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Status of the KM3NeT Design Study

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- History and structure
- Tasks and progress
- The European context
- Context of decisions to be taken
- Conclusions

KM3NeT Design Study: The last years



Design Study for a Deep-Sea Facility in the Mediterranean for Neutrino Astronomy and Associated Sciences

- Initial initiative **Sept. 2002**.
- VLV_vT Workshop, Amsterdam, **Oct. 2003**.
- ApPEC review, **Nov. 2003**.
- Inclusion of marine science/technology institutes (**Jan. 2004**).
- Proposal submitted to EU **04.03.2004**.
- Confirmation that Design Study will be funded (**Sept. 2004**).
- KM3NeT on ESFRI list of Opportunities, **March 2005**.
- 2nd VLV_vT Workshop, Catania, **08-11.11.2005**.
- ESFRI presentation, Brussels, **Nov. 2005**.
- Design Study contract signed, **Jan. 2006 (9 M€ from EU, ~20 M€ overall)**.
- Start of Design Study project, **01.02.2006**.
- Kick-off meeting, **Erlangen, April 2006**.

And: Essential progress of ANTARES, NEMO and NESTOR in this period!

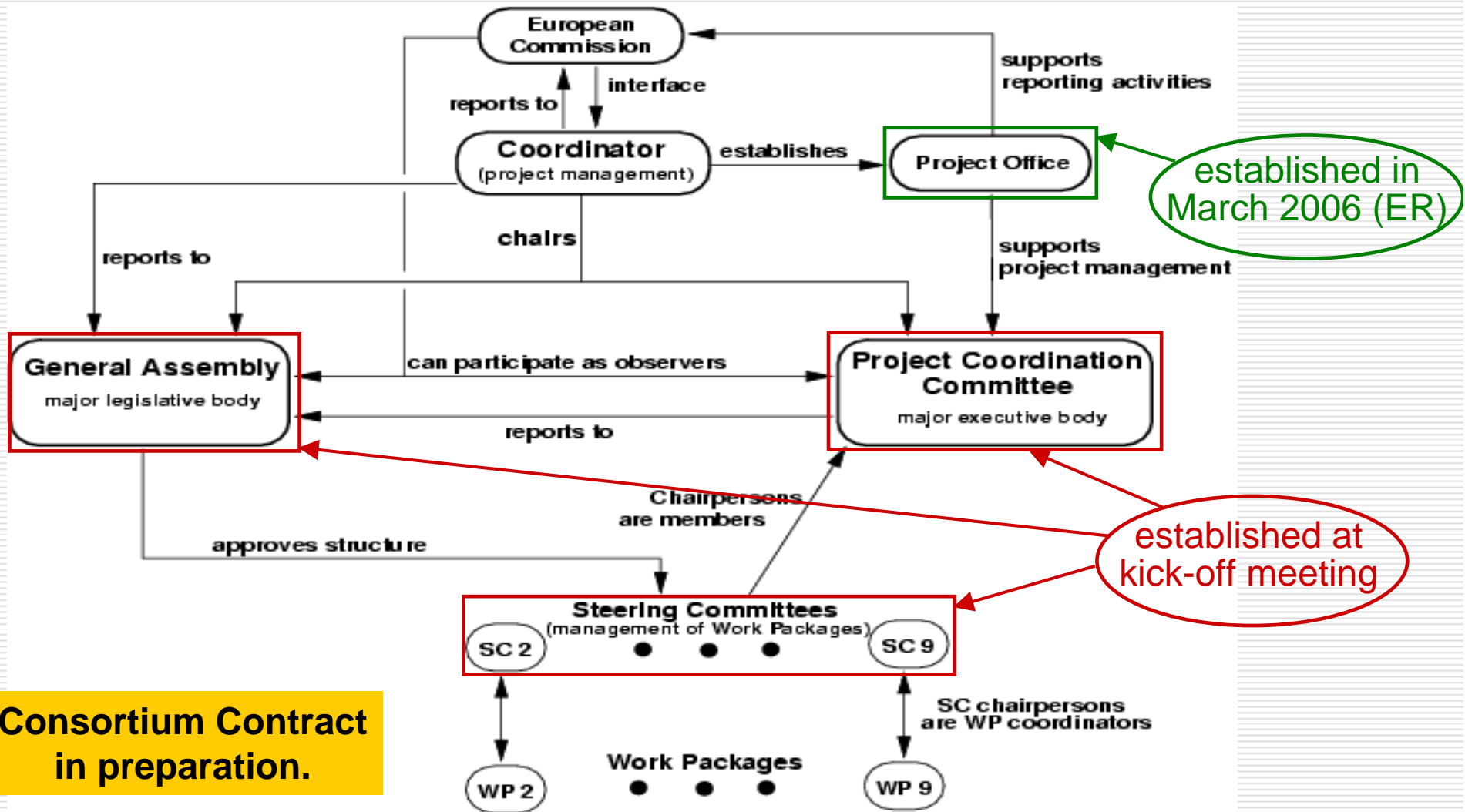
KM3NeT Design Study: Participants



- Cyprus: Univ. Cyprus
- France: CEA/Saclay, CNRS/IN2P3 (CPP Marseille, IreS Strasbourg, APC Paris-7), Univ. Mulhouse/GRPHE, IFREMER
- Germany: Univ. Erlangen, Univ. Kiel
- Greece: HCMR, Hellenic Open Univ., NCSR Demokritos, NOA/Nestor, Univ. Athens
- Ireland: Dublin Institute of Advanced Studies (expected Oct. 2006)
- Italy: CNR/ISMAR, INFN (Univs. Bari, Bologna, Catania, Genova, Napoli, Pisa, Roma-1, LNS Catania, LNF Frascati), INGV, Tecnomare SpA
- Netherlands: NIKHEF/FOM (incl. Univ. Amsterdam, Univ. Utrecht, KVI Groningen)
- Spain: IFIC/CSIC Valencia, Univ. Valencia, UP Valencia
- UK: Univ. Aberdeen, Univ. Leeds, Univ. Liverpool, Univ. Sheffield

Particle/Astroparticle institutes (29+1) – Sea science/technology institutes (7) – Coordinator

Design Study management structure



The KM3NeT Design Study work packages



- **WP1:** Management of the Design Study
- **WP2:** Physics analysis and simulation
- **WP3:** System and product engineering
- **WP4:** Information technology
- **WP5:** Shore and deep-sea infrastructure
- **WP6:** Sea surface infrastructure
- **WP7:** Risk assessment and quality assurance
- **WP8:** Resource exploration
- **WP9:** Associated sciences

The KM3NeT Vision



- KM3NeT will be a **multidisciplinary research infrastructure**:
 - Data will be **publicly available**;
 - Implementation of specific online filter algorithms will yield particular sensitivity in predefined directions
→ non-KM3NeT members can apply for **observation time**;
 - Data will be buffered to respond to **GRB alerts** etc.
 - Deep-sea access for **marine sciences**.
- KM3NeT will be a **pan-European project**
 - 8+1 European countries involved in Design Study;
 - Substantial funding already now from national agencies.
- KM3NeT will be constructed in time to take data **concurrently with IceCube**.
- KM3NeT will be **extendable**.

**Target price tag:
200 M€/km³ or less**

KM3NeT Design Study: Progress



■ Filling positions:

- Problem: in many cases job announcements have not been possible before signature of the contract.
- Nevertheless: Most positions filled, problems rather administrative than unavailability of suitable candidates.

■ First milestones (first 10 months):

- done ✓ M1.1 Kick-off meeting held
- done ✓ M1.2 Project office established
- done ✓ M1.3 Draft Consortium Agreement presented to GA
- in the works ❖ M1.4 Draft cost model for detector presented to PCC and GA
- in the works ❖ M2.1 Benchmark neutrino fluxes defined
- in the works ❖ M5.1 Report on evaluation of existing water, oceanographic, biological and geological data from candidate sites ready

■ ... and also: **KM3NeT logo** selected.

KM3NeT: Path to Completion



Time schedule (partly speculative & optimistic):

01.02.2006	Start of Design Study
Mid-2007	Conceptual Design Report
February 2009	Technical Design Report
2009-2010	Preparation Phase (possibly in FP7)
2010-2012	Construction
2011-20xx	Data taking

European Context: ApPEC & ASPERA



- KM3NeT in the ApPEC roadmap for astroparticle physics in Europe:
For a complete sky coverage, in particular of the central parts of the Galaxy with many promising sources, we recommend to build a cubic kilometre detector in the Northern Hemisphere which will complement the IceCube detector. Resources for a Mediterranean detector should be pooled in a single, optimized large research infrastructure “KM3NeT”. Start of the construction of KM3NeT should be preceded by the successful operation of small scale or prototype detector(s) in the Mediterranean. Its design should also incorporate the improved knowledge on galactic sources as provided by H.E.S.S. and MAGIC gamma ray observations, as well as initial results from IceCube. Still, the time lag between IceCube and KM3NeT detector should be kept as small as possible.

Note: Physics case to be reviewed in the light of the findings of H.E.S.S. and IceCube.

- ApPEC will be asked for help in establishing an External Review Committee for the Design Study.
- We look forward to cooperate with ASPERA.

European Context: ESFRI



- ESFRI (*European Strategy Forum for Research Infrastructures*) develops European roadmap for new, large-scale research infrastructures.
- March 2005: KM3NeT included in *List of Opportunities (LoO)* as one of 25 projects (all science disciplines).
- Since summer 2005: ESFRI expert panels review candidate projects (not only those on the LoO) to produce *selection for final roadmap*; KM3NeT presented to expert panel in Nov. 2005.
- Roadmap expected in *autumn 2006* (see presentation by Yves Petroff).



Site considerations

- Final site decision involves **scientific** and **political** arguments (funding, host country support, ...).
- Objective of Design Study:
Provide scientific input and stimulate political discussion.
- Possible scenario: Similar to Pierre Auger Observatory (two candidate sites, final decision taking into account **commitment of host country**).
- Relation of funding options to site choice will be explored in Design Study.
- **Multi-site option(s)** have come up in ongoing discussion, but are not yet assessed in detail.

Scientific issues and their consequences



- Boundary conditions (my personal view):
 - If KM3NeT does not match the physics objectives, there will be no “next generation” – **large pressure to be successful**.
 - Establishing the support of the community and the funding requires a **solid “scientific added value” with respect to IceCube**. Best arguments: **galactic disk/sky coverage, higher sensitivity**.
 - The H.E.S.S. results have initiated a **new era**: For the first time, solid estimates of neutrino fluxes from some source classes are possible ... and also they require **high sensitivity**.
- We must very **carefully study** these issues and **react** to recent/new findings.
 - The physics part of the Design Study is far more than a “10%-optimisation”.
 - Premature design decisions must be avoided.

Conclusions



- The KM3NeT Design Study has **started on Feb. 1, 2006** and will provide the framework to prepare the future km^3 Mediterranean ν telescope.
- The first **milestones** have been successfully matched, **positions** are being filled (delay: a few months).
- The KM3NeT project is well connected to the relevant **European** bodies (**ApPEC, ASPERA, ESFRI**).
- The KM3NeT Design Study is embedded in a fast and dynamic **development of high-energy astroparticle physics**.