

Update on KM3NeT alert System



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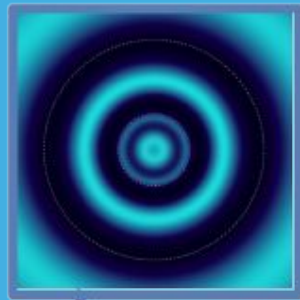
Post-doc

July, 2024

Overview

1. Short overview of KM3NeT status
2. Presentation on the KM3NeT online system
3. KM3NeT alert system

KM3NeT detector

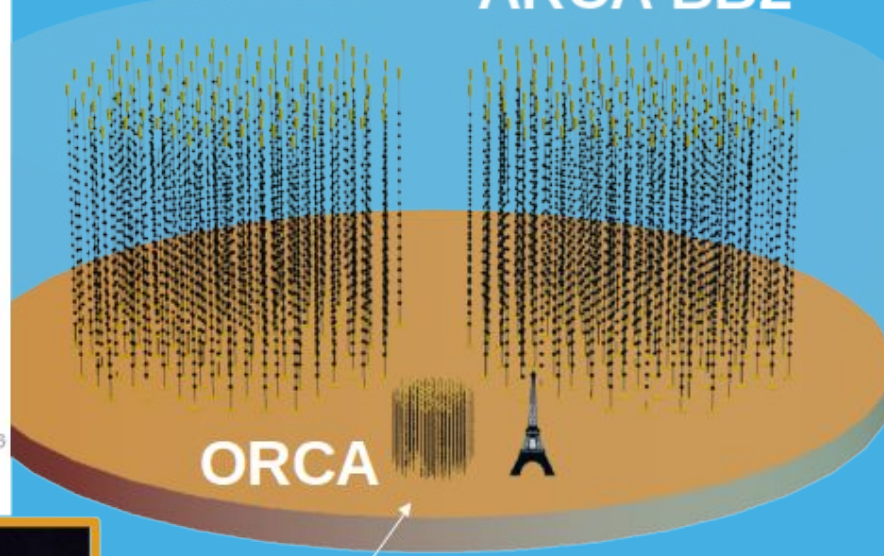
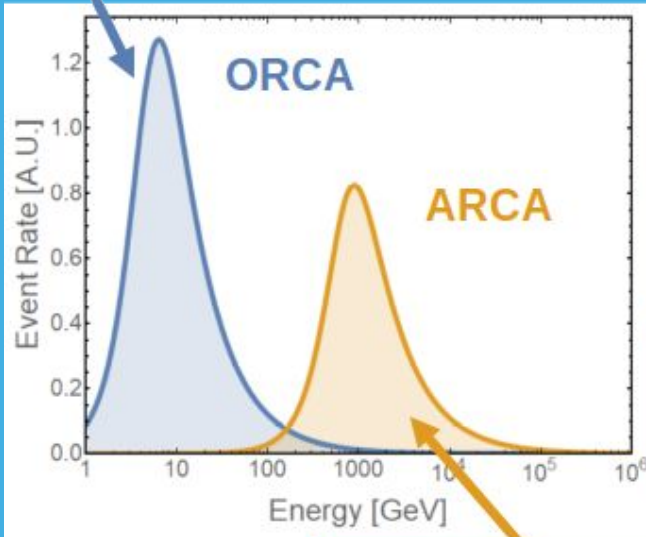


Two Detector Scales

36m vert. x 90m horiz. spacing TeV - PeV

ARCA BB1

ARCA BB2



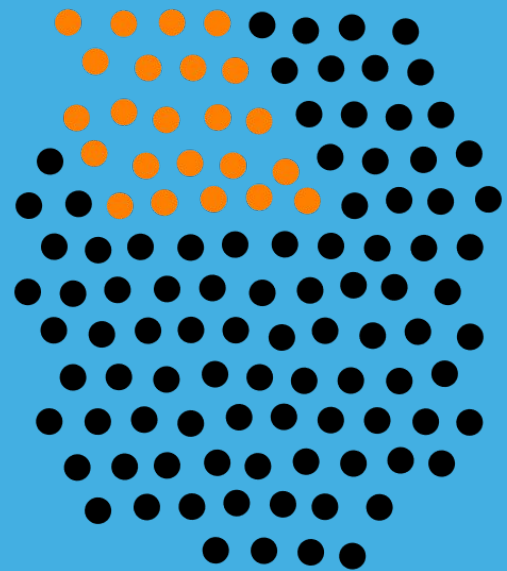
ORCA

9m vert. x 20m horiz. spacing
GeV - TeV



KM3NeT detector

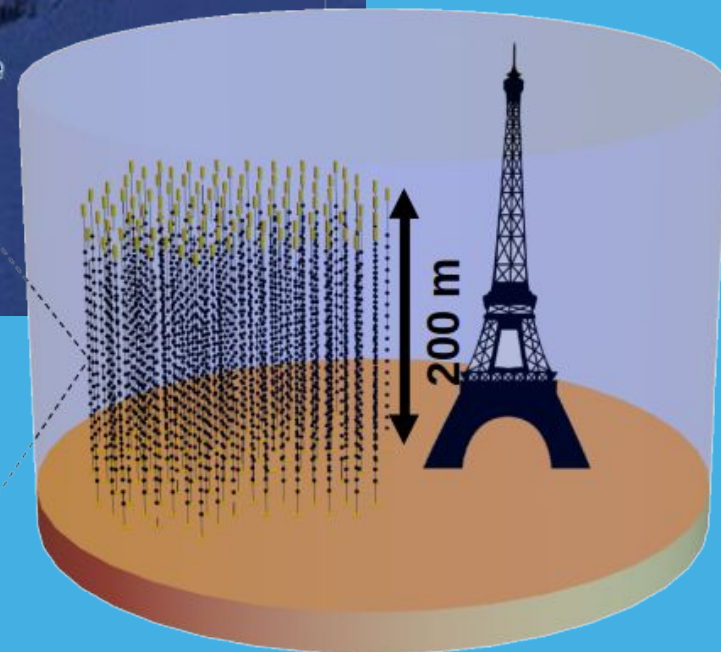
23 DUs deployed



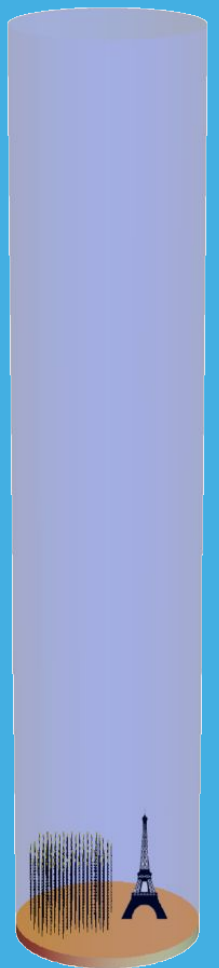
ORCA



43 cm



115 Detection Units
18 DOMs / DU

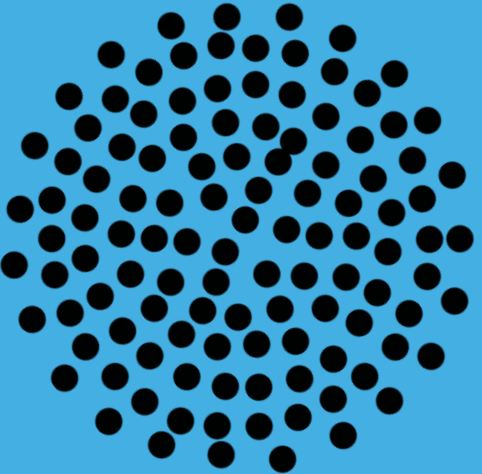
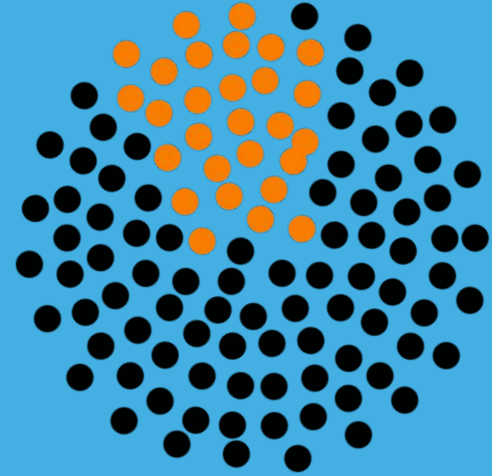


2450 m

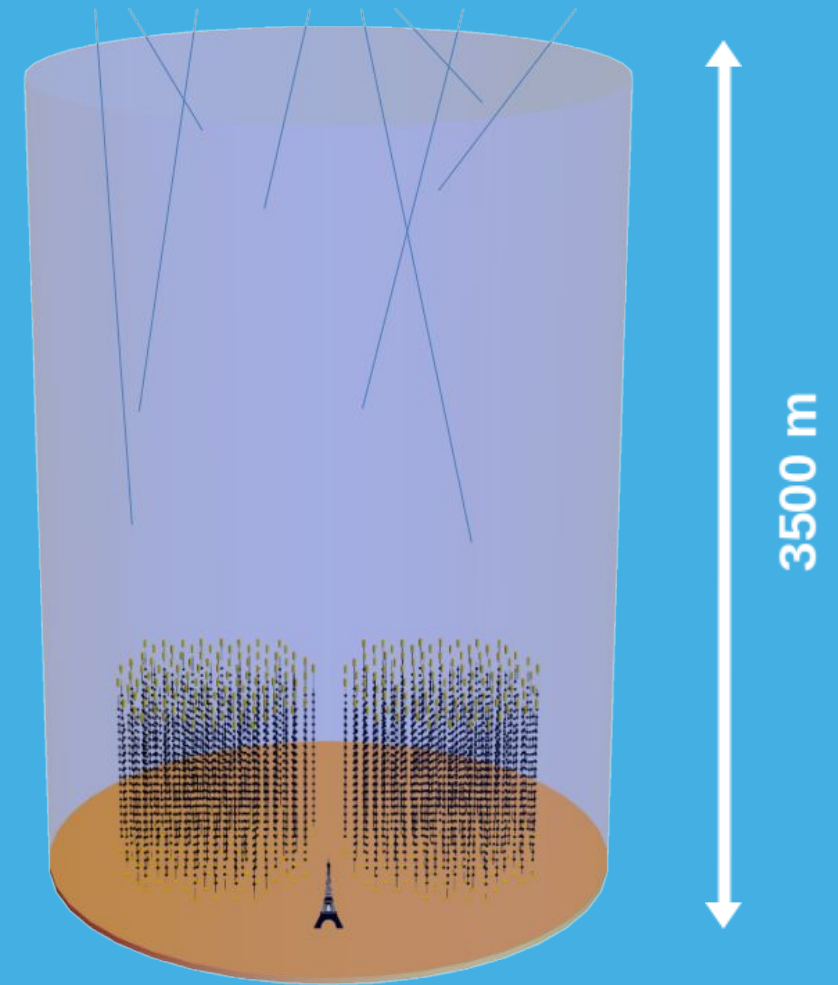
KM3NeT detector

28 DUs deployed

ARCA

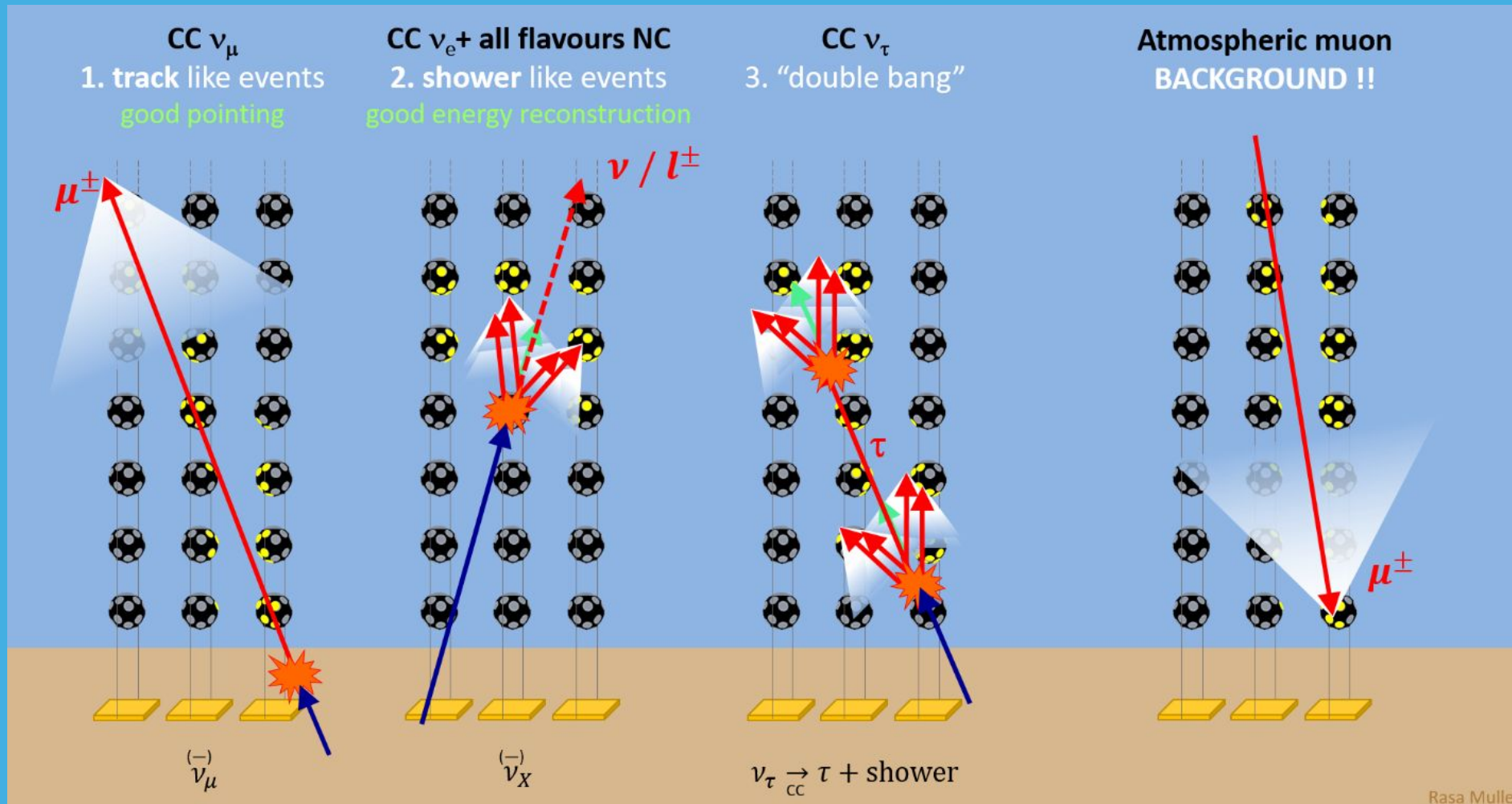


230 Detection Units
18 DOMs / DU
1 Gton detector

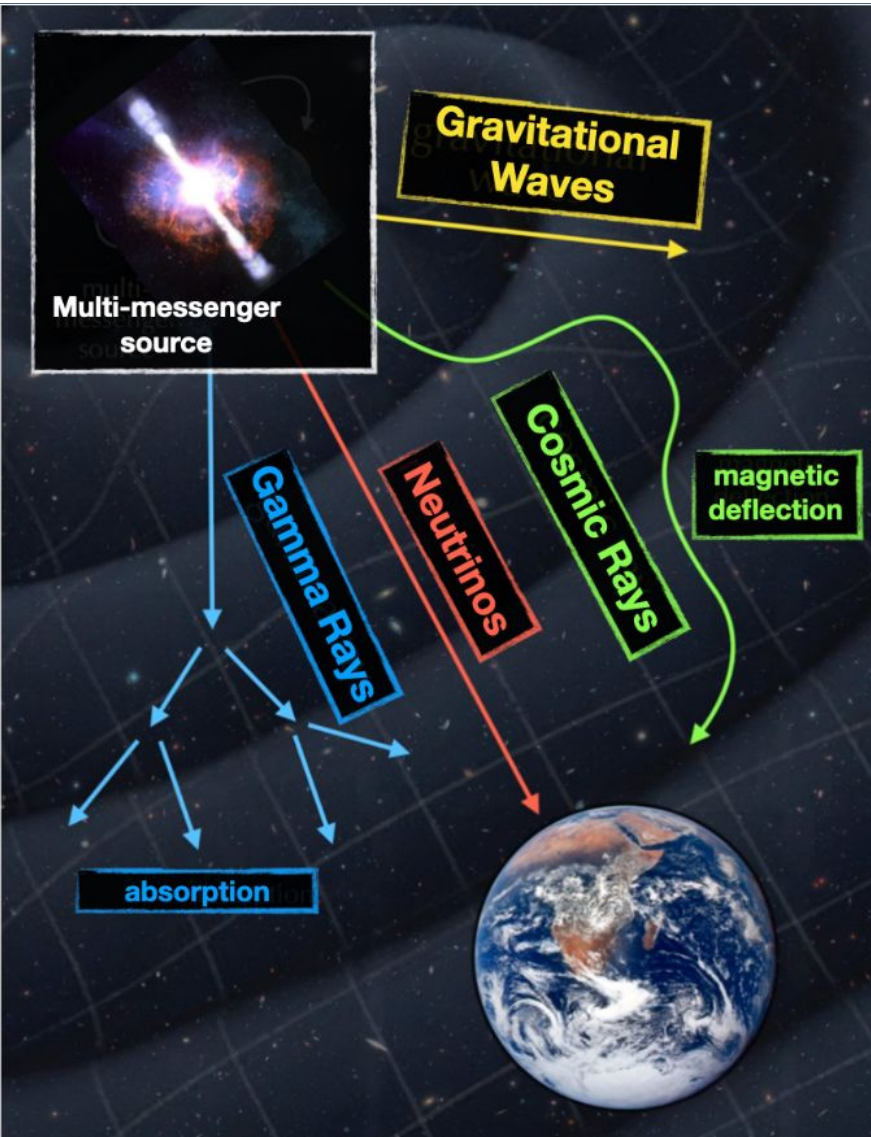


Neutrino detection principle & event topologies

Track like events → golden astronomical channel



KM3NeT Astrophysical sources

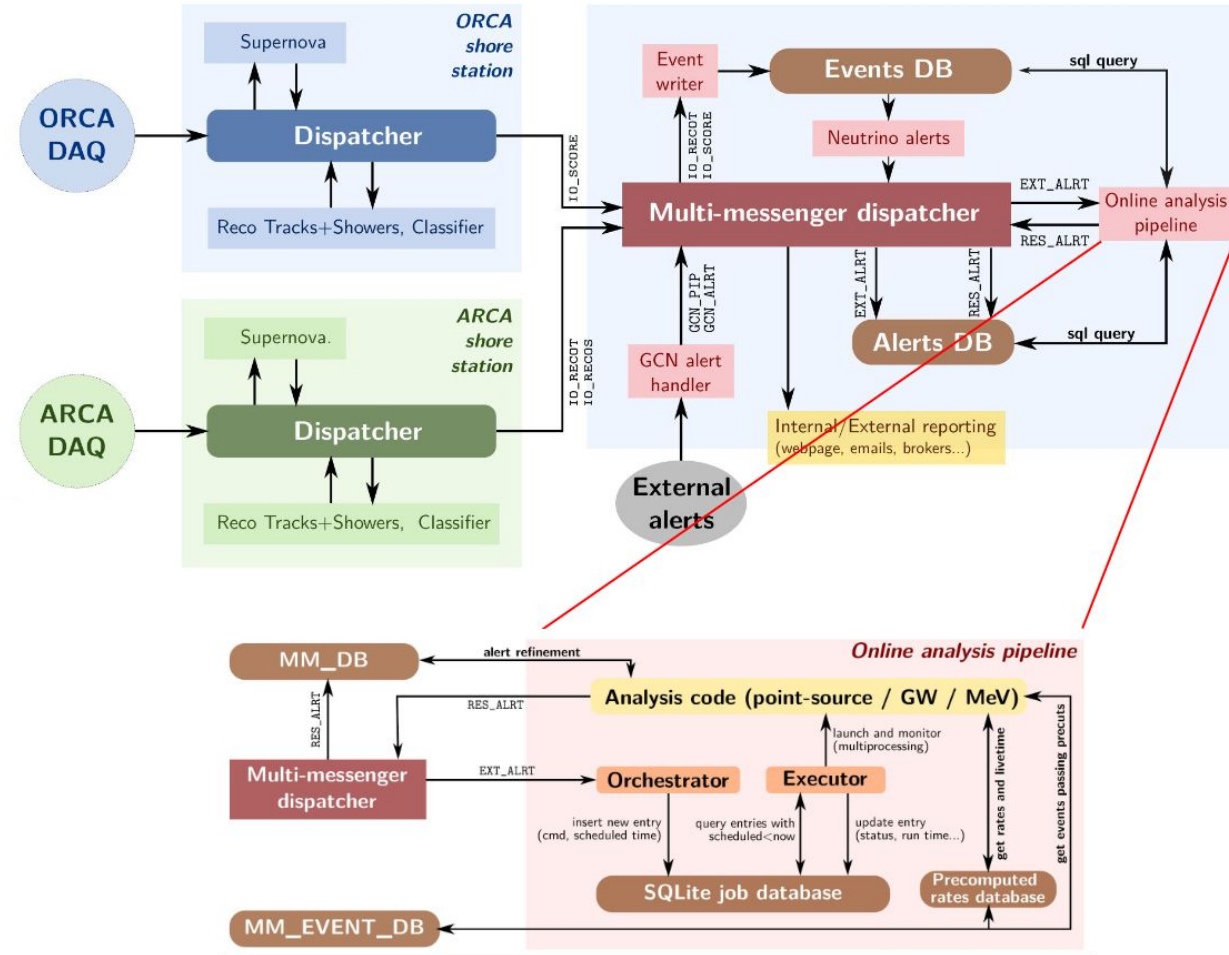


In the GRANDMA scope, basically all multi-messenger sources we are interested in are also potential sources of HEN :

- supernova
- kilonova
- GRB
- TDE
- BNS/NSBH
- ...

KM3NeT online system

Currently running



Alerts triggering the analysis and time windows

GRB (PS)

- $[T_0 - 500s, T_0 + 500s]$
- $[T_0 - 1\text{hour}, T_0 + 1\text{hour}]$
- $[T_0 - 1\text{day}, T_0 + 1\text{day}]$

GW (GWs):

- $[T_0 - 500s, T_0 + 500s]$
- $[T_0 - 500s, T_0 + 6\text{hours}]$

Neutrino (PS)

- $[T_0 - 1\text{hour}, T_0 + 1\text{hour}]$
- $[T_0 - 1\text{day}, T_0 + 1\text{day}]$

GW (MeV):

- $[T_0, T_0 + 2s]$

Transient (PS)

- $[-\text{duration}, T_0]$
- $[T_0 - 1\text{day}, T_0 + 1\text{day}]$

FRB (PS) NEW

- $[T_0 - 500s, T_0 + 500s]$
- $[T_0 - 1\text{hour}, T_0 + 1\text{hour}]$
- $[T_0 - 1\text{day}, T_0 + 1\text{day}]$

CCSN (MeV)

- $[T_0, T_0 + 2s]$

μ -Quasar (PS) NEW

- $[-\text{duration}, T_0]$

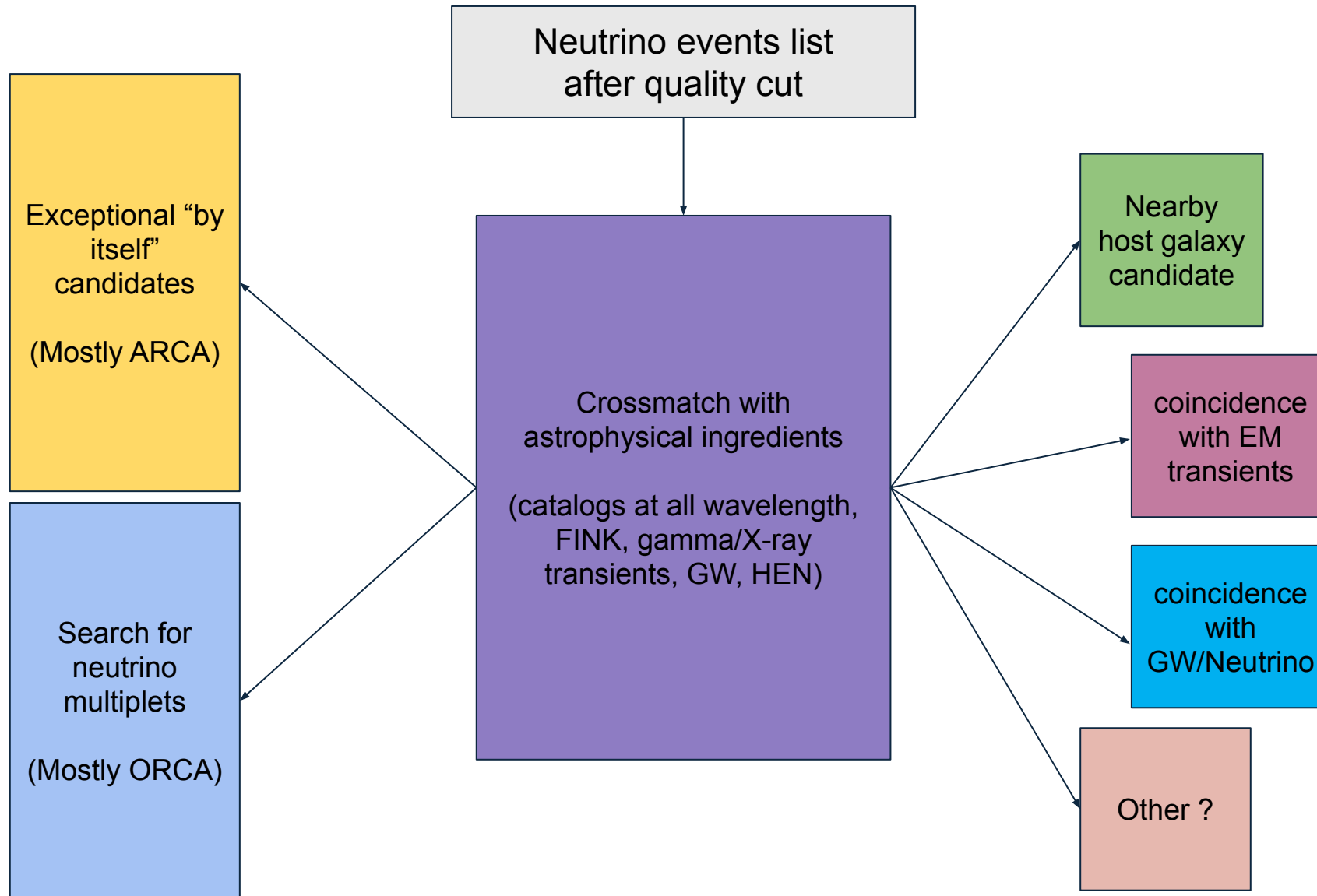
KM3NeT Alerts : our objectives

Provide alerts for HEN candidates identified to be exceptional in the light of KM3NeT data alone (very high energy and well reconstructed events, multiplets) similar to IceCube alerts

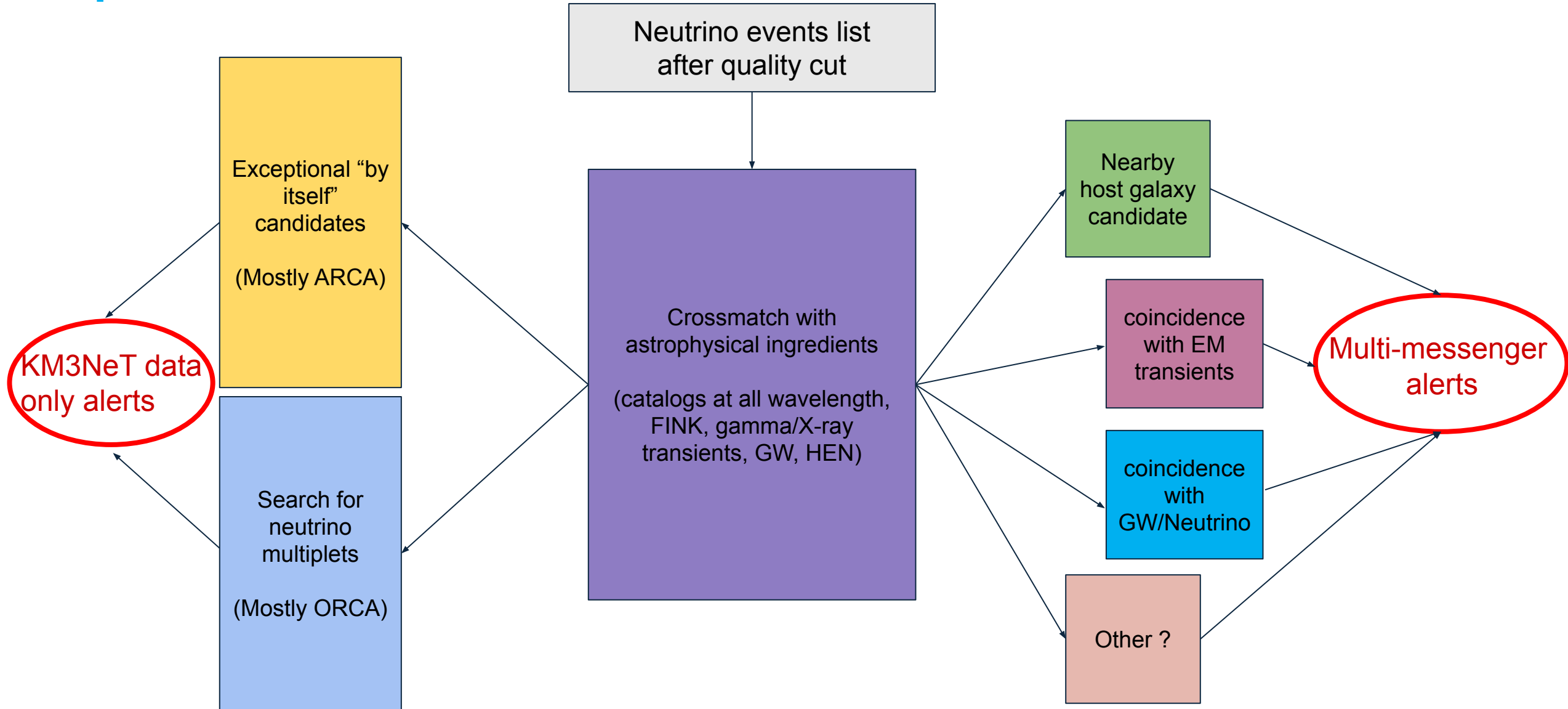
To **enhance** the scientific output and the community effort in optical follow-up of ν alerts that KM3NeT will provide we propose to incorporate others **astrophysical ingredients**.

⇒ provide clear scientific objectives and constraints for the observations

Separated channels of alerts



Separated channels of alerts



Alerts properties

Alerts will be provided through GCN with :

- False alarm rate
- Source localisation : ORCA $\sim 2 \text{ deg}^2$
ARCA $\sim 0.5 \text{ deg}^2$
- Trigger time
- All the astrophysical ingredients used for the selection

Plan is to provide **~few alerts per months** (including all the channels)

First alerts for internal (and collaborators) follow-up in \sim septembre

Follow-up of neutrino alerts within the collaboration and collaborators

Time available to the KM3NeT collaboration:

- COLIBRI : 1.3m robotic telescope (grizy, JH), Mexico
- OHP/MISTRAL : low resolution spectro-imager of the 1.93m telescope, 3h granted
- XSHOOTER : VLT multi-wavelength (300-2500 nm), blazar follow-up

Ongoing :

- proposal for XMM-Newton, Swift, SVOM, IXPE and Nustar
- Open discussion for radio observation (OVRO, MeerKAT, ASKAP) + VLBI
- HESS (MoU signed), MAGIC + LS1 (MoU in discussion)

Collaborators :

GRANDMA (MoU?), Antares alerts was followed by TAROT et Master

THANK YOU!

First alerts soon : stay tuned !!!

