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A large fiber sensor network for an acoustic neutrino telescope

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The scientific prospects of detecting neutrinos with an energy close or even higher than the GKZ cut-off energy has been discussed extensively in literature. It is clear that due to their expected low flux, the detection of these ultra-high energy neutrinos ($E_\nu > 10^{18}$ eV) requires an telescope larger than 100 km^3. Acoustic detection [1, 2] may provide a way to observe these ultra-high energy cosmic neutrinos, as sound induced in the deep sea by their loss travels undisturbed for many kilometers so that a large neutrino telescope can be established. To realize such a telescope, acoustic detection technology must be developed that allows for a large deep sea sensor network.

Fiber optic hydrophone technology is a promising means to establish large a scale sensor network [3] with the proper sensitivity to detect the small signals from the neutrino interactions. In this talk we present an update of the research and development of the fiber hydrophone technology at TNO. We report on the recent progress related to sensor developement as well as R&D on sensor networks.

[1] G. A. Askaryan. Acoustic recording of neutrinos. Zemlia i Vselennaia, 1:13–16, 1979.
[2] J. G. Learned. Acoustic radiation by charged atomic particles in liquids: An analysis. Phys. Rev. D, 19:3293–3307, June 1979.
[3] E. J. Buis et al. Fibre laser hydrophones for cosmic ray particle detection. Journal of Instrumentation, 9(03):C03051, 2014.

Summary

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