Status of the KM3NeT Design Study

Uli Katz
Univ. Erlangen

- 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

- 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 VLVνT Workshop, Catania, 08-11.11.2005.
- 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

European Commission
- reports to Coordinator
  (project management)
  - chairs General Assembly
    - major legislative body
  - Project Office
    - supports reporting activities
  - Project Coordination Committee
    - major executive body
  - Steering Committees
    - SC 2
    - SC 9
    - Chairpersons are members
      - Chairpersons are WP coordinators
  - Work Packages
    - WP 2
    - WP 9

Consortium Contract
in preparation.

established at kick-off meeting
established in March 2006 (ER)
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):**
  - ✔️ M1.1 Kick-off meeting held
  - ✔️ M1.2 Project office established
  - ✔️ M1.3 Draft Consortium Agreement presented to GA
  - ❖ M1.4 Draft cost model for detector presented to PCC and GA
  - ❖ M2.1 Benchmark neutrino fluxes defined
  - ❖ 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):**

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
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<tbody>
<tr>
<td>01.02.2006</td>
<td>Start of Design Study</td>
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<tr>
<td>Mid-2007</td>
<td>Conceptual Design Report</td>
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<tr>
<td>February 2009</td>
<td>Technical Design Report</td>
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<tr>
<td>2009-2010</td>
<td>Preparation Phase (possibly in FP7)</td>
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<tr>
<td>2010-2012</td>
<td>Construction</td>
</tr>
<tr>
<td>2011-20xx</td>
<td>Data taking</td>
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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 km³ 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.