## Abstract Submitted for the MAR17 Meeting of The American Physical Society

**Defect-induced** Non-linear Optical Properties  $\mathbf{in}$ BN YONGCHANG DONG, PRAKASH PARAJULI, LONGYU HU, RAMAKRISHNA PODILA, APPARAO RAO, Clemson Univ — Emerging two-dimensional materials are known for their excellent optical properties. Unlike most 2D materials which display saturable absorption, boron nitride (BN) is an exception in that it exhibits multi-photon absorption. Although a two-photon absorption process was proposed to explain intrinsic non-linear absorption in BN, we find higher order nonlinearities such as five-photon absorption at 1064 nm. Interestingly, as will be discussed in this talk, our density functional theory calculations, finite-element analysis simulation, and experimental studies present compelling evidence that defect-induced mid-gap states in BN reduce higher order nonlinearities to enable two-photon absorption. Lastly, strong nonlinear light-matter interactions in BN are found to induce defects, which convert five-photon absorption to two-photon in situ.

> Yongchang Dong Clemson Univ

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