



李政道研究所
TSUNG-DAO LEE INSTITUTE



TRIDENT
海 | 铃 | 计 | 划

Detecting the next core-collapse supernova neutrino with TRIDENT

曹瑞珂 Ruike Cao

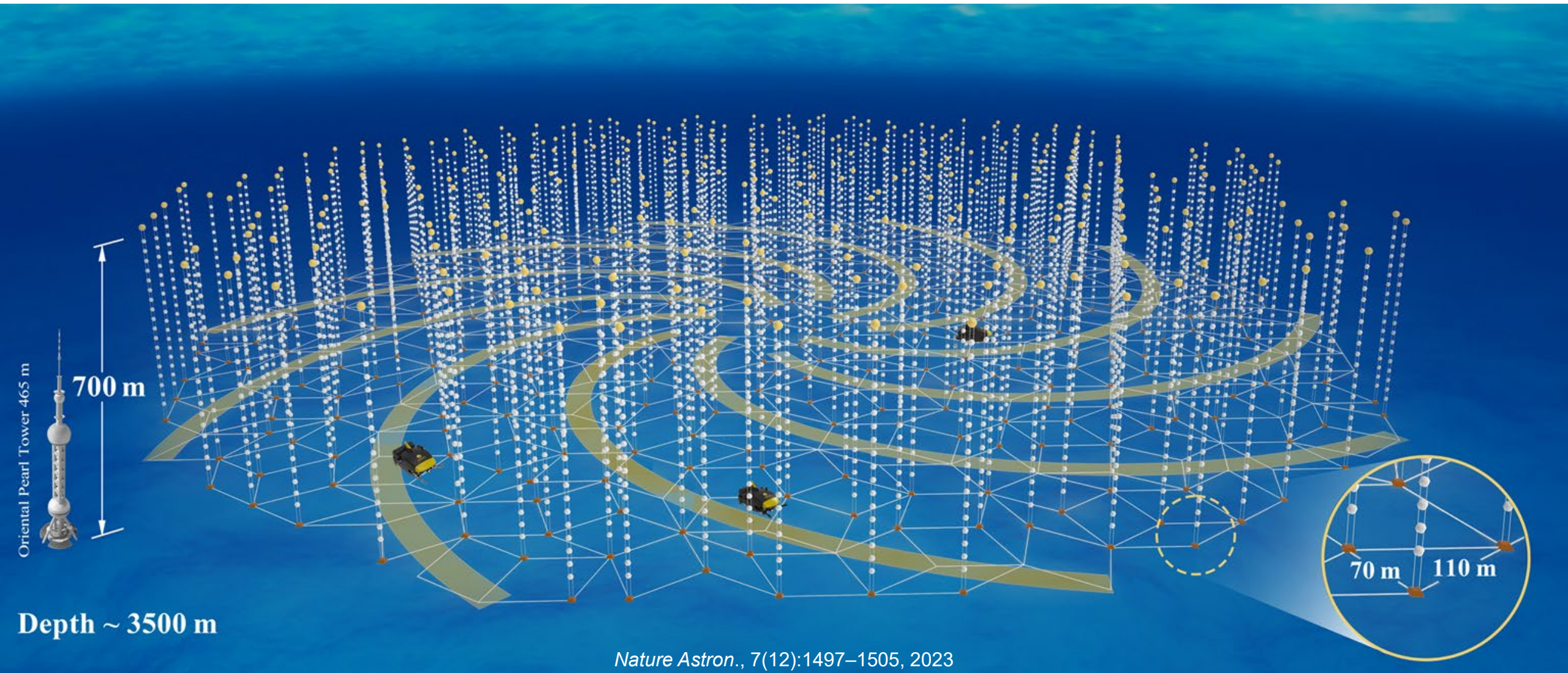
2026.07.17

2026 Chinese High Energy Physics Meeting, Guangzhou

TRopical DEep-sea Neutrino Telescope (TRIDENT)

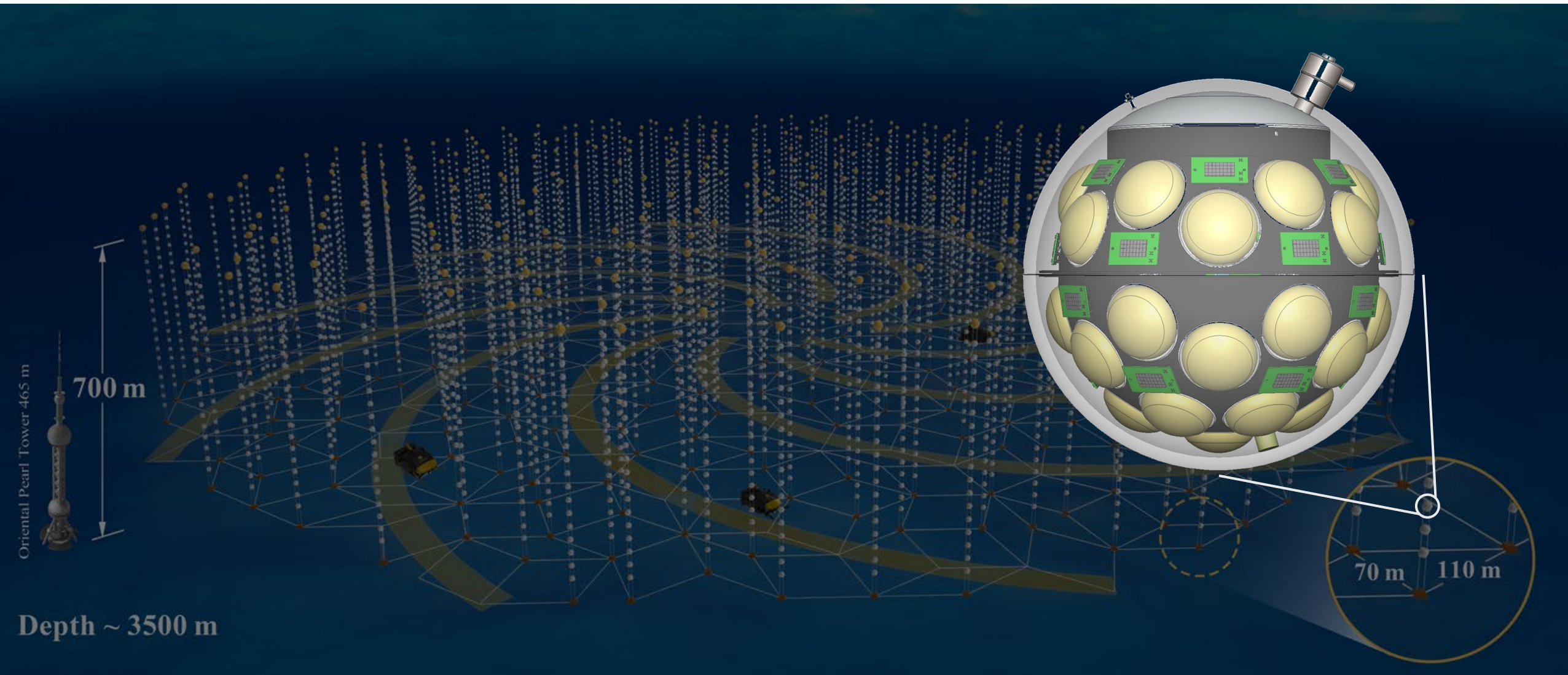


Aim: All-flavour **TeV~PeV** astrophysical & atmospheric neutrinos



Hybrid Digital Optical Module (hDOM)

Multi-channel coincidence: Sensitive to **MeV** events!



Neutron capture in seawater

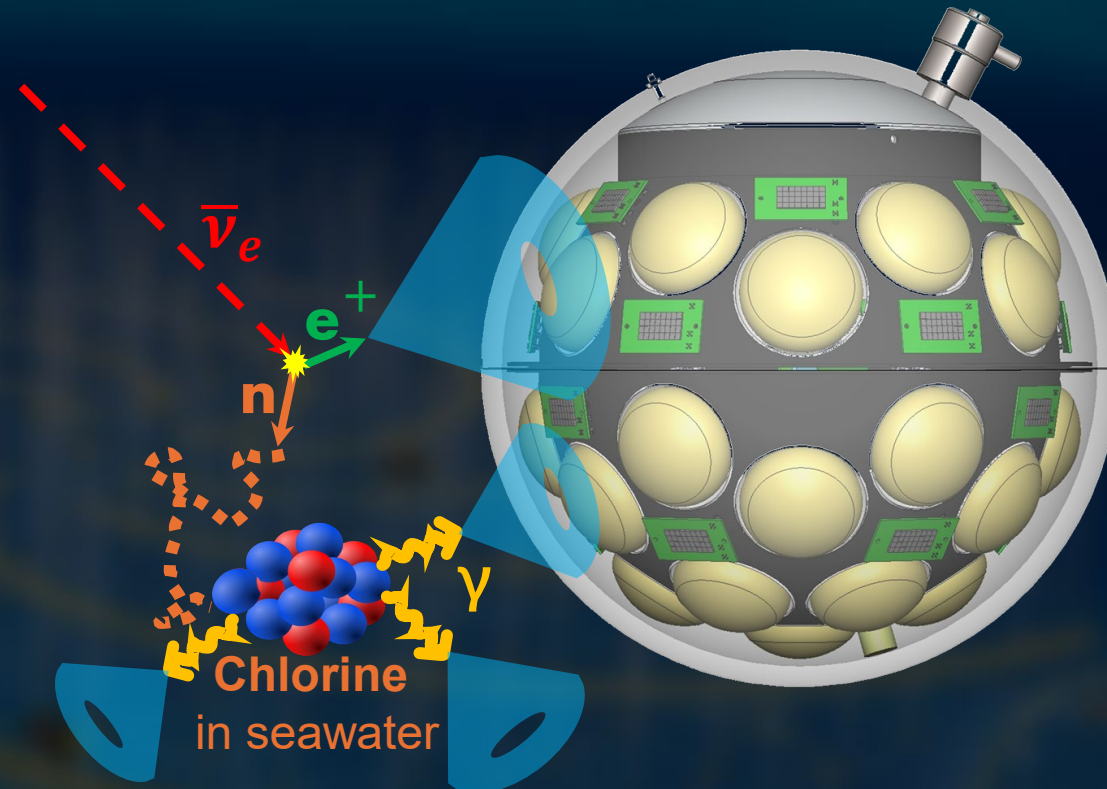
Inverse beta decay (IBD): $\bar{\nu}_e + p \rightarrow e^+ + n$

Naturally abundant **Chlorine**: First time in neutrino telescopes!

PoS(ICRC2025)1004

Seawater components:

Nuclei	n (number fraction)	$\overline{E}_\gamma$ [MeV]	σ [bar]
^1H	66.1%	2.22	0.333
^{16}O	33.2%	4.14	0.0002
^{23}Na	0.28%	6.96	0.52
^{35}Cl	0.25%	8.58	43.6
^{37}Cl	0.08%	6.11	0.43
^{24}Mg	0.03%	7.33	0.054

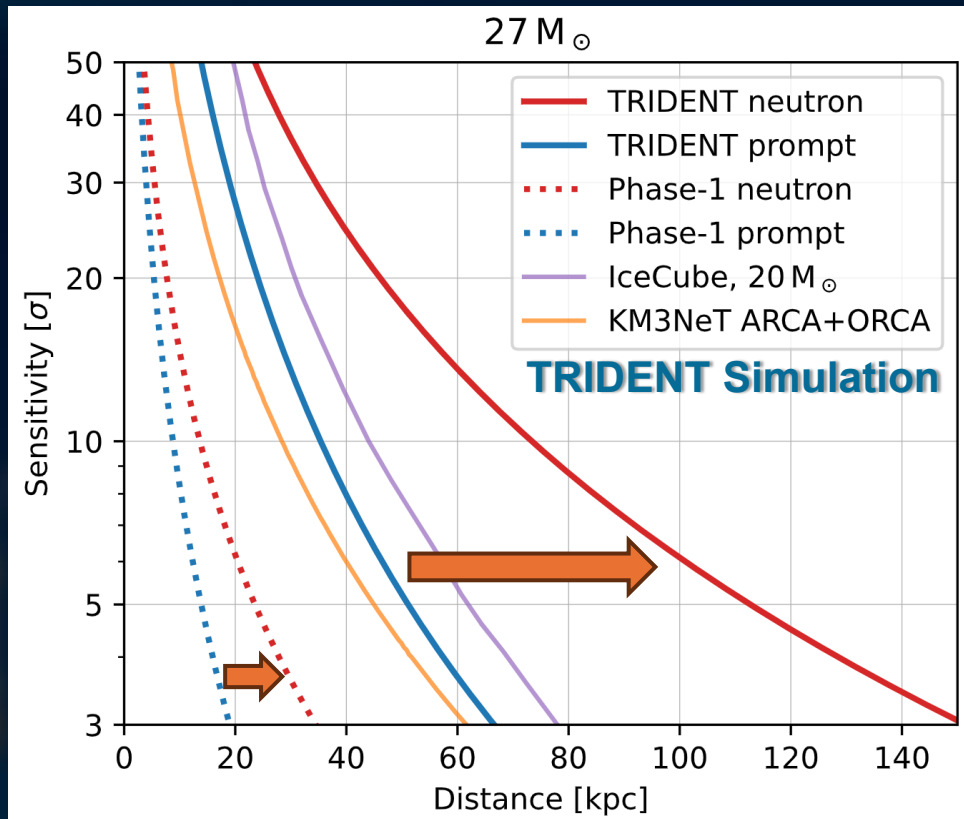


Neutron capture data from NNDC

Sensitivity horizon

Using neutron: Discovery distance $\times 2$

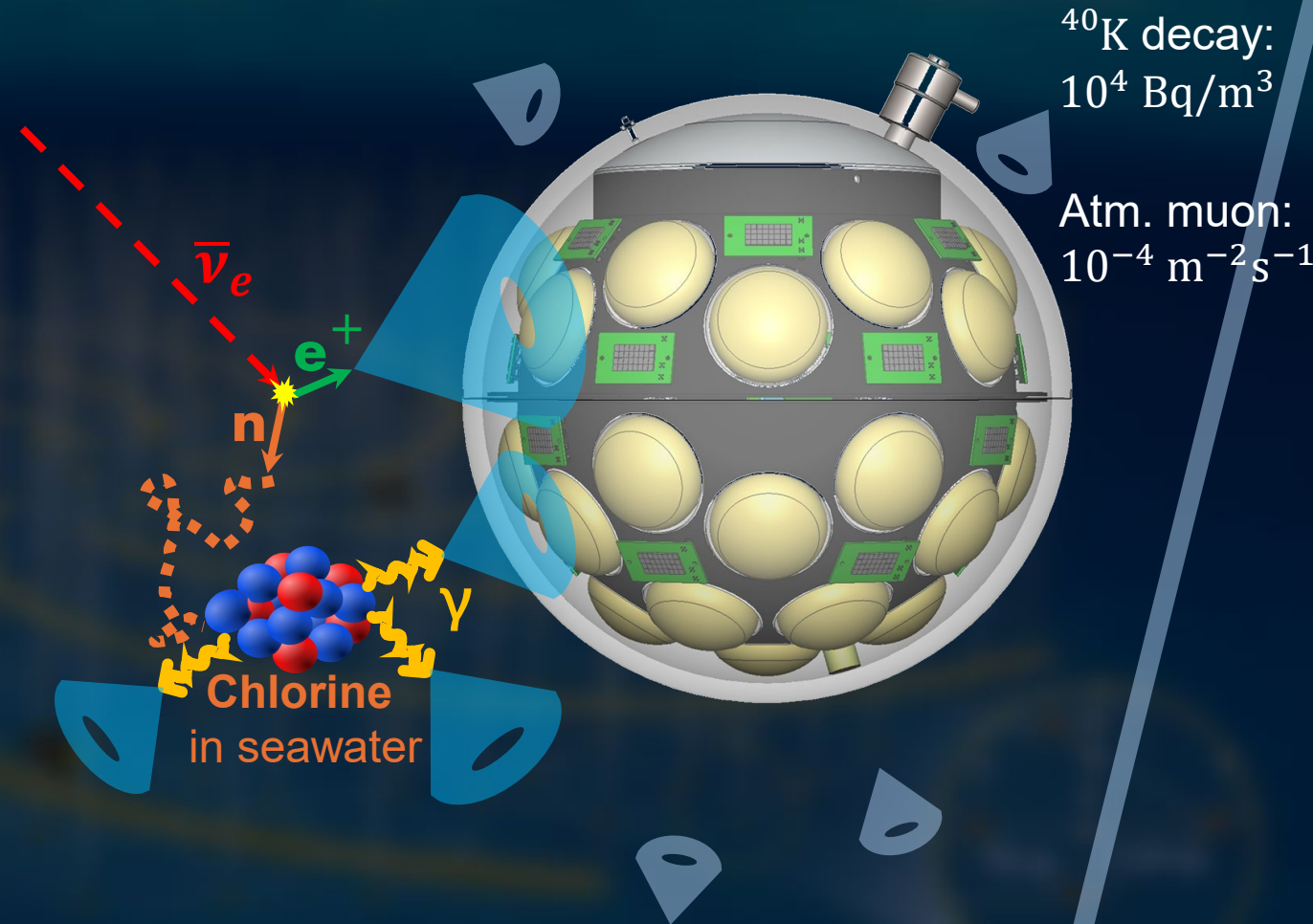
TRIDENT **Phase-1** in 2027: Cover the Milky Way!



MW

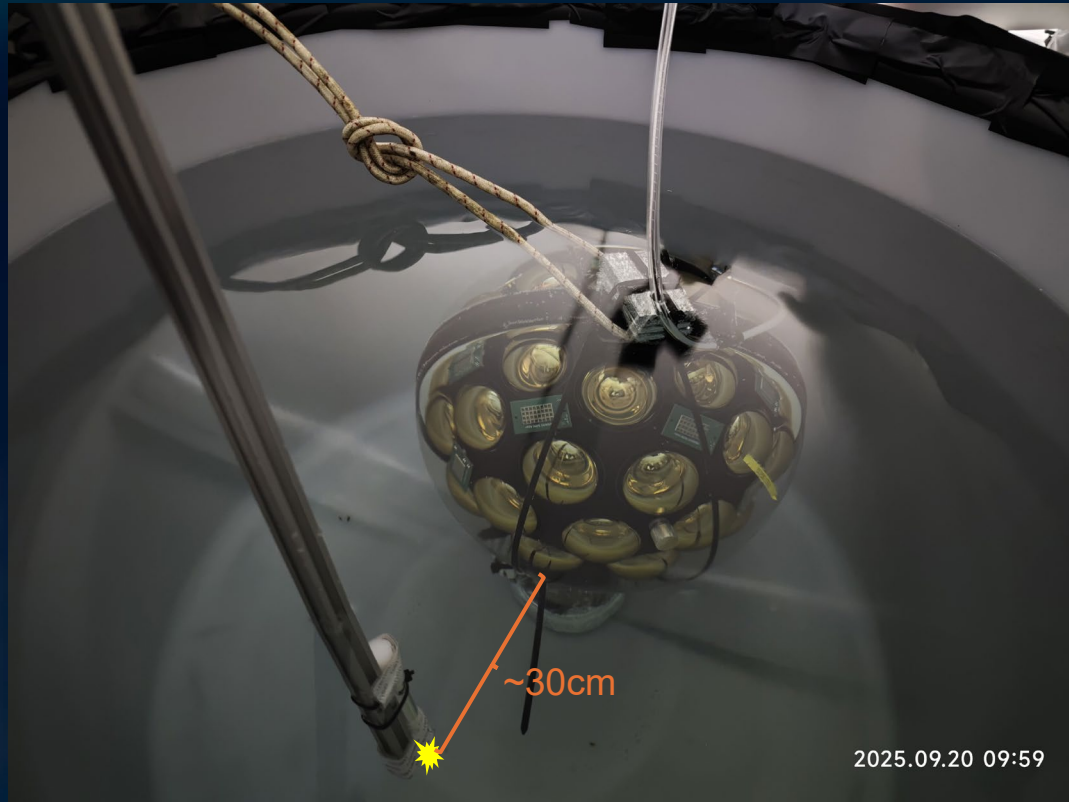
LMC

SMC

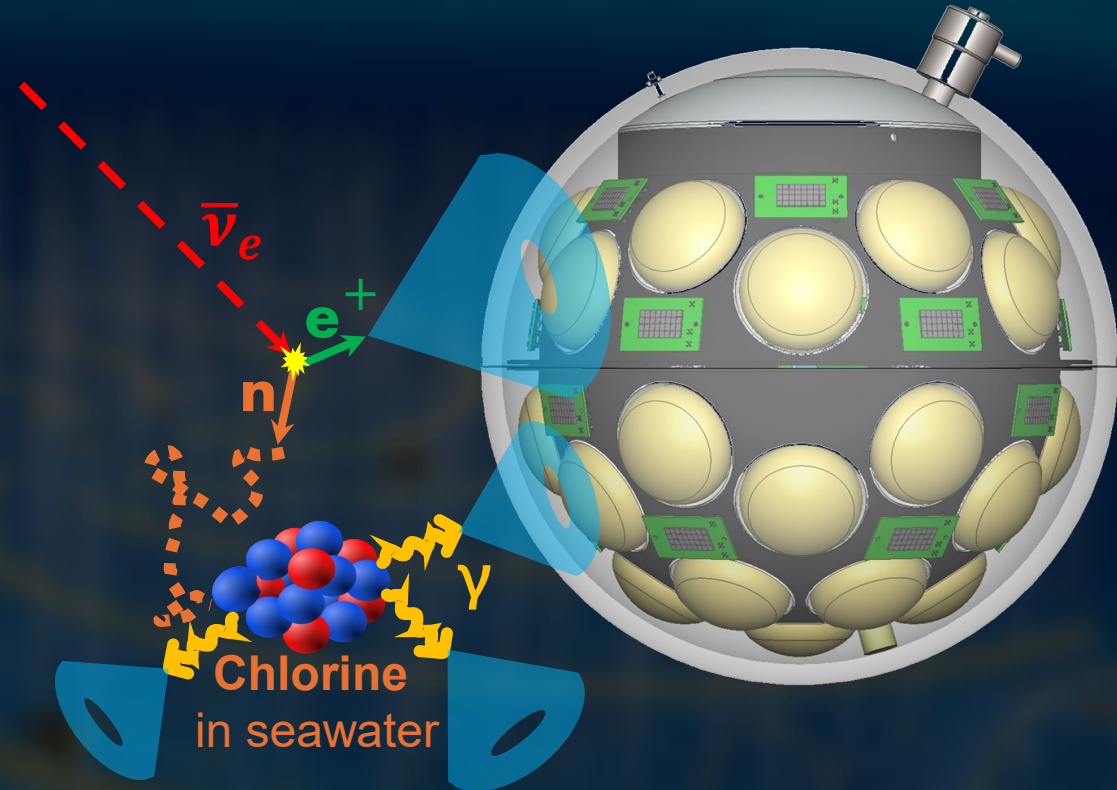


Experimental demonstration

Take an hDOM to CJPL (China Jinping Underground Laboratory)



AmBe source, ~10Bq
4.4MeV γ , 4~5MeV n

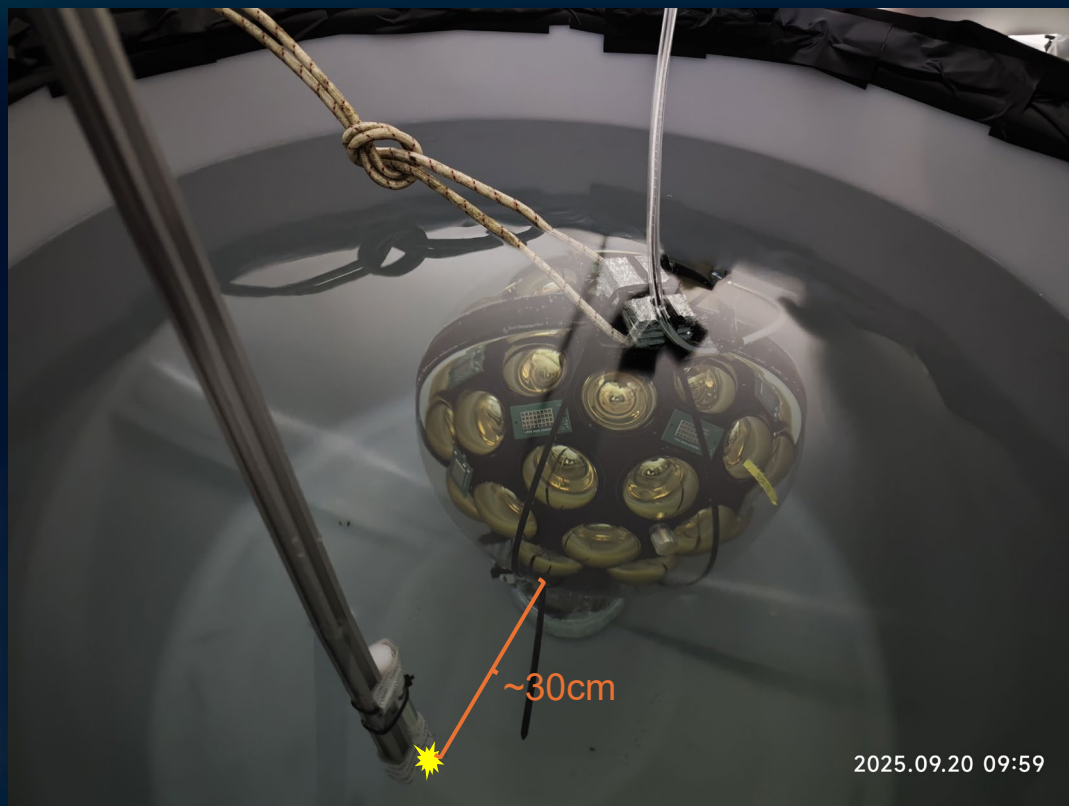


Experimental demonstration

Take an hDOM to CJPL (China Jinping Underground Laboratory)

3σ detection of AmBe source, weaker than typical CCSN

Publication coming soon!



AmBe source, $\sim 10\text{Bq}$
 $4.4\text{MeV } \gamma$, $4\sim 5\text{MeV } n$

