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**Phase-locked measurements of gas-liquid horizontal flows**[1] IVAN ZADRAZIL, OMAR MATAR, CHRISTOS MARKIDES, Imperial College London — A flow of gas and liquid in a horizontal pipe can be described in terms of various flow regimes, e.g. wavy stratified, annular or slug flow. These flow regimes appear at characteristic gas and liquid Reynolds numbers and feature unique wave phenomena. Wavy stratified flow is populated by low amplitude waves whereas annular flow contains high amplitude and long lived waves, so called disturbance waves, that play a key role in a liquid entrainment into the gas phase (droplets). In a slug flow regime, liquid-continuous regions travel at high speeds through a pipe separated by regions of stratified flow. We use a refractive index matched dynamic shadowgraphy technique using a high-speed camera mounted on a moving robotic linear rail to track the formation and development of features characteristic for the aforementioned flow regimes. We show that the wave dynamics become progressively more complex with increasing liquid and gas Reynolds numbers. Based on the shadowgraphy measurements we present, over a range of conditions: (i) phenomenological observations of the formation, and (ii) statistical data on the downstream velocity distribution of different classes of waves.

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