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Nano-Position Sensors with Superior Linear Response to Position and Dynamic Range from Sub-nm to Centimeters SHENG-CHIANG LEE, RANDALL PETERS, Mercer University — Commercial nano-positioners have achieved direct position measurements at the scale of 0.01 nm with capacitive sensing metrology. However, the commercial sensors have small dynamic ranges (up to only a few hundred μm) and are relatively large in size (centimeters in the transverse directions), which is necessary for healthy signal detections but making it difficult to use on smaller devices. The small dynamic range also limits its applications in which large materials (on the scale of centimeters or greater) are handled with needs of sub-nm resolutions. What has been done in the past is to combine the fine and coarse position sensors with different dynamic ranges to cover the required dynamic range. In this paper, we present a novel capacitive position sensing metrology with ultra-wide dynamic range from sub-nm to literally any practically desired length for a translation stage. This sensor will greatly simplify the task and enhance the performance of direct metrology in a hybrid translational stage covering translation tasks from sub-nm to centimeters.

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