# The foilstack method for 10Be analysis at iThemba LABS - first results and intercomparison for field samples

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Beryllium-10 is an important isotope for the AMS system at iThemba LABS in Johannesburg because of demand for cosmogenic radionuclide dating methods in the national, regional, and international earth science and paleosciences community. Rather than being designed as one system, the AMS system at iThemba LABS has been set up over several phases based on an existing tandem accelerator, which usually poses challenges implementing the best measurement approach for any given isotope. The injector-side features an in-house built multi-sample cesium sputter ion source, similar to systems employed at CAMS/Lawrence Livermore National Laboratory and Purdue Rare Isotope Measurement Laboratory. The ion source is followed by an in-house built electro-static analyzer and an (in-house built) analyzing magnet, with NEC's multi-beam switching electronics system applied to our own insulated magnet chamber. The accelerator is a pelletron-refurbished HVEC Model EN tandem, and the high-energy beam line is modified by addition of a switching magnet beam-line from a typical setup delivered by NEC for 5 MV tandem accelerators. Unfortunately using the gas absorber cell employing Havar windows (as was delivered) requires higher energies, usually requiring the 3+ charge state and relatively high terminal voltage, which, for the purpose of AMS operations, are not currently delivered reliably enough by our tandem accelerator. Recently it has been shown that low-stress silicon nitride membranes can be used as absorber foils for full stopping of Boron-10 with a particle energy as low as 6 MeV for the measurement of Beryllium-10 [Steier, et al., 2019]. This allows for the use of the 2+ charge state, avoiding the charge state losses of the post-stripping method used with accelerators capable of similar or lower terminal voltage elsewhere, albeit at the expense of allowing some background from nuclear reactions. We implemented this method in lieu of the gas absorber cell, thus utilizing from the efficiency gain from using the 2+ charge state. In order to investigate the impact of Boron-10 interference and to devise a background correction formalism we conducted experiments using our own ultra-low-Beryllium-10 phenakite-based carrier, and a dilution series of deliberately added Boron-10. We present data which demonstrate good performance of the system on standards and the dilution series samples, and 14 comparison measurements with results obtained at CAMS/LLNL, with all the comparison samples having been prepared at University of Vermont for a landscape evolution study in South Africa. The independent AMS measurements results from the two laboratories are in excellent agreement. A correlation analysis for the two data sets yields a Pearson's r of 0.9993, with slope (1.009+/-0.017) and offset fully consistent with cross-calibration between the laboratories. The mean difference between the laboratories' results for individual samples is just 1.7%, in line with the AMS uncertainty given by the laboratories.