Research (What is it about?)	**Pseudo-relativistic three-dimensional particles in condensed matter systems**
UNN authors	*Morozov S.V., Gavrilenko V.I.*
We find (The result)	It has been observed in 3D system (solid solution HgCdTe) the electron states (quasi-particles) with zero rest-mass (massless ***Kane fermions***)
Abstract	The relationship between impulse and energy of particle (dispersion relation) being quadratic at low pulses become linear for ultra relativistic particles (photon) and corresponds to ***zero rest-mass*** at constant velocity. Such pseudo-relativistic particles (since their velocity are much less than the velocity of light) have been observed earlier in 1D system (carbon nanotubes) and 2D system (grapheme sheets). We show that such particles may exist in 3D system (solid solution HgCdTe close to phase transition point between semimetal and semiconductor states). Its rest-mass changes the sign in phase transition point when the band gap E_g turns zero. The $E_g \rightarrow 0$ state can be produced roughly by the variation of Cd content (x≈0.16) and tuned by temperature. Only temperature tuning (near T≈77 K and x= 0.155) allows one to produce $E_g=0$ and to observe just massless Kane fermions with the constant velocity (1.07±0.05) 10^6 m s^{-1} in the wide range of temperatures.

Representative articles 2016-2017, quartiles	1. *Teppe F., Marcinkiewicz M., Krishtopenko, S. S., Ruffenach S., Consejo C., Kadykov A., Desrat W., But D., Knap W., Ludwig J., Moon S., Smirnov D., Orlita M., Jiang Z., Morozov S.V., Gavrilenko V.I., Mikhailov N.N., Dvoretskii S.A.* Temperature-driven massless Kane fermions in HgCdTe crystals. Nature Commun. **7**:12576 (2016).	Q1
	Q-index (Qi) of the result	**4**

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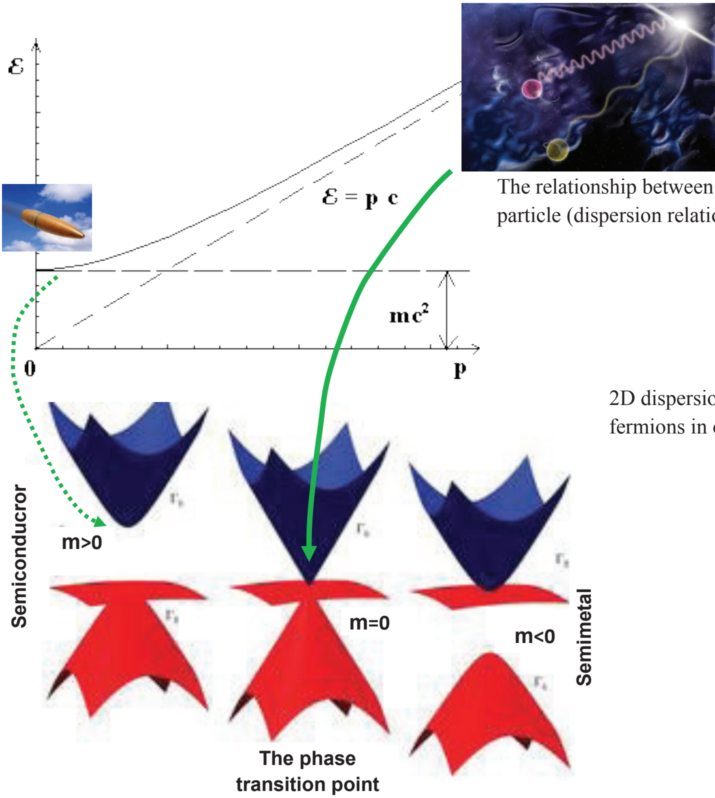
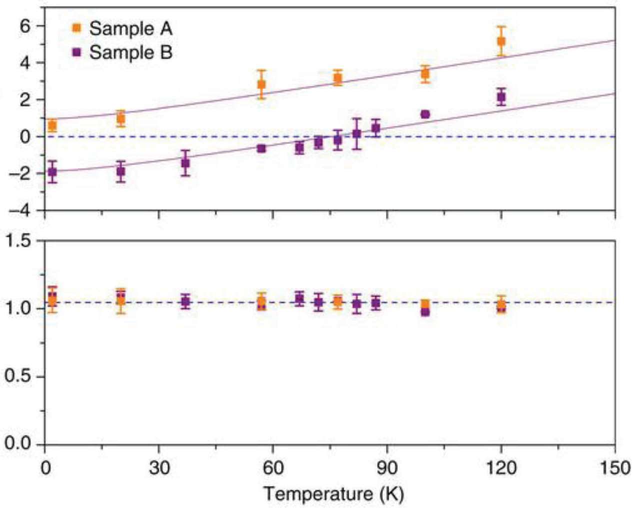


The relationship between impulse and energy of particle (dispersion relation) in 1D system.

2D dispersion relations for Kane fermions in crystal



The experimental result: mass (above) and velocity (below) of Kane fermions (in relative units) for two samples of crystal *HgCdTe*