



# Combined KM3NeT/ARCA and ANTARES searches for point-like neutrino emission

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on behalf of the KM3NeT and ANTARES collaborations



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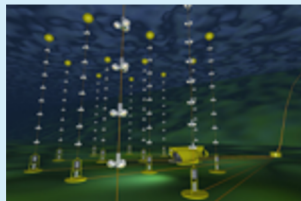
# Combined point-like search

- ANTARES detector switched off in February 2022 after 15 years of data taking.
  - This analysis exploits 2007-2022 data.
- KM3NeT collaboration installs next generation of neutrino detectors in the deep sea.
  - The data from about 3 year of KM3NeT/ARCA6-8-19-21 is used in this analysis.
  - KM3NeT/ARCA operates now with 28 lines and the detector will continue to grow.

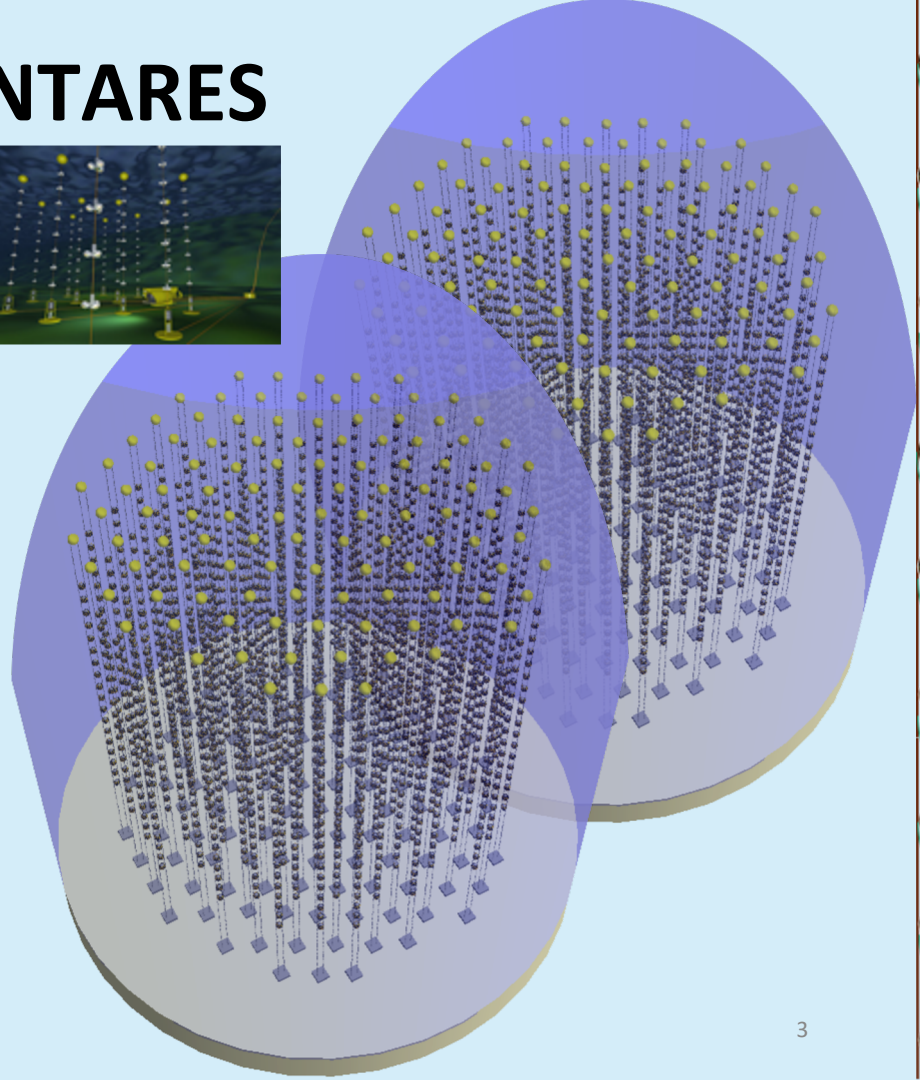


# KM3NeT/ARCA and ANTARES

	ANTARES	ARCA
Effective Mass	10 Mt	1 Gt
Line length	350 m	650 m
Interline distance	70 m	90 m
OM Vertical spacing	14.5 m	36 m

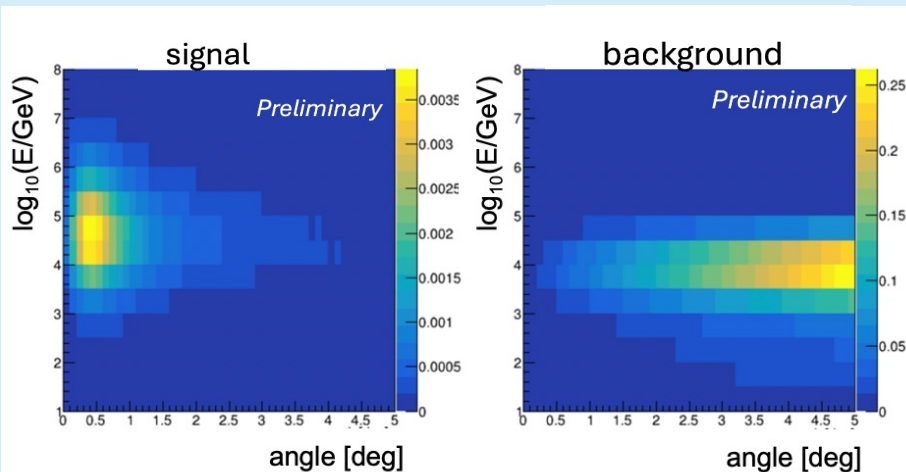


DATASET	LIVETIME [ days]
ANTARES	4541
KM3NET/ARCA 6	92
KM3NET/ARCA 8	210
KM3NET/ARCA 19	53
KM3NET/ARCA 21	70

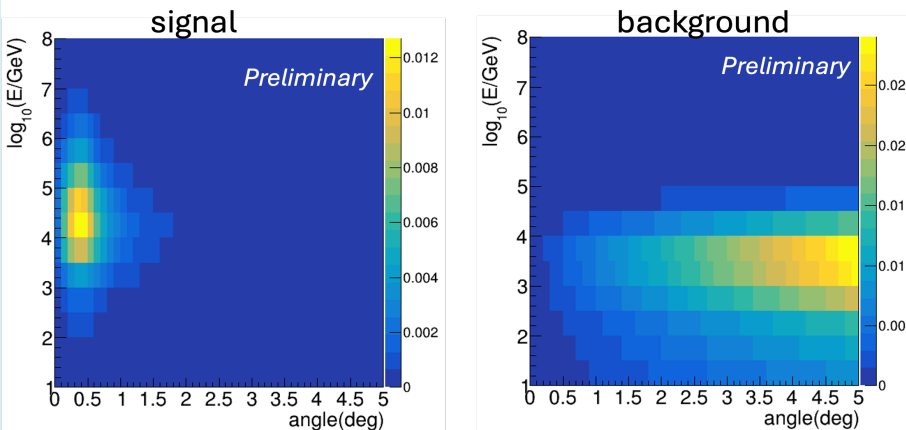


# Point search analysis framework

KM3NeT/ARCA8 (210 days)  
preliminary



KM3NeT/ARCA21 (70 days)  
preliminary



- Data set: detector period with a particular event selection (track/showers etc).
  - Data sets do not overlap (no common events).
- For each data set:
  - Signal expectation (MC)  $S$ ,
  - Background expectation (MC, **data sampling**)  $B$ ,
  - Data/pseudo-experiment  $N$ ,

$$\log L = \sum_{bins} N_i \log(-B_i - \mu S_i) - (B_i + \mu S_i)$$

- $\mu$  signal strength (for a given default flux)

# Signal estimation

$$S_i = \sum_{E_{true}} \text{rate}(\delta, E_{true}) \times f_{\alpha}(E_{true}, \alpha_{min}, \alpha_{max}) \times f_E(E_{true}, \delta, E_{rec,min}, E_{rec,max})$$

FROM  
EFFECTIVE  
AREA

FROM  
ANGULAR  
RESOLUTION

FROM  
ENERGY  
RESOLUTION

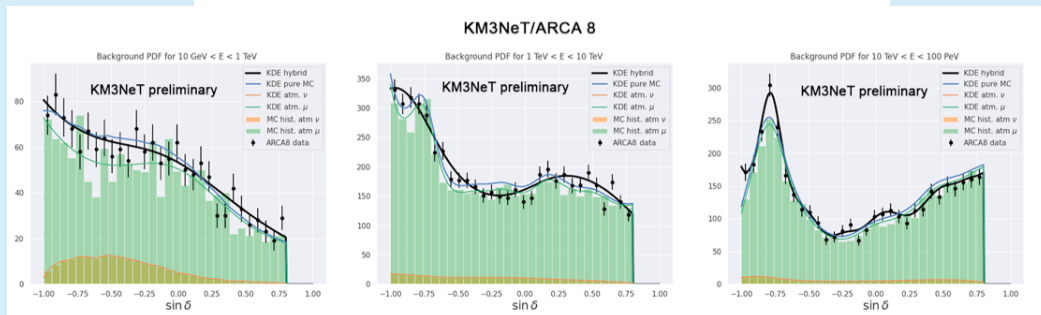
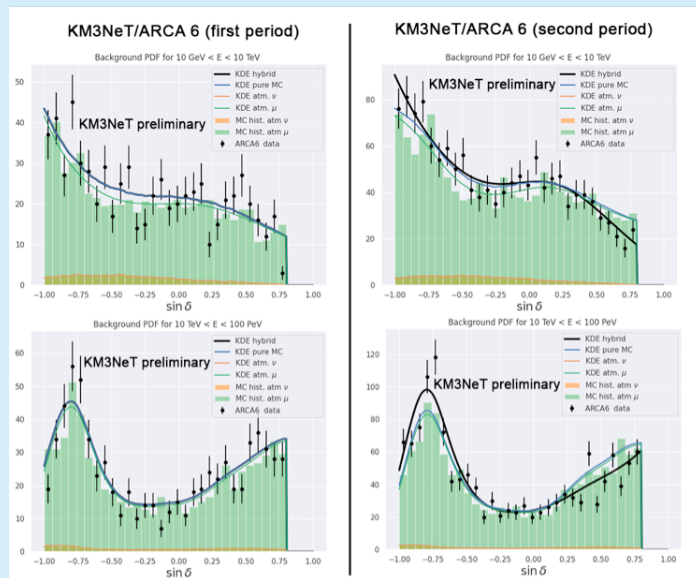
# Background estimation

For ANTARES (showers),  
KM3NET/ARCA 19 and  
KM3NET/ARCA 21

$$B_i = n \times F(\log E) \times G(\sin \delta)$$

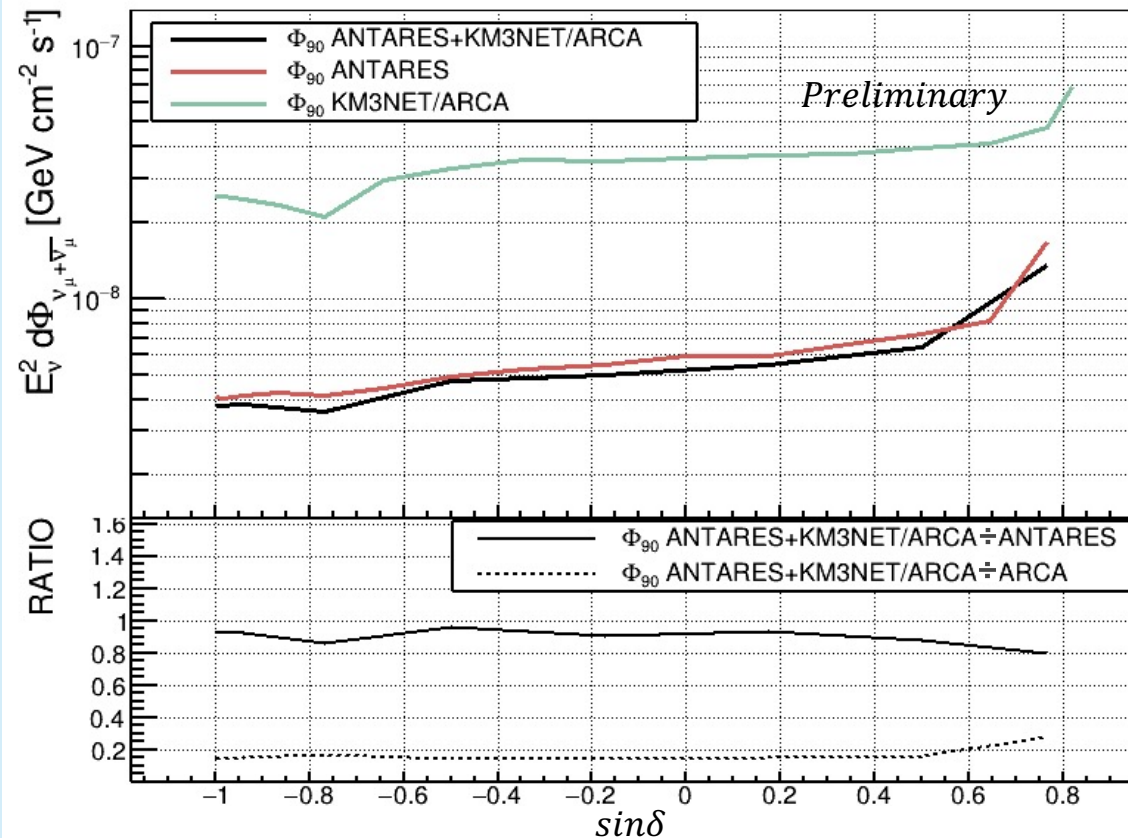
For ANTARES (tracks),  
KM3NET/ARCA 6 and  
KM3NET/ARCA 8

$$B_i = n \times KDE(\sin \delta, \log E)$$



# Sensitivities

- Median Neyman upper limit for pseudo-experiments with no signal.



# Conclusions

- The analysis framework incorporate data from the ANTARES and KM3NeT/ARCA neutrino telescope.
- Currently, ANTARES contributes most significantly, but combining with KM3NET/ARCA the performance enhances by 10%.
- The first KM3NeT/ARCA building block (consisting of 115 lines) is expected in few years. Stay tuned!