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Electro-active polymer transduction for distributed netted sensing

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The Naval Undersea Warfare Center in Newport, RI is developing an electro-active polymer-based sensing node for use in a persistent distributed underwater surveillance system. Persistence demands extreme energy conservation measures. The node will resemble a jellyfish in form, complete with tentacles housing a volumetric array of light-weight piezoelectric polyvinylidene fluoride trifluoroethylene (PVDF-TrFE) copolymer cylindrical hydrophones designed for an ultra-low power acoustic receiver. Each cylinder has conductive silver electrodes on the inside and outside surfaces, a length of 2.5 cm, an outside diameter of 11 mm, a 1 mm wall thickness, and a mass less than 2 g. Operating in the hydrostatic mode, the hydrophone sensitivity is typically $-195 \text{ dB//1V//}\mu\text{Pa}$ and is stable with both hydrostatic pressure (50 to 1000 psi) and temperature (-1 to 35°C). (Work supported by the Office of Naval Research).