We present a breakthrough in micro-four-point probe (M4PP) metrology to substantially improve precision of transmission line (transfer length) type measurements by application of advanced electrode position correction. In particular, we demonstrate this methodology for the M4PP current-in-plane tunneling (CIPT) technique. The CIPT method has been a crucial tool in the development of magnetic tunnel junction (MTJ) stacks suitable for magnetic random-access memories for more than a decade. On two MTJ stacks, the measurement precision of resistance-area product and tunneling magnetoresistance was improved by up to a factor of 3.5 and the measurement reproducibility by up to a factor of 17, thanks to our improved position correction technique.