

# Polarization-resolved Raman resonant excitation of surface and bulk electronic bands and phonons in MBE grown topological insulator thin films

N. Kumar<sup>\*1,2</sup>, D.V. Ishchenko<sup>1</sup>, I.A. Milekhin<sup>1,3</sup>, P.A. Yunin<sup>4,5</sup> E.D. Kyrova<sup>1,6</sup>, A.V. Korsakov<sup>7</sup>, O.E. Tereshchenko<sup>1,8</sup>

<sup>1</sup>Rzhanov Institute of Semiconductor Physics, SB RAS, Novosibirsk, 630090, Russia.

<sup>2</sup>Tomsk State University, 36 Lenin Ave., Tomsk, 634050 Russia.

<sup>3</sup>Novosibirsk State University, Novosibirsk, 630090, Russia.

<sup>4</sup>Institute for Physics of Microstructures, RAS, Afonino, Nizhny Novgorod 603087, Russia.

<sup>5</sup>Faculty of Radiophysics, Lobachevsky State University, Nizhny Novgorod 603950, Russia.

<sup>6</sup>Novosibirsk State Technical University, Novosibirsk, 630073, Russia.

<sup>7</sup>V.S. Sobolev Institute of Geology and Mineralogy, SB RAS, Novosibirsk, 630090, Russia

<sup>8</sup>Synchrotron Radiation Facility SKIF, Boreskov Institute of Catalysis, SB, RAS, Koltsovo 630559, Russia.

\*E-mail: [kumar@isp.nsc.ru](mailto:kumar@isp.nsc.ru)

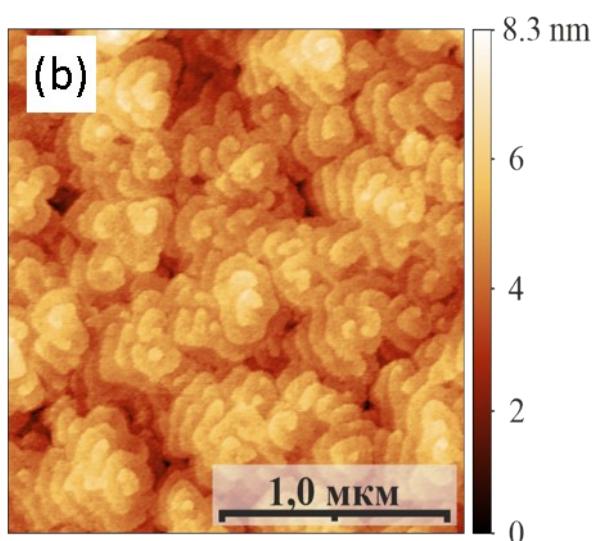
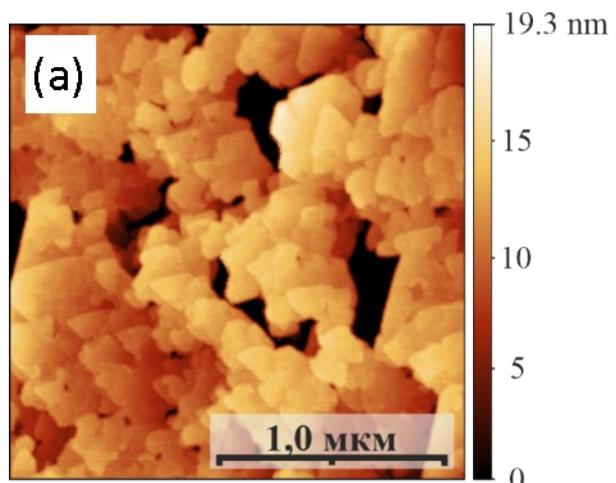


Fig. SI-1. Topography of (a) Bi<sub>2</sub>Te<sub>3</sub> and (b) BSTS films

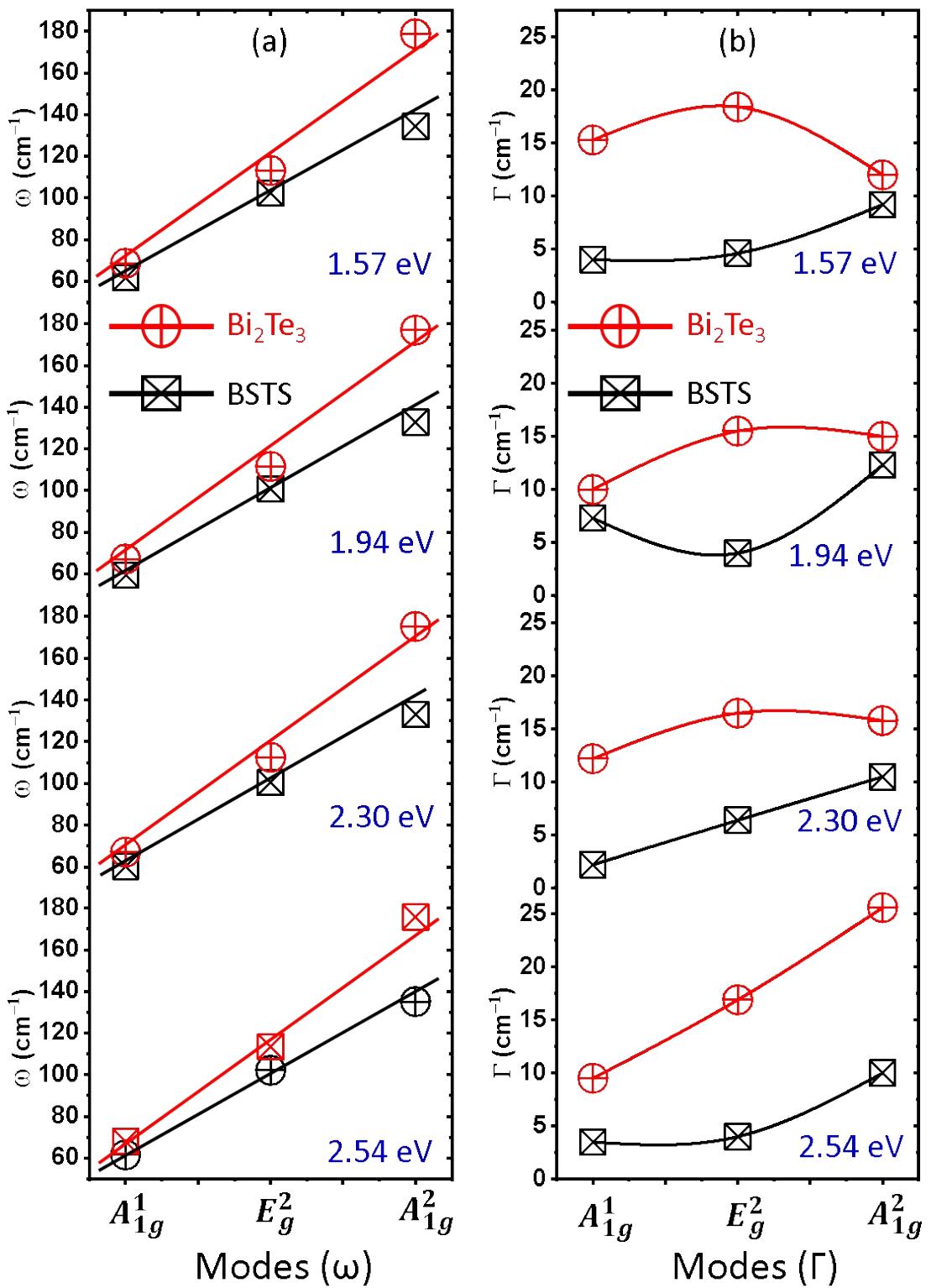


Fig. SI-2. Frequency shift of  $A_{1g}^1$ ,  $E_g^2$  and  $A_{1g}^2$  modes for  $\text{Bi}_2\text{Te}_3$  and BSTS film (a) and mode width (b) at four different excitation energy of photon  $E_p$  1.57, 1.94, 2.3 and 2.94 eV.