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Observation of high order sum frequency generations observed in polycrystalline ZnS

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Finding a temporally overlapping condition is necessary for pump-probe experiments. This can be achieved by obtaining sum frequency generation (SFG) signal. Our attempt proceeded using a mid-infrared free electron laser (MIR-FEL) of 12.5 micro-m, ps-Nd:YVO4 laser of 1064 nm from Kyoto University free electron laser (KU-FEL) facility, and a polycrystalline ZnS plate at room temperature. An ideal overlapping condition of the two lasers was confirmed when the highest intense SFG signal was observed at 980 nm. Along with that, additional peaks have been observed simultaneously at 909, 846, 510, and 490 nm. Each of these appears to correspond with higher order SFGs of (2×MIR-FEL+1×ps-laser), (3×MIR-FEL+1×ps-laser), (1×MIR-FEL+2×ps-laser) and (2×MIR-FEL+2×ps-laser) respectively. It is also confirmed that these observed peaks are not associated with the vibrational Raman scattering process since there are no phonon absorption energies of ZnS [1] within our observation range.

Footnotes

[1] C. A. Klein and R. N. Donadio, J Appl Phys, 1980, doi: 10.1063/1.327295.

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