

# The Acoustic Module for the IceCube Upgrade

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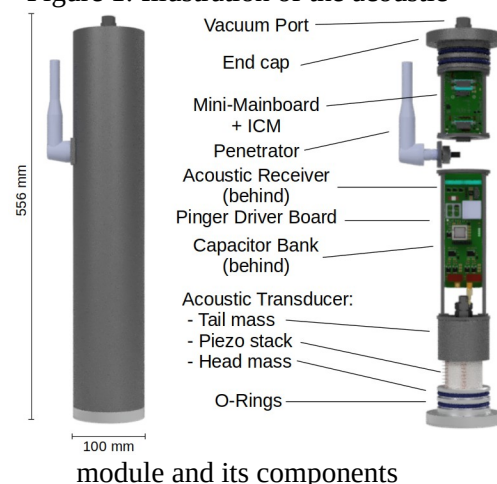
## The IceCube Upgrade

- 7 new strings will be deployed at the center of the existing IceCube detector
- Approximately 700 new optical modules and multiple calibration devices will be deployed

## The Acoustic Calibration System

- The acoustic module (AM) is a calibration device aiming to improve the geometrical uncertainty of the optical modules by means of trilateration
- 10 AMs will be deployed which will be capable of sending and receiving acoustic signals
- Acoustic receivers will be integrated into some of the optical modules
- Proof of concept for the upcoming Gen2 detector
- Coincident detection of high-energy neutrino events together with optical modules

Figure 1: Illustration of the acoustic



## Phase Response Measurement

- New method has been developed to measure the propagation time measurement of acoustic signals in ice
- Analysis of the signals in frequency domain, information is found as group delay  $\tau$

## Simulation of the Array Performance

- Simulation of the localization uncertainty yields  $\sim 12$  cm for distances of several 100 m of the AMs
- Different assumptions for the attenuation length  $\lambda$  and output power give similar results

## Conclusion

- Results from the Upgrade will provide important measurements of the acoustic attenuation length and the overall performance of the system
- Based on these results the design can be further optimized for the upcoming IceCube Gen2 detector