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Atomically thin single-photon emitting diodes MATTEO BARBONE, CARMEN PALACIOS-BERRAQUERO, DHIREN M. KHARA, XIAOLONG CHEN, ILYA GOYKHMAN, ALEJANDRO R.-P. MONTBLANCH, ANDREA C. FERRARI, METE ATATURE, University of Cambridge — Integrating single-photon sources into on-chip optical circuits is a challenge for scalable quantum-photonic technologies. Despite a plethora of single-photon sources reported to-date, all-electrical operation has been reported for only a few. The attractiveness of single-photon sources in layered materials stems from their ability to operate at the fundamental limit of single-layer thickness, foreseeing high extraction efficiency and providing the potential to integrate into conventional and scalable high-speed opto-electronic device systems. We use light emitting devices realized by vertical stacking of graphene, hexagonal-BN few layers thick and mono- and bilayer transition-metal dichalcogenides (TMDs) and achieve charge injection from graphene into the TMD layer containing optically active quantum dots. We demonstrate that layered materials enable all-electrical single-photon generation over a broad spectrum. We demonstrate for the first time that quantum emitters reported in WSe_2 can operate electrically, paving the way towards a new class of quantum light emitting devices. We further report all-electrical single-photon generation in the visible spectrum from quantum emitters in a new material, WS_2. I will also discuss the potential for scalability and charge control to show that 2d materials are a platform for fully integrable and atomically precise quantum photonics device technologies.

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