Water Cherenkov Test Experiment

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Motivation

- Many existing and next-generation neutrino experiments use water Cherenkov technology
- With increase in collected data reducing systematics is of crucial importance
- Hyper Kamiokande will achieve 3% statistical error for CP violation measurements → current systematic uncertainty in T2K is 6%
- Detector systematics are one of the dominant systematic contributions → calibration of water Cherenkov detector

**Water Cherenkov Test Experiment**
- developing percent level calibration of water Cherenkov detectors
- measuring physical processes (pion scattering in water, Cherenkov light profile, secondary neutron production)
- testing new technologies: multi-PMT, water based liquid scintillator

[http://cds.cern.ch/record/2712416/files/?ln=en](http://cds.cern.ch/record/2712416/files/?ln=en)
Water Cherenkov Test Experiment (WCTE)

T9 beamline @ East Area (0.4 - 12 GeV/c secondary beam)

- Water tank
- Shielding and collimator
- Secondary beam trajectory
- The tank can slide between secondary and tertiary beams
- Compact spectrometer and tungsten target (not shown here)
- Low momentum pions decay in secondary beamline
WCTE Tertiary Beam Spectrometer

Spectrometer axis tilted 450 mrad wrt. secondary beam

Tungsten target

16 cm

~20 cm

~12 cm

~20 cm

~12 cm

Compensation magnet

Magnet for momentum measurements

ATLAS SCT
(8 modules approved)
Water Cherenkov Detector

- ~4 m diameter
- 128 mPMT modules
- Two beam windows
Conclusion

● Reducing systematics in existing and future water Cherenkov detectors is of crucial importance
● WCTE will use the 50t water Cherenkov detector to study physics processes inside the detector with a well-defined beam and develop calibration techniques
● WCTE is a platform for testing new technologies (multi PMT, WBLS, ...)