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**EUROPE BETS
ON THE KM3NET SUBMARINE
NEUTRINO TELESCOPE**
*Interview with Giacomo Cuttone,
director of the INFN*
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The KM3NeT project in which INFN plays an important role with its National Laboratories of the South, has been selected as part of the 2016 ESFRI (European Strategy Forum for Research Infrastructures) Roadmap.

KM3NeT is a project for the construction of a submarine neutrino detector in the Mediterranean Sea, which will have as its scientific objectives the study of astrophysical sources of cosmic neutrinos, determination of the mass of the neutrino and creation of new opportunities for synergistic research in marine and environmental studies. The project envisages a research infrastructure distributed among three deep-sea sites: off Portopalo di Capo Passero in Sicily (Italy), Toulon (France) and Pylos (Greece). The preparatory phase of the experiment ended in December 2015 when the Capo Passero site concluded sea laying and land connection operations of the first KM3NeT string.

Inclusion of the KM3NeT project in the ESFRI Roadmap was announced on 10 March during the launch event of the roadmap 2016. A result based on a history of frontier research started many years ago. Could you tell us about the most salient points?

Inclusion in the ESFRI Roadmap is a very important result for the KM3NeT project, which comes after a rigorous selection process, in which projects are evaluated for their scientific excellence, pan-European importance, socio-economic impact and level of maturity. KM3NeT was selected along with another 20 projects that have been identified as those new research infrastructures of pan-European interest, reflecting the long-term needs of the European research community.

The idea of KM3NeT dates back to the early 2000s and has seen INFN and, in particular, the National Laboratories of the South as a key player, having proposed and developed the idea of installing a very high energy submarine neutrino telescope in the Mediterranean Sea, an ideal location for observing our Universe. Thus Sicily was identified as the candidate site to host the observatory, at a distance of 100 km off the coast of Portopalo di Capo Passero and at a depth of 3500m. An ideal location for the

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installation, also due to the ideal conditions of water transparency.

In 2008, a research laboratory was built in Portopalo from where a 96 km long electro-optical cable departs, connecting it with the installation site. Thanks to the direct funding of INFN and that received within the scope of the program “PON Ricerca” of the Italian Ministry of Education, University and Research (MIUR), the first part of the telescope (approx. 25%) was constructed and wired.

Once completed, KM3NeT will be a submarine neutrino observatory with a total extension of one cubic kilometre. Why are we building a giant experiment at a depth of 3500 metres? What are the research objectives?

The KM3NeT neutrino telescope must be installed at these depths in the sea since the objective is to exploit the water both to shield the detector from cosmic background radiation as well as to use the sea water itself as a Cherenkov scintillator for the detection of neutrinos. The latter are among the most important messengers of information on the creation of the universe and its evolution.

This project has a strong interdisciplinary characterisation. Which are the scientific communities that will benefit? What will be the impact in terms of technological innovation?

The construction of a wired observatory at a depth of 3500m in the Mediterranean Sea offers a unique opportunity for the study of geophysical and volcanological processes in an area characterised by the clash between the North African and the European plates and the presence of the largest active volcano in Europe, Mount Etna. It also represents a unique opportunity for the study of marine biology and the ecosystem of such a particular sea as the Mediterranean. It has therefore been possible, and will be even more so in the future, to launch an intensive research and development programme in the field of detectors, gauges and wiring and data transmission systems in extreme environments such as the depths of the sea. A sea that is not just a route for escaping from poverty, hunger and war, but also an opportunity for the recovery of our economy and our entrepreneurs.

In physics, KM3NeT is the only research project to be included in the ESFRI Roadmap with a location in Italy, and in this case managed by a research facility based in the South...

The inclusion of KM3NeT in the ESFRI Roadmap recognises the efforts and the role of the National Laboratories of the South in the construction of the submarine telescope for high energy neutrinos at its headquarters in Portopalo. The significant investments made to date, both in economic as well as human capital terms, have enabled this goal to be achieved and have had a crucial affect in determining the role of our laboratory and the Sicily Region, which has also acknowledged in its development plan the decisive role of KM3NeT for the growth of our area

What will be the next challenge?

The next and perhaps the most difficult challenge will be convincing our regional, national and European

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institutions to transform the plans, which to date has seen KM3NeT excel, in actions aimed to raise funding for completion of our activities and full development of the human capital that we have created in this field, not only in Sicily and in Italy but throughout Europe. ■