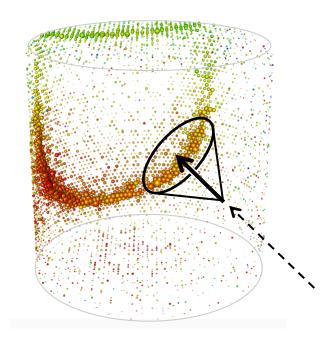
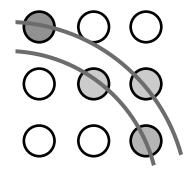
Can we improve water-Cherenkov detectors?

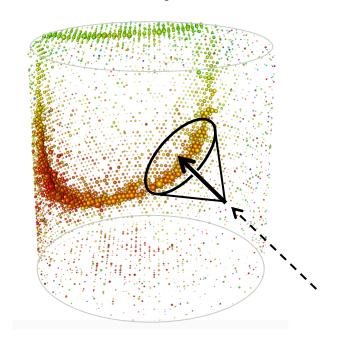




- 40% photo-coverage
 → 60% photons lost
- All PMTs outside the ring are "unused"

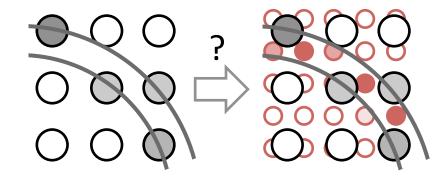


Can we improve water-Cherenkov detectors?





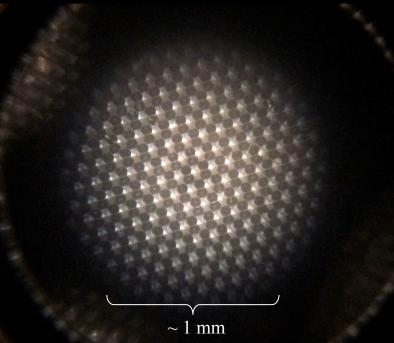
- 40% photo-coverage
 → 60% photons lost
- All PMTs outside the ring are "unused"

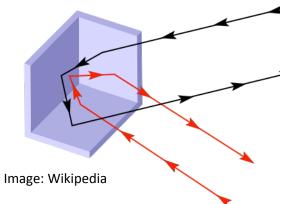


Can we map lost photons to other side of tank?

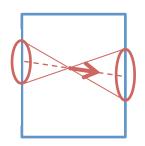


Retro-reflectors



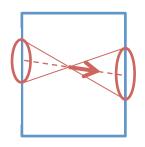


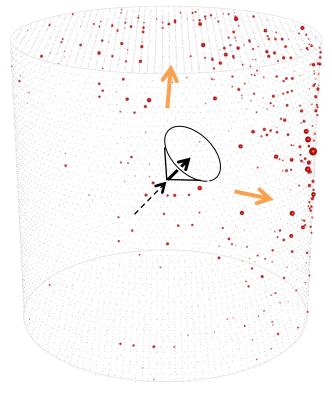




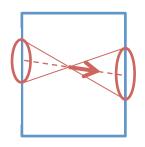






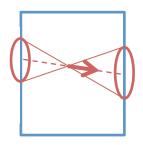






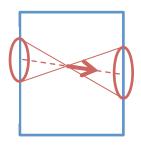






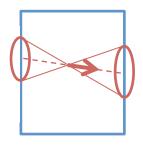






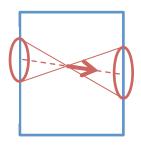






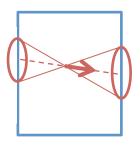






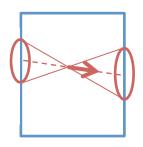






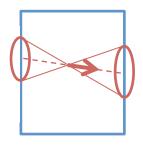






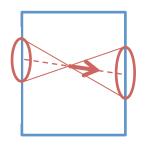


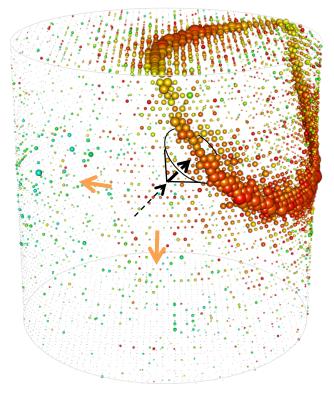




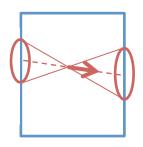






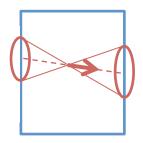


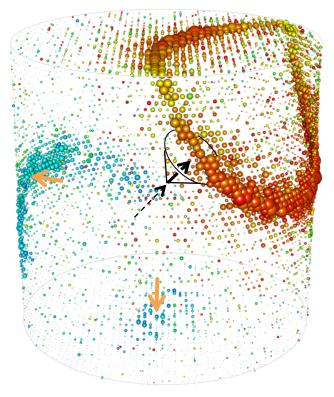




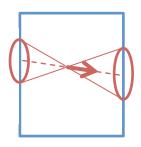


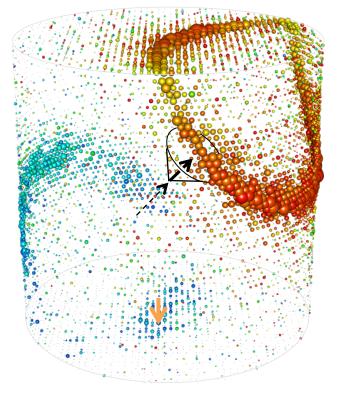




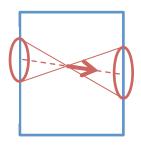


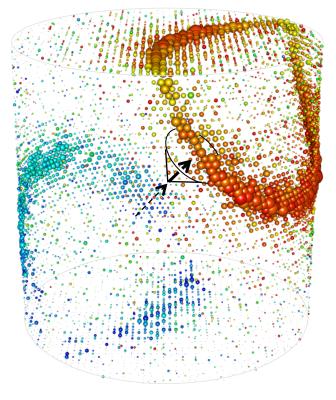




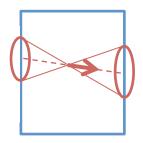


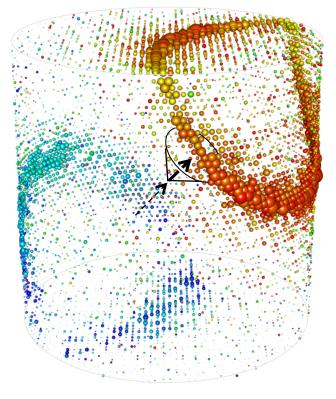




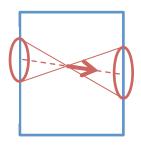


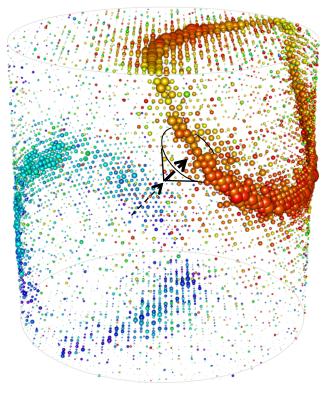




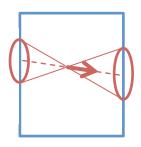


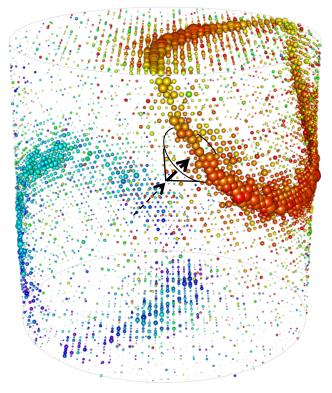




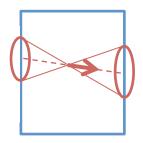


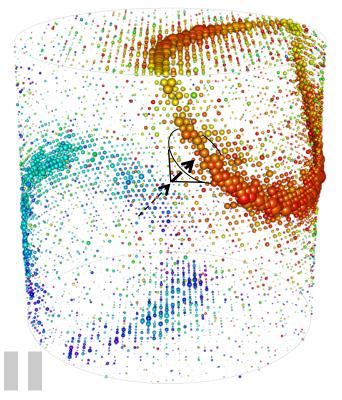




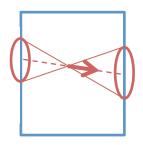


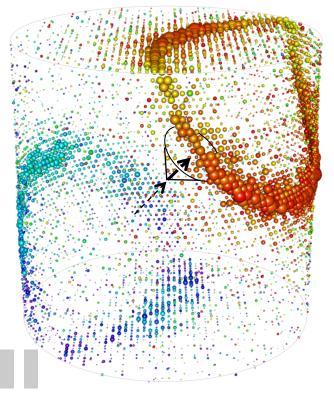




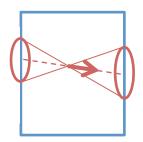


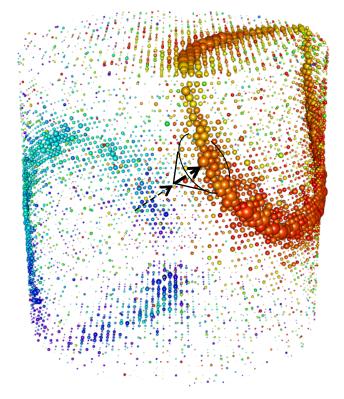




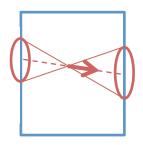






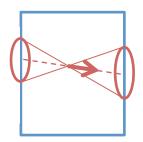


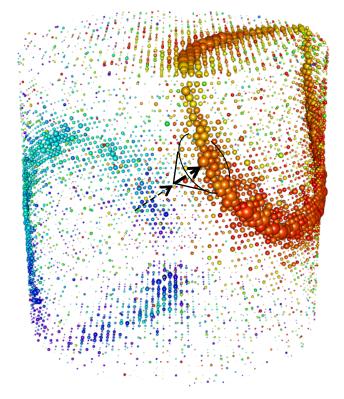




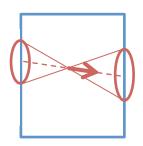


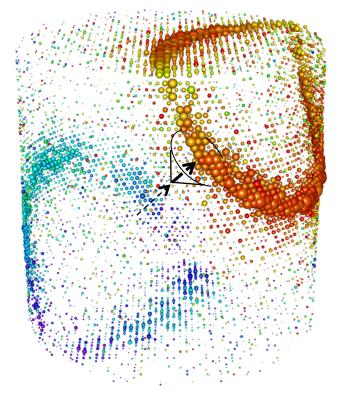




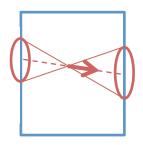


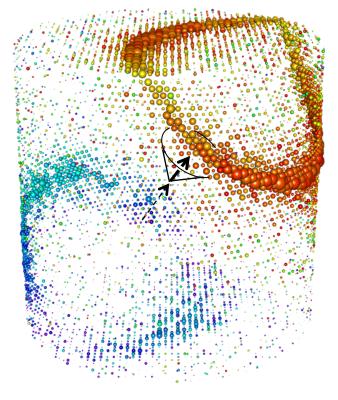




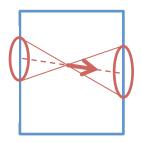


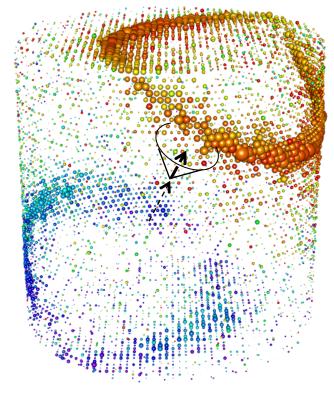




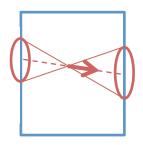


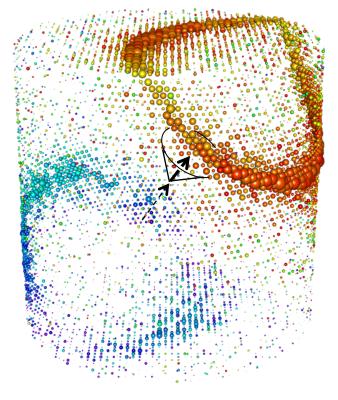




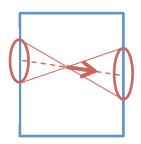


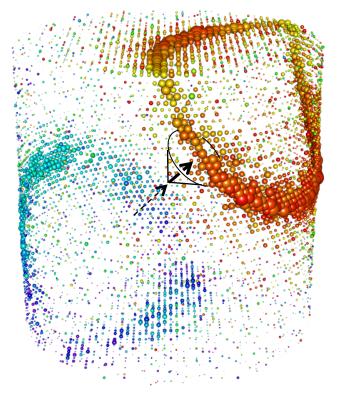




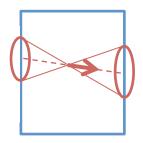


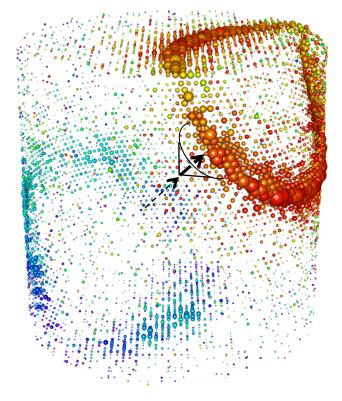




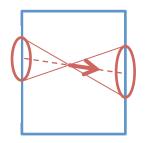






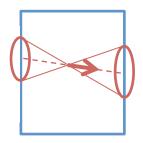


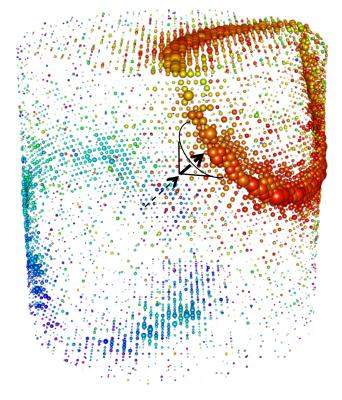




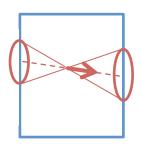


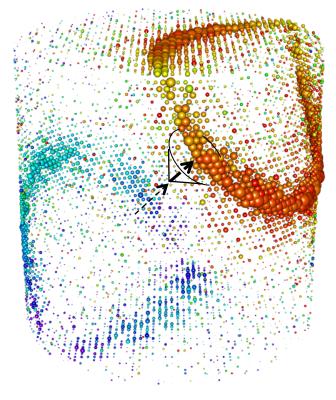




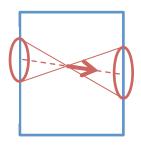


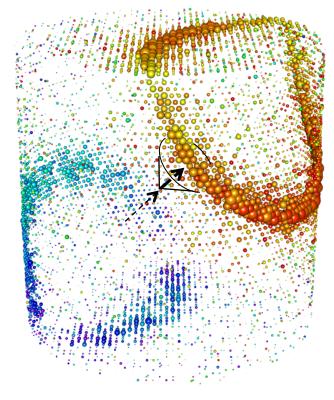






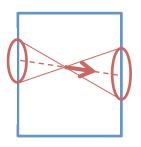


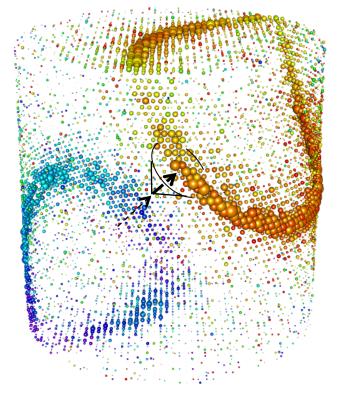




#89, Lukas Berns, Tokyo Institute of Technology

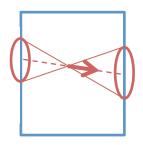


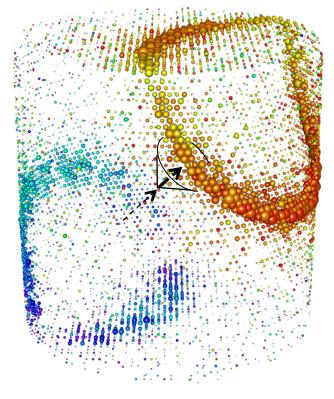




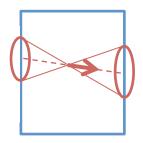
#89, Lukas Berns, Tokyo Institute of Technology

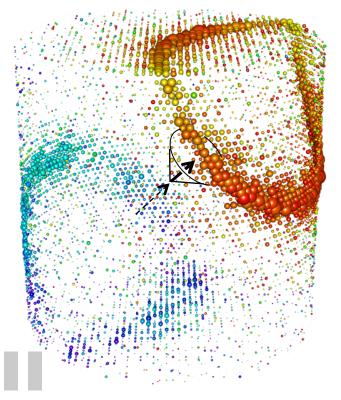




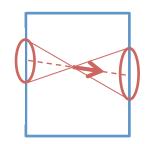


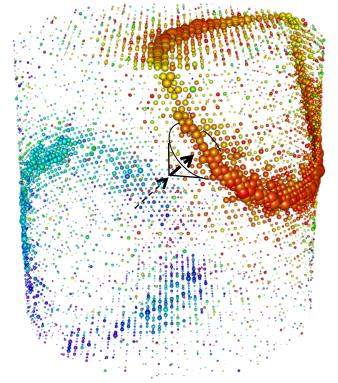


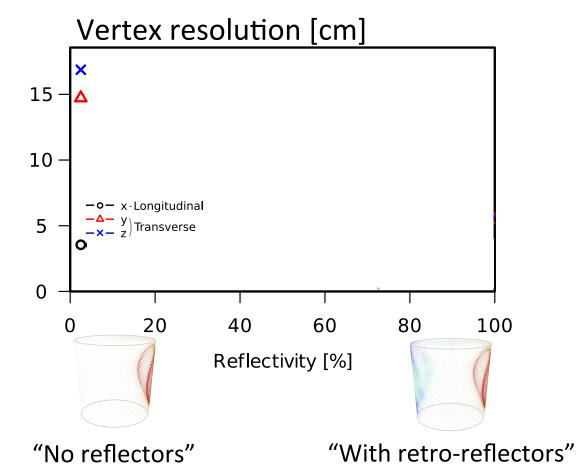




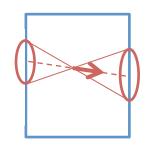


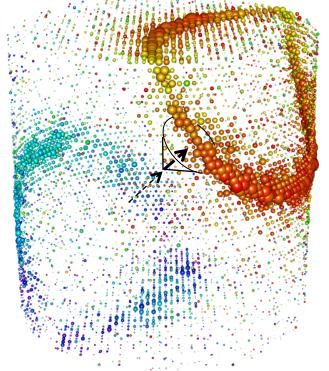


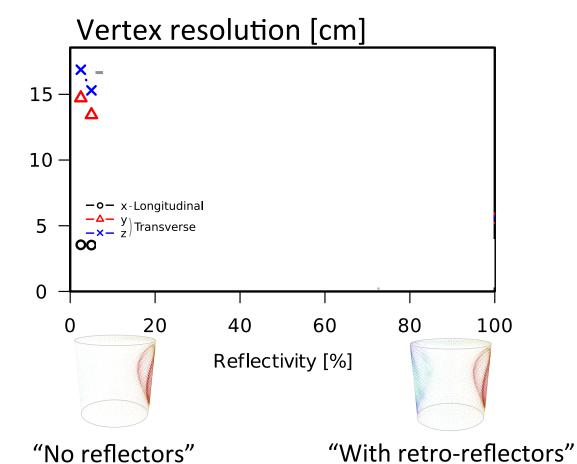




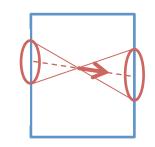


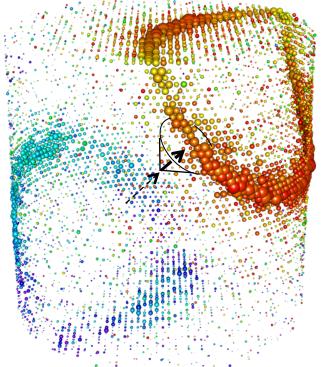


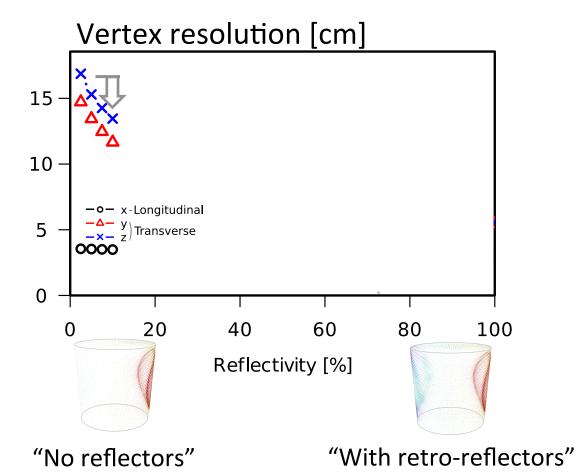




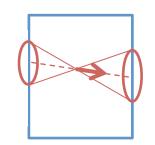


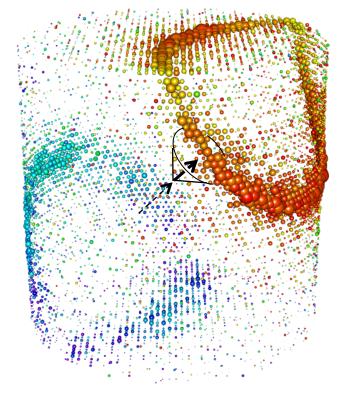


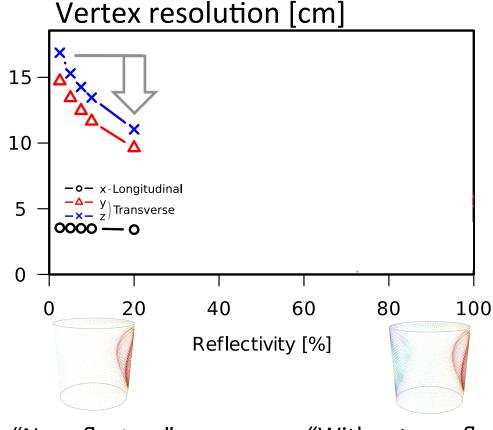








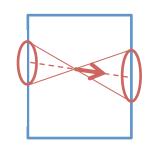


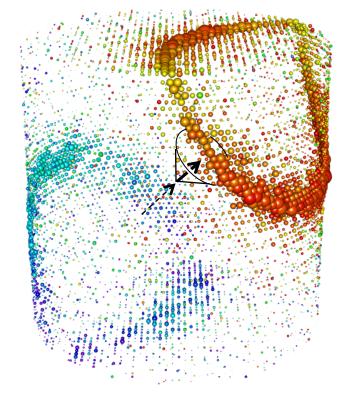


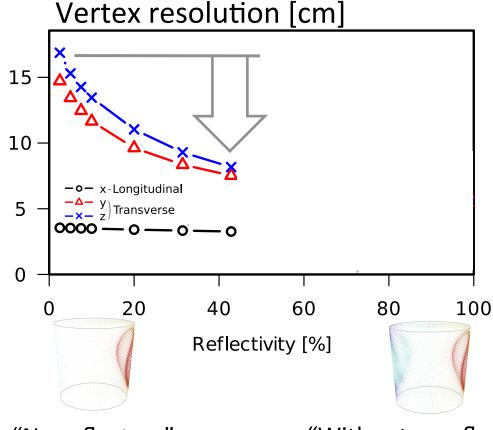
"No reflectors"

"With retro-reflectors"





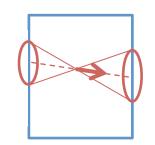


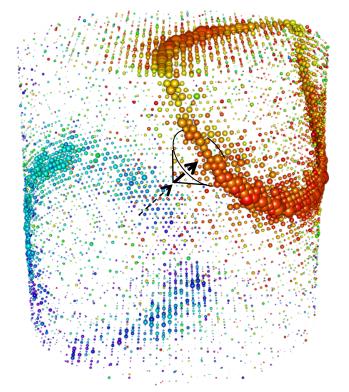


"No reflectors"

"With retro-reflectors"





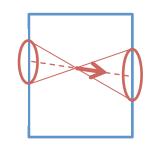


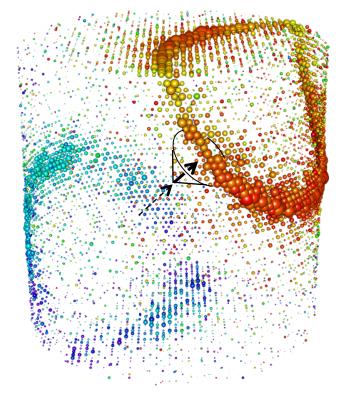
Vertex resolution [cm] Up to 15 2x better 10 x-Longitudinal 20 40 60 80 100 Reflectivity [%]

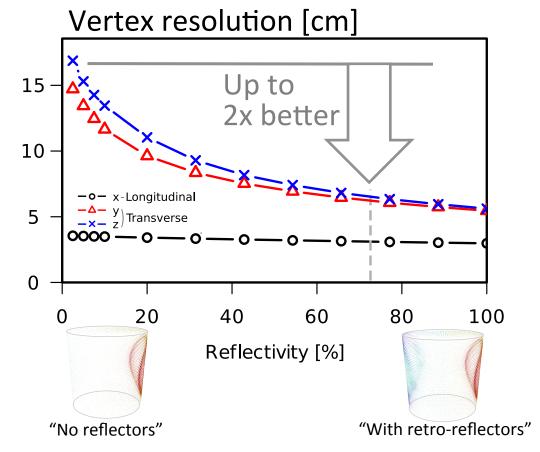
"No reflectors"

"With retro-reflectors"

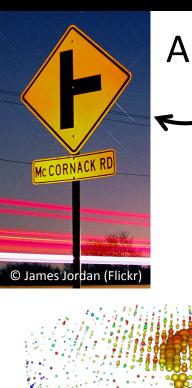


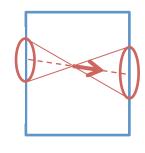


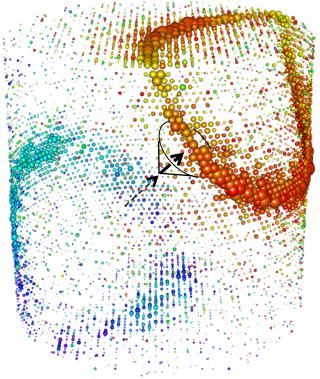


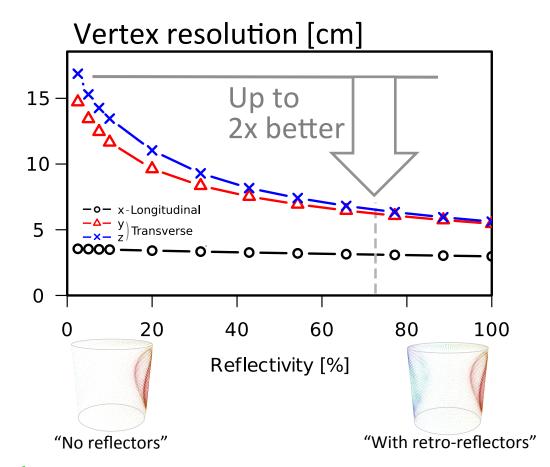


✓ Better ring reconstruction → physics



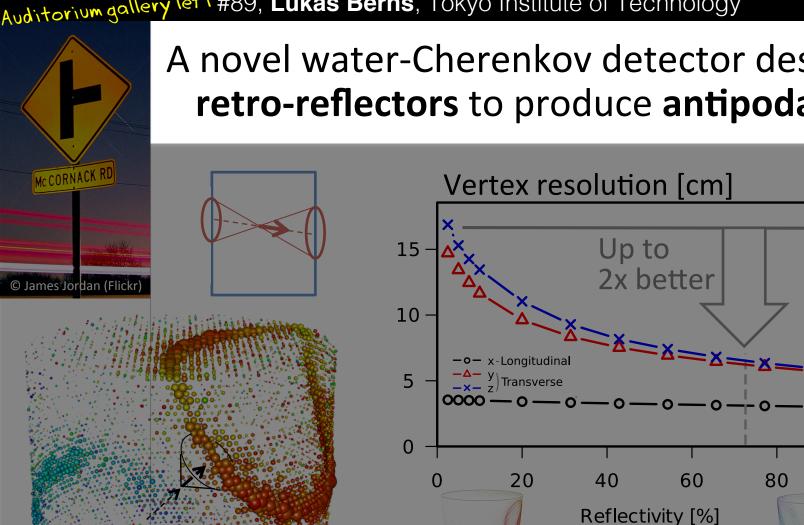






- ✓ Better ring reconstruction → physics
- ✓ Can reduce number of PMTs \rightarrow \$\$





"No reflectors"

A novel water-Cherenkov detector design with retro-reflectors to produce antipodal rings

✓ Better ring reconstruction → physics

100

"With retro-reflectors"

 \checkmark Can reduce number of PMTs \rightarrow \$\$