GoldCoreX Preliminary Lab Protocol: Photon-Induced Quantum State Excitation in Embedded Gold Atoms

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Objective

To provide a clear, focused experimental protocol for early-stage validation of photon-induced quantum state flips in isolated gold atoms, embedded in a lattice structure. This protocol is designed to test the viability of neutral gold atoms as room-temperature qubits using green photon excitation, under compression.

Overview

GoldCoreX is a novel quantum system architecture that utilizes isolated gold atoms embedded in dielectric crystalline structures to act as room-temperature photon-controlled qubits. This lab protocol outlines the conditions necessary for experimental validation of quantum state flips using low-energy green photons (~2.33 eV), relying on atomic stability, orbital compression, and optical resonance principles.

Core Principles

1. Preserve the 6s Electron (Avoid Ionization)

- Do **not ionize** the gold atom prior to or during embedding.
- **Retaining the $6s^1$ electron** is essential for enabling low-energy photon interaction.
- Ionization (Au^+) removes the 6s orbital, requiring higher-energy photons and potentially eliminating the desired qubit behavior.

2. Apply Atomic Compression via Lattice Embedding

- Embed the gold atom in a dielectric host (e.g. diamond, SiC) using a bore or pocket that applies **nanoscale compression** to the atom.
- Recommended bore diameter: **2.5–2.7 Å** (angstroms)
  - This applies **pressure to the 6s orbital**, reducing the 6s–5d orbital energy gap.
  - Enhances spin–orbit coupling and orbital hybridization.
- The compression environment should be:
  - Electrically insulating
  - Low-noise (phonon-suppressive)
  - Thermally stable at room temperature

3. Photon-Based Excitation Using Green Light (~2.33 eV)

- Use a **532 nm green laser** or pulsed diode laser as the initial photon source.
- Photon delivery should be:
  - Focused on the embedded gold atom
  - Delivered via a waveguide or photonic tunnel (optional in Phase 1)
  - Capable of pulsing (ns or ps range ideal) for enhanced state transition probability
- Photon energy is intended to:
  - Stimulate **spin flips or orbital transitions** via 6s → 5d coupling
  - Induce **non-ionizing state perturbation** measurable via fluorescence, spin-dependent charge conversion, or magnetic readout (if available)

Recommended Experimental Phases

Phase 0 – Basic Excitation Test

- Use neutral gold embedded in a compressive matrix
- Bombard with green photons continuously or in pulses
- Look for fluorescence, EM shift, or measurable quantum signature

Phase 1 – Wavelength Sweep (Optional)

- If green fails, sweep 450–350 nm (blue to UV-A) in 10–20 nm steps
- Monitor for first signs of orbital or spin behavior

Expected Outcome

- Photon-induced quantum behavior (preferably spin flip) in neutral, embedded gold atom
- At minimum, observation of **excitation threshold behavior** in compressed gold environment

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Additional Notes

- Higher-energy photons (>3 eV) may introduce precision loss and ionization risks
- Maintain lattice integrity—decoherence increases with defect density
- Document any response data including:
  - Energy of incident photon
  - Bore material and dimensions
  - Detection method used
  - Duration of state (if measurable)

Acknowledgements

This document is part of the **GoldCoreX Quantum Architecture Project**, a private quantum initiative exploring room-temperature, field-stable qubit systems based on photon-activated gold atoms.