Concept Study of a Radio Array Embedded in a Deep Gen2-like Optical Array

The Gen2 Collaboration
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Opportunistically deploying Radio Antennas with Gen2 Digital Optical Modules

Potential Benefits:

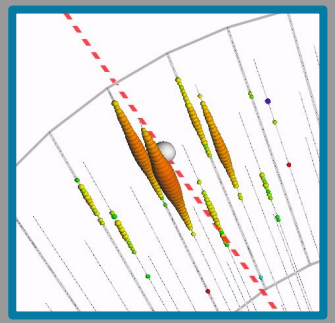
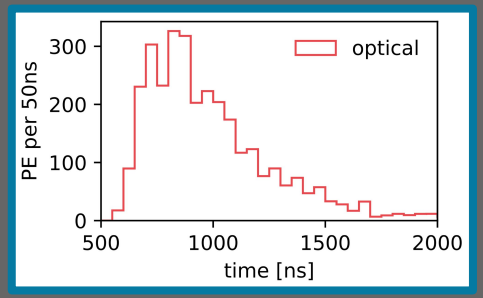
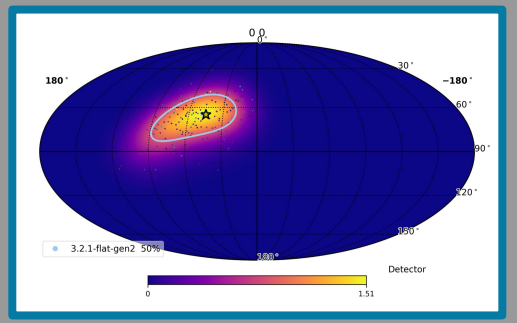
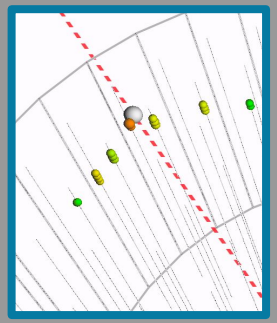
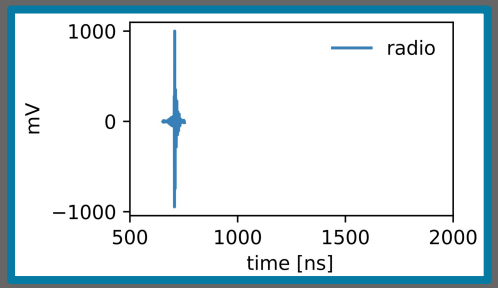
- Improve angular reconstruction of neutrino events
- Improve flux measurements around 10 PeV
- Connect radio neutrino observations to multi-messenger possibilities

Potential Downsides:

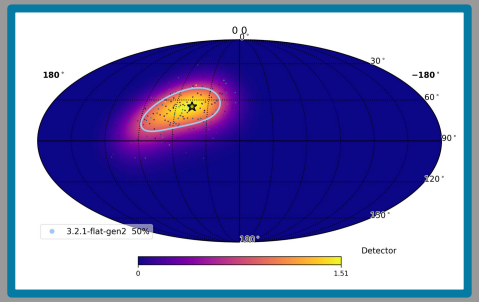
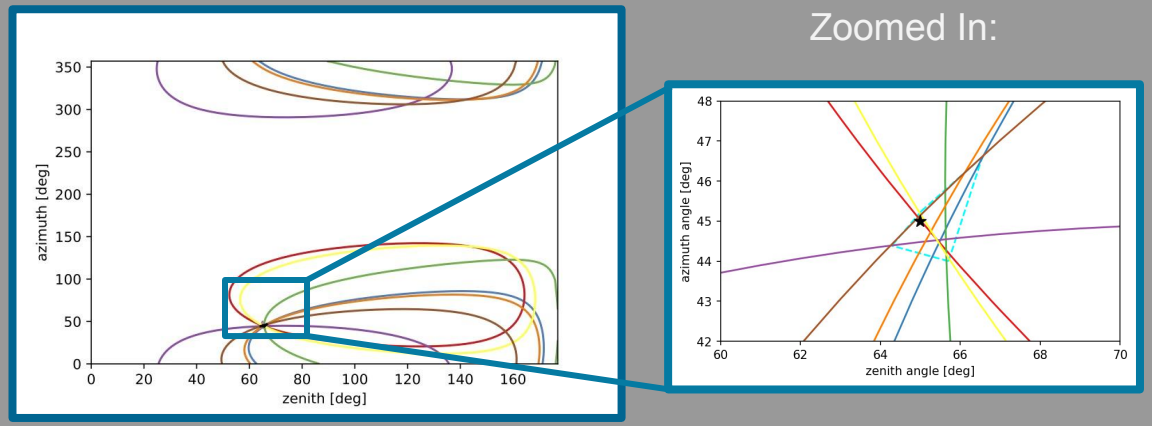
- The simulated detector uses one radio antenna per dom which amounts to 9,760 antennas - an exorbitant and costly amount

This project is just a concept study and this type of detector is not proposed for IceCube.

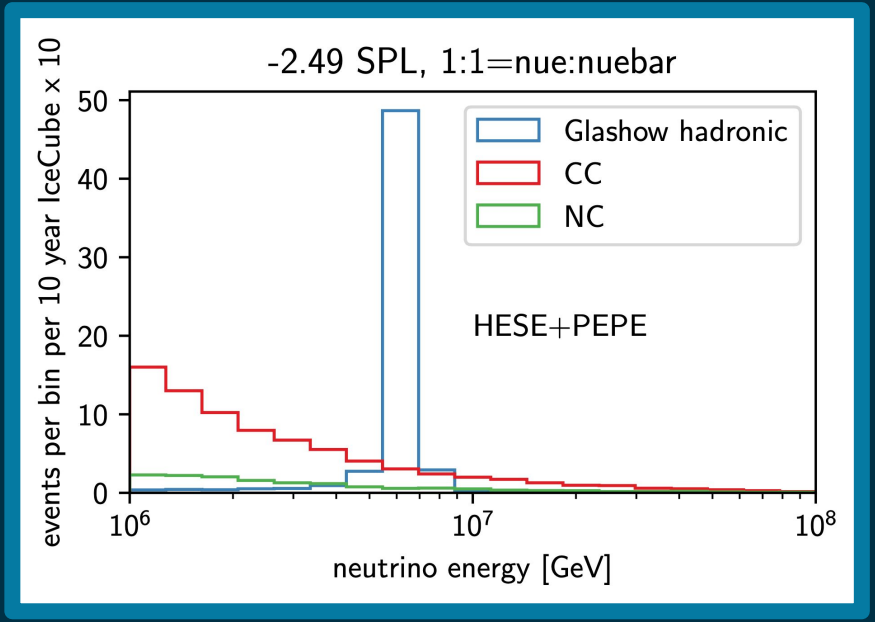
Angular Reconstruction

	Event Topology	Waveform for Optical and Radio Antennas in the Same Location	Angular Reconstruction
Optical			
Radio			

Angular Reconstruction

	Angular Reconstruction	Accuracy
Optical		Within ~10°
Radio		Within ~1°

Event Rates



Energy /PeV	Fraction of Events with Radio Content
6	0.11
10	0.41
30	0.84
100	0.91

Out of 60-70 expected observed events over 10 years in the IceCube and Gen2 optical channel, we expect 5-10 would also have a radio component.