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**Nonlinear optical effects in semi-polar GaN micro-cavity emitter** SWEEN BUTLER, Depratment of Physics, University of North Texas, Denton Texas, 76203, HONGXING JIANG, JINGYU LIN, Nanophotonics Center, Electrical Computer Engineering, Whitacre College of Engineering, Texas Tech University, Lubbock, TX 79409, ARUP NEOGI, Depratment of Physics, University of North Texas, Denton Texas, 76203 — Nonlinear optical (NLO) response of low dimensional emitters is of current interest because of the need for active elements in photonic applications. NLO effects in a selectively grown array of semi-polar GaN microcavity structures offer a promising route toward devices for integrated optical circuitry in optoelectronics and photonics field. Localized spatial excitation of a single hexagonal GaN microcavity with semipolar facets formed by selective area growth was optimized for nonlinear optical light generation due to second harmonic generation (SHG) and multi-photon luminescence(MPL). Multi-photon transition induced by tightly focused femtosecond NIR incident field results in ultra-violet and yellow luminescence for excitations above and below half bandgap energy, whereas SHG was observed for below half bandgap energy. We show that color and coherence of the light generation from the emitter can be controlled by selective onset of the nonlinear process which depends not only on the incident laser energy and intensity but also on the geometry of the microcavity. Quasi-WGM like modes were observed for off-resonant excitations from the GaN microcavity resulting in enhanced SHG. The directionality of MPL and SHG will be presented as a function of the pump polarization.

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