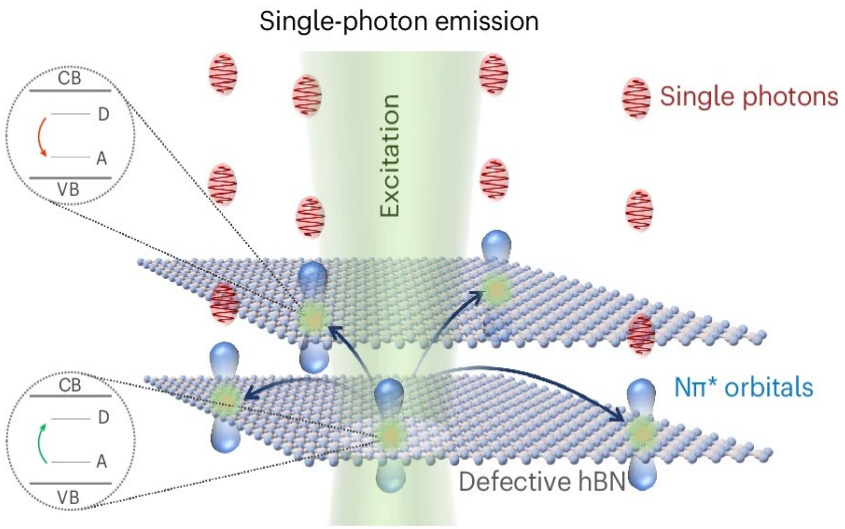
Decoding Imperfections in Hexagonal Boron Nitride for Quantum Applications

2-ID
SIX



Single-photon emission process in layered hBN. Upon excitation on a defect site, electrons can recombine optically with other defects at a distance of a few atomic site and emit single photons.

Pelliciari J, Mejia E, Woods JM, Gu Y, Li J, Chand SB, Fan S, Watanabe K, Taniguchi T, Bisogni V, Grosso G. Elementary excitations of single-photon emitters in hexagonal boron nitride. *Nat. Mater.* (2024). https://doi.org/10.1038/s41563-024-01866-4

Work performed in part at NSLS-II

Scientific Achievement

Scientists uncover an elementary excitation in hexagonal Boron Nitride (hBN) that triggers a range of harmonic electronic states correlated with single-photon emitters (SPEs).

Significance and Impact

A more complete understanding of SPEs in materials like hBN could lead to breakthroughs in quantum applications like quantum computing, sensing, cryptography, and simulations.

Research Details

- Photoluminescence spectroscopy and resonant inelastic X-ray scattering revealed a fundamental energy excitation occurring at E_0=285 millielectron volts.
- The harmonics states happening at multiple of E_0 correlate with energies of SPEs observed across several other experiments conducted worldwide.
- This harmonic energy scale points to a common underlying origin of SPEs.