

Abstract Submitted  
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**Heisenberg Limit Superradiant Superresolving Metrology<sup>1</sup>**

DAWEI WANG, MARLAN O. SCULLY, Texas A&M University, SCULLY TEAM  
— We propose a superradiant metrology technique to achieve the Heisenberg limit super-resolving displacement measurement by encoding multiple light momenta into a three-level atomic ensemble. We use  $2N$  coherent pulses to prepare a single excitation superradiant state in a superposition of two timed Dicke states that are  $4N$  light momenta apart in momentum space. The phase difference between these two states induced by a uniform displacement of the atomic ensemble has  $1/4N$  sensitivity. Experiments are proposed in crystals and in ultracold atoms.

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Dawei Wang  
Texas A&M University

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