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**Phononic, magnetic, and inter-band Raman scattering in  $K_{0.75}Fe_{1.75}Se_2$  superconductor**<sup>1</sup> ALEXANDER IGNATOV, PHIL LUBIK, Department of Physics & Astronomy, Rutgers University, Piscataway, NJ 08854, USA, R.H. YUAN, W.T. GUO, NAN-LIN WANG, Beijing Natl Lab for Condensed Matter Physics, CAS, Beijing 100190, China, GIRSH BLUMBERG, Department of Physics & Astronomy, Rutgers University, Piscataway, NJ 08854, USA — We have analyzed collective excitations in  $K_{0.75}Fe_{1.75}Se_2$  single crystal ( $T_c \sim 32$  K) by polarized Raman scattering in the energy shift range of 20-8000  $cm^{-1}$ , the temperature range of 10-300 K, and laser excitation energies from 1.8 to 3.0 eV. Seven  $B_g$  and nine  $A_g$  phonon modes are observed at 300K. Below  $\sim 150$  K an extra  $A_g$  mode appears at 165  $cm^{-1}$ . The amplitudes of the  $A_g$  modes at  $\sim 67$ , 112, and 124  $cm^{-1}$  are reduced, while the amplitude of 183  $cm^{-1}$   $A_g$  mode is enhanced by factor of five as temperature decreases from 300 to 40 K. Magnetic scattering bands at 1000-2000  $cm^{-1}$  consist of at least three distinct peaks each, implying different Fe-Fe AFM exchange coupling constants for underlying structure. Inter-band transitions are observed at  $\sim 3700$  and 4600  $cm^{-1}$  at 300 K in the  $A_g$  and  $B_g$  channels, respectively. Below 140 K these excitations are hardened to  $\sim 4040$  and 4820  $cm^{-1}$ .

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Prefer Oral Session  
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Alexander Ignatov  
aignatov@physics.rutgers.edu  
Dept of Physics & Astronomy, Rutgers University,  
Piscataway, NJ 08854, USA

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