Derivables from the 3x1x1

1) Cryostat and cryogenics performance

- Performance of the insulation: Is the 5W/m2 achieved?.
- Monitoring instrumentation (temperature and pressure) inside insulation space.
- Heat load measurements at different operation stages.
- Maintaining stable pressure inside the cryostat.
- Monitoring of insulation layer using RGA.
- Cryogenic performance and installation:
  - Thermodynamic stability of the liquid argon: movement of the surface (where is the level of waves? How sensitive we are to slow and fast variations of the level?), Is there bubbles?, pressure variations. Our goal is to maintain stable level during operations.
  - Heat load safety factor
  - Level of gas impurities (O_2, N_2 and H_2O) reached before filling (in closed and open loop). Impurities vs number of gas volumes exchanged.
  - Level of liquid impurities before and after recirculation starts. How many volumes do we need to reach the required purity level?
  - Test of the gas purge procedure.
  - Test of the cooling and filling procedure.
  - Liquid and gas temperature gradient during stable operation.
  - Test of liquid pump system for liquid recirculation and lifetime.

Derivables from the 3x1x1

2) Detector:

<u>2.1) CRP mechanical frame and suspension system:</u>

-Functioning of the automatic frame adjustment system.
-Calibration procedure of level meters.
-Resolution of level meters and their stability over time.
-Planarity of the frame in cold conditions

2.2)<u>LAr level measurement precision</u>: long coaxial LM (next to drift cage and in pump tower), PT100s ribbon chain, plate capacitors around CRP and drift cage, level measured using cameras.

- How do they compare to each other in terms of accuracy and precision?
- Cameras: are we satisfied with the number of cameras, their location in the cryostat and their performance at cold?
- Plate capacitors around CRP: are these sufficient? Do we need more? Are we satisfied with their size, i.e. optimal shape and size of the level meters.

2.3)Very High Voltage system and feedthrough:

-Long-term voltage sustainability of the feedthrough.
-Stability of the voltage and the current as a function of time of the entire VHV system in general.
-Fiducial volume and uniformity of the drift field.

<u>2.4) High voltage system:</u>

- CAEN power supply stability over time.
- Need for a current limiting resistor.
- Need for filter and or resistor to ground.

Derivables from the 3x1x1

2.5)LEM, anode and extraction grid

- LEM performance: maximum gain achieved and gain stability over time and position dependence of the gain.
- Extraction efficiency and position dependency,
- Charge attenuation and cross-talk.

2.6)FE electronics:

-Low level noise and grounding optimisation at warm.
-Cryogenic operation of the front end electronics
-Insertion and extraction of the blades at warm.
-Temperature inside the SGFT: Stability of the temperature with and without electronics on.
-Operation of the DAQ and timing system.
-Setting up of the online and storage farm.
-Operation and performance of the electronics at different detector conditions.

2.7) PMTs:

-positive HV vs negative HV. Are there some differences?
-self trigger vs CRT trigger mode. What rate can the self triggering mode sustain?
-data/MC comparison
-light maps
-gain calibration of the PMTs
-slow and fast component decay times in the liquid and in the gas.

2.8) Detector slow control system:

-Stability over time and performance.
-Monitoring and stability of the different sensors.

2.9) Performance of the muon trigger system:

-Communication with DAQ of charge readout and light readout.
-Trigger rate and efficiency.