NP02 plan and update

Week of Jan 13th:

- Continue filing with truck
- Little window of opportunity to access the cryostat roof but not impossible; need the system to be stable and have cryo team available to supervise the system
- => turn ON the TDE (this is a priority but difficult by access and power cut issues this week), and complete fiber connection to the new switch which makes possible sending data from FE to the 2 DAQ systems

Week of Jan 20th:

- End of filling and define the stopping height : given by Top CRP level meters.
- After Jan 22nd, the access is not anymore restricted on the roof
- => test the power supply, HV cable and noise condition during this week
- => With priority to these tests and solving any noise situation before going into the different system commissioning even if cryostat is full
- Monitor and correct geometrically the top CRP horizontality which translate also on the cathode plane horizontality

Summary of the HV coherent noise tests performed so far

Slide from Dario

➢ **20-21 November**. First checks: NP02 HV PS in standard position on the cryostat roof

- Seen that the HV PS introduces significant coherent noise on the top CRPs, noise increasing with HV values set (5-20 kV). This noise should be fixed.
- Measurements with/out the termination resistor and varistor on the shield at the HV FT → termination resistor and varistor make the noise quite worse by more than a factor two, they should not be put
- Checked a few different grounding connections at the level of the HV PS, different braids, floor etc .. → some changes, in principle expected to improve, making the observed noise slightly worse

➢ **3-4 December.** NP02 HV PS still in standard position

- **Connected to HV FT the cold-box HV PS → zero coherent noise observed for the same voltages of the NP02 PS**
- Tested alternative grounding configurations of the NP02 HV PS → worse noise
- Otherwise reproduced, when in the same grounding conditions, the same noise observed on 20-21 November when the NP02 HV PS is switched on

➢ **19 December** NP02 HV PS moved outside the cryostat roof → **turns out to be a very bad configuration**

- In this configuration, dramatic increase in the noise by more than one order of magnitude compared to what measured for the same voltages on 20-21 Nov and on 2-4 Dec
- In this configuration observed for the first time that just the connection of the HV cable to the FT with the HV off increases the noise by more than a factor two with respect to the normal noise. This was not the case in the previous tests. When the HV is switched on, then this noise dramatically increases with the increase of HV value

Tests planning in steps for next week and in the following weeks (discussion between Francesco, Dario, Dominique)

Slide from Dario

- In the current position the HV cable acts as antenna since it is not properly grounded at the cryostat entrance. The noise is then amplified by the HV circuity as a function of the HV level
- The experience with the cold box PS used in NP02 in December shows no noise in the same conditions but that PS was located very close to the HV FT and with the connection cable running on metallic surfaces of the cryostat
- No other sources of coherent noise have been observed in all previous on/off and disconnection tests (level meters, cameras, temperature probes, CRP biases, BDE etc ..). With the cathode HV off/disconnected the top CRPs do not see coherent noise and have very good noise conditions.

Next steps:

1) With the NP02 PS in its current position (outside the roof) ground the shield of the HV cable at the HV FT flange, check for the noise improvement
2) Still in the same configuration remove the connection of the shield of the HV cable to the PS ground (to avoid double-ended grounding of the cable and a ground loop) it requires some modifications to cable → check for the improvement
3) Move back the NP02 PS on the cryostat roof on a location as close as possible to the HV FT. This is beneficial as seen during the test made on NP02 with the cold box PS
4) Properly shield the HV cable running it on metallic surfaces with a metallic platform hosting the excess of cable at the exit of the PS and by building a cable support tray (this step may take of the order of a week).

There should be no coherent noise induced by the HV system on the top CRPs. There is suitable plan to fix this issue which up to now was delayed due to access restrictions (completion of cryostat closure, filling etc …). This planning needs to devote the proper work and amount of time.

This is clear that the time span needed for testing and finishing proper installation before turning ON the detector cannot be quantified yet:
⇒ Depends strongly on the test results and work needed to guarantee the best condition for operation
⇒ Commissioning may last several weeks

Starting next week:

Investigate the power supply and HV cable following the steps described in the previous slides:

- Grounding ; Shielding
- Or faulty PS

For info : NP04 PS has been moved on top of NP02 cryostat last Thursday
⇒ Can be used for nominal run if the original one is found faulty

This week and next week activities:

PDS:

- check laser box and move temporarily the PoF laser power unit on top of NP02.
- switch ON PD cathode Modules for “verification and status”

} => test done on Jan 10th

Week of Jan 27th:

- PMTs: testing the PMTs with the associated DAPHNE and calibration systems: will require turning off light systems for 1 hour several time/day => this has to be matched and articulated with other activities
- …
- …