

# Experimental Study on Velocity Representation of Ultrasonic Transit-time Discharge Measurement in Open Channel

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**Abstract:** It is very important to accurately measure the open channel discharge, especially for trade settlement involved in water transportation projects blooming in China. Ultrasonic Transit-time method is widely used for accurate open channel discharge measurement with many advantages. Due to complexity of open channel flow, velocity representation is the main source of discharge uncertainty, including representation of area-average velocity from measured acoustic path velocities and path velocity itself. We build a 25m long, 2m wide, 1.2m deep open channel facility with an over-fall tank providing a very stable flowrate of 1.5m<sup>3</sup>/s in maximum. Two parallel installed DN500 ultrasonic flowmeters calibrated on gravimetric facility are used as master meters, and two open channel flowmeters from different manufacturers are installed in series as test meters for velocity representation study. Both of the two test meters have cross-plane configuration with five acoustic paths on each plane. Path heights and mounting protrusion of transducers can be adjusted, and all geometric parameters are accurately measured using a FARO arm. Discharge indication errors using different combinations of transducers installed at different acoustic path heights are calculated to study area-average velocity representation. Effect of transducer mounting protrusions on discharge measurement are analysed for path-average velocity representation.

**Key words:** open channel, discharge, ultrasonic transit-time, velocity representation

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