

Flashers in Gen2

Are they any good?

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Gen2 Calibration Workshop April 2021



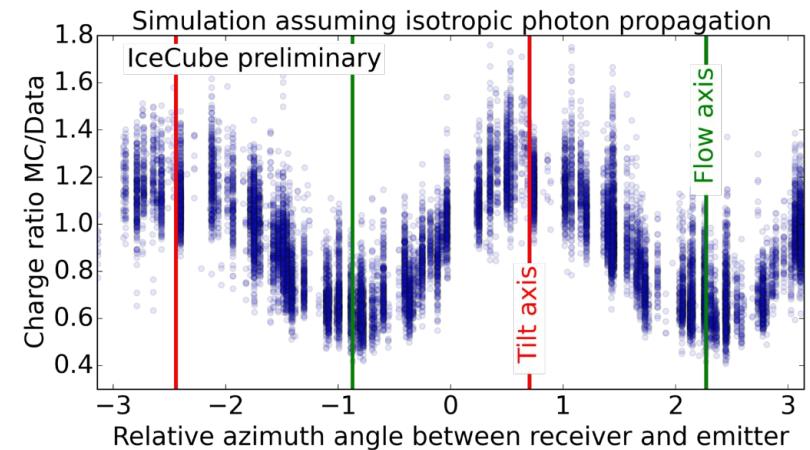
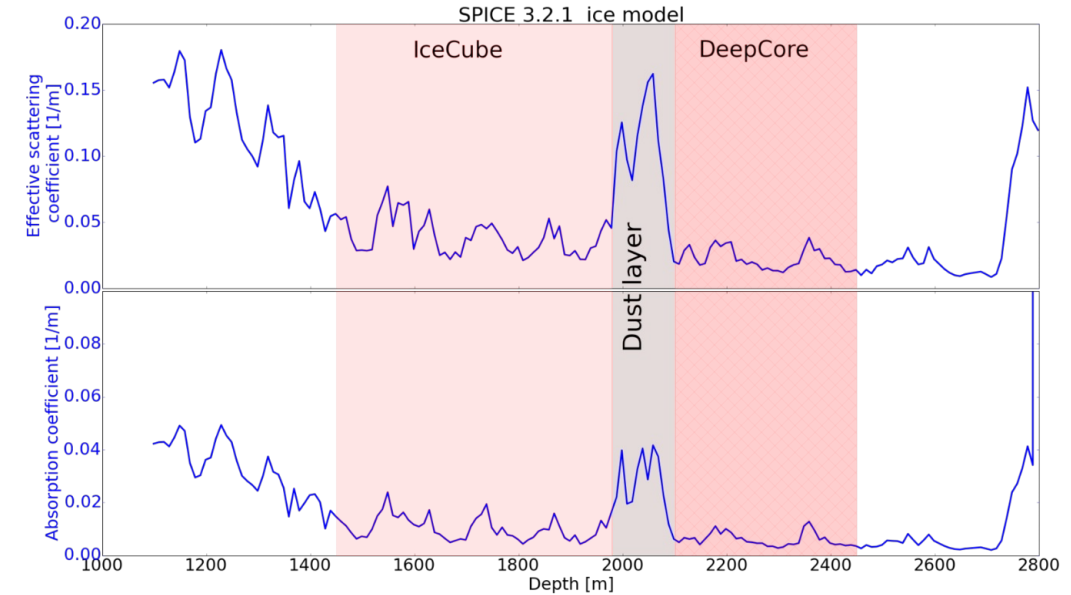
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What do we do with flashers now?

- Primary workhorse for ice model studies (bulk and hole ice)
- DOMCal PMT calibration (using mainboard LEDs)
- Geometry and timing studies / cross-checks
 - Stage2 geometry for z-offsets between strings
 - Lateral geometry calibration so far unsuccessful but being continued
 - Timing cross-checks along string
- Hardware studies
 - PMT saturation, afterpulses
 - Front-end artifacts...



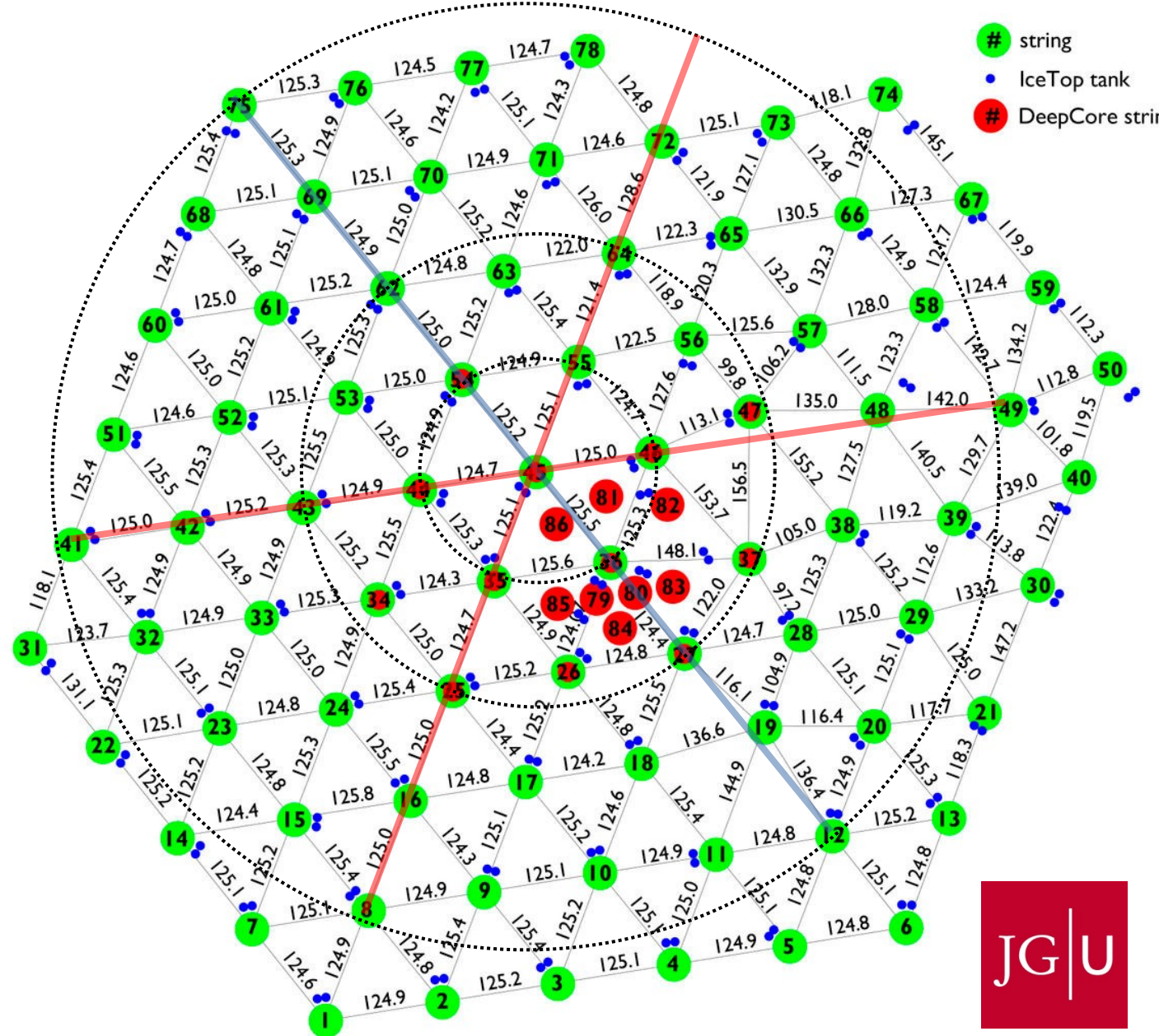
Data driven Gen2 estimation

- There were some thoughts/ fears that the Gen2 string spacing would not yield usable flasher data
- Gen2 geometry still changing, but rough string spacing of ~240m seems decided
- This is roughly twice the IceCube string spacing of 125m
 - Instead of running dedicated simulation, look at actual IceCube flasher data
- Chose to go with All-purpose horizontal data
 - all 6 horizontal LEDs flashing at once & maximum intensity settings (brightness and width DACs)
 - This was the default ice model fitting data until the BFR models (which switched to single LED data → 6x less charge per DAQ setting)
- Feel free to scale this data up by any given factor for your favorite module...



Study geometry

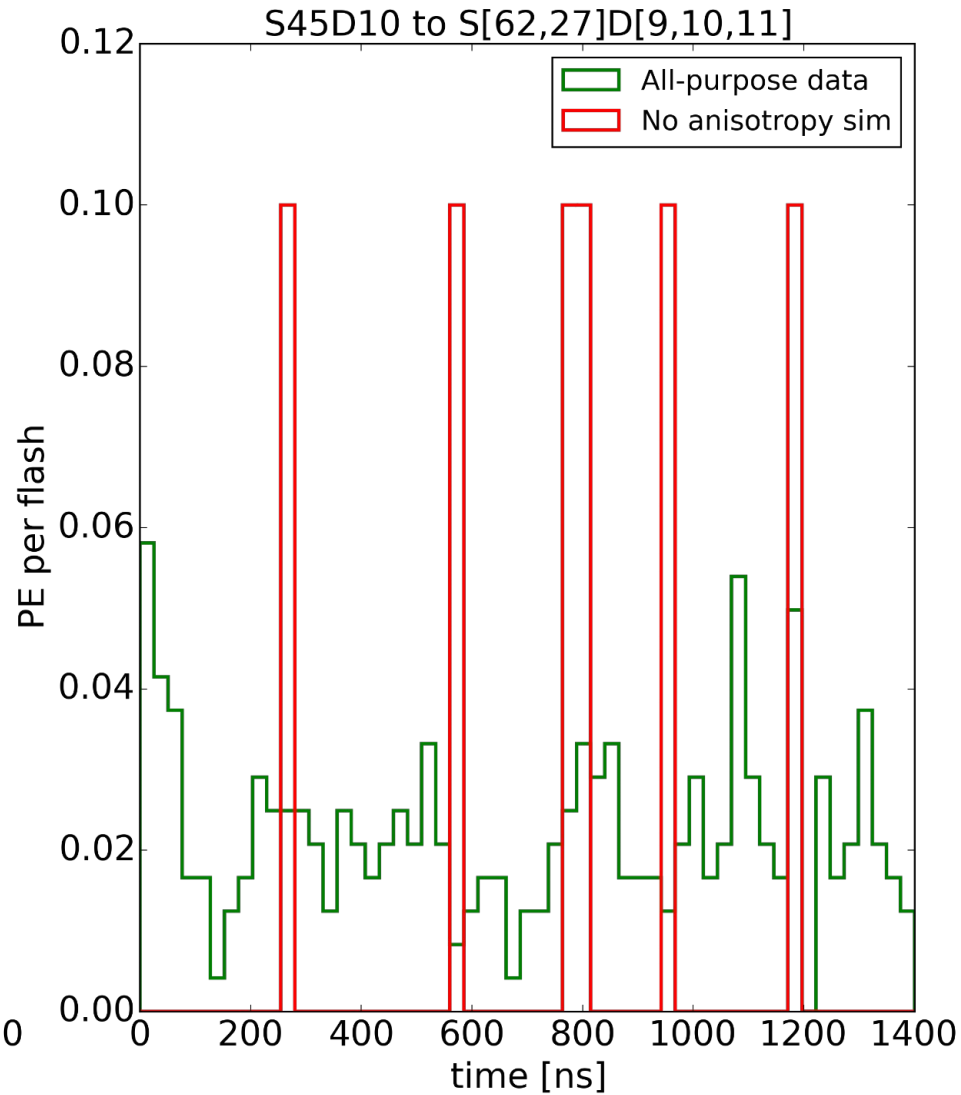
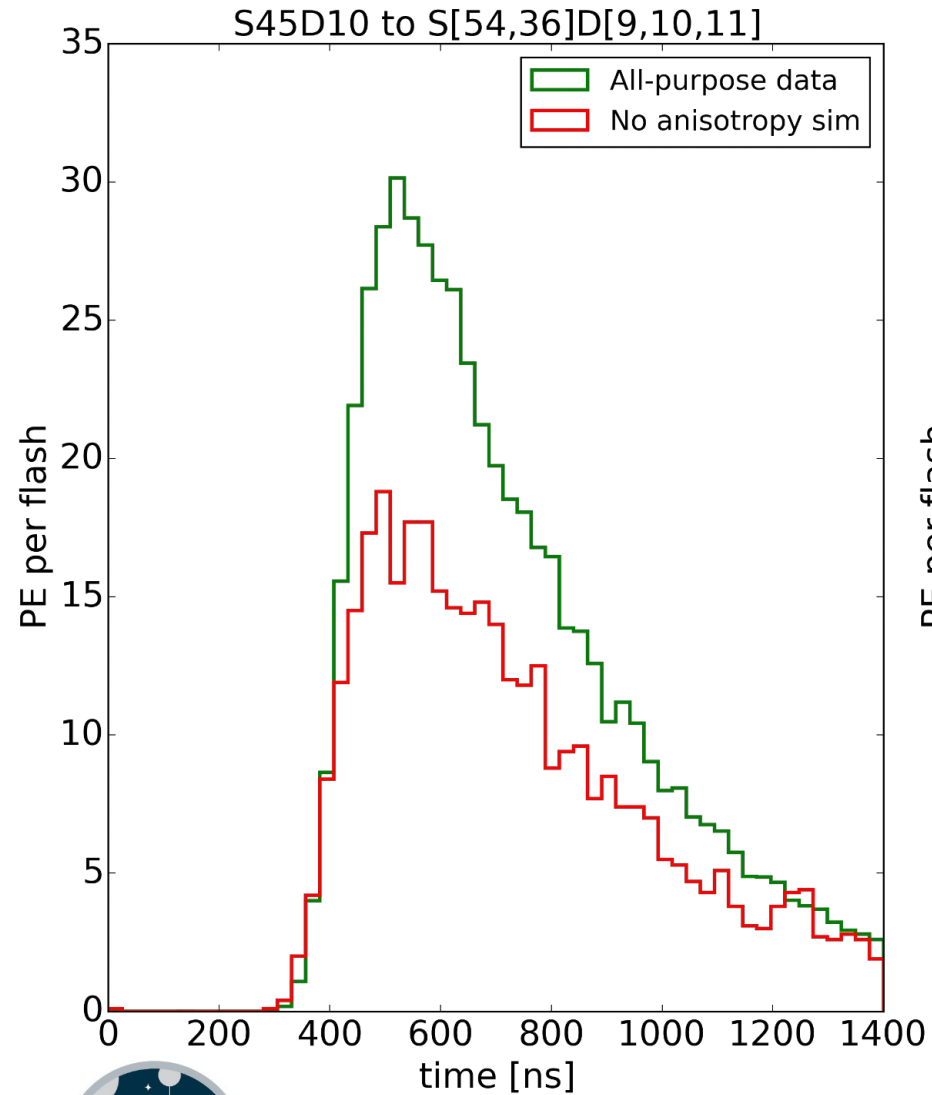
- Take string 45 as emitter (chosen for long range of receivers on as regular of a grid as possible)
- OM10 depth as proxy for mediocre ice
- OM50 depth as proxy for good ice
- Look at light curves for OMs 9-11 & 49-51 on IceCube and Gen2 string spacings:
 - ▶ S54 & 36 for IceCube on flow
 - ▶ S62 & 27 for Gen2 on flow (~250m)
 - ▶ S75 & 12 for 2xGen2 on flow (~500m)
 - ▶ S44, 46, 55, 35 for IceCube 45° to flow
 - ▶ S43, 47, 64, 25 for Gen2 45° to flow
 - ▶ S41, 8 & 49 for 2xGen2 45° to flow



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On flow mediocre ice



Nothing detected

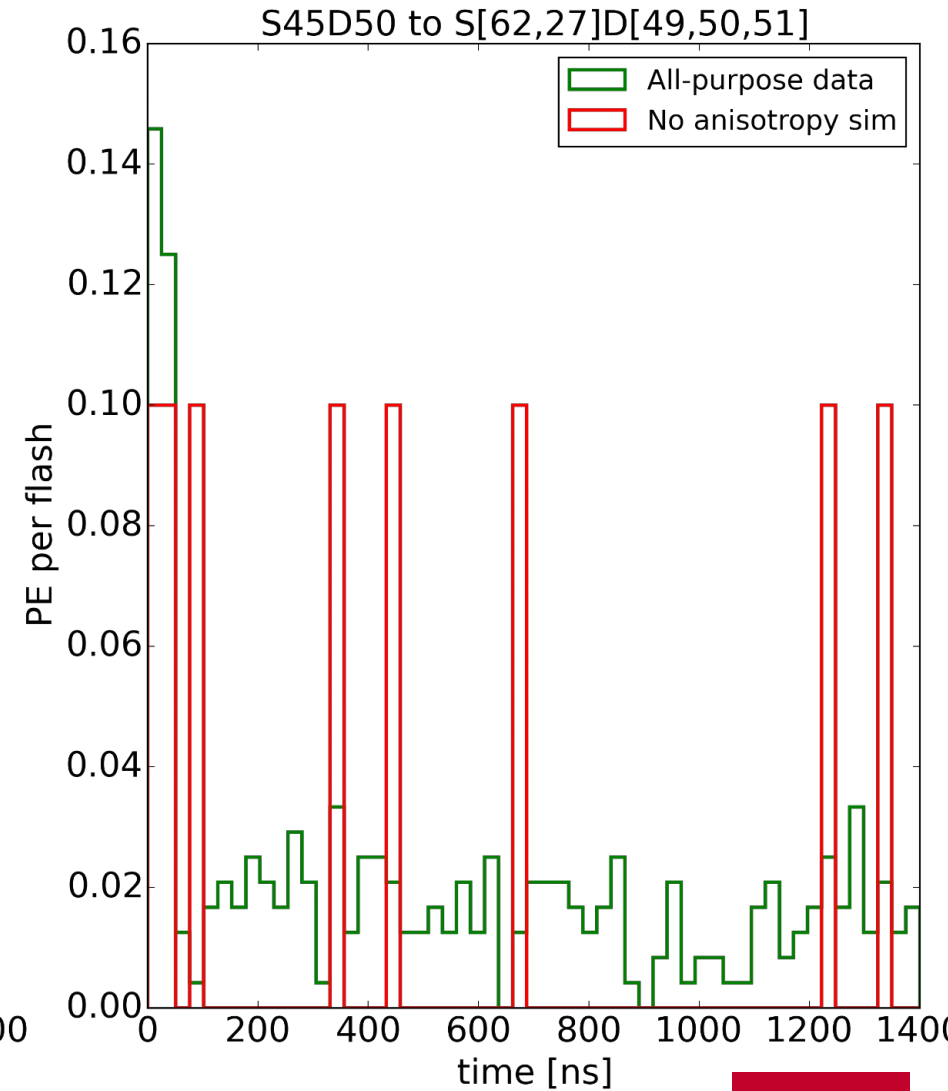
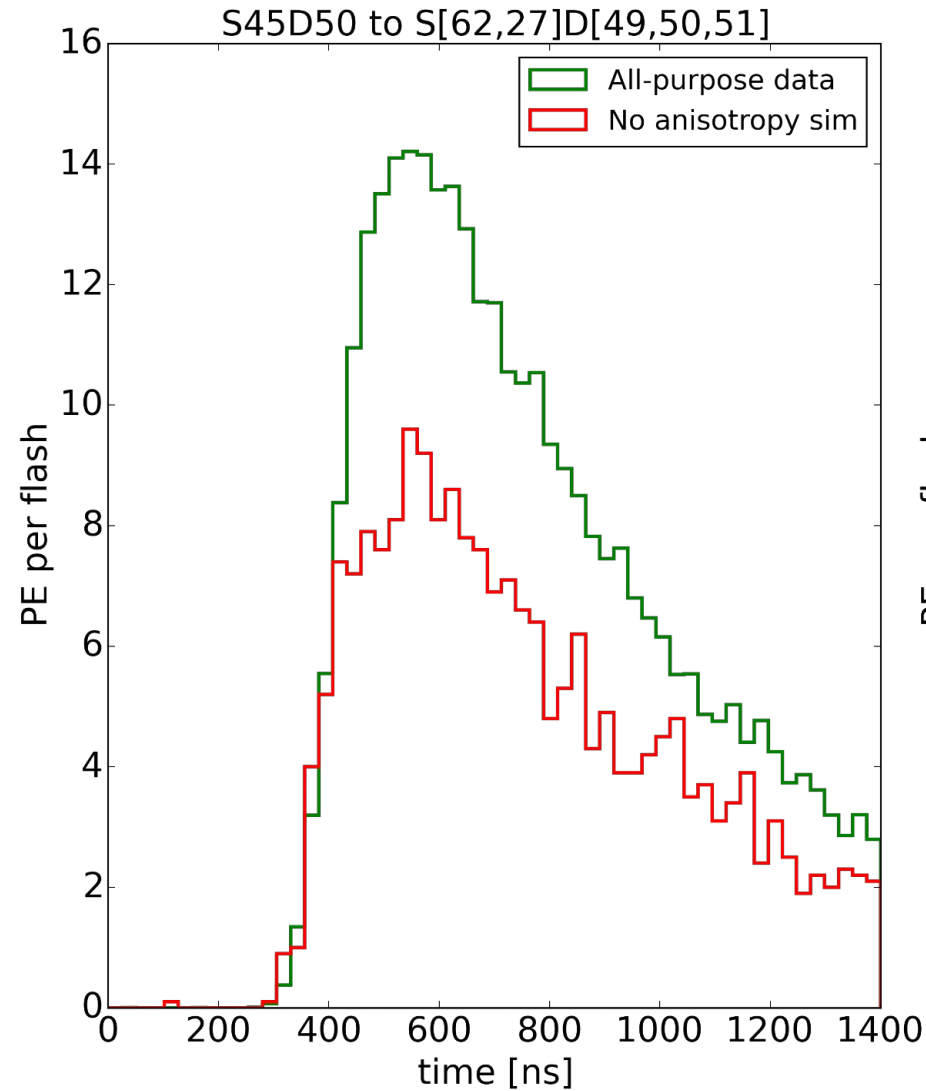


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On flow good ice

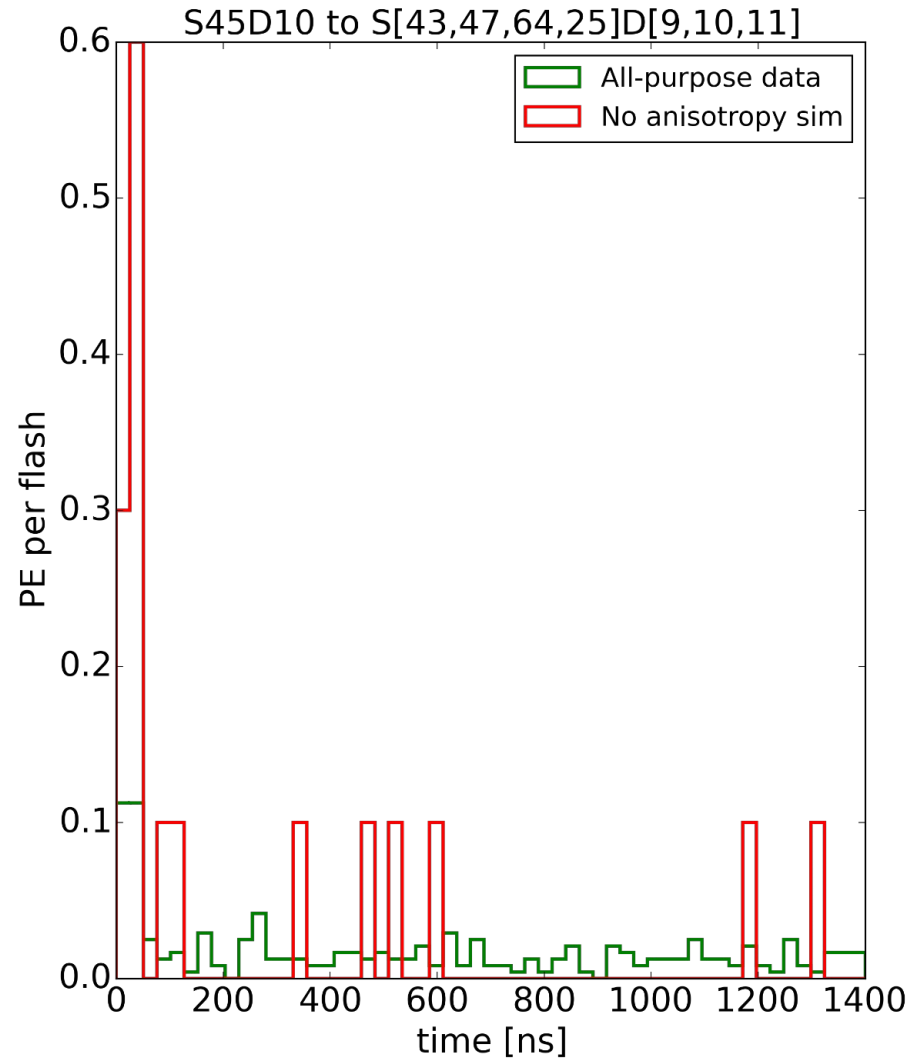
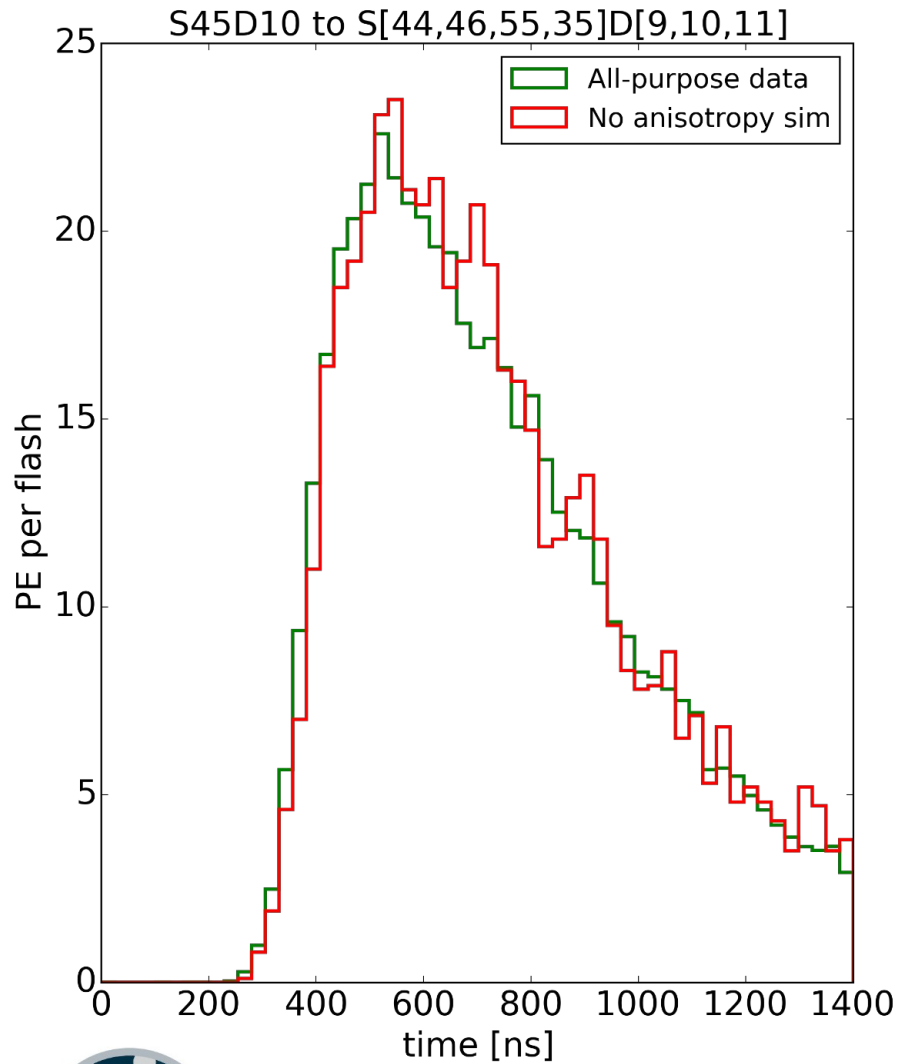
Saturated and
not processed to
final level flasher data

(Charge per DOM
1-2 kPE)



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45° mediocre ice

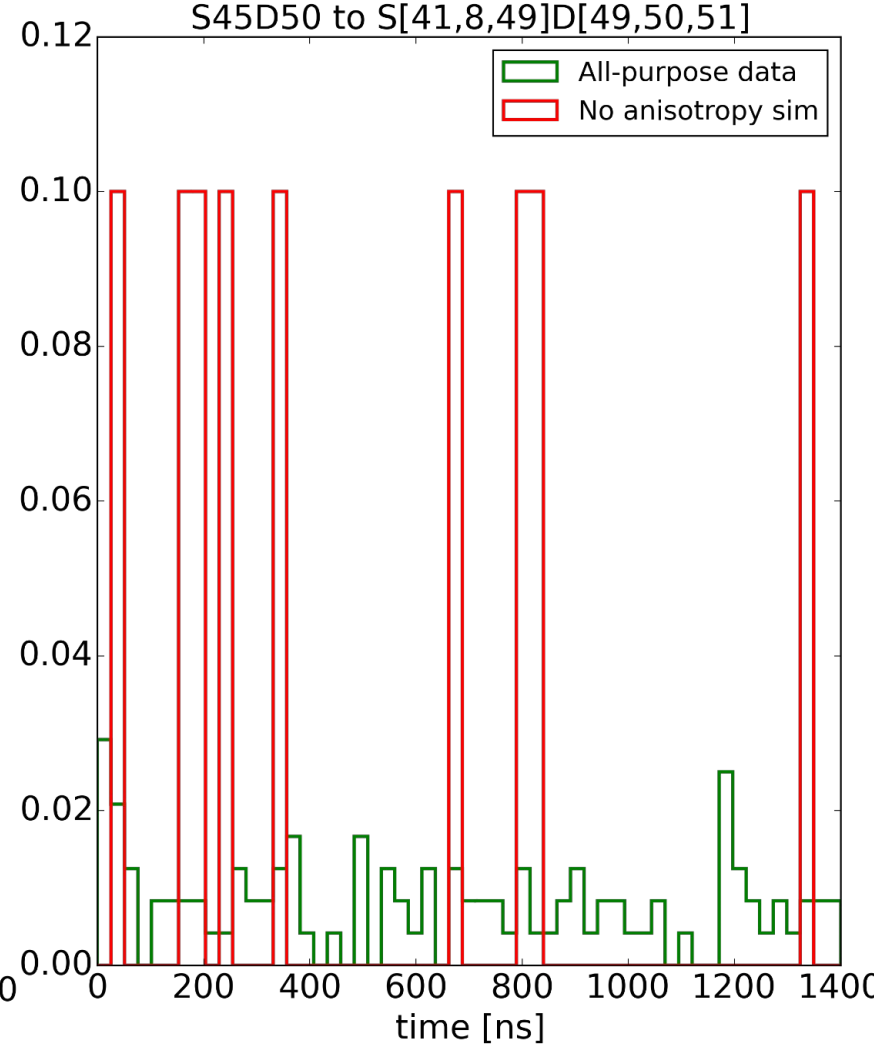
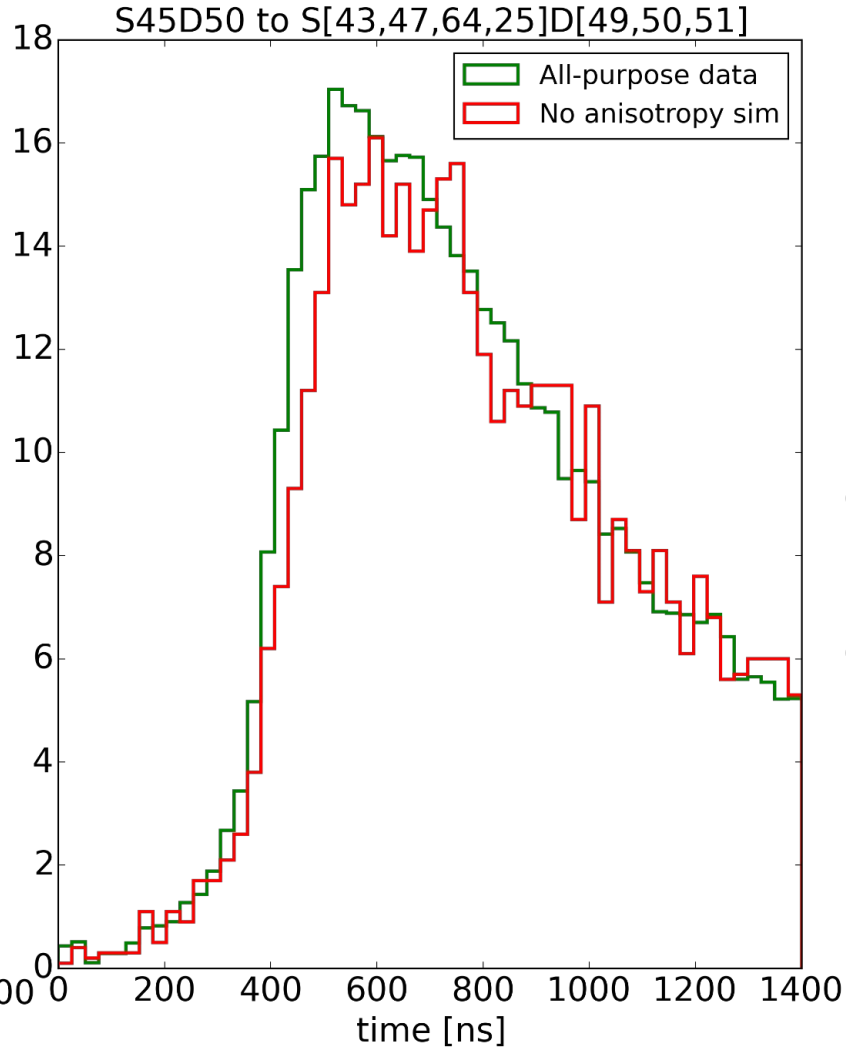
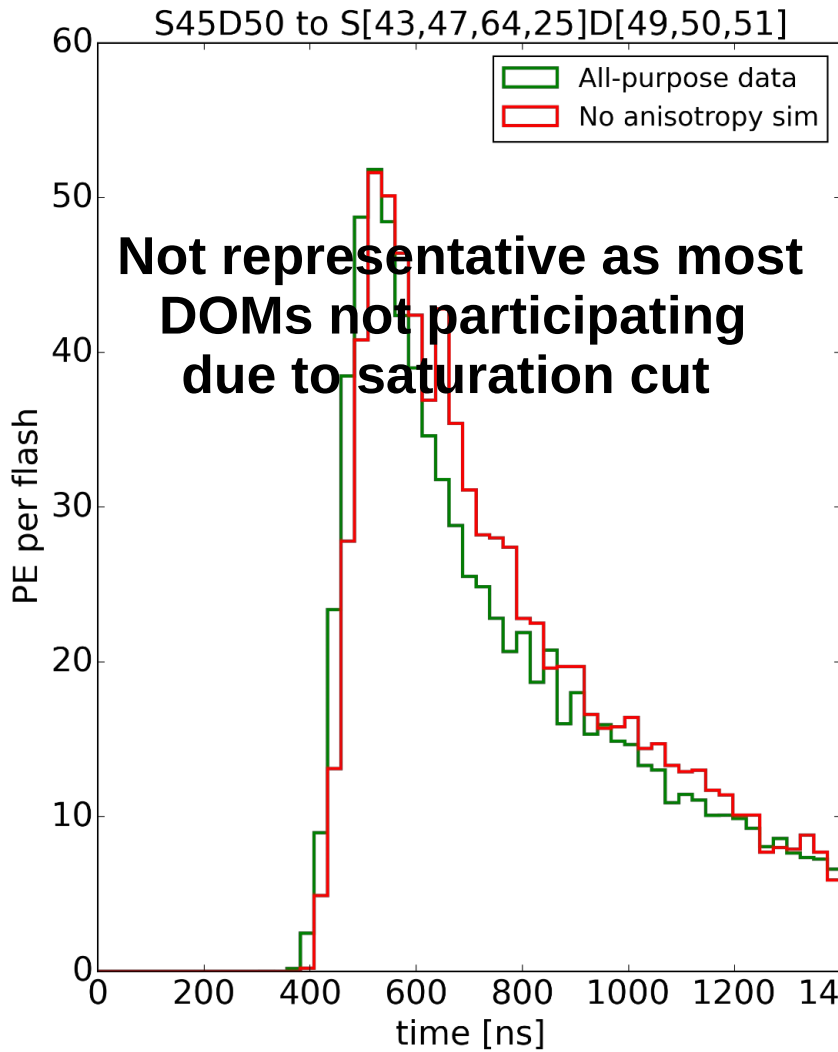


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45° good ice



Summary / Thoughts...

- **Flashers will NOT be useless**
- **But visibility range will be restricted to only the neighboring string**
- **And this will require brighter flashers to be able to cover most depths**
- **Scattering function (a focus of the Upgrade) largely irrelevant**
→ flashers can be slowish as in IceCube
- **Scope will likely be limited to cross-checking precision ice model from IceCube & the Upgrade over the entire footprint of the Gen2 array**
- **New ideas to maybe pursue: Ice fitting from vertical flashers**