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Parity Non-Conservation in the gamma decay of 180mHf(8-);revisited

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Since the discovery of parity violation in beta decay, Parity Non-Conservation (PNC) in bound nuclei has provided a means to address the parity violating term in the nuclear Hamiltonian due to the weak interaction component. The few cases identified as promising ones have been studied but showed marginal or no effects.
In the case of 180Hf(8-) isomer, the PNC effect was studied nearly four decades ago by observing its 501 keV gamma decay from a polarized source which showed a large effect of ~10 standard deviations, i.e. 1.66±0.18%. Since then it has been the only bound nucleus where the parity violation in its gamma decay is clearly and unambiguously observed. This very uniqueness of the 180mHf case, and the availability of a 180mHf(8-) beam from ISOLDE, are the basis for the present renewed interest in this PNC case.
The 180mHf beam with 3.105 particles/s was implanted into a magnetized Fe host in the NICOLE dilution refrigerator and is polarized using the low temperature orientation method. The gamma decays from a total of ~5.1013 implanted 180mHf nuclei are observed in 4 HPGe detectors placed at 90 degrees to each other and at a distance of ~12 cm from the Fe foil and ~1cm from the cryostat wall. The direction of magnetic field was changed every ~5 hrs. to left (L) or right (R) by changing the direction of the current sent through the coil. This ensured minimization of systematic errors.
The measured 0 to 180 degree asymmetry from a preliminary analysis yields A(gamma) =1.14±0.052% in basic agreement with the earlier measurement. A careful analysis of the complete data is underway and is expected to further improve upon the error.
The complete results, together with a detailed discussion, will be presented.

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