# Early and delayed spectroscopy of Ac isotopes around N = 126

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Study of nuclei above Z = 82 and around the N = 126 spherical shell closure plays an important role in understanding the structure of heavy elements. The attractive proton-neutron residual interactions and the particle-octupole vibration coupling in these nuclei, the latter of which favors specific multiparticle configurations, are the driving mechanism for the existence of low-spin to high-spin isomeric states. Comprehensive level schemes are already known for nuclei up to Z = 88 [1]. To further extend our knowledge, we report on high-spin studies of $^{214\text{-}217}$Ac (Z = 89, N = 125-128).

High-spin states in these isotopes were populated using fusion-evaporation reactions with $^{12}$C, $^{14}$N and $^{15}$N beams on $^{204}$Pb and $^{209}$Bi targets with beam energies between 79 and 91 MeV. The experiments were carried out with the 14UD accelerator of the Heavy Ion Accelerator Facility at the Australian National University. The CAESAR array was used for the detection of the emitted gamma-rays. Previously, energy levels up to spin $29/2^+$ were known in $^{215,217}$Ac [2,3], and only one gamma-ray had been assigned to each of $^{214}$Ac and $^{216}$Ac. New level schemes have been constructed for $^{214,216}$Ac, and significant extensions have been made for $^{215,217}$Ac, with new isomeric states observed in some cases. The results will be presented in detail together with semi-empirical shell model calculations to help interpret the proposed level schemes.

[1] G. D. Dracoulis *et. al., Phys. Rev. C* ***80****, 054320 (2009), and references therein.*
[2] D. J. Decman *et. al., Nuclear Physics A* ***436*** *(1985) 311-337.*
[3] D. J. Decman *et. al., Z. Phys. A* ***310****, 55-59 (1983).*