Friedrich-Alexander-Universität
Erlangen-Nürnberg

KM3NeT status using gammapy

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Gammapy General User Call: Drifting Instruments

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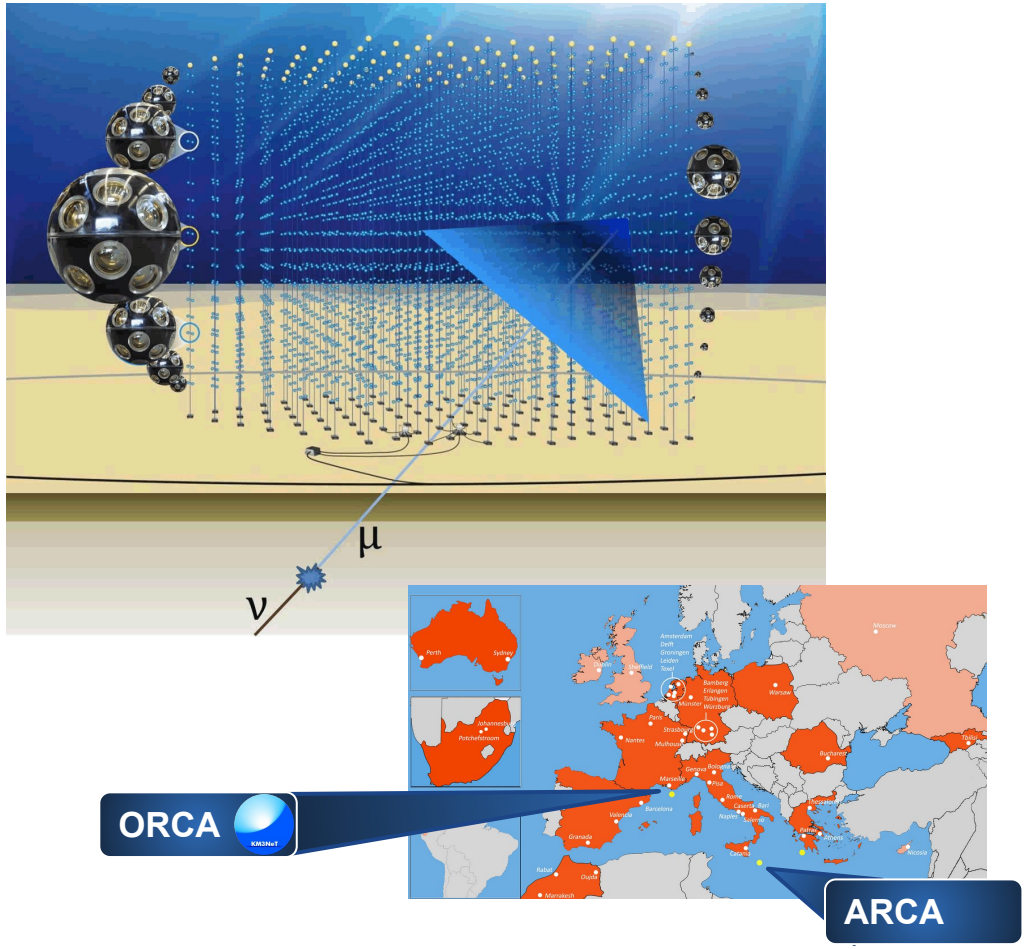
The KM3NeT detector

The KM3NeT collaboration



KM3NeT is

a Water Cherenkov detector for high-energy neutrinos

- Multi-PMT sensor modules
- Two detector sites in the Mediterranean

aiming for

- astrophysics (ARCA): > GeV range
- neutrino oscillations (ORCA): (MeV-) GeV range

under construction!

KM3NeT data

ν event list
(dec, ra, E, …)

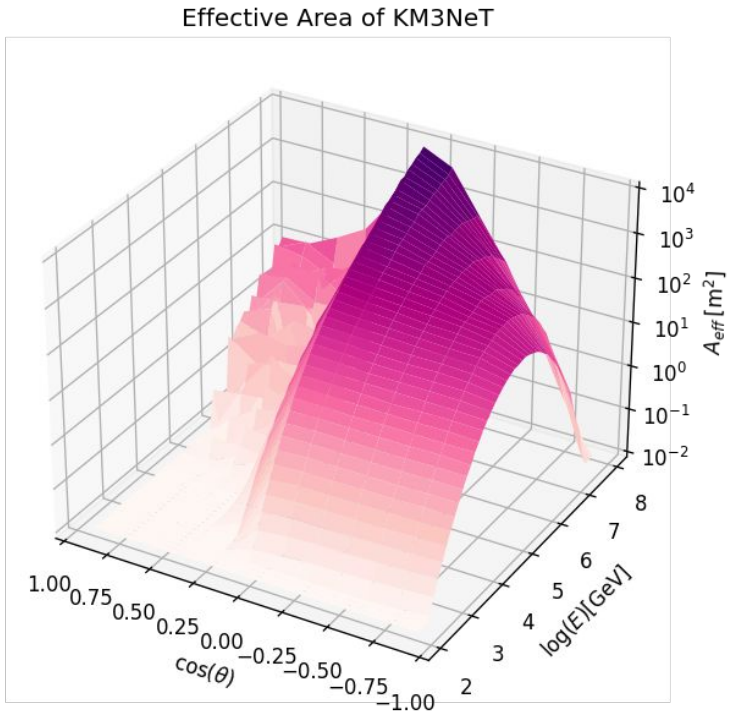
IRF
(psf, aeff, …)

cos. ν **atm. ν** **atm. μ** **sim.**

Status & Goals

Current status

- Master's thesis on joint instrument analysis with gammapy by Tim Unbehaun
- km3irf python package in VRE @ESCAPE: https://gitlab.in2p3.fr/escape2020/virtual-environment/irf-from-km3net
  - building on thesis, including effective area, psf, background, energy dispersion
  - main steps (in notebooks):
    - create irfs from KM3NeT event files (simulation for signal & background)
    - plot IRF properties



Developing goals

- "Building the adaptor"
  - generate event list writer
  - modularize IRF generation from KM3NeT files, allowing flexible event generation
- provide use case notebooks

Use cases

1. KM3NeT point source analysis

- analogous to “standard” analysis, e.g. like in ANTARES (notebook, not using gammapy)
- evaluating neutrino flux from given source using including several years of data
- needs event list, background estimate, effective area

2. Multimessenger analysis

- Wavefier project (pipeline prototype), lead by EGO, with CTA et al. in ESCAPE project
- combine gravitational waves & expectations for electromagnetic counterpart
- providing simulated events according to source catalogue

Specific KM3NeT requirements

- Calculate properties from full sky map and with long observation times
    - extremely low count rate -> data sets cover several years
    - analyses can be done for large sky areas or full sky

- Deal with different detector configurations
    - One event list includes events with different number of detection lines (effective area)

Will discover the “fine points” on implementation

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KM3NeT

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Let's do science together
&
Thank you for your attention!