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New source and test masses for G experiments and their metrology[1] KOFI ASSUMIN-GYIMAH, Mississippi State Univ — There are serious inconsistencies in our current knowledge of the universal gravitational constant, G despite a long history of measurements. The scatter in the measured values could be an indication of the incompleteness of general relativity, the current accepted description of gravity, or due to underestimated biases in the metrology of small forces. The metrology of test and source masses, typically made of high density metals, is of prime importance. There are however, some inherent limitations in the previous evaluations of systematic uncertainties associated with them. We propose to address these by developing high density transparent materials such as $PbWO_4$, for use in the next generation of experiments. This is motivated by the fact that density variation in glass and single crystals are significantly smaller than in metals and can be measured nondestructively. Consequently, we will develop a laser interferometer for the measurement of the internal density gradients of these masses. All components of the interferometer have been purchased and assembled in the Medium Energy Physics Lab at MSU. Preliminary measurements have begun and we will show some results from a 2x2x12 cm^3 $PbWO_4$ sample.

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