Super-Seed: Synthetic Networks in Quantum Materials utilized a combination of photoluminescence (PL), second harmonic generation (SHG) and nano-infrared imaging to systematically investigated non-linear electrodynamics of prototypical van der Waals material hexagonal boron nitride hBN. Artificial photonic structures were assembled using methods previously developed by IRG1 team (Fig. 1). We observed a systematic enhancement of the SHG signal at engineered hBN interfaces (Fig.2). Complimentary data were acquired through nano-infrared imaging of phonon polaritons in mid-infrared spectral region (Fig.3).

In parallel, our team pursued the development of novel scanning probe nano-imaging methods for the characterization of SHG response in moire arrays of twisted hBN.

Future plans include: i) the development of in-operando tunable hBN interfaces for control of non-linear susceptibility and ii) the development of novel methods for SHG experiments with the nano-scale spatial resolution.