ADVANCED OPTICAL MATERIALS

Supporting Information

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Towards Double Resonant Cavity Enhanced Second Harmonic Generation in Monolayer MoS_2

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Towards double resonant cavity enhanced SHG in monolayer MoS_2

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Supporting Information

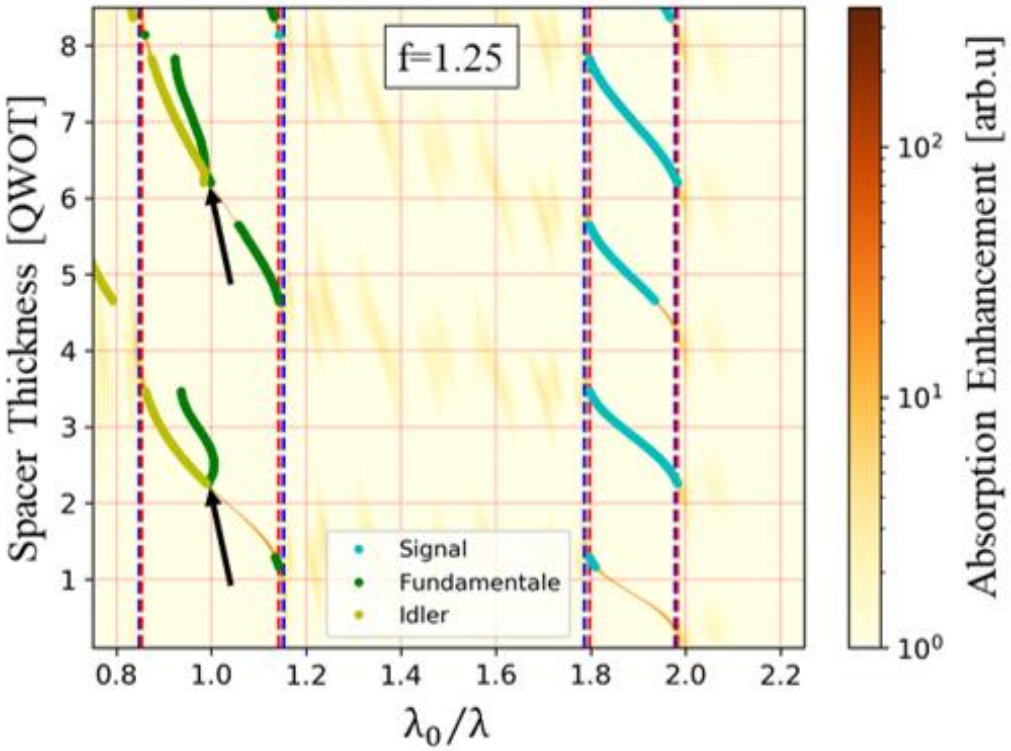

Figure S1. Simulated Absorption enhancement for a resonator system with double resonance at different values of λ_0/λ and spacer thicknesses.

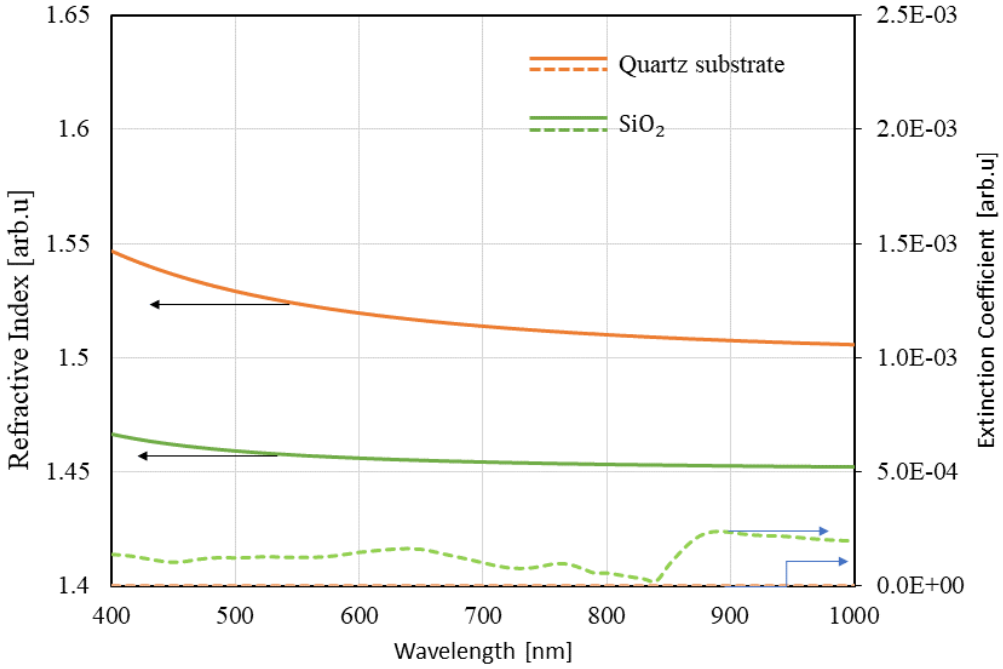

Figure S2. Refractive index (solid lines) and extinction coefficient (dotted lines) of SiO2 and quartz substrate.

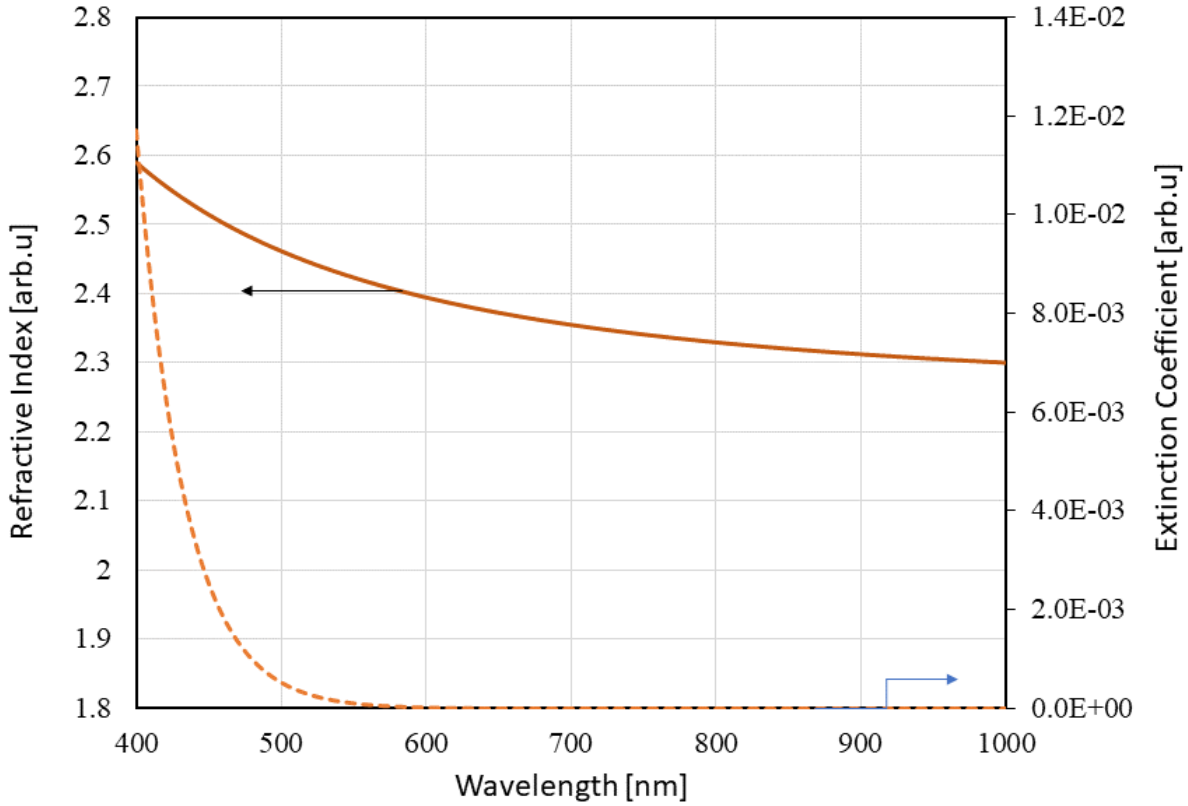

Figure S3. Refractive index (solid lines) and extinction coefficient (dotted lines) of TiO2.

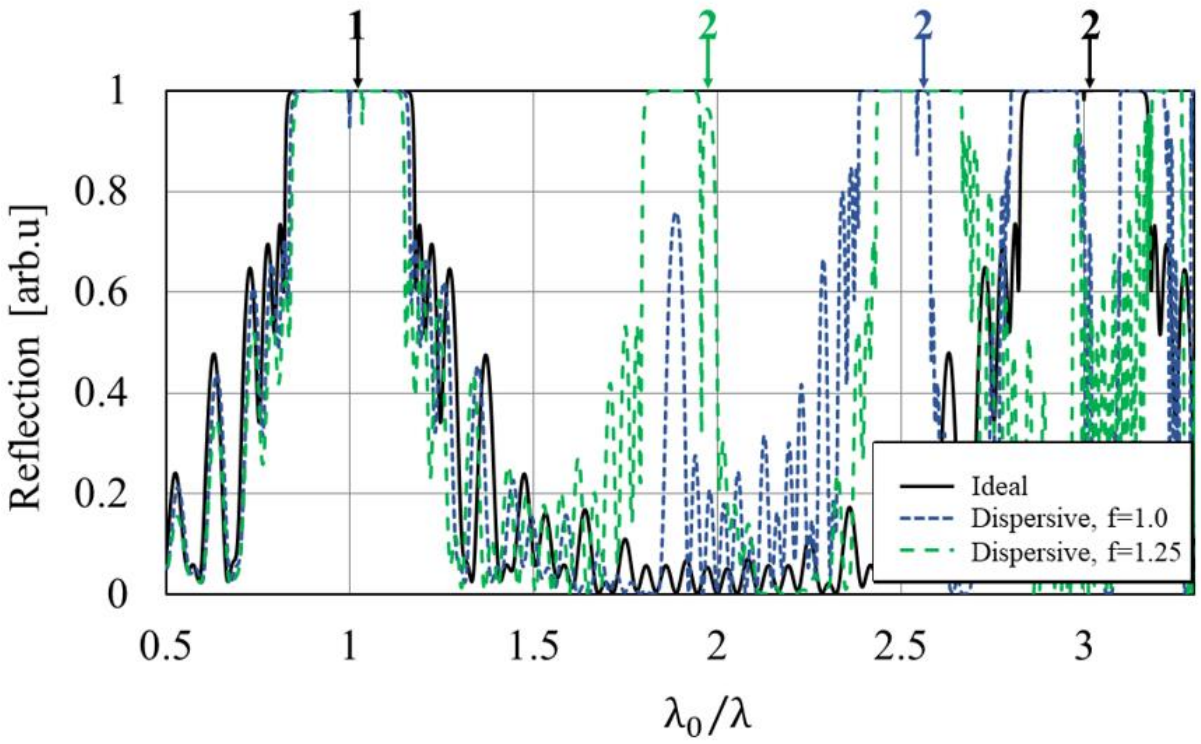

Figure S4. Reflection spectra of Bragg resonator with 10+6 mirror pairs, without dispersion (black), with dispersion (blue) and a real asymmetric (f = 1.25) one (green)

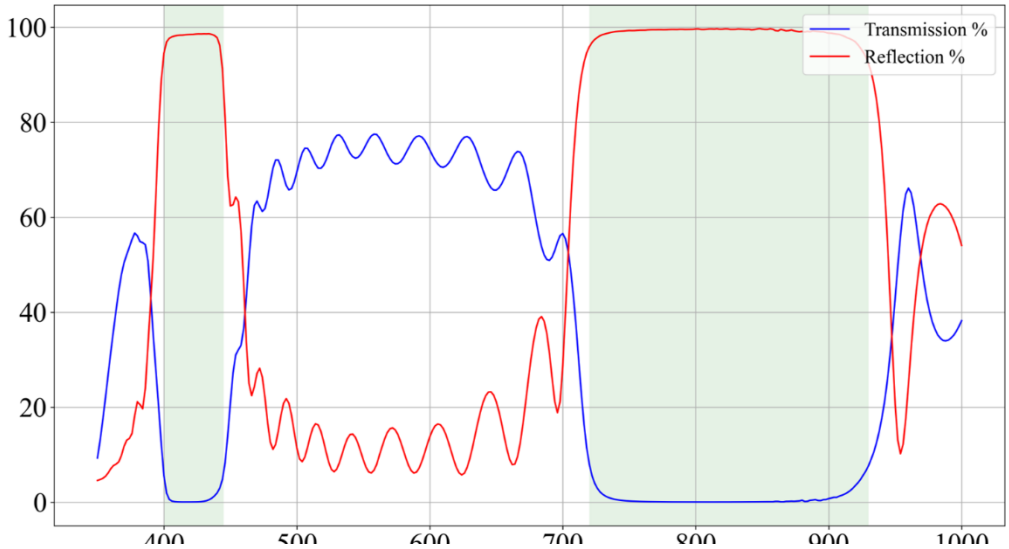

Figure S5. Measured linear Spectra of bottom DBR comprising of 11 pairs of high and low refractive index layers.

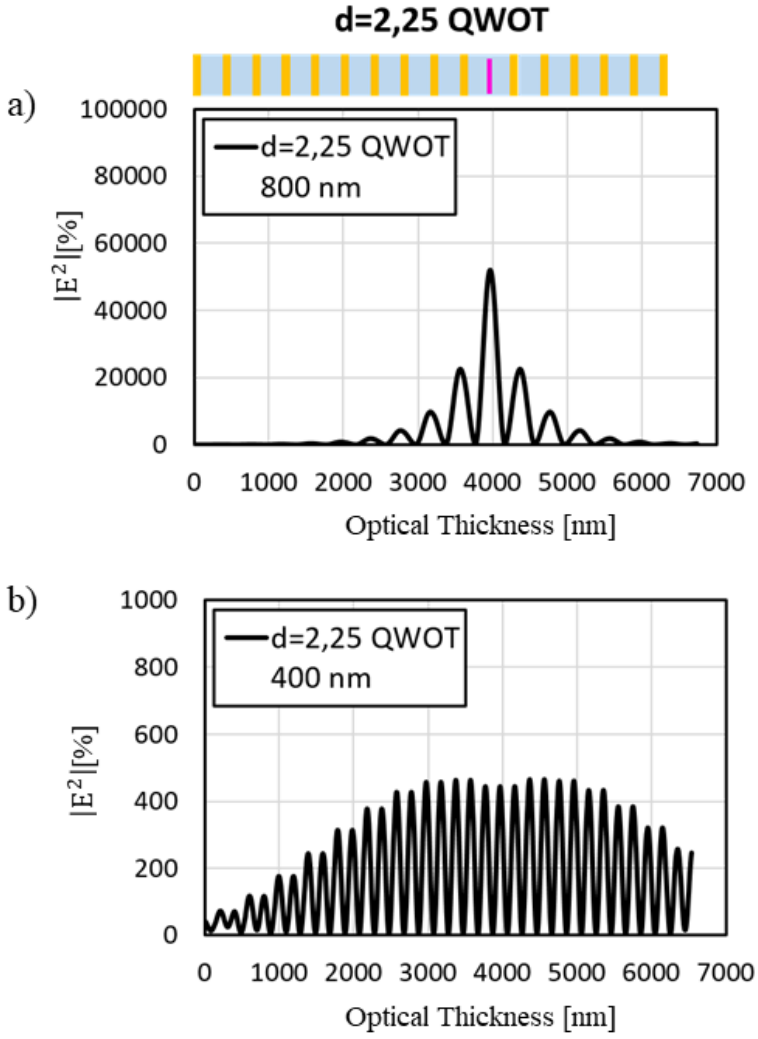

Figure S6. Intensity of a) fundamental and b) second harmonic modes for the chosen spacer thickness d=2.25 QWOT.

Calculation of SHG Conversion Efficiency:

To compare the SHG of the monolayers before and after being embedded, we calculate their SHG conversion efficiency using the data for the intensity maps. The SHG conversion efficiency, η_{SH} is given by the equation,

$$\eta_{SH} = \frac{P_{SH}}{P_{in}^2} \times T.f \times 1.06\sqrt{2}$$

Here, P_{SH} is the second harmonic power, P_{in} is the incident or pump power, T is the pulse width of the laser, and f is the repetition rate. The power of the SHG is in turn determined using the formula,

$$P_{SH} = \frac{E_{SH} \times n}{t}$$

where $E_{SH} = hc/\lambda_{SH}$ is the energy of the SH photon, n is the number of SHG photons and t is the exposure time of the measurement. We calculate the number of photons using,

$$n = \frac{I_{SH} \times Gain}{QE \times Sys.Tran.}$$

The gain of the detector is 0.54, the quantum efficiency (QE) is 0.425. The system transmission (Sys. Tran.) was measured by comparing the power before and after every element in the setup. It was found to be 0.75.