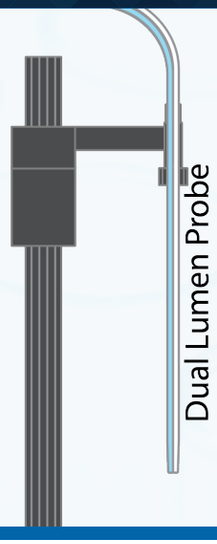
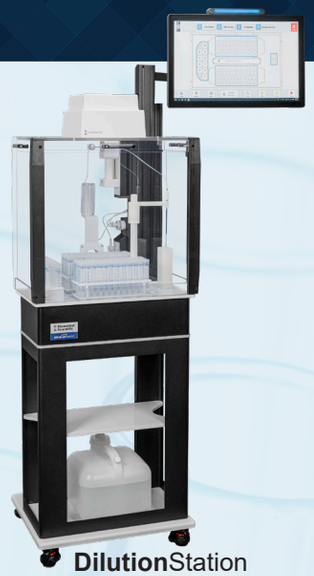


DilutionStation
Serial Diluting

Automatically performs serial dilutions up to and beyond 100,000x with high accuracy and excellent repeatability

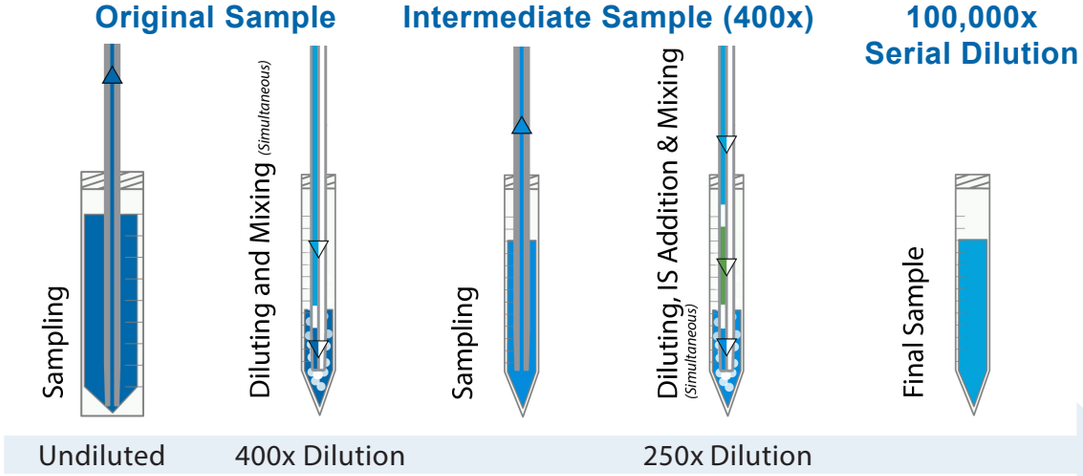


Authors: Scott Neihardt and Bo Wullenwaber

Evaluation of an Automated Serial Dilution Sample Preparation Method for 100,000x Dilutions using **Dilution**Station

Synopsis

DilutionStation automatically performs serial dilutions by loading and dispensing defined volumes using a DualLumen mixing probe. This study evaluates accuracy and reproducibility while performing a two-step serial dilution of five hundred 100 ppm samples to a final concentration of 1 ppb, representing a 100,000x dilution. With a single tap on the touchscreen, **Dilution**Station easily executed a complex multi-step method: each sample is loaded into the probe, diluted 400x, and simultaneously mixed to ensure homogeneity. The intermediate solution (250 ppb) was then combined with a 400 ppb internal standard and further diluted 250x to yield a final concentration of 1 ppb. Air gaps introduced between each liquid segment prevented carryover or premature mixing. Dilution factors exceeding 1,000,000x can be achieved. This fully automated workflow delivers hands-free, consistent results that improve efficiency and reproducibility.

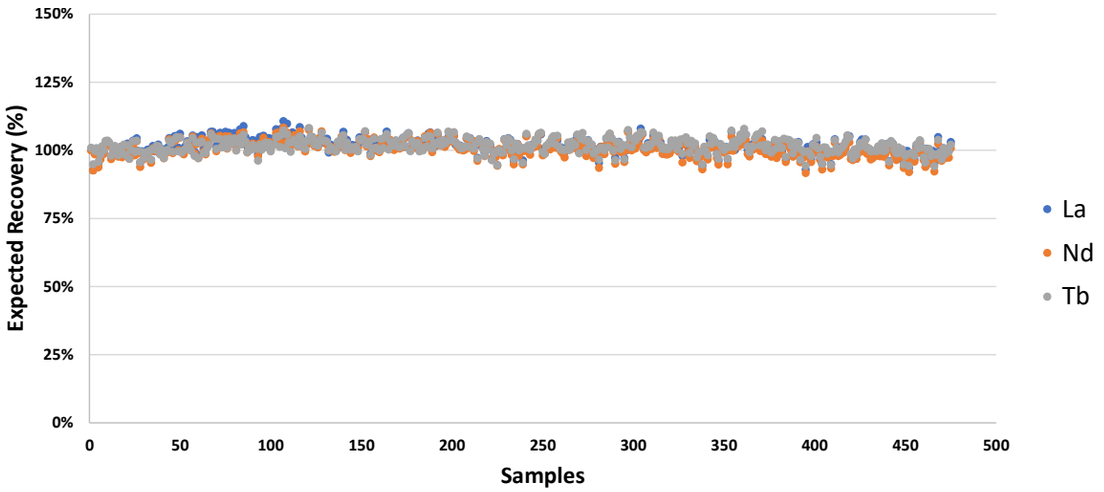


Complex serial dilution methods can be imported from CSV or Excel files for daily use. In this example, the original sample is loaded, diluted 400x, and simultaneously mixed using a DualLumen Probe, then further diluted 250x with internal standard addition to achieve a final 100,000x serial dilution.

Learn More

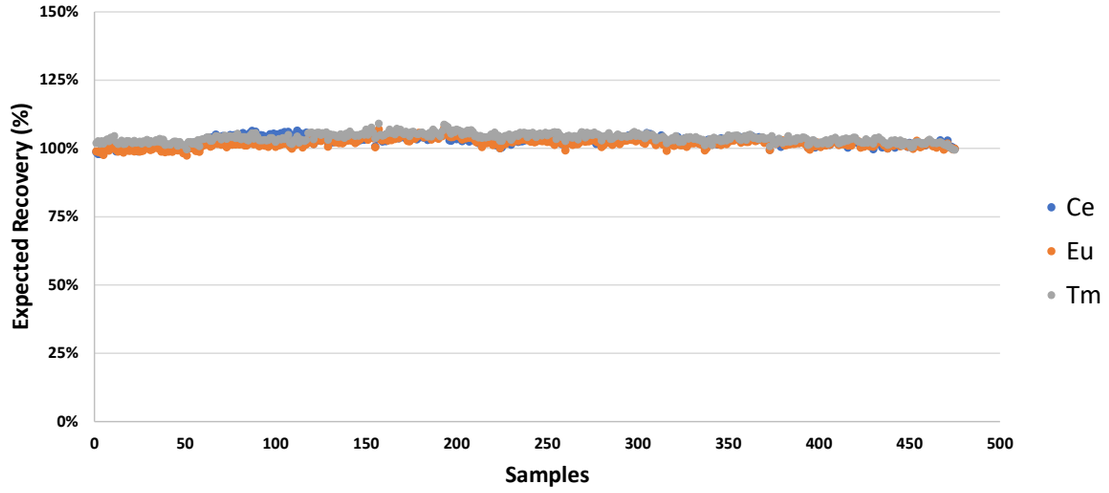
Accurate and Precise Serial Dilution

Reproducibility of 100,000x Serial Dilution Verified by ICPMS



Recovery of 500 samples diluted 100,000x using the **Dilution**Station followed by analysis with ICPMS. Each original sample, containing 100 ppm of La, Nd, and Tb, was serially diluted to 1 ppb. The first dilution step of 400x yielded a 250 ppb intermediate solution, which was further diluted 250x to reach a final 1 ppb concentration. The components were dispensed into the sample vials and homogenized using pneumatic mixing. The average percent recoveries across the 500 samples prepared were: La = 101.5%, RSD 2.8%; Nd = 100.5%, RSD 2.9%; Tb = 101.4%, RSD 2.6%.

Reproducibility of IS Addition to Final Concentration of 10 ppb



Recovery of internal standard addition for 500 samples which were automatically prepared to a final dilution of 100,000x using **Dilution**Station and subsequently measured by ICPMS. During the intermediate dilution step, the system added 400 ppb of a multi-element internal standard solution containing Ce, Eu, and Tm. This produced a final solution containing 1 ppb standard and 10 ppb internal standard. The average internal standard percent recoveries from the 500 prepared samples were: Ce = 100.6%, RSD 1.6%; Eu = 99.8%, RSD 1.4%, Tm = 100.0%, RSD = 1.7%.