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HIGHLIGHTING NEWS

IBM AND PARTNERS DEMONSTRATE TRUSTED QUANTUM ADVANTAGE

For the first time, researchers have shown how to verify quantum computations even when classical computers can no longer check the answer — a major step toward making quantum results scientifically trustworthy.

In a trio of papers released with IBM, teams from the University of Chicago, Qedma (with RIKEN and BlueQubit), and Algorithmiq each tackled the verification problem differently:

- **UChicago + IBM:** Used a technique called "doped Clifford sampling" embedded in error-detecting spacetime codes, achieving a 10x reduction in effective gate error on a 70-logical-qubit computation — while building self-verification directly into the computation.
- **Qedma / RIKEN / BlueQubit:** Ran 74-qubit circuits to study Floquet dynamics and observed persistent oscillations that two leading classical simulation methods (run on one of the world's largest supercomputers) failed to reproduce or even agree on.
- **Algorithmiq:** Used 56-qubit experiments across five different quantum computers with varying noise profiles, showing consistent results even where three leading classical simulation groups disagreed with each other.

Together, these results mark a shift from "quantum vs. classical" competitions toward building rigorous, built-in trust in quantum computations — a critical milestone on the path to fault-tolerant quantum computing.

READ MORE (PRESS RELEASE)

ROOM-TEMPERATURE QUANTUM MATERIAL COULD END THE NEED FOR DEEP FREEZING

Most quantum materials only work near absolute zero — but Louisiana State University(LSU) physicists just changed that.

Led by Associate Professor Omar S. Magaña-Loaiza, the team built a quantum statistical plasmonic metacrystal: a 110-nanometer gold film patterned with 100 nanoantenna (meta-atoms, each just 200 by 400 nanometers), which together can sort and transport different quantum states of light at room temperature, with no cryogenic cooling required. Light traveling across the gold surface excites a plasmonic field that couples the meta-atoms together, producing collective interference across the array.

The key finding is that this interference creates "allowed" and "forbidden" quantum statistical bands — in direct analogy to how semiconductors filter electrons or photonic crystals filter wavelengths, except here the filter acts on the quantum statistics of the light itself (measured by the degree of second-order coherence, $g^2(0)$). Light landing in an allowed band passes through undistorted; light in a forbidden band gets actively reshaped toward the nearest allowed value. Critically, this behavior is designable: meta-atom size sets which coherence values are allowed, while their number and orientation control how wide the forbidden bands are — giving researchers a deterministic recipe for engineering the effect, rather than having to discover it in nature.

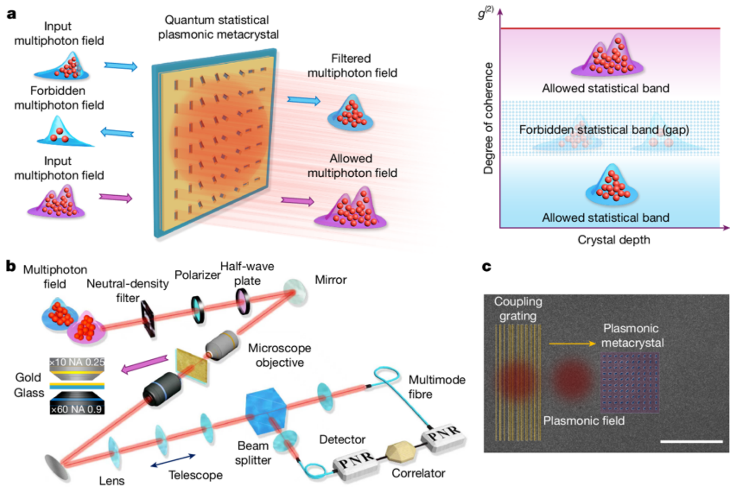

Fig. 1: Quantum statistical plasmonic metacrystals.

The authors note this could help reduce the heat losses that ordinary partial coherence causes in solar absorbers, and more broadly call it a step toward “many-body quantum technologies operating beyond cryogenic environments” — including robust, room-temperature building blocks for scalable quantum computing. Next up: testing how the metacrystal handles entangled photon states, and whether it can boost solar cell efficiency in practice.

READ MORE (Paper Research Article & News)

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