The $3_1^-$ level in $^{56}$Fe

N. FOTIADES, M. DEVLIN, R.O. NELSON, LANL, NM, USA — The question whether the 3076.2-keV, $(3^-)$, or the 4509.6 keV, $3^-$, is the first $3^-$ level in $^{56}$Fe is important for reaction model calculations [see M. B. Chadwick et al., Nucl. Data Sheets 118, 1 (2014)]. The inclusion in the databases of the 3076.2-keV level will be discussed. A work by A. M. Demidov et al. [Phys. Atom. Nucl. 67, 1884 (2004)] using the $^{56}$Fe(n,n'γ) reaction and fast neutrons from a reactor, reported that the 3076.2-keV state does not exist and triggered the present work, where γ-γ coincidence data in $^{56}$Fe, which are more definitive, were recorded with the GEANIE spectrometer comprised of 26 high-purity Ge detectors. The pulsed beam of the Los Alamos Neutron Science Center’s WNR facility provided fast neutrons impinging on a $^{56}$Fe target. As we reported in Phys. Rev. C 81, 037304 (2010), our experiment supported the assignment of the 4509.6 keV level as the first $3^-$ state, with no observation in the gated spectra of the two transitions that were reported to decay out of the 3076.2-keV level by Z. Guo et al. [Nucl. Phys. A540, 117 (1992)]. A plan to repeat the (p,γ) reaction that reported the observation of these two transitions will be discussed.