Instrumentation for Underwater Acoustic Intensity Measurement

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Introduction
This poster shows the instrumentation for underwater acoustic intensity measurement, include the intensity probe and the Self-Noise Evaluation System.

Underwater Acoustic Intensity Probe
The underwater acoustic intensity probe is actually a vector hydrophone, which combined a pressure sensor and an acceleration sensor together. Particle velocity and sound pressure at one point can be obtained simultaneously by using vector hydrophone.

Self-Noise Evaluation System (SNES)
The SNES is composed of a cylinder acrylic bucket covered by red copper and signal analyze system can evaluate self-noise of sensors and systems. The coat of bucket shield the interferences from the electromagnetic signal, in particular from the power frequency. The vacuum environment inside the bucket generated by a vacuum pump can prevent the propagation of sound wave, an absolute silent condition therefore is created. Isolating materials are put on the bottom inside of the bucket to reduce vibration from the outside.

Results
The self-noise of underwater acoustic intensity probe has been measured in SNES, the following figure describe the PSD of the intensity probe. The reactive/active intensity and phase between sound pressure and particle velocity inside a standing wave tube has been measured by the acoustic intensity probe as well. The reactive intensity is around 15 dB higher than the active intensity, which indicates the standing wave is existed in the tube. The phase is around 90° over the concerned frequency. The largest fluctuation at the last frequency, 630 Hz, is due to the first radial mode of the tube.