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Targeting specific azimuthal modes using wall changes in turbulent pipe flow TYLER VAN BUREN, LEO HELLSTRM, Princeton University, IVAN MARUSIC, University of Melbourne, ALEXANDER SMITS, Princeton University — We experimentally study turbulent pipe flow at Re=3486 using stereoscopic particle image velocimetry. Using pipe inserts with non-circular geometry to perturb the flow upstream of the measurement location, we excite specific naturally occurring energetic modes. We consider inserts that directly manipulate the flow momentum (vortex generators), and/or induce secondary flows through Reynolds stresses (sinusoidally varying wall shape). These inserts substantially change the mean flow, and produce distinct regions of low and high momentum corresponding to the mode being excited. The inserts add energy in the targeted modes while simultaneously reducing the energy in the non-excited azimuthal modes. In addition, inserts designed to excite two modes simultaneously exhibit non-linear interactions. Supported under ONR Grant N00014-15-1-2402, Program Manager/Director Thomas Fu and the Australian Research Council.

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