Abstract Submitted
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Raman scattering study of low-energy excitations in the metallic glass $Ni_{67}Zr_{33}$[1] RUDOLF HACKL, Walther Meissner Institut, DE-85478 Garching, BERNHARD MUSCHLER, Zoller & Fröhlich, DE-88239 Wangen, ISTVÁN TÜTTŐ, Wigner RCP, HU-1121 Budapest, ALFRÉD ZAWADOWSKI, BUTE, HU-1111 Budapest, JUDIT BALOGH, Wigner RCP, HU-1121 Budapest — We present Raman scattering results on the metallic glass $Ni_{67}Zr_{33}$. The spectra were measured as a function of polarization and temperature and were analyzed theoretically. There are three relevant types of excitations which can be disentangled: (i) A temperature independent Drude-like response due to electron-hole excitations, as suggested earlier for dirty metals, extending to approximately half an eV. (ii) A strictly linear response in the range below $20\,cm^{-1}$. (iii) A maximum which loses about 30% of its spectral weight upon increasing the temperature, just opposite to what is expected from the occupation number of bosonic excitations. The temperature dependence of the spectral weight indicates that local modes contribute substantially to the cross section. The increase with decreasing temperature can be described in a qualitative way assuming that scattering of conduction electrons is dominated by the temperature dependence of the Debye-Waller factor rather than by the occupation number of the vibrations alone. None of our assumptions is material specific, and the results are expected to be relevant for disordered systems in general such as doped semiconductors, metallic functionalized carbon nanotubes or polymers.

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Rudolf Hackl
Walther Meissner Institut, 85478 Garching

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