

IceCube and IceCube-Gen2

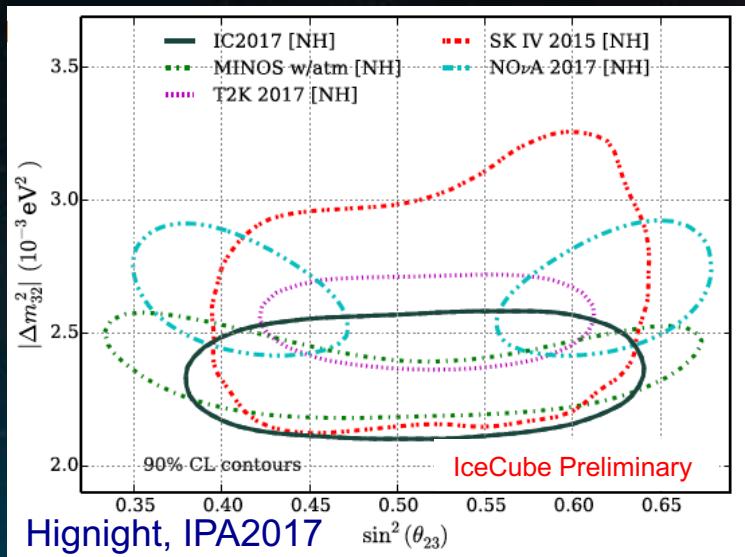
Teppei Katori
Queen Mary University of London,
PPAP meeting, RAL, July 21, 2017



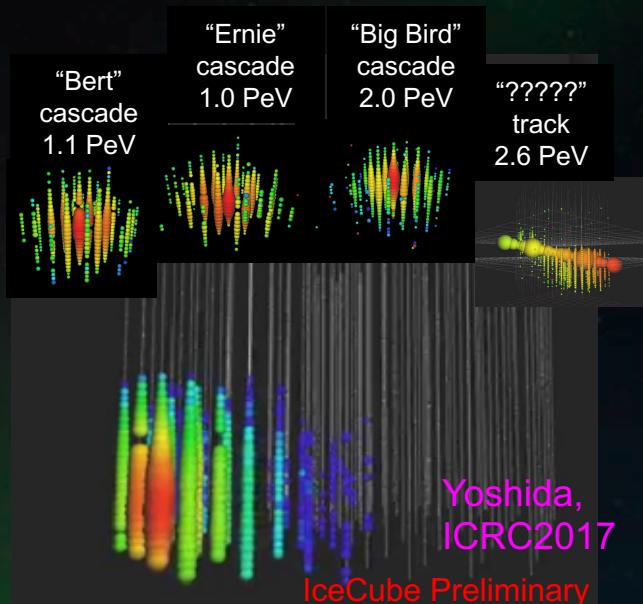
Highlights from recent results

5th PeV neutrino (name: ?????)

- cascade type
- ~2.7 PeV (the highest energy)
- unlikely to be GZK neutrino



Hignight, IPA2017

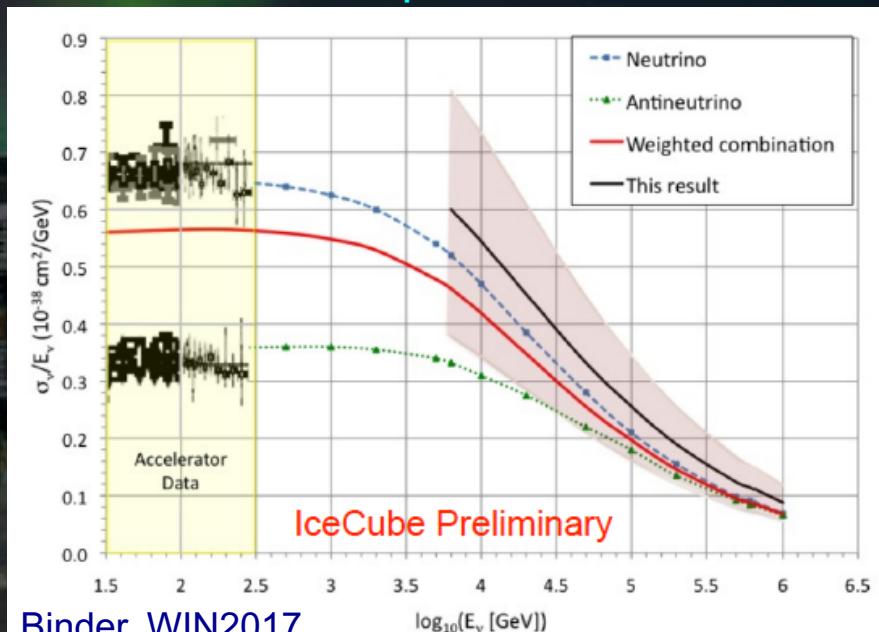


Yoshida, ICRC2017

IceCube Preliminary

PeV neutrino cross section

- First observation of DIS saturation
- Consistent with perturbative QCD



Binder, WIN2017



IceCube V-neck high energy neutrino t-shirt

\$15.00
The 'Ber' it comfor
cotton. A

Buy T-shirts, and
support IceCube!

[https://charge.wisc.edu/
icecube/wipac_store.aspx](https://charge.wisc.edu/icecube/wipac_store.aspx)

Future: IceCube-Gen2

IceCube-Gen2 covers particle physics from MeV to EeV with real discovery potential

PINGU (GeV)

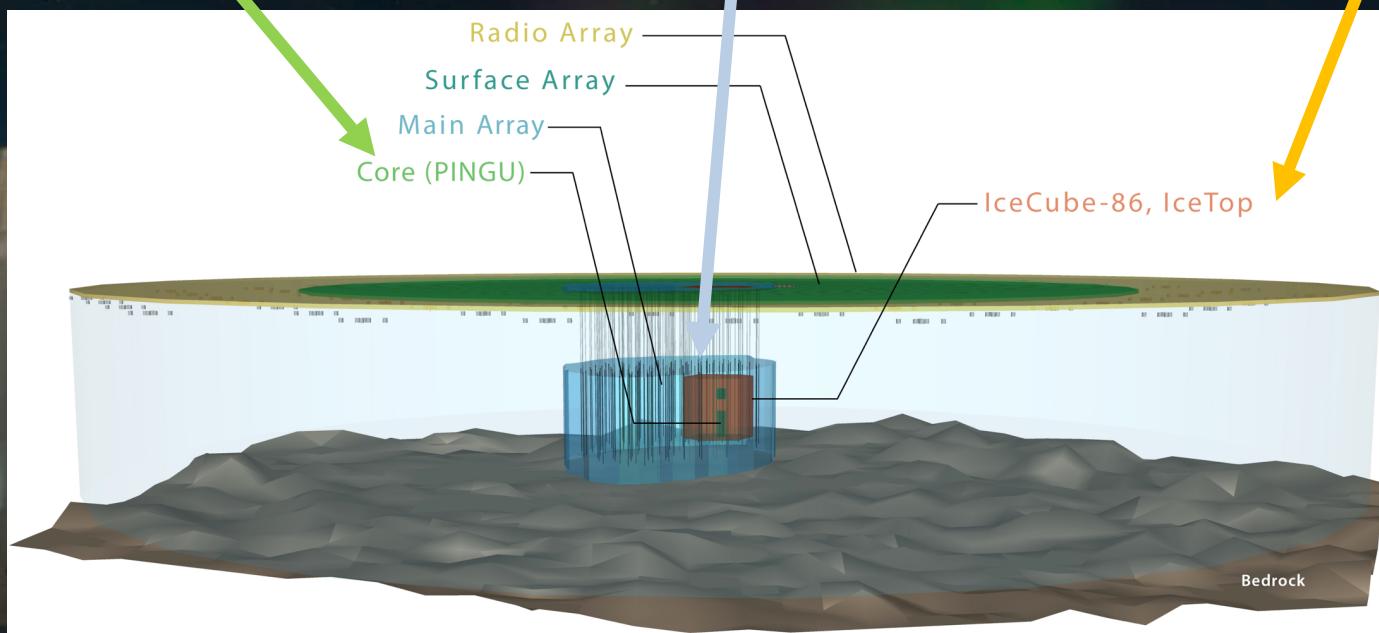
- ~20m spacing dense array
- neutrino mass ordering

Askaryan Radio Array (EeV)

- GZK neutrinos

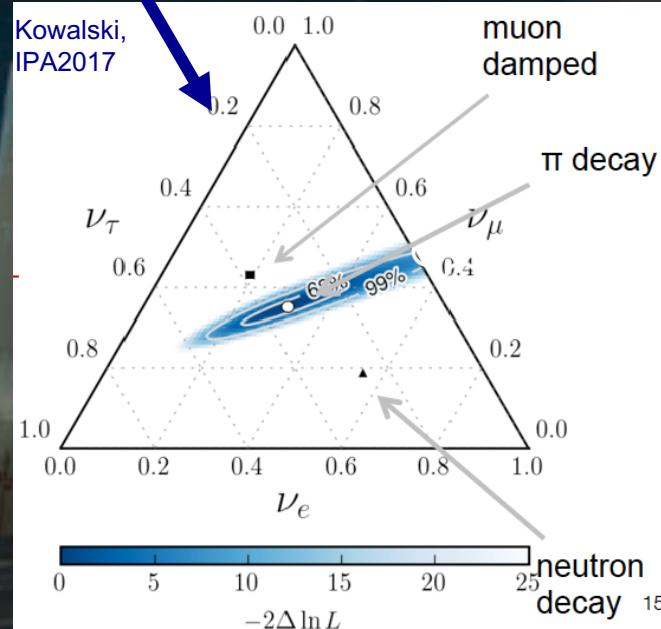
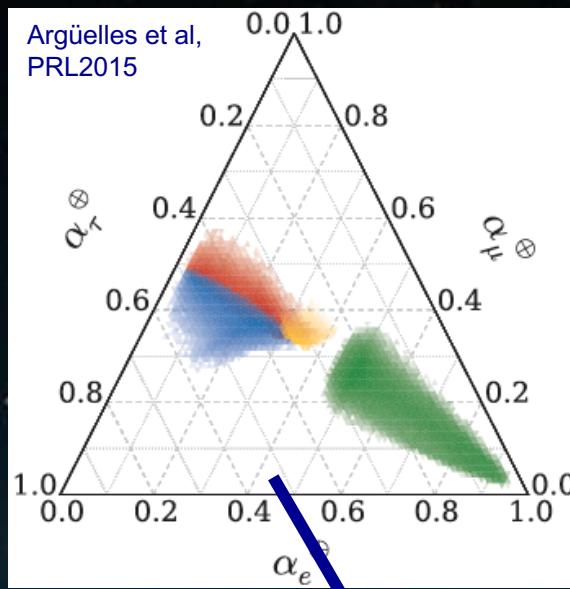
Main array (TeV-PeV)

- 120 new strings, 80 DOMs per string
- 240m separation to cover x8 volume
- x2 QE PMTs, and/or new photo-sensors



Physics of IceCube-Gen2

Argüelles et al,
PRL2015

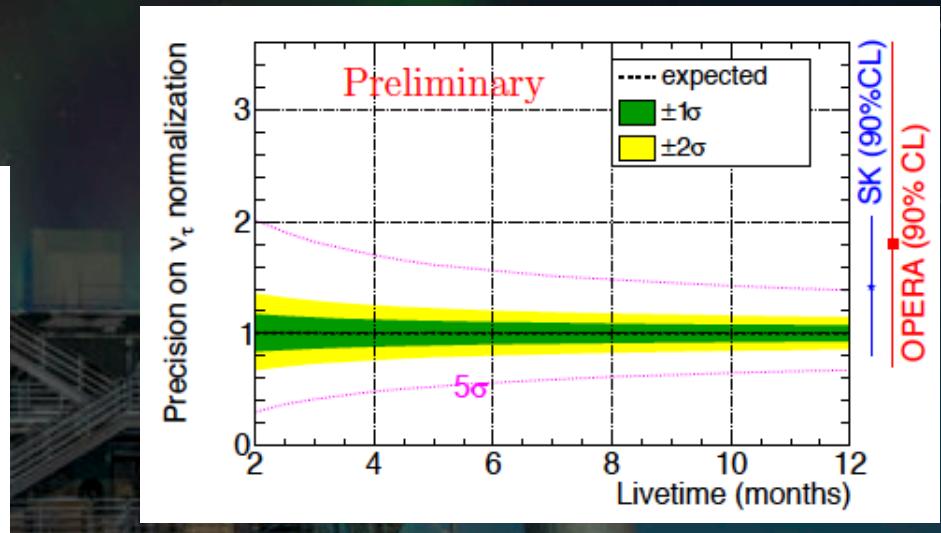


Astrophysical neutrino flavour

- very sensitive to new physics such as neutrino decay, non-standard interaction, quantum gravity, etc

Lepton unitarity triangle

- High statistics tau appearance to test of lepton unitarity



Unlimited list of science!

- low mass dark matter
- neutrino mass ordering
- multi-messenger astronomy, etc



IceCube-Gen2 in UK

IceCube data analysis

- Mass ordering analysis on DeepCore
- Test of quantum gravity

Software development

- Atmospheric flux systematics Evans et al, PRD95(2017)023012
- Hadronization systematics Katori et al, JPhysG42(2015)115004
- PINGU fast oscillation analysis code paper in preparation

Hardware

- FEB firmware development
- DOM Fermilab beam test paper in preparation

Analysis coordination

- Gen2 low E convener (Justin Evans)

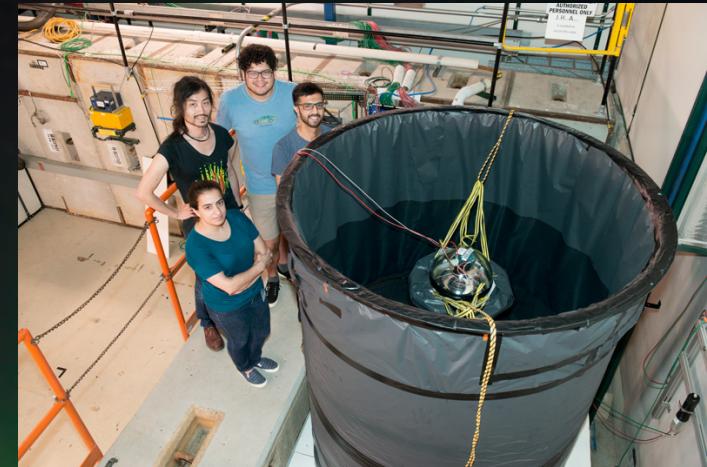
On top of these, there is a large theory contribution from Oxford (Subir Sarkar)

- LHCb for prompt- ν production, JHEP02(2016)130
- High energy neutrino cross section, JHEP08(2011)042
- etc

Manchester: J. Evans, S. Söldner-Rembold, S. Wren
Oxford: S. Sarkar
Queen Mary: T. Katori, S. Mandalia



The University of Manchester



The IceCube–Gen2 Collaboration



Teppi Katori, Queen Mary

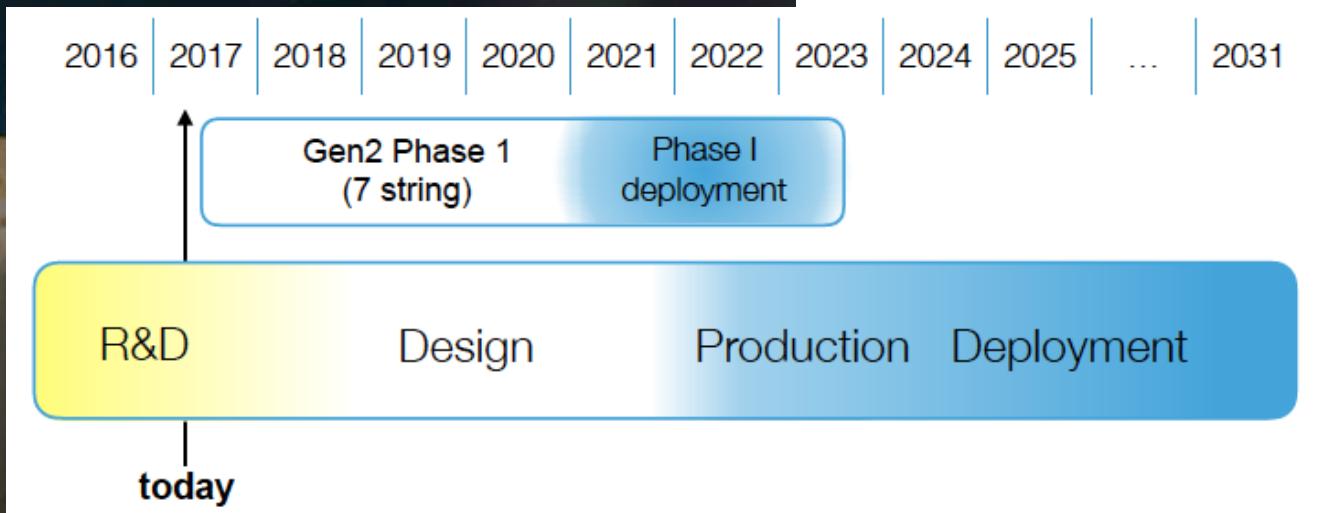
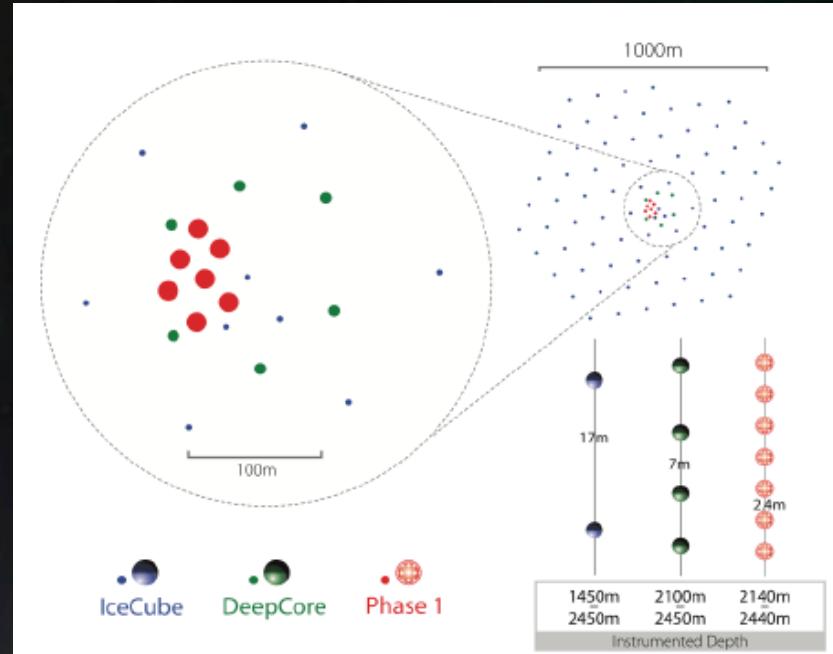
IceCube-Gen2 phase I

Staged approach

- Phase I includes 7 close strings to focus on ν_τ appearance (unitarity triangle)
- Proposal submitted to NSF, received with favor

PINGU: A vision for neutrino and particle physics at the South Pole
arXiv:1607.02671, JPhysG44(2017)054006

IceCube-Gen2: A vision for the future neutrino astronomy
arXiv:1412.5106



Thank you for your attention!