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**Polygonal Drops formed by AC field induced resonance.** PING WANG, SIDDHARTH MAHESHWARI, HSUEH-CHIA CHANG, Center for Microfluidics and Medical Diagnostics, Univ. of Notre Dame, Notre Dame, IN, 46556 — Liquid phase polarization of a drop in a DC field gives rise to the formation of the classical Taylor cones whose singular Maxwell pressure cancels the singular azimuthal capillary pressure. We report the observation of a novel interfacial singularity that produces polygonal drops. This new singularity also arises due to Maxwell stress and liquid polarization, but when both are selectively and resonantly amplified by an AC field. A particular frequency is chosen such that the period is larger than the ion diffusion time across the interfacial double layer. The drop size is controlled with the Maxwell force such that the drop dimension is smaller than the capillary length and the resonance frequency of the undeformed spherical drop is commensurate with the AC frequency. The resonant interaction selects different interfacial modes with different patterns and wavelengths. The liquid polarization focuses the ridges of the interfacial patterns into conical protrusions that deform the drop into polygonal shapes. The capillary stress at the cusp is now compensated by a Maxwell stress. Due to the symmetry of the drop, only certain polygonal shapes are selected at specific resonant frequencies that are consistent with the inviscid resonant dispersion relationship for a spherical drop.

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