



ID de Contribution: 62

Type: **Contributed talk**

The acoustic positioning system for NEMO Phase 2

mercredi 23 avril 2008 14:30 (15 minutes)

The acoustic positioning system is one of the key subsystems of an underwater neutrino telescope. Both in Antares and in NEMO-phase 1 the acoustic positioning system was based on “off-the-shelf” commercial technology. This technology is typically based on the use of acoustic beacons, displaced to form a Long Baseline (LBL) on the sea bed, and acoustic receivers (hydrophones) mounted on the structure, to monitor the movements of photomultipliers (PMTs) in water. The hydrophone signals are processed independently from the rest of the detector signals and used only for acoustic positioning. Thanks to the synchronous and phased data transmission/acquisition protocols developed by the NEMO Collaboration, already tested in the NEMO Phase 1 experiment, an innovative DAQ system for acoustic signals is now under realization for the NEMO Phase 2 experiment. On the NEMO Phase 2 tower, we will install 34 hydrophones (two per each floor plus two in the tower base). All hydrophone signals will be sampled underwater at 192 kHz and 24 bit resolution, and continuously sent to shore. Acoustic data samples will be tagged with the absolute GPS clock information of the detector, used to tag the PMT data, that has a precision of about 1 ns. On shore, acoustic data will be distributed to the PC farm for acoustic positioning analysis and to PC farm for the acoustic background monitoring. The latter will permit the first studies for acoustic neutrino detection and interdisciplinary studies.

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Classification de Session: Parallel session on Engineering for deep deployment neutrino telescopes

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