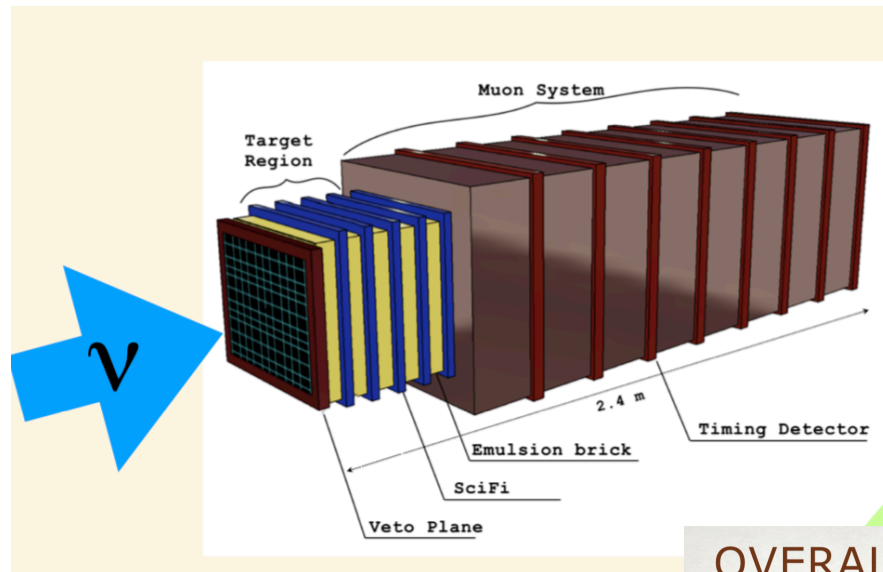
LoI: CERN-LHCC-2020-013; LHCC-I-037
<https://cds.cern.ch/record/2729015/files/LHCC-I-037.pdf>



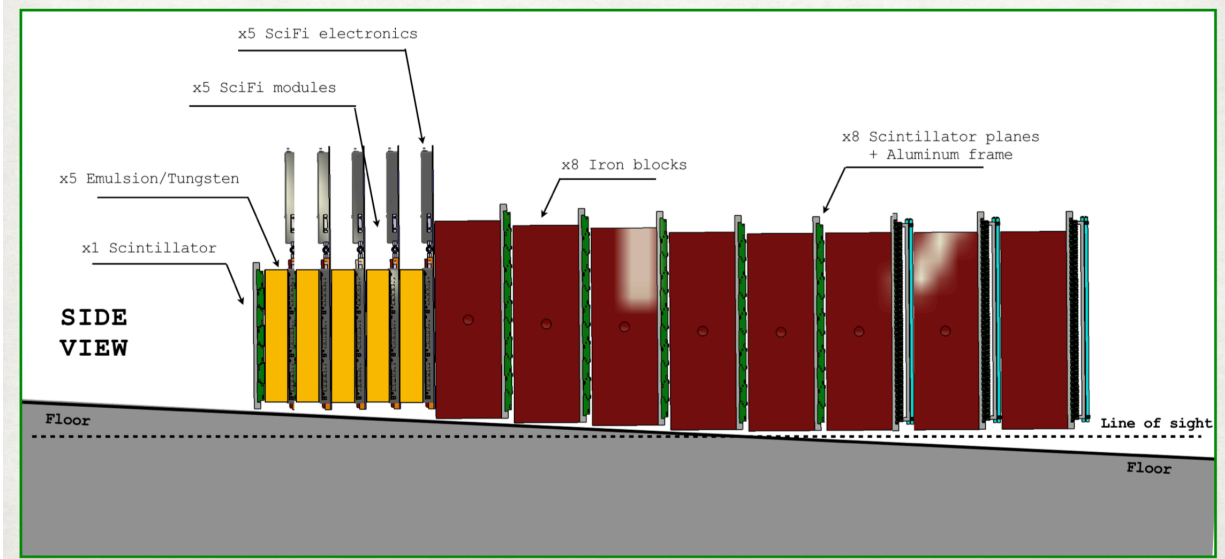
History

- Several projects discussed for measuring TeV energy neutrinos from the LHC (XSEN, FASER-Nu, SND) in '18 & '19
- FASER-Nu approved
- XSEN and SND merged
- All detectors use emulsions (a la OPERA)

SND Detector Proposal



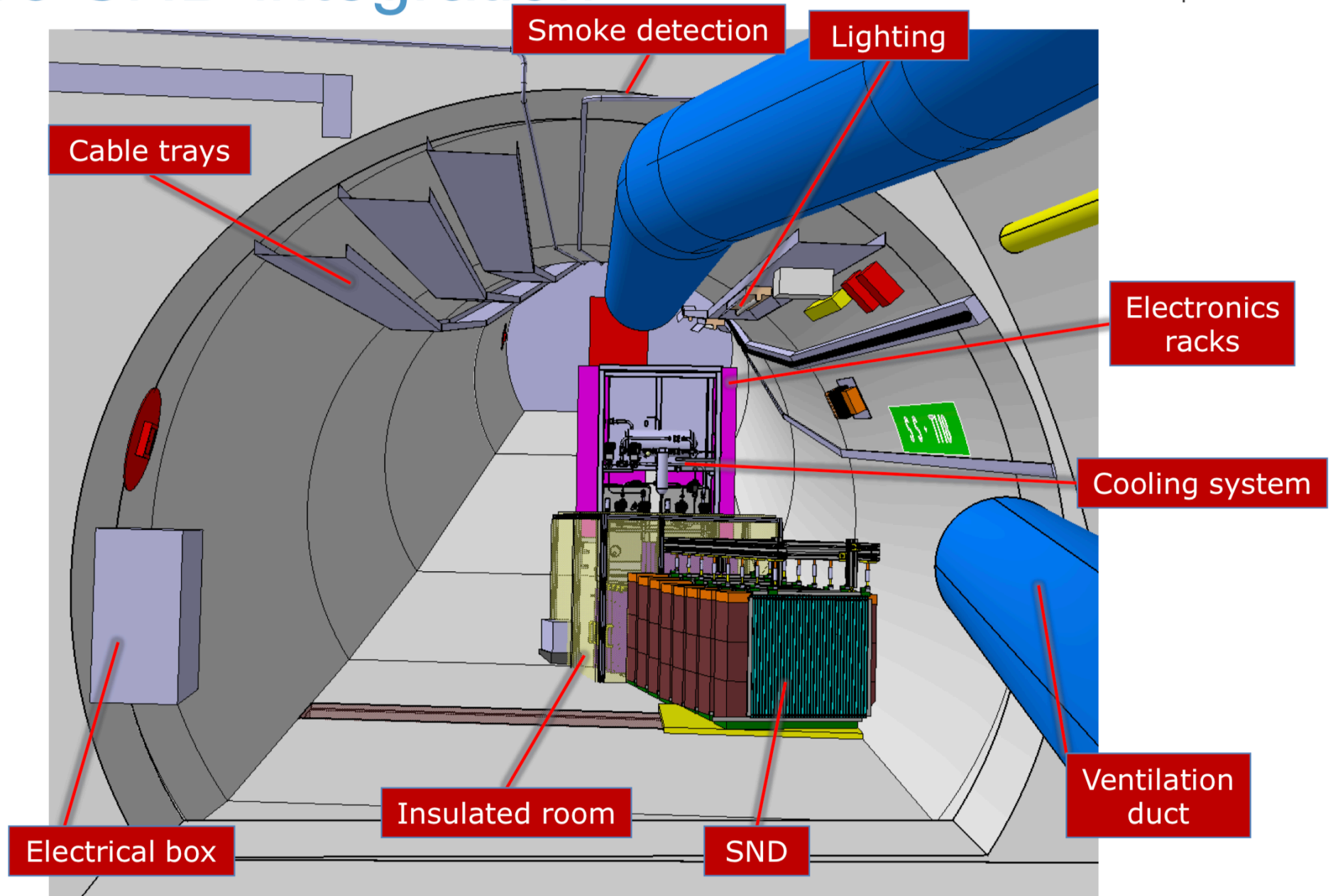
OVERALL LAYOUT



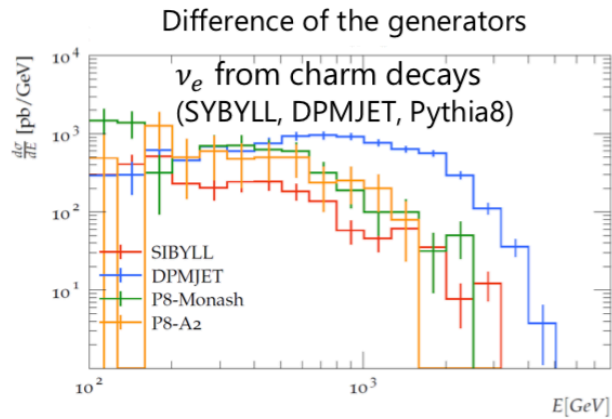
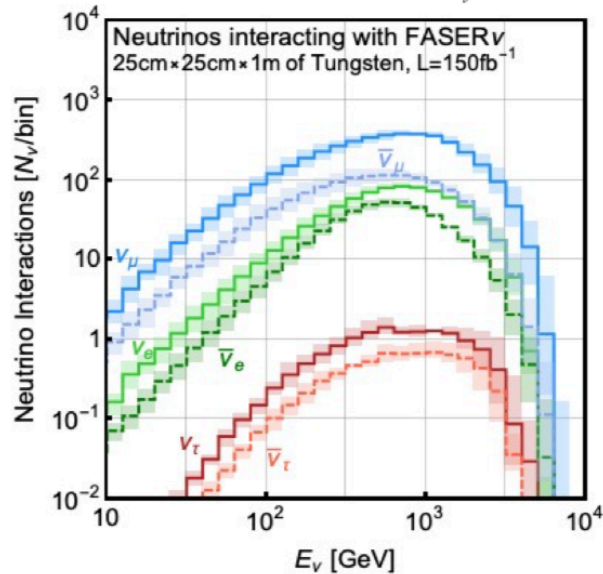
- ▶ **Number of walls:** 5
- ▶ **Passive material:** Tungsten alloy
- ▶ **Total mass:** ~810 kg
- ▶ **Total emulsion surface:** ~46 m²

TI18 SND integration

SND 3D model
provided by A. Di Crescendo
& A. Crupano



SND Physics Targets



Study of neutrino interactions at 2 TeV in the lab

Table 2: (Third column) Integrated neutrino flux for 150 fb^{-1} for the different neutrino flavours at the target region. (Fifth column) Expected number of CC interactions for the different neutrino flavours for 150 fb^{-1} .

Neutrino flavour	$\langle E \rangle$ GeV (incident)	Neutrino Flux	$\langle E \rangle$ GeV (interacting)	CC Interactions Updated config
ν_μ	140	2.6×10^{12}	430	783
ν_e	370	3.4×10^{11}	670	256
ν_τ	410	1.7×10^{10}	710	13
$\bar{\nu}_\mu$	150	2.3×10^{12}	480	324
$\bar{\nu}_e$	380	3.6×10^{11}	725	130
$\bar{\nu}_\tau$	390	1.7×10^{10}	740	5
TOT		5.6×10^{12}		1511

In additions

- Search for Light Dark Matter
- FIPS searches
- Added valuer to FASER-nu?

SND Schedule (evolving)

- 2020: preparation of the hall in T18
- 2021: summer: instalation
- 2022 data taking starting

Detector construction and commissioning



- Essential to check again dimensions of components against the transport paths defined
- Bulk of preparatory works could be done from July onwards, ~1-2 months
- Installation ~2 months?
 - Leaves significantly less time for in-situ commissioning than originally planned
 - Detector commission on the surface
 - We should soon follow LPC and LBOC meetings

For discussion in our group

- There is neutrino physics @ LHC/CERN ☺
- So far I am on it as an observer (via XSEN). Interest from other group members?
- Plans for a TDR iff encouraged by LHCC in November– start this year (2020).
- Builds on prior XSEN and SHIP commitments
- Presently the needs are mostly in global DAQ, trigger... but also physics preparation studies
- I suggested they should to contact Marzio for possible help for eg detector assembly via the NP (the NP helps FASER-nu now). May have to pass SPSC to formally request that.

In addition

- CERN is starting a study for a conceptional design for a muon collider, for the next strategy meeting (D. Schulte organizing)
- One application is neutrino physics through a neutrino factory or at the collider itself.
- NuStorm likely will fit in this study (meeting next Friday)
- Question arises to have neutrino people on board in this study...

- ▶ Upstream Veto detector acts as a veto for charged particles and is located upstream of the Emulsion/SciFi detector
- ▶ Muon system will identify muons and located downstream of ECC/SciFi
- ▶ Both systems comprise scintillating bars read out by SiPMs
- ▶ 3 configurations
 - 1 upstream veto plane
 - 5 upstream muon planes
 - 3 downstream muon planes
- ▶ Veto plane and upstream muon planes roughly modeled after SHiP timing detector

