Plutonium characterization is a critical aspect of safeguards operations of spent nuclear fuel reprocessing facilities. hiRX has the potential to provide accurate, rapid and direct quantification of plutonium in spent fuel reprocessing streams thereby decreasing the likelihood of a diversion of plutonium. Over the last several years we have presented the early development of hiRX demonstrating excellent sensitivity with detection limits around 200 pg of plutonium in a synthetic spent fuel matrix. This sensitivity offers a new level of accuracy and precision for direct plutonium quantification in spent fuel matrices on as little as 1 microliter of sample. In this presentation we will explore the analytical capabilities of hiRX including calibration linearity range, precision and accuracy of the technique. We will include the use of a novel sampling procedure known as TIPS or thermal inkject picofulidic system capable of depositing from 1 to 300 pL of solution onto a substrate with spot sizes from 10 to almost 100 micrometers. The advantage of this deposition technology enables spatially resolved calibration and ultimately quantification of samples. This work was supported by the Next Generation Safeguards Initiative, Office of Nuclear Safeguards and Security, National Nuclear Security Administration.