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A search for double beta decays of ^{136}Xe to the excited state of ^{136}Ba with EXO-200 SERERES JOHNSTON, UMass, EXO-200 COLLABORATION — EXO-200 is one of the most sensitive searches for neutrinoless double beta decay of ^{136}Xe in the world. The experiment uses 110 kg of active enriched liquid xenon in an ultralow background time projection chamber installed at the Waste Isolation Pilot Plant, a salt mine with a 1600 m water equivalent overburden. This detector has demonstrated excellent energy resolution and background rejection capabilities. While the experiment is designed to search for the double beta decays of ^{136}Xe to the ground state of ^{136}Ba, transitions to the excited states of ^{136}Ba are also plausible. The $\beta\beta2\nu$ decay to the first 0^+ excited state of the daughter nuclei has been observed for ^{100}Mo and ^{150}Nd; this particular transition for ^{136}Xe has a theoretical lifetime on the order of 10^{25} year, which is right around the sensitivity of EXO-200. We present the results from the search of double beta decays to the excited state using two years of EXO-200 data.

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