

(12) **United States Patent**
Gordon et al.

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(54) **QUANTUM ATOMIC RECEIVING ANTENNA AND QUANTUM SENSING OF RADIOFREQUENCY RADIATION**

(58) **Field of Classification Search**
None
See application file for complete search history.

(71) Applicant: **Government of the United States of America, as represented by the Secretary of Commerce**, Gaithersburg, MD (US)

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

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(65) **Prior Publication Data**

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(57) **ABSTRACT**

Related U.S. Application Data

A quantum atomic receiving antenna includes: a probe laser; a coupling laser; an atomic vapor cell that includes: a spherically-shaped or parallelepiped-shaped atomic vapor space and Rydberg antenna atoms that undergo a radio-frequency Rydberg transition to produce quantum antenna light from probe light such that an intensity of the quantum antenna light depends on an amount of radiofrequency radiation received by the Rydberg antenna atoms, the quantum antenna light including a strength, direction and polarization of the radiofrequency radiation; and a quantum antenna light detector in optical communication with the atomic vapor cell.

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H04B 10/532 (2013.01)
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H04B 10/50 (2013.01)

(52) **U.S. Cl.**
CPC **H04B 10/532** (2013.01); **H04B 10/503** (2013.01); **H04B 10/70** (2013.01); **H04B 2210/006** (2013.01)

26 Claims, 12 Drawing Sheets

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