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Pioneering mass measurements in the rare-earth region for the astrophysical r-process JAMES M KELLY, University of Notre Dame, MARKUS VILEN, University of Jyvskyl, MAXIME BRODEUR, University of Notre Dame, ANU KANKAINEN, University of Jyvskyl, IGISOL TEAM — The astrophysical r-process generates around half of the elements heavier than iron, yet precisely where or how this occurs remains a topic of intense inquiry. Understanding the formation of one of its hallmarks, the rare-earth abundance peak, could shed light on the astrophysical sites because this feature is very sensitive to underlying nuclear properties, particularly to nuclear binding energies which have so far been largely derived from theoretical mass models. We have performed precise atomic mass measurements of 12 neutron-rich rare-earth isotopes using the JYFLTRAP double Penning trap mass spectrometer. The atomic masses of ^{158}Nd, ^{160}Pm, ^{162}Sm, and $^{164-166}$Gd have been experimentally determined for the first time, and the precisions for ^{156}Nd, ^{158}Pm, ^{162,163}Eu, ^{163}Gd, and ^{164}Tb have been significantly improved. The ^{163}Gd measurement also indicates the presence of a previously suspected isomeric state. Trends in two-neutron separation energies are compared to theoretical mass model predictions, and the effects of these new mass measurements on r-process abundance calculations will be examined.

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