Ultrasonic studies of Fermi surfaces in the AuZn shape memory alloy

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The AuZn low-temperature shape memory alloy is considered to be a good model system to investigate the role of the Fermi surfaces reconstruction in the martensitic phase transition. To explore the Fermi surfaces in the martensite phase of the AuZn single crystal, we for the first time use the method of ultrasonic pulse-echo probing. We measure oscillations of speed and attenuation of the longitudinal sound wave propagating in (110) direction in the magnetic fields of up to 45 T in the temperature range 0.07-40 K. To explore the topography of the surfaces, the crystal was rotated with respect to the magnetic field, so the field direction was changing between (110) and $(1\bar{1}0)$, or (110) and (001) crystallographic directions. While the extracted dHvA frequencies of 1140 and 4720 Tesla were in a good agreement with those, obtained from magnetic susceptibility measurements[1], we also observed a new, theoretically predicted earlier[2], dHvA frequency of 120 Tesla. The effective masses associated with these frequencies calculated for $H||(110)$ configuration are $0.21m_e$, $0.32m_e$, and $0.125m_e$; the Dingle temperatures we estimate to be equal to 19, 16 and 11 K correspondingly. The first two values of the effective masses are reasonably close to those reported in the Ref.1.

[1]P.A.Goddard, J.Singleton, R.D.McDonald, N.Harrison, et al., accepted to PRL
[2]R.D.McDonald, J.Singleton, P.A.Goddard, et al., J.Phys.: Condens. Matter, **17**, L69 (2005)

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