Fermi-liquid behavior of quasiparticle scattering in the normal state of BaFe$_2$(As$_{1-x}$P$_x$)$_2$\(^1\) YING JIA, LEI FANG, ULRICH WELP, ALEXEI KOSHELEV, GEORGE CRABTREE, WAI-KWONG KWOK, Materials Science Division, Argonne National Laboratory, Argonne, IL 60439, USA — We present studies of the galvanomagnetic effects of compensated BaFe$_2$(As$_{1-x}$P$_x$)$_2$ (x=0.32$\sim$0.6) superconductors. The magnetoresistance follows the relaxed Kohler’s scaling for all doping levels. Using a two-band model, we quantitatively extracted the scattering parameter $m^*/\tau$ and the carrier density of the electron and hole bands. The temperature dependence of the carrier concentration reveals the semimetal properties of BaFe$_2$(As$_{1-x}$P$_x$)$_2$. The Fermi-liquid behavior, $m^*/\tau \sim T^2$, is observed from optimal doped x=0.32 to overdoped x=0.6 crystals, suggesting that the proximity of the SDW state does not play an important role in transport. Our analysis suggests that the normal state transport properties of BaFe$_2$(As$_{1-x}$P$_x$)$_2$ can be well understood in the framework of a compensated two-band Fermi-liquid semimetal.

\(^1\)Crystal synthesis was supported by the Energy Frontier Research Center funded by the US DOE-BES (YJ, LF, WKK, GWC), materials characterization and theoretical support were provided by the DOE-BES (UW, AEK), under Contract No. DE-AC02-06CH11357.