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Covering of detector

O Presentation Overview

- → Engineering array in Milano
- → Tanks for detector
- → Water purification system
- → Internal structures (sustain for PMTs)
- → Covering of detector
- → Mounting and maintenance system
- → Works on SWGO collaboration



Engineering array in Milano

With funds of PNRR

- -> Completing array of detector to a total of 3 detectors (2 new tanks with diameter 2m)
- \rightarrow Water purification system and all accessories
- \rightarrow Internal structures for all the detectors
- \rightarrow Covering structure and sheets for insulation





Tanks for detectors



O Tanks

- Prefabricated by metal sheets with internal covering in AQUATEX PVC (in black)
- → One already in position diameter 3,36m height 3,12m
- \rightarrow Two to be implemented with diameter of 2m height 3,12m
- \rightarrow The configuration designed is showed below
- \rightarrow All the tank will be filled with water up to about 3m





Water purification system

O Water purification system

- → Purified water will be provided at GRADE 2 standard (0,1µS/cm) by a purification system positioned inside lab
- Pipe with specific characteristics will conduct water to the tanks that will be filled from above main openings
- To empty the tank from water will be used a submersible pump
- → To evaluate the possibility to conduct tests with this system on water degradation caused by different material applied (in small tank like SWGO HAP-22-011)





Internal structures I





Internal structures

Structure to support PMTs already designed by PoliMi colleagues for 3,36m diameter tank, need to be scaled to smaller tanks and optimized in strength



Internal structures II



Ouides to Internal structure

- → To guide in position this structure correctly inside the tank will be applied 4 wheels radial to the detector, these will support positioning without damaging internal of tank
- → Wheels will have stainless steel support and Nylon body of 160mm diameter (without bearing and lubrification)



How to move internal structure

O How to lower and lift internal structure

- → Each internal structure will be equipped by four stainless steel cables
- → These cables will remain in place also after deployment to allow recovery of submerged structure
- → Later will be described the structure to operate with these cables (see Mounting and maintenance system)





Covering of detector I

Overing structure

- → A structure to support covering is designed, it will avoid the tarpaulin to collapse
- → The covering structure will be in aluminum, composed by a central plate and four beams with H section. These beams can be used as support to crossbars (to further support tarpaulin)
- → The covering tarpaulin will fit correctly around tanks, and it will seal to the light the detector
- → The tarpaulin has a sleeve to guide outside detector wiring cables of PMTs







Covering of detector II



Overing structure and coincidence

→ The covering structure can support coincidence scintillator tile with specific structure that will be realized with Bosh Rexroth beams







The Southern Wide-field Gamma-ray Observatory



Mounting and maintenance system II

O Lifting winch

- → The stainless-steel cables from internal support are inserted in pulleys and connected to the manual winches that will operate the lifting/lowering operations
- → For each operation will be applied 4 winches and 8 pulleys all mounted on gantry crane
- → Each detector will have specific pulleys and hoist configuration on crane since position will be different







Operative configuration with tarpaulin on detectors





Remove the tarpaulin on detectors with the help of ladders and scaffold





Position the crane over the detector with all elements incorrect position to work with the specific detector





Connect the central hoist to the covering support





Lifting and removing covering support by moving crane and deposit it in free space in front of biggest detectors





Move the crane again on detector





Connect cables of internal structure to pulleys and winch to allow lifting





Lifting and removing internal structure by moving crane and deposit it in free space in front of biggest detectors



Future works

Engineering array in Milano

- → Finalize tenders and orders procedures for all the elements (orders in half December 2023)
- \rightarrow Mount and test all elements starting in beginning 2024
- → The system will be operational from spring 2024

SWGO collaboration

- The experience gained with this design will be helpful to work on deployment and maintenance system for final detector array
- With water purification system available could be conducted tests on water purity with contamination by different materials
- → The array will allow to test also different PMT solution (e.g. MultiPMT)





Thank you for your attention