

G-probe 8 summary
January 2012
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A total of thirteen labs submitted final results during this stage of the G-probe 8 study. Technique breakdown was nine labs used LA-ICP-MS, two used SEM, three used EPMA. One lab provided results for both SEM and EPMA. The starting glass material used in this study was a commercial soda lime glass which was spiked with original USGS GSE-1 glass. This glass material was originally prepared in 1976 at the Corning glass works. In this round of G-probe testing study results for three elements are reported without target values. These elements include B, Pd, and Pt. Z-scores are not reported for these elements but it is believed that this information may prove useful for participants. Efforts are underway at the USGS and collaborating labs to provide target information for these elements in the future. If you have any questions or comments about this study please forward them to me at your earliest convenience.

Below you will find summary results for each element studied in this test. Target element concentrations were determined using a combination of bulk analysis and consensus study results. In element diagrams you will find information for each technique providing a value. Also included is the target value (◆) and calculated precision ($X \pm Ha$) (◆) based on the Horowitz equation. A figure is also presented representing the data compilation for the entire study when more than one technique reported values. The study average is represented by ■, the standard deviation of the average by ■ and the maximum and minimum values by □. This study average is calculated primarily for the analysis of the major elements where multiple techniques provided data. For each technique an average value is presented (ex LA-ICP-MS, ▲) as well as \pm one standard deviation (ex LA-ICP-MS, ▲), and the maximum and minimum values reported (ex LA-ICP-MS, △).

Table 1 **Symbols used on figures 1 through 59**

<u>Symbol type</u>		<u>Represents</u>
Large solid symbol,	●	Study or method average
Small solid symbol,	•	Study or method one standard deviation
Large open symbol,	○	Study or method Maximum or Minimum

Table 2. G-probe 8 (SL-1G soda lime glass) Assigned values and statistical analysis of contributed results

Oxide	Xa % m/m	Ha % m/m	s.d.m. % m/m	GP-8 AVG. % m/m	Max % m/m	Min % m/m
SiO2	71.24	1.49	1.04	71.98	74.4	70.7
TiO2	0.06	0.004	0.023	0.060	0.104	0.017
Al2O3	2.44	0.085	0.49	2.15	2.61	0.73
Fe2O3T	0.74	0.031	0.21	0.60	0.76	0.056
Fe(II)OT	0.66	0.028	0.037	0.62	0.66	0.57
MnO	0.01	0.001	0.005	0.012	0.019	0.002
MgO	0.91	0.037	0.27	0.86	1.19	0.101
CaO	10.36	0.291	1.79	9.53	10.95	5.29
Na2O	13.02	0.354	2.99	12.7	18.74	3.79
K2O	0.57	0.025	0.15	0.512	0.66	0.085
P2O5	0.02	0.001	0.006	0.016	0.031	0.008

Element	Xa mg/kg	Ha mg/kg	s.d.m. mg/kg	GP-8 AVG. mg/kg	Max mg/kg	Min mg/kg
Ag	19.4	1.9	6.99	20.1	31.3	5.44
As	25	2.46	7.69	26.3	33.7	11.8
B	-	-	0.61	55.8	85.2	5.14
Ba	506.8	31.8	125	458	710	186
Be	34.2	3.21	7.07	29.1	33.8	14
Bi	25.6	2.51	11.1	28.2	53.6	21.6
Cd	17.9	1.85	11.2	21.8	49.7	7.67
Ce	51.9	4.58	12.4	49.2	76	22.3
Co	31.9	3.03	9.45	33.4	52.4	12.8
Cr	1355	73.2	680	1170	2173	0.22
Cs	23.9	2.37	7.59	24.1	37.6	7.37
Cu	44.1	3.99	14.9	39.7	68.4	14.2
Dy	1.88	0.27	0.43	1.69	2.66	0.89
Er	2.1	0.3	0.54	1.93	3.31	0.99
Eu	32	3.04	7.46	30.5	48.2	15.1
Ga	3.03	0.41	8.09	7.38	25.6	3.06
Gd	1.83	0.27	0.55	1.75	3.02	0.92
Ge	27.8	2.7	8.14	33.2	48.8	26.7

Element	Xa mg/kg	Ha mg/kg	s.d.m. mg/kg	GP-8 AVG. mg/kg	Max mg/kg	Min mg/kg
Hf	31.8	3.02	6.88	31.1	47.8	17.5
Ho	1.55	0.23	0.41	1.47	2.32	0.75
In	27.8	2.69	10.6	33.3	49	11.5
La	34.6	3.25	8.48	32	52.1	15.4
Li	38.5	3.55	16.6	42.1	86.5	15.1
Lu	1.68	0.25	0.38	1.6	2.38	0.89
Mo	28.3	2.73	6.26	33.4	47.5	28.4
Nb	31.5	2.99	8.74	31.7	52.9	14.9
Nd	3.77	0.49	0.83	3.32	5.31	1.64
Ni	44.1	3.99	11.51	40.4	62.3	16.1
Pb	74.2	6.21	28.1	79.9	132	24.2
Pd	-	-	4.1	5.89	10.2	2.3
Pr	2.05	0.29	0.54	1.87	3.02	0.86
Pt	-	-	2.69	4.06	6.45	1.4
Rb	35.2	3.29	11.1	37.2	56.9	11.4
Sb	31.8	3.02	9.25	33.8	51.5	16.2
Sc	1.63	0.24	1.1	3.23	5.8	2.12
Sm	1.83	0.27	0.47	1.72	2.8	0.88
Sn	41.5	3.79	14.8	43.6	67.3	14.9
Sr	163	12.1	46.7	172	283	76.6
Ta	28.8	2.78	6.81	30.9	47.3	17.5
Tb	1.56	0.23	0.36	1.38	2.1	0.71
Te	18.7	1.92	1.35	33.8	35.4	32.4
Th	2.54	0.35	0.61	2.49	3.94	1.42
Tl	0.79	0.13	0.4	1.05	1.74	0.68
Tm	1.5	0.22	0.34	1.34	2.03	0.76
U	31.4	2.99	8.6	32.3	46.5	12.6
V	43.2	3.92	9.25	40.4	47.2	16.8
W	29	2.79	6.78	35.7	48.8	30.2
Y	34.6	3.25	7.04	33.4	52.5	21.9
Yb	2.08	0.30	0.44	1.99	2.92	1.18
Zn	103	8.21	32.1	118	170	50.6
Zr	108	8.51	25.3	115	184	75.5

- Xa = Target value obtained from USGS bulk analysis
Ha = Target precision calculated using modified version of Horowitz equation
for data quality 2, ($Ha = 0.01Xa^{0.8495}$)
s.d.m. = Standard deviation of population mean
mean = Mean element concentration for all techniques reporting
Max. = Maximum element/oxide concentration reported
Min. = Minimum element/oxide concentration reported

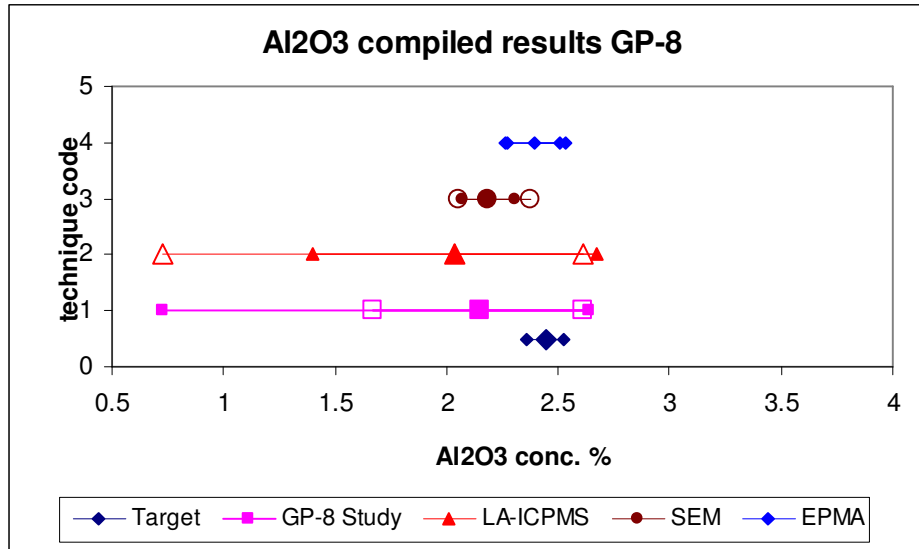


Figure 1. Al₂O₃ results for G-probe 8 study

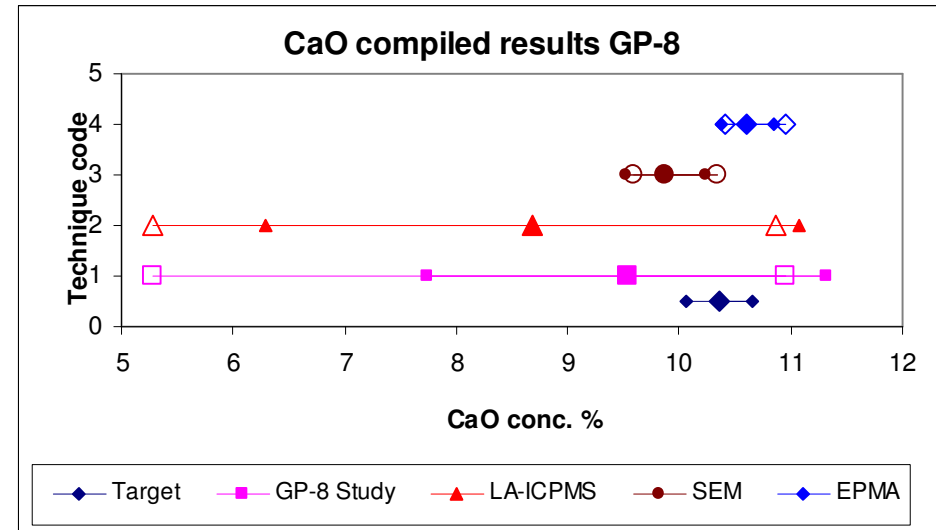


Figure 2. CaO results for G-probe 8 study

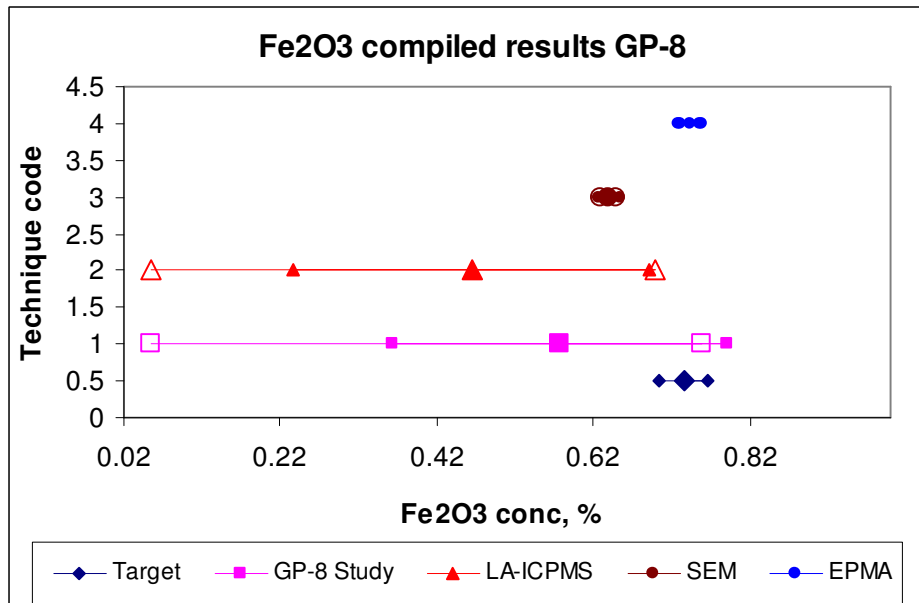


Figure 3. Fe₂O₃ results for G-probe 8 study

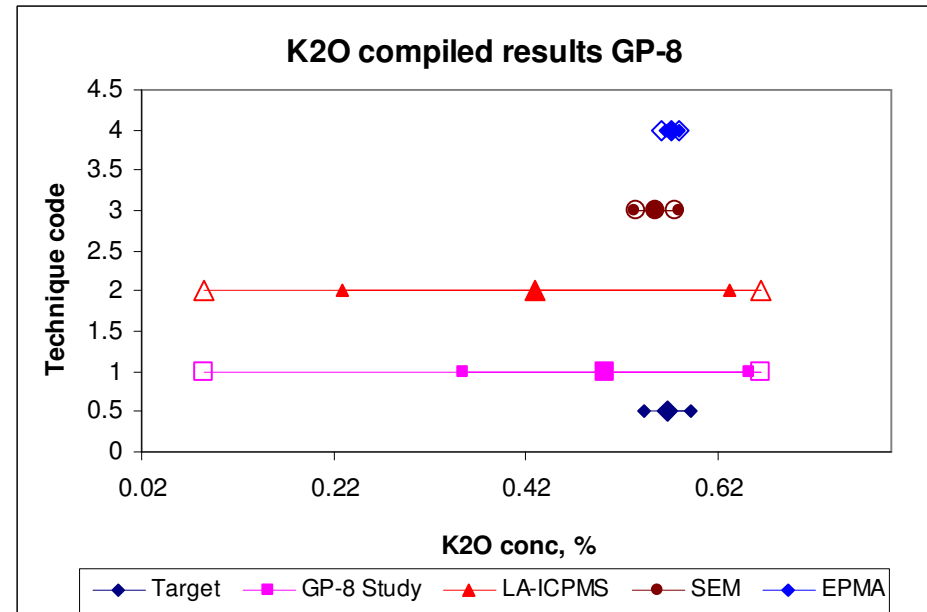


Figure 4. K₂O results for G-Probe 8 study

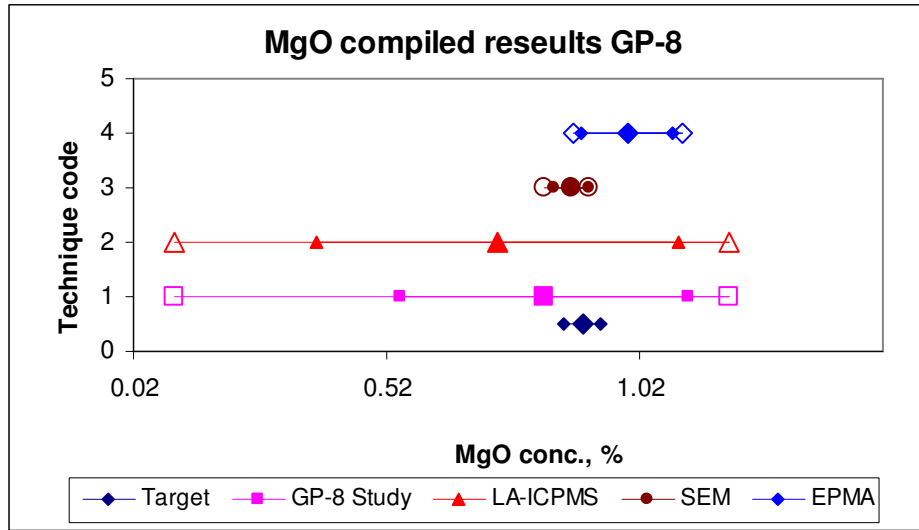


Figure 5. MgO results for G-probe 8 study

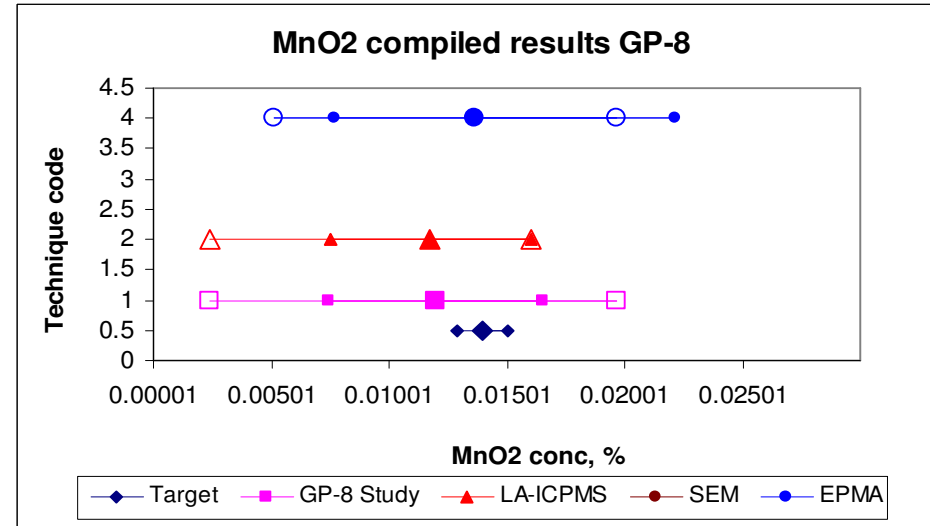


Figure 6. MnO₂ results for G-probe 8 study

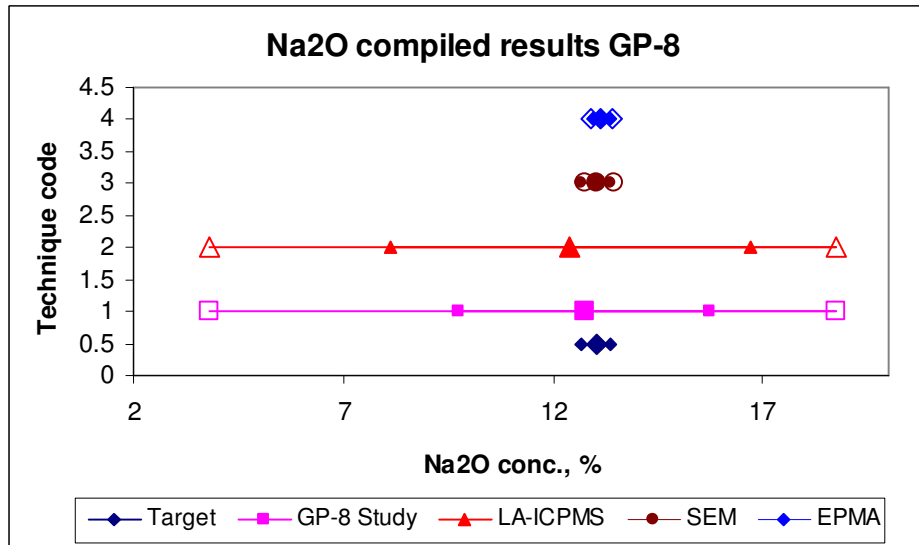


Figure 7 Na₂O results for G-probe 8 study

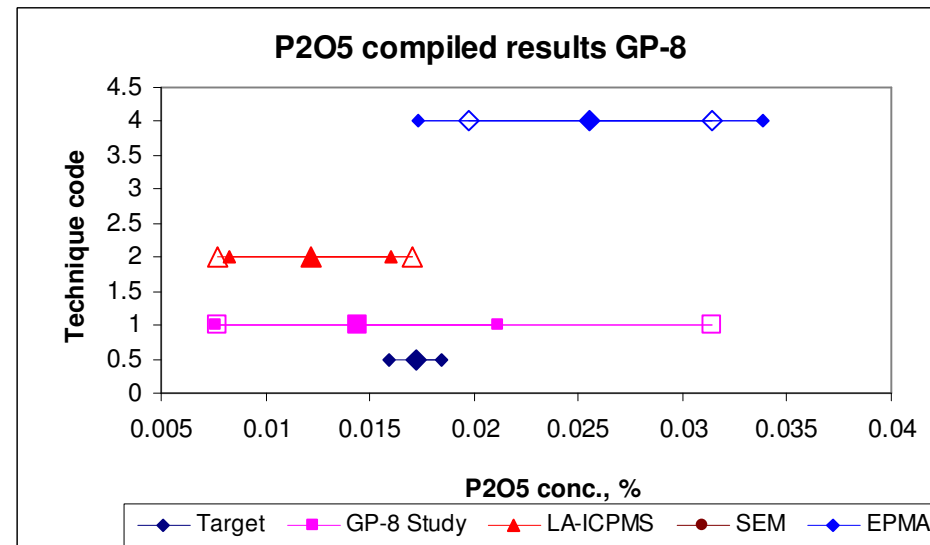


Figure 8. P₂O₅ results for G-probe 8 study

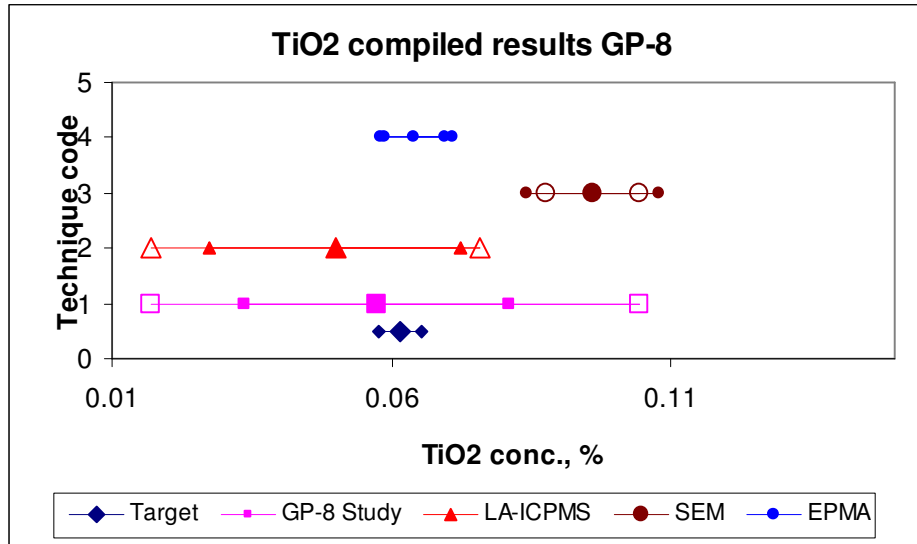


Figure 9. TiO₂ results for G-probe 8 study

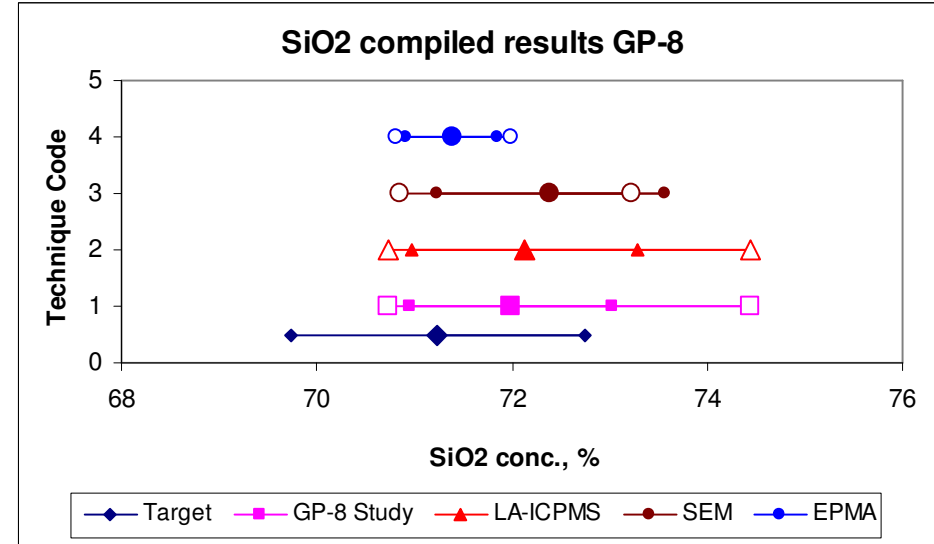


Figure 10. SiO₂ results for G-probe 8 study

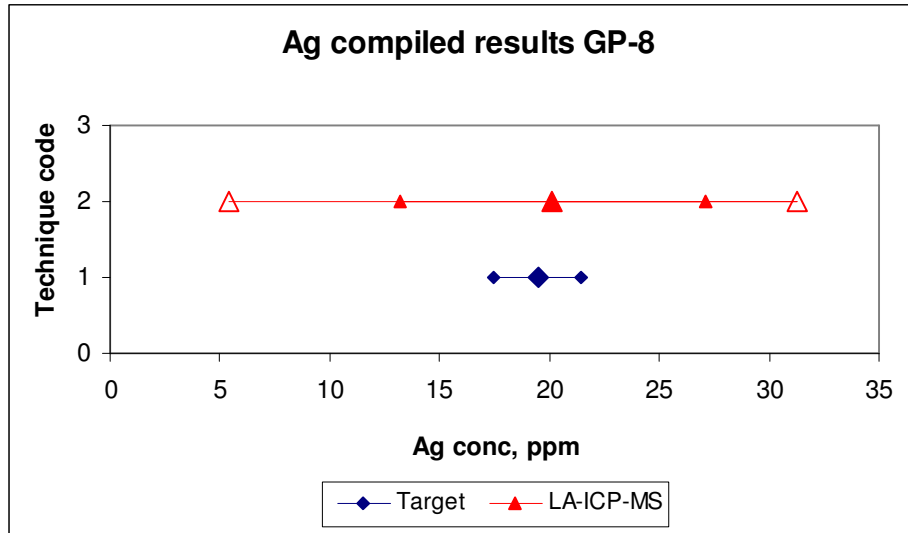


Figure 11. Ag results for G-probe 8 study

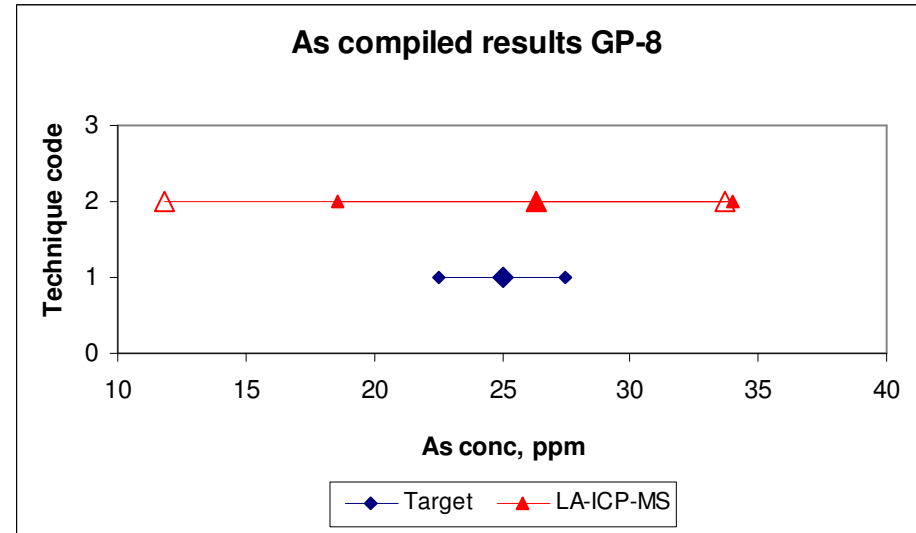


Figure 12. As results for G-probe 8

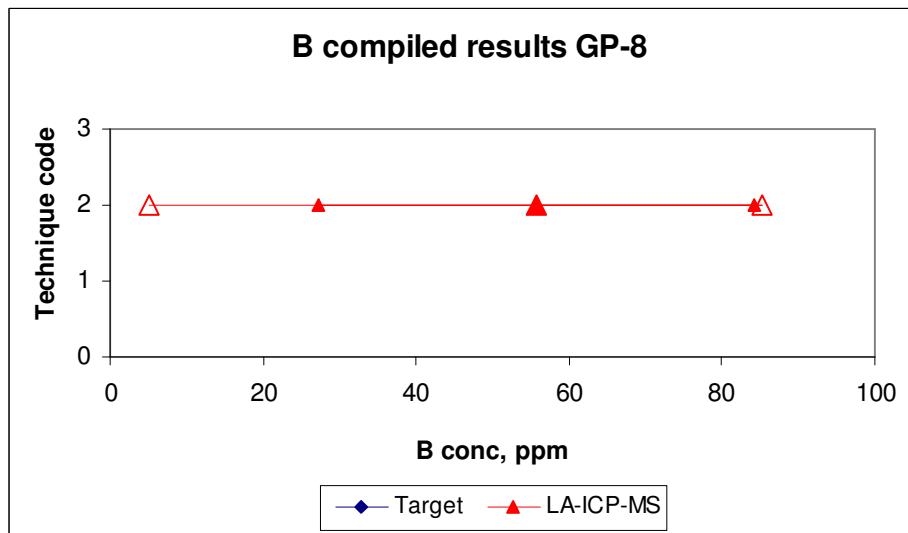


Figure 13. B results for G-probe 8

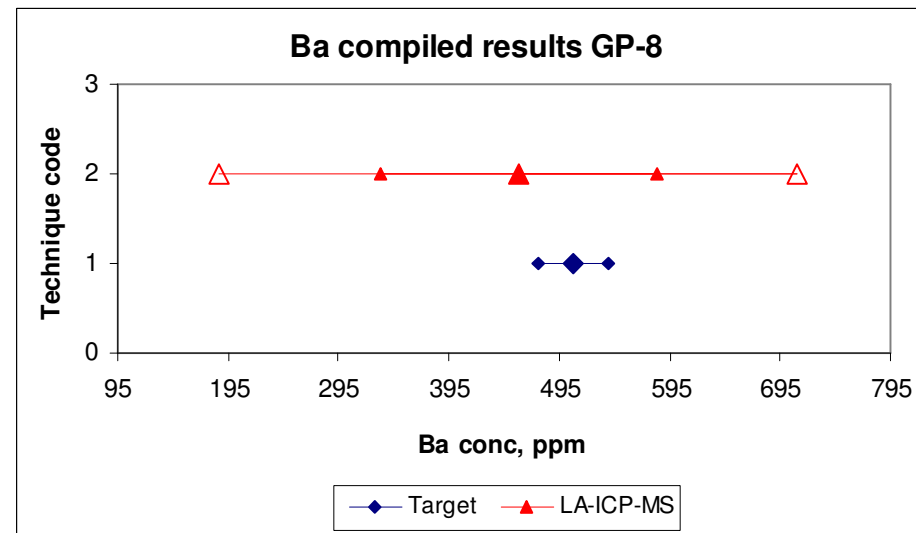


Figure 14. Ba results G-probe 8 study

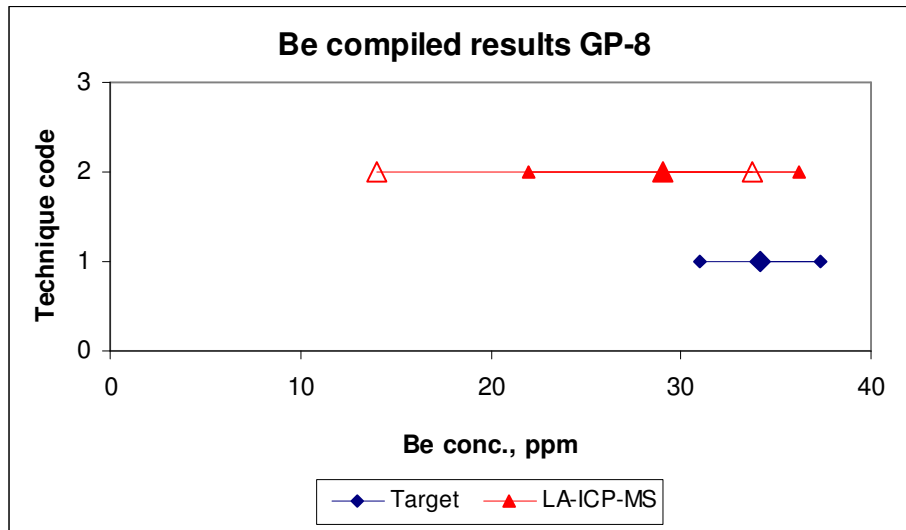


Figure 15. Be results G-probe 8 study

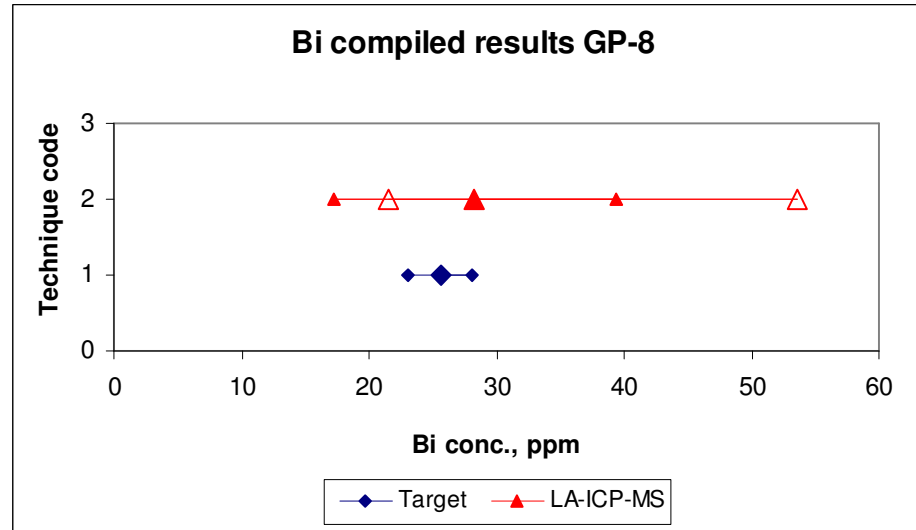


Figure 16. Bi results G-probe 8 study

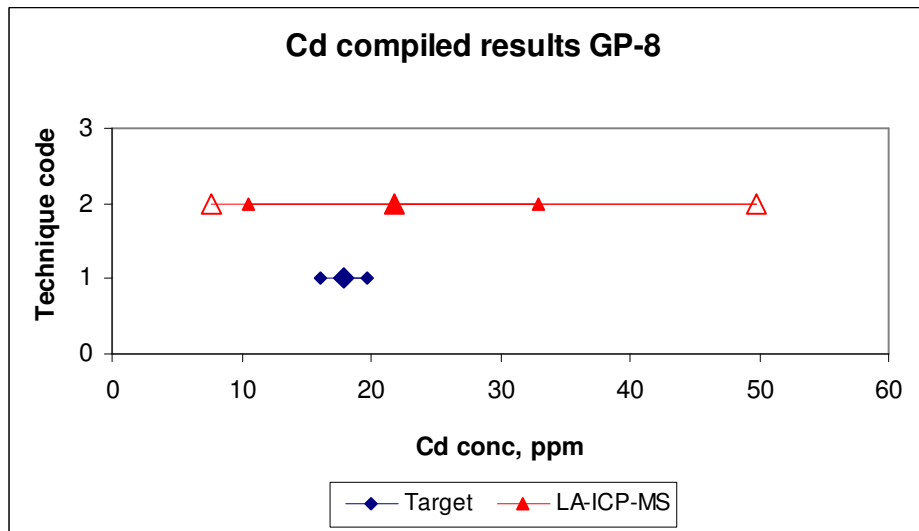


Figure 17. Cd results G-probe 8 study

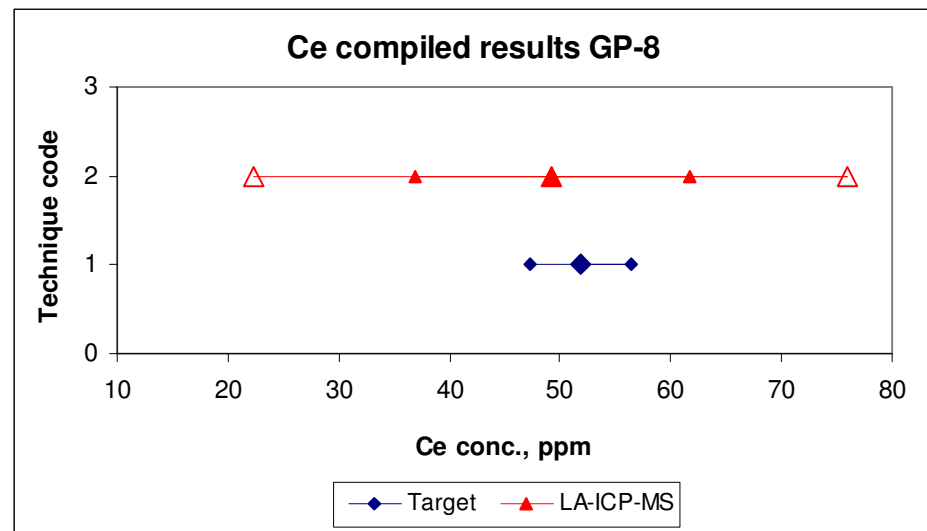


Figure 18. Ce results for G-probe 8 study

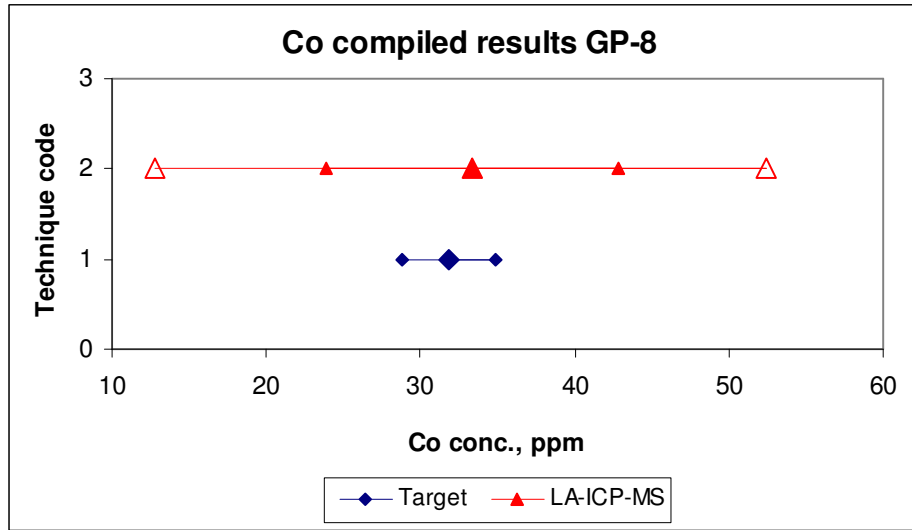


Figure 19. Co results for G-probe 8 study

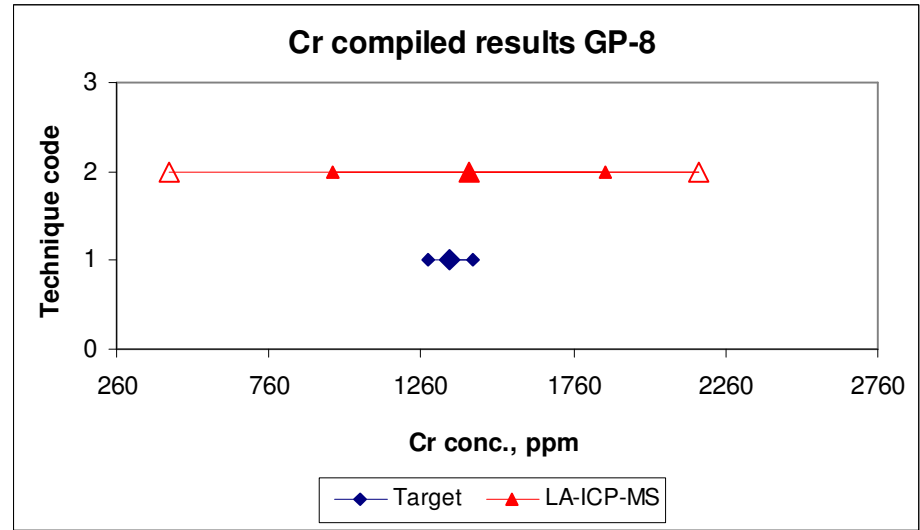


Figure 20. Cr results G-probe 8 study

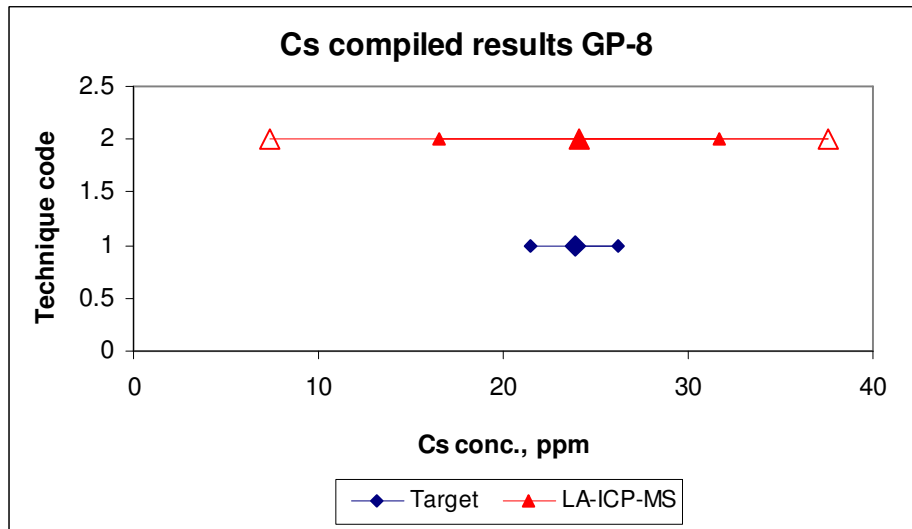


Figure 21. Cs results G-probe 8 study

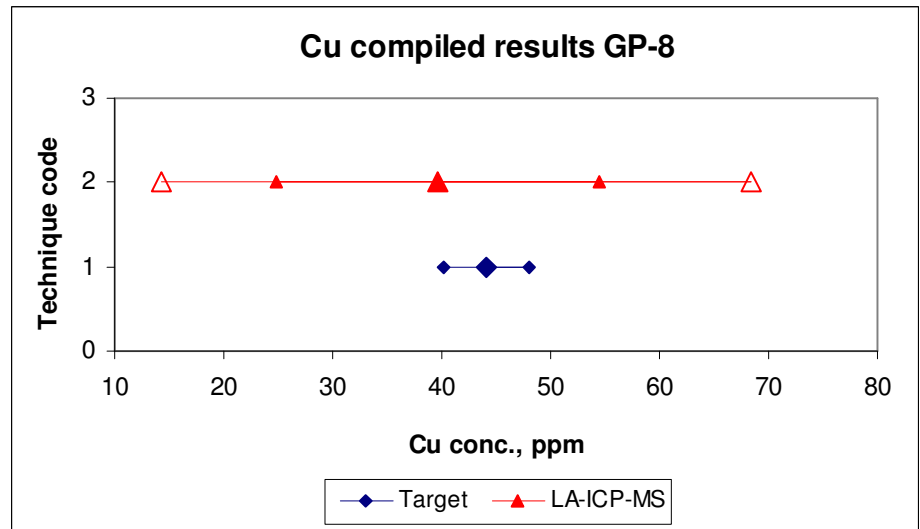


Figure 22. Cu results G-probe 8 study

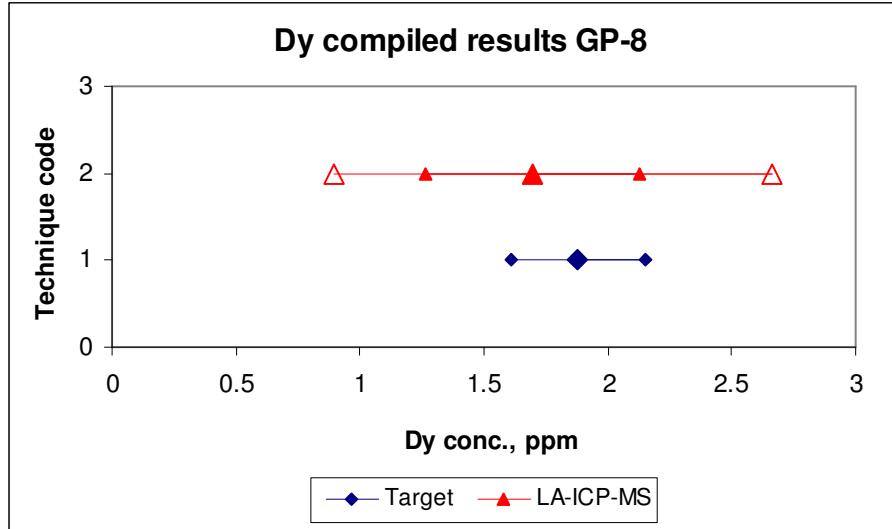


Figure 23. Dy results G-probe 8 study

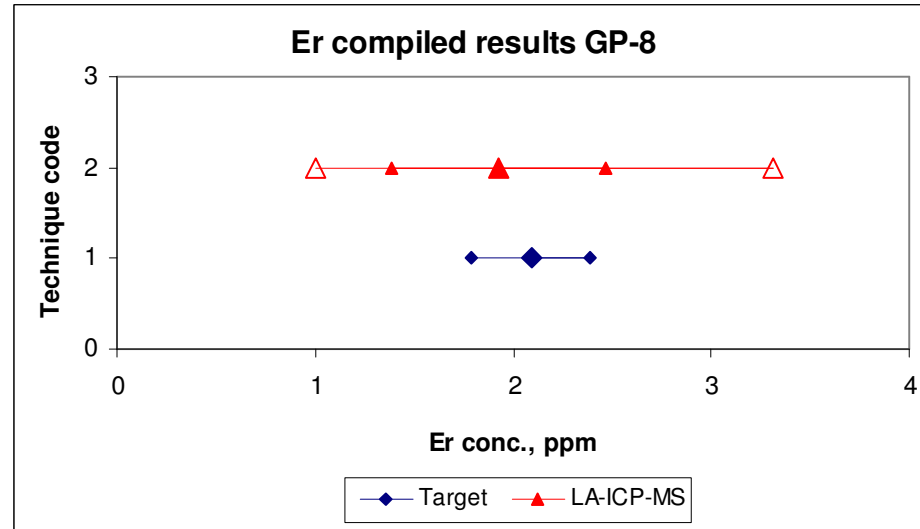


Figure 24. Er results G-probe 8 study

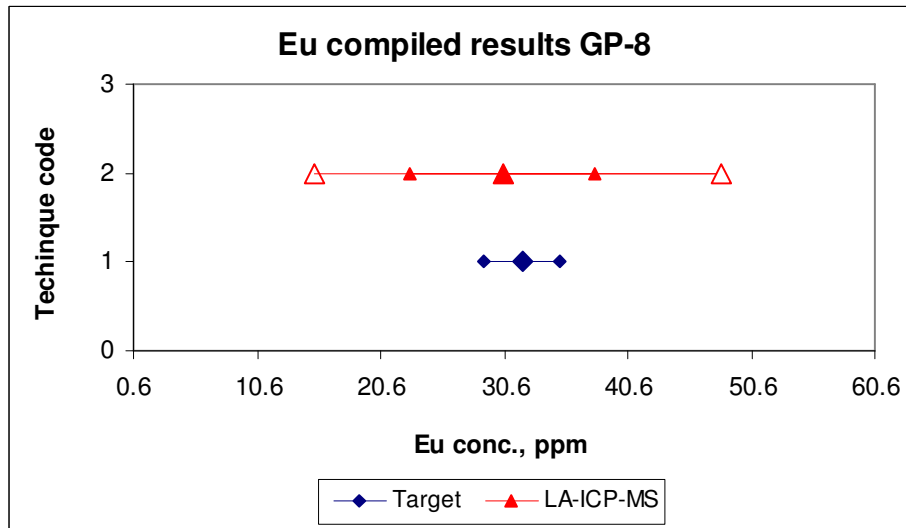


Figure 25. Eu results G-probe 8 study

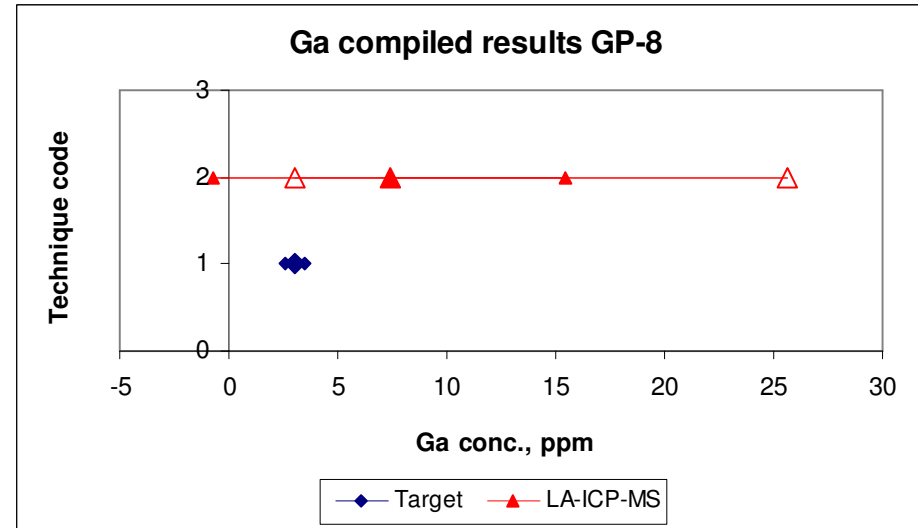


Figure 26. Ga results G-probe 8 study

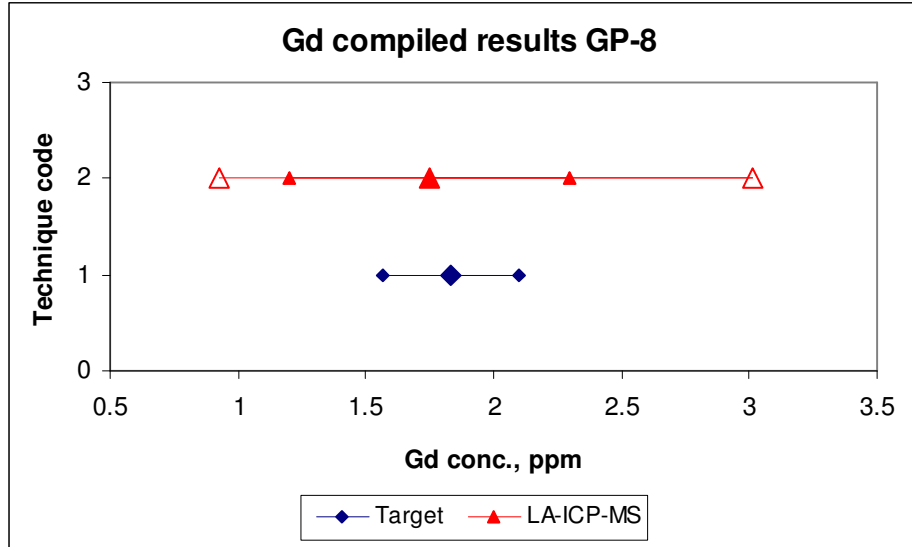


Figure 27. Gd results G-probe 8 study

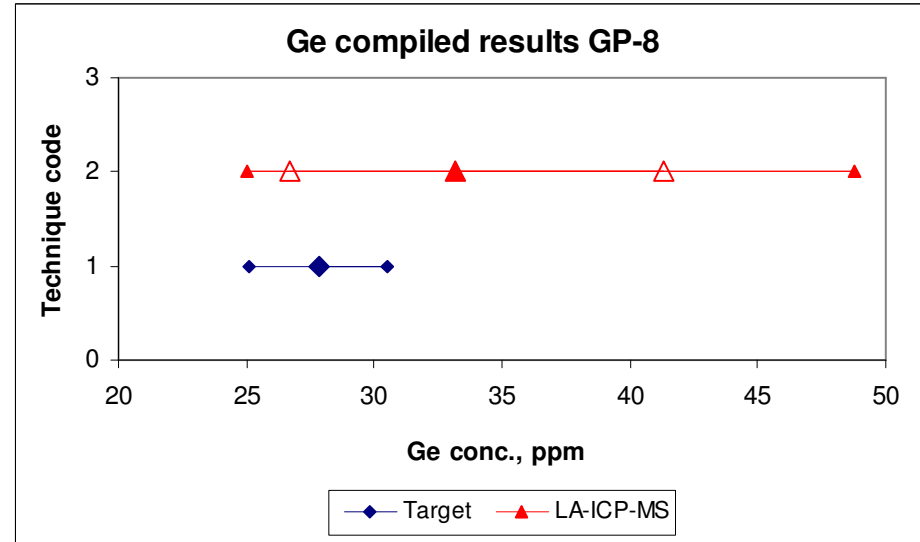


Figure 28. Ge results G-probe 8 study

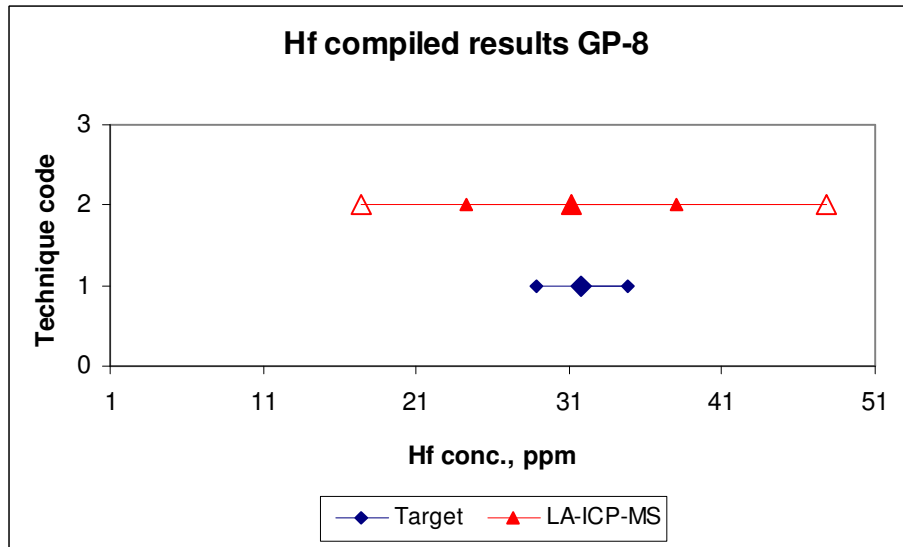


Figure 29. Hf results G-probe 8

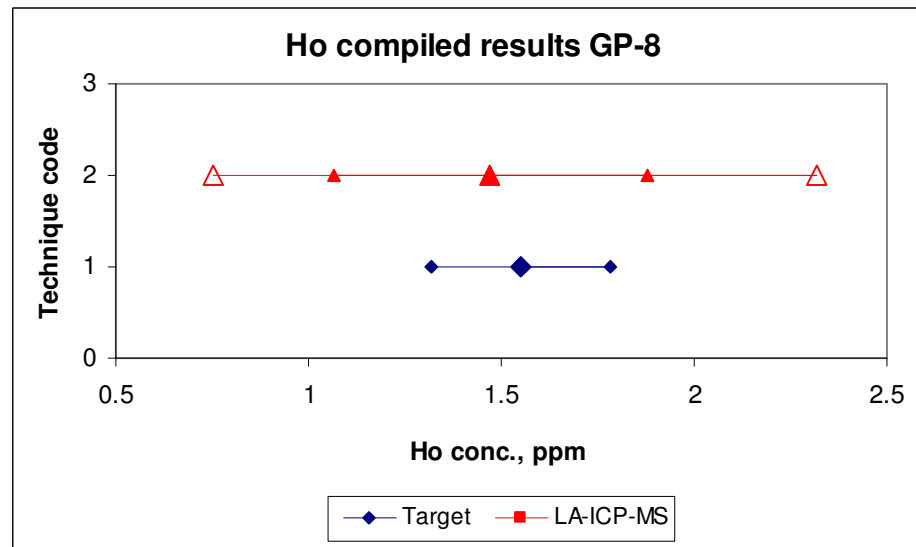


Figure 30. Ho results G-probe 8

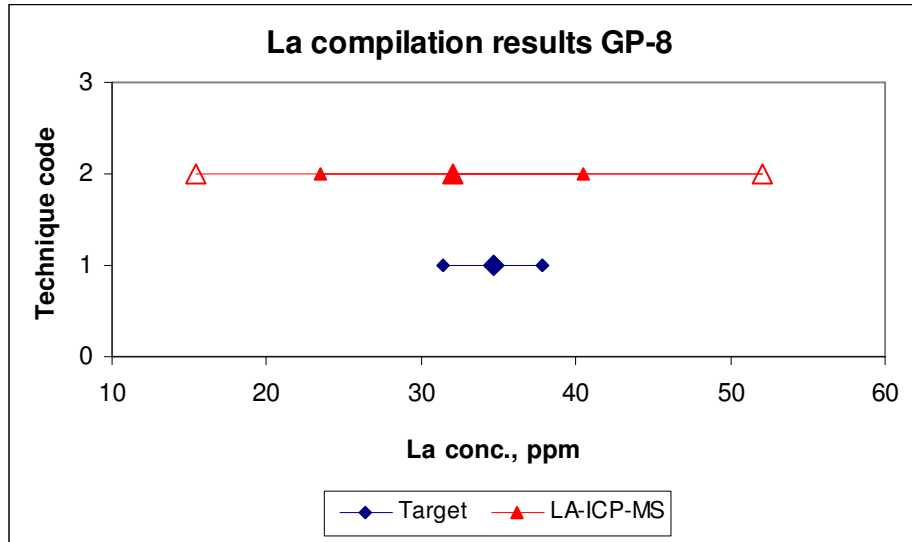


Figure 31. La results G-probe 8

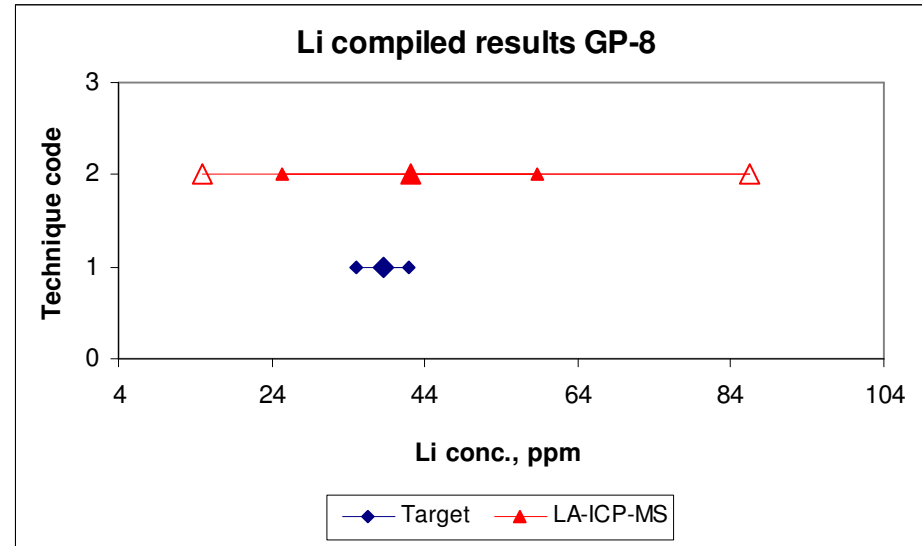


Figure 32. Li results G-probe 8

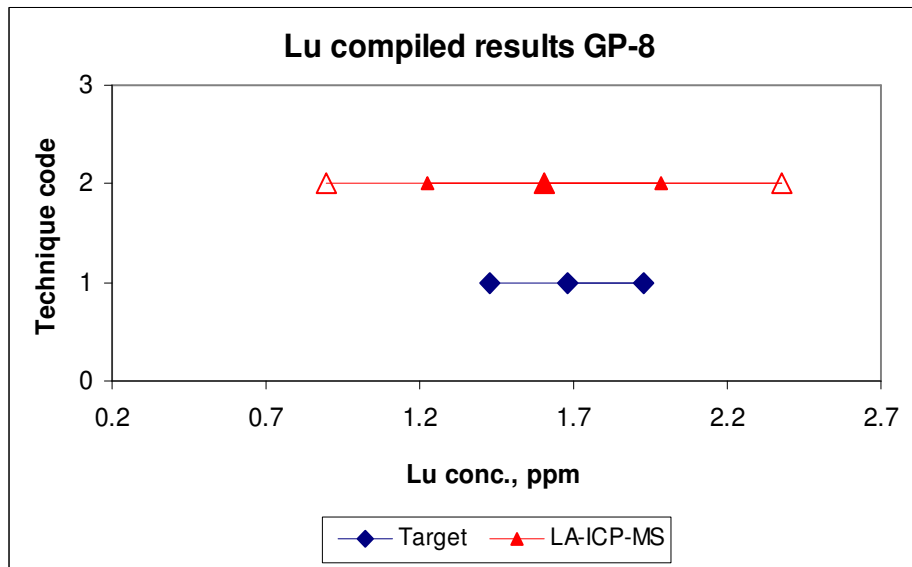


Figure 33. Lu results G-probe 8

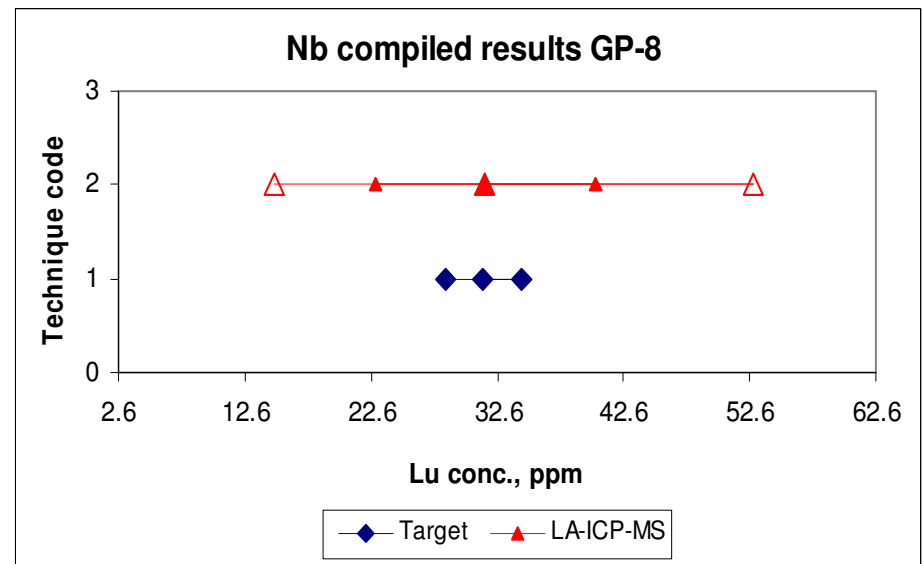


Figure 34. Nb results G-probe 8

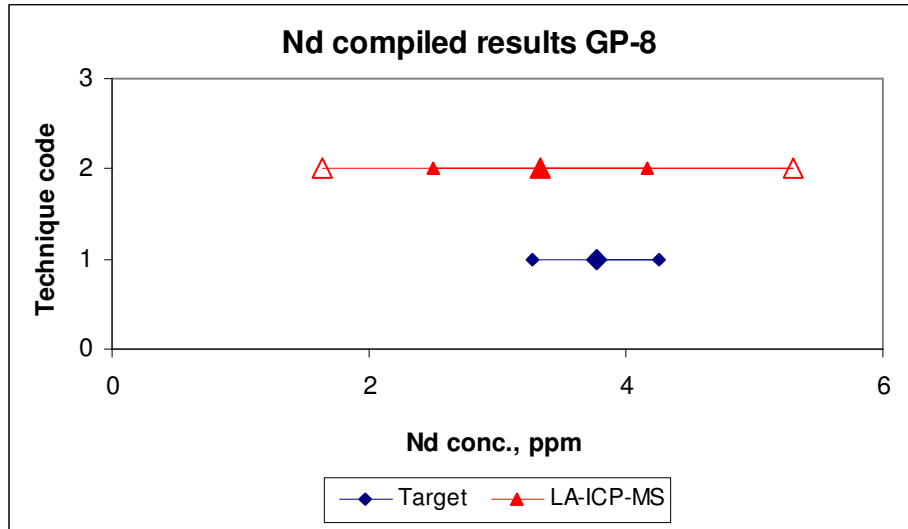


Figure 35. Nd results G-probe 8

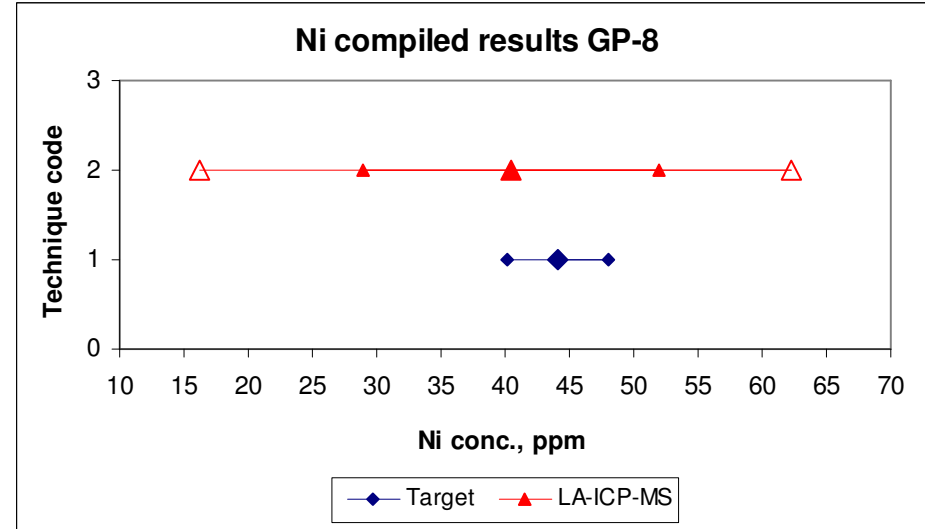


Figure 36. Ni results G-probe 8

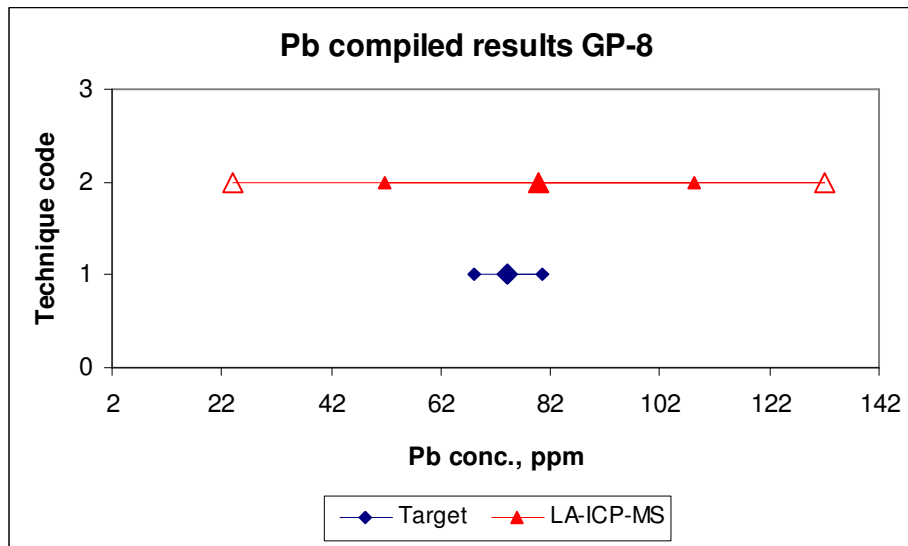


Figure 37. Pb results G-probe 8

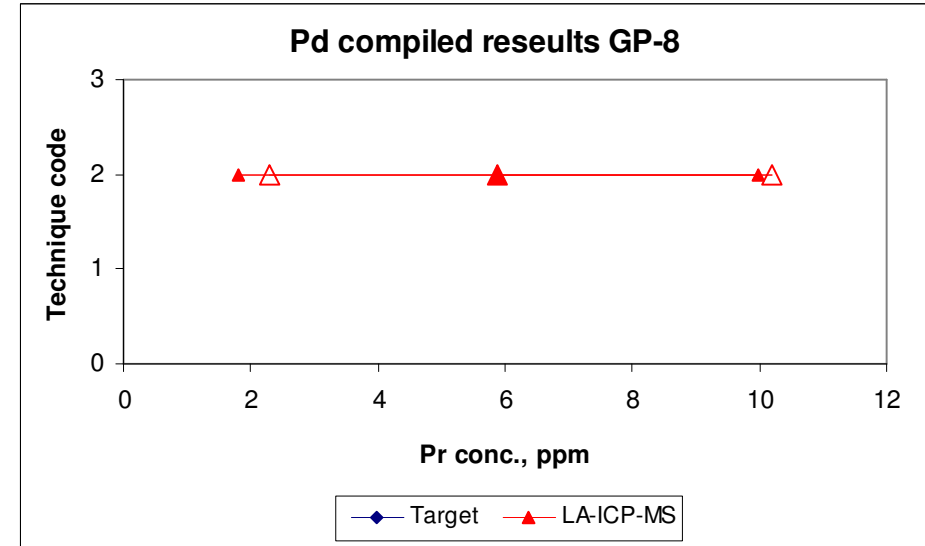


Figure 38. Pd results G-probe 8

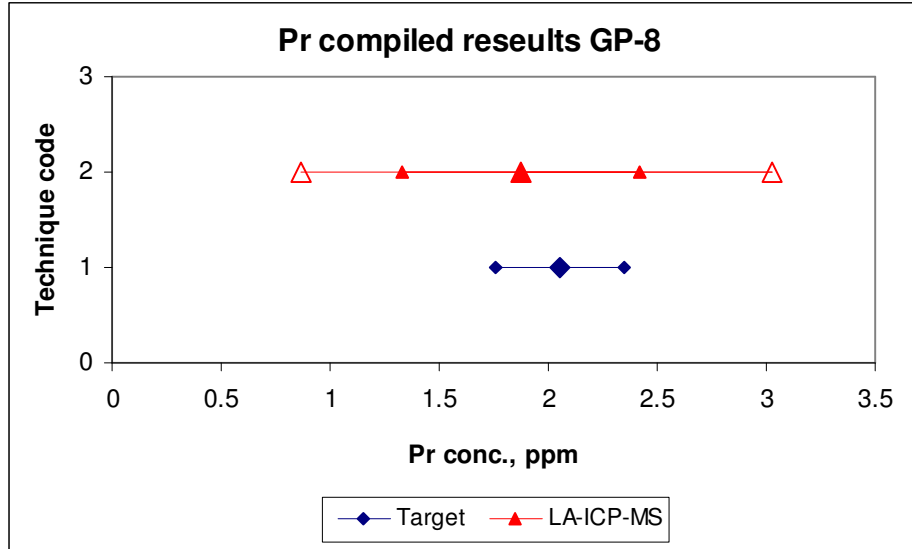


Figure 39. Pr results G-probe 8

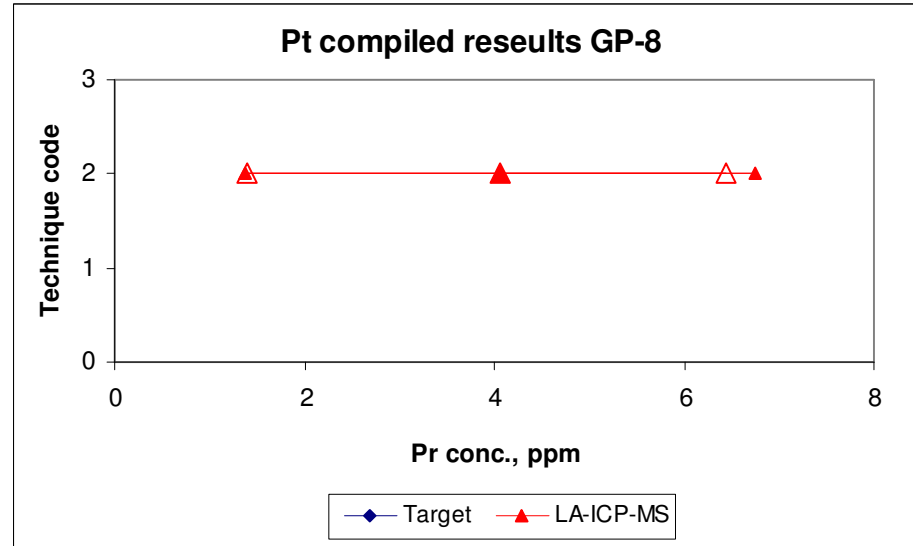


Figure 40. Pt results G-probe 8

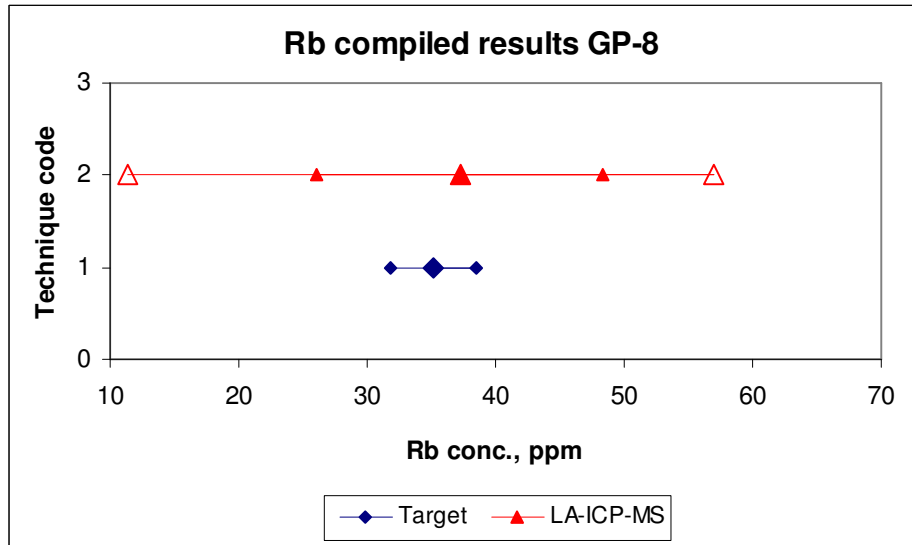


Figure 41. Rb results G-probe 8

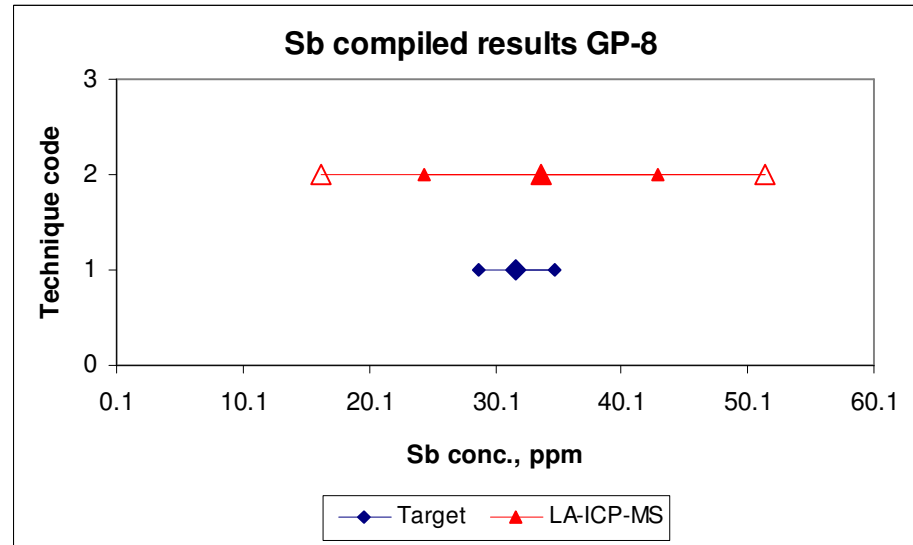


Figure 42. Sb results G-probe 8

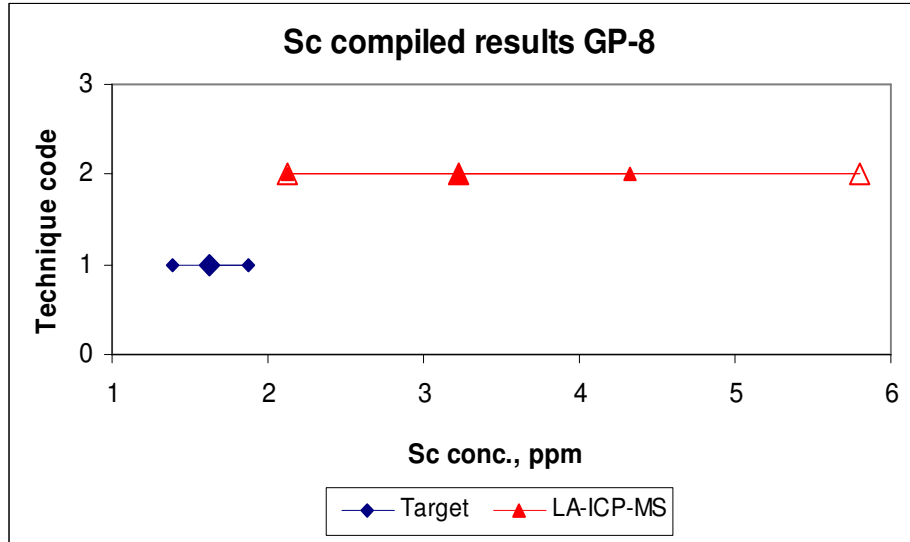


Figure 43. Sc results G-probe 8

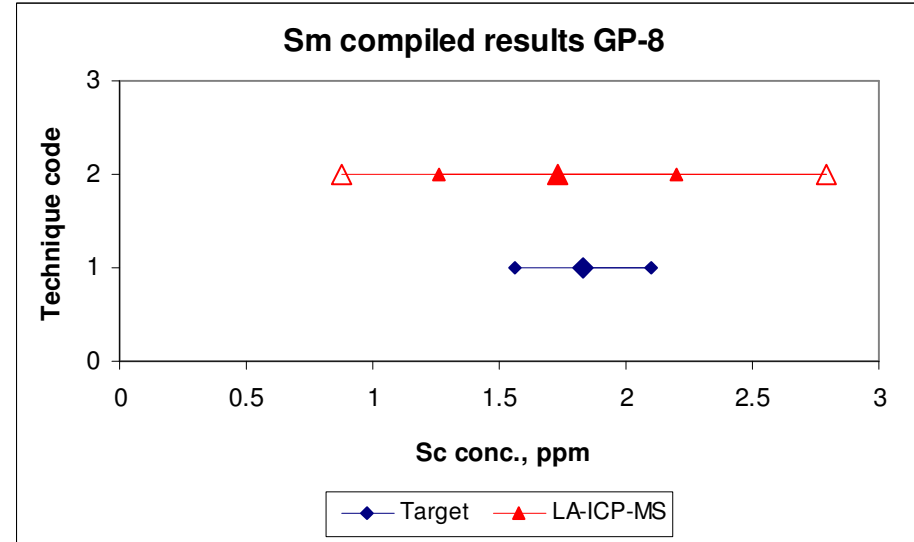


Figure 44. Sm results G-probe 8

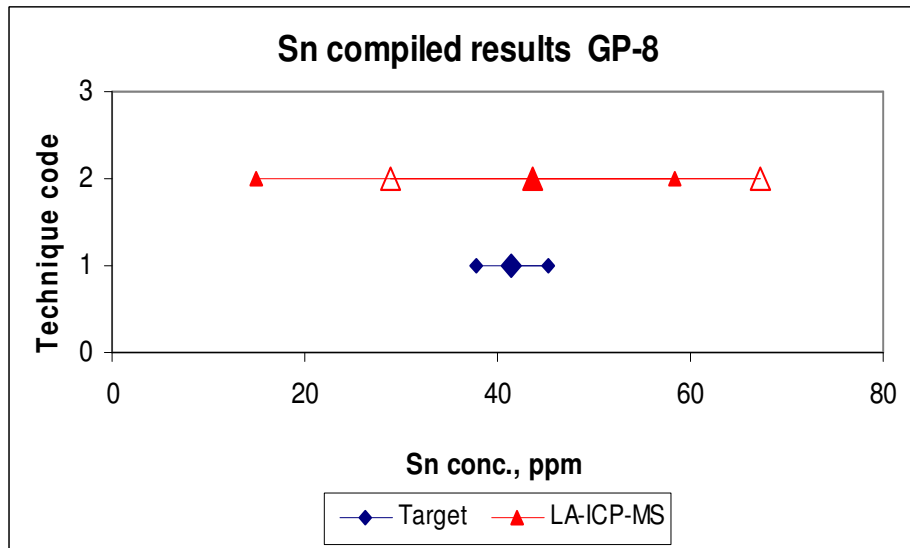


Figure 45. Sn results G-probe 8

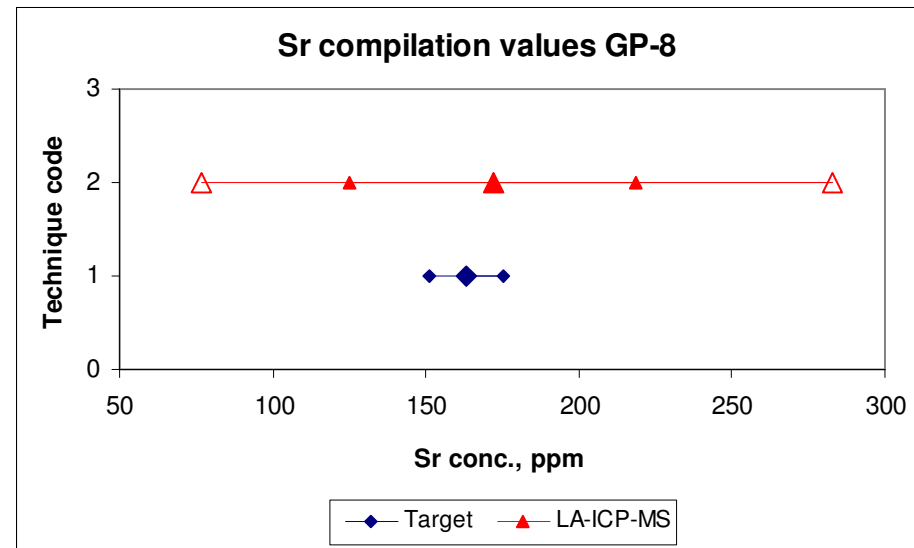


Figure 46. Sr results G-probe 8

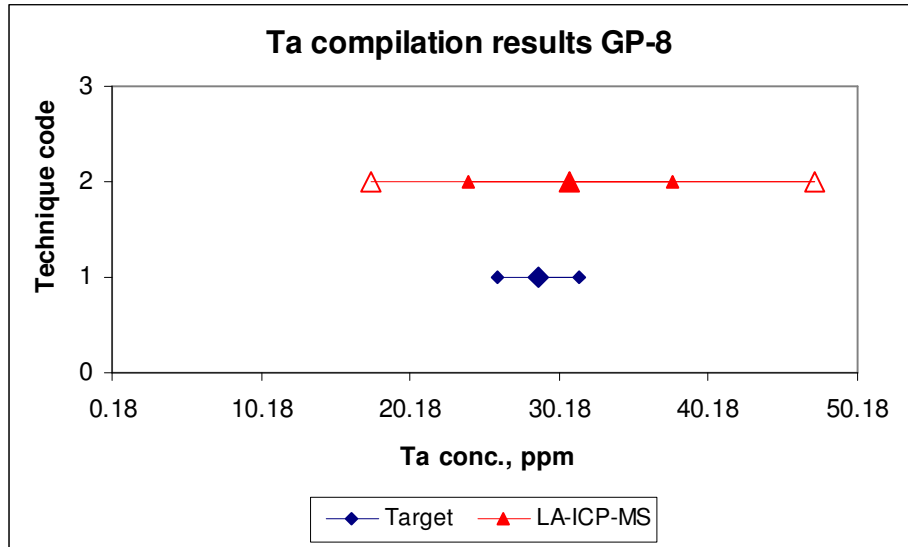


Figure 47. Ta results G-probe 8

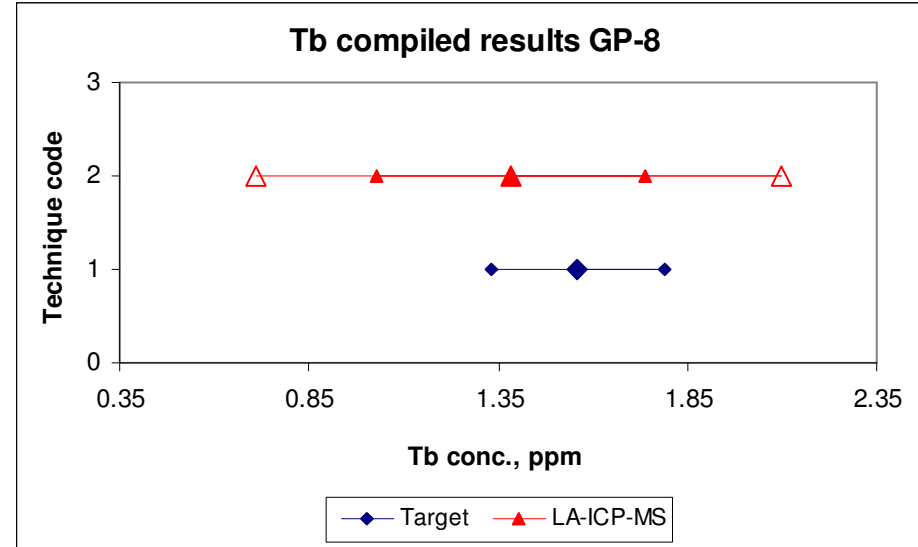


Figure 48. Tb results G-probe 8

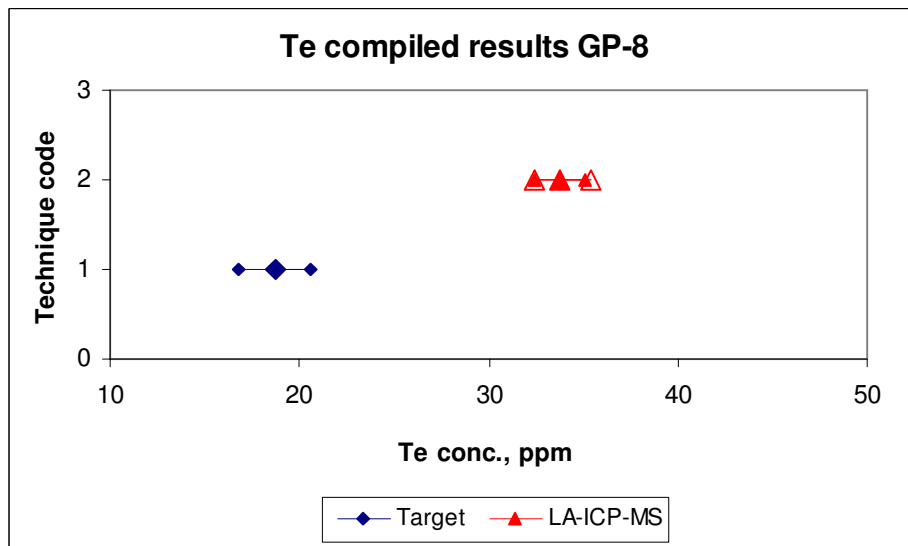


Figure 49. Te G-probe 8

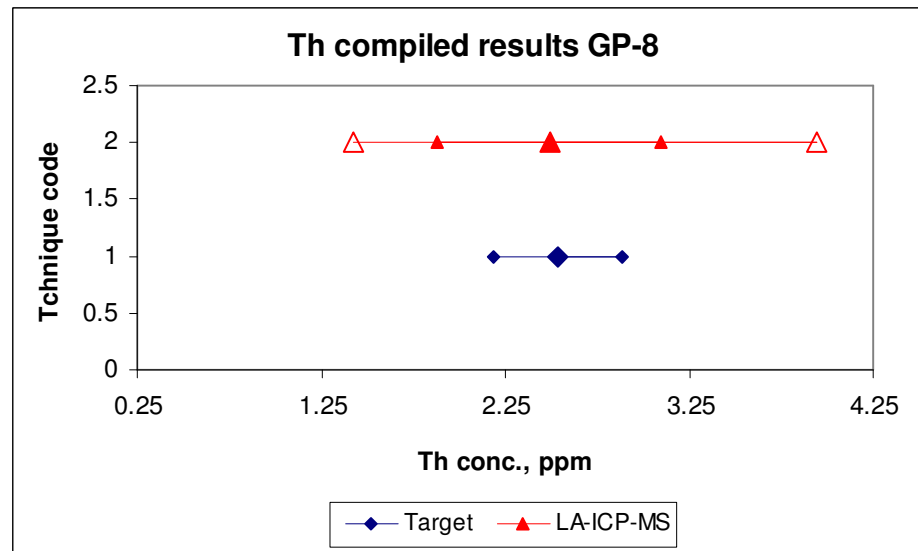


Figure 50. Th G-probe 8

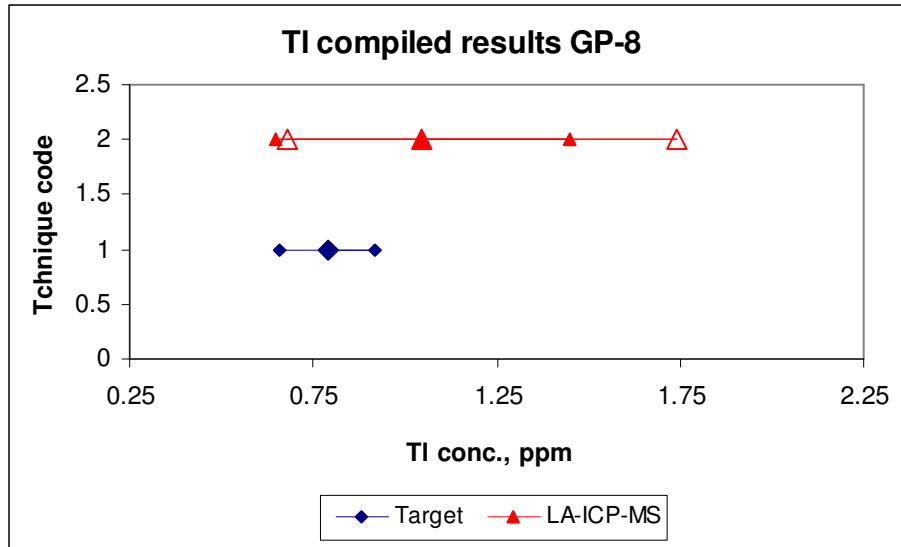


Figure 51. TI G-probe 8

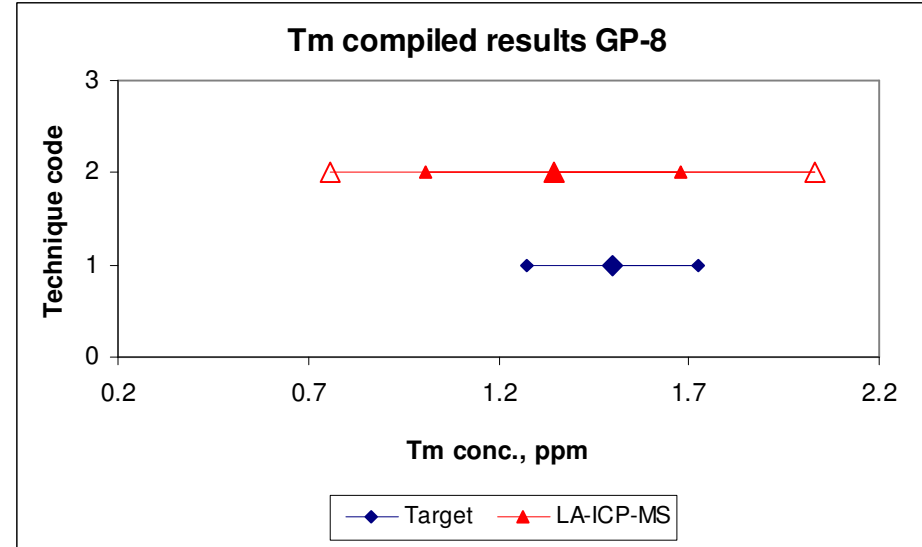


Figure 52. Tm G-probe 8

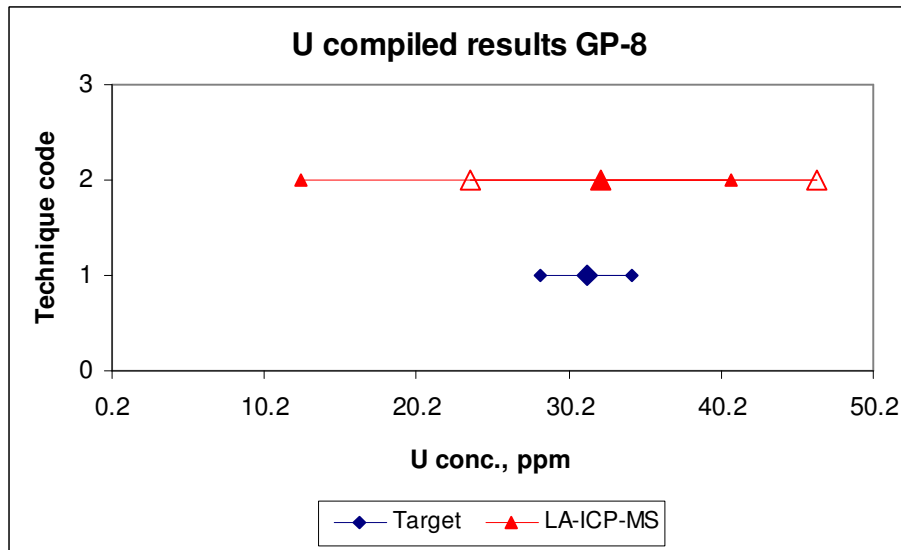


Figure 53. U G-probe 8

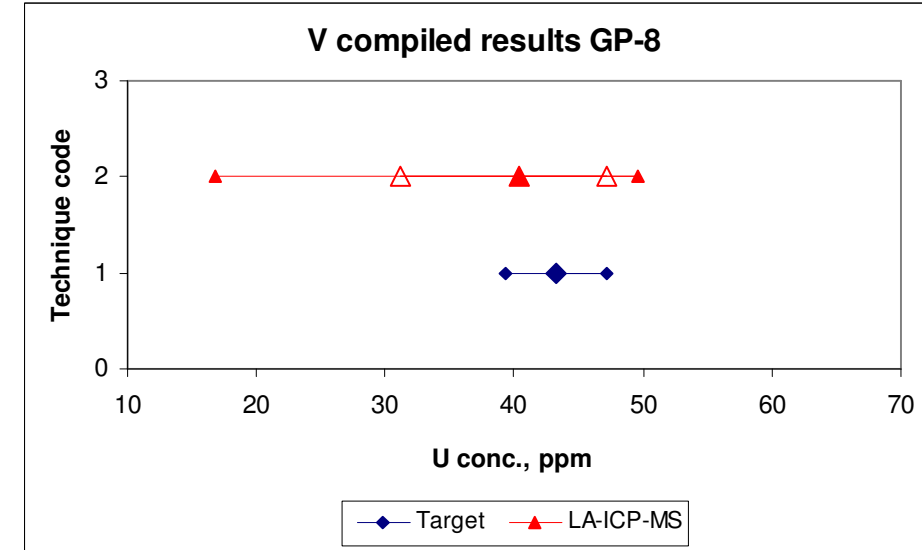


Figure 54. V G-probe 8

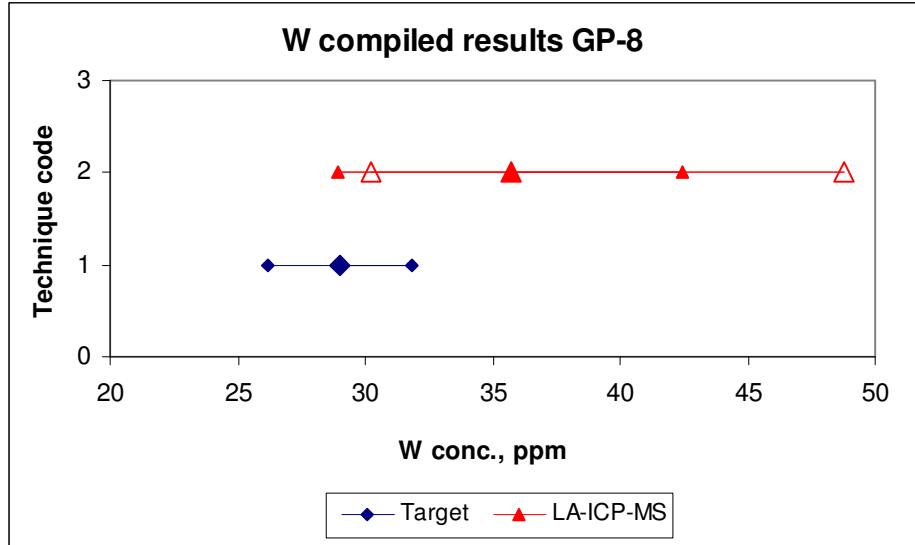


Figure 55. W G-probe 8

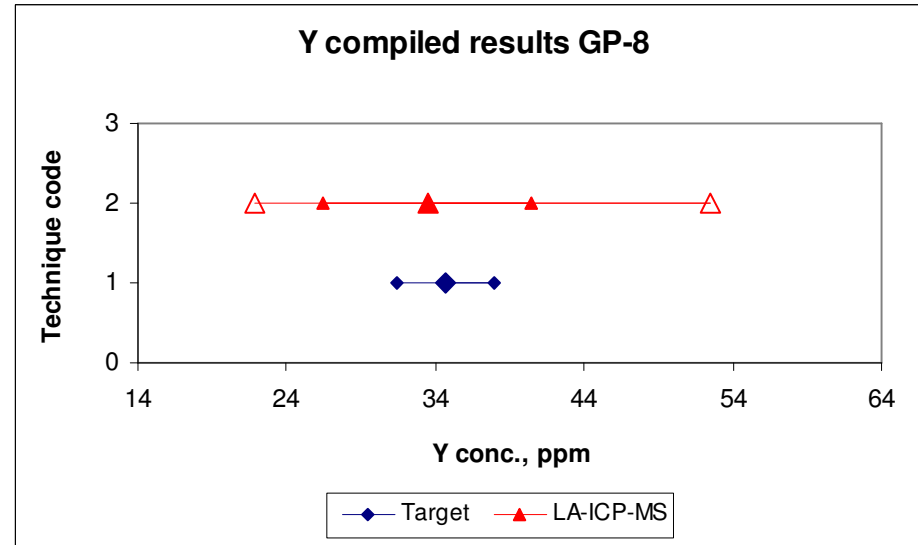


Figure 56. Y G-probe 8

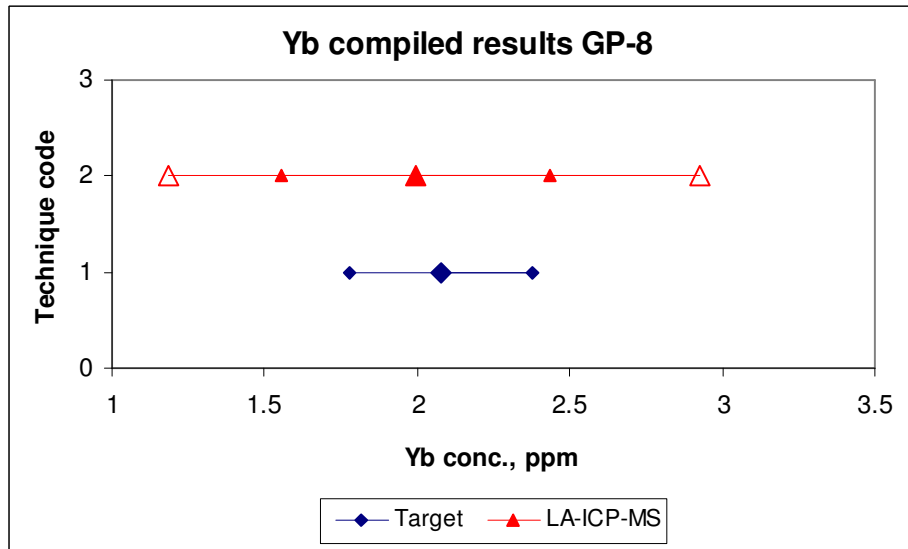


Figure 57. Yb G-probe 8

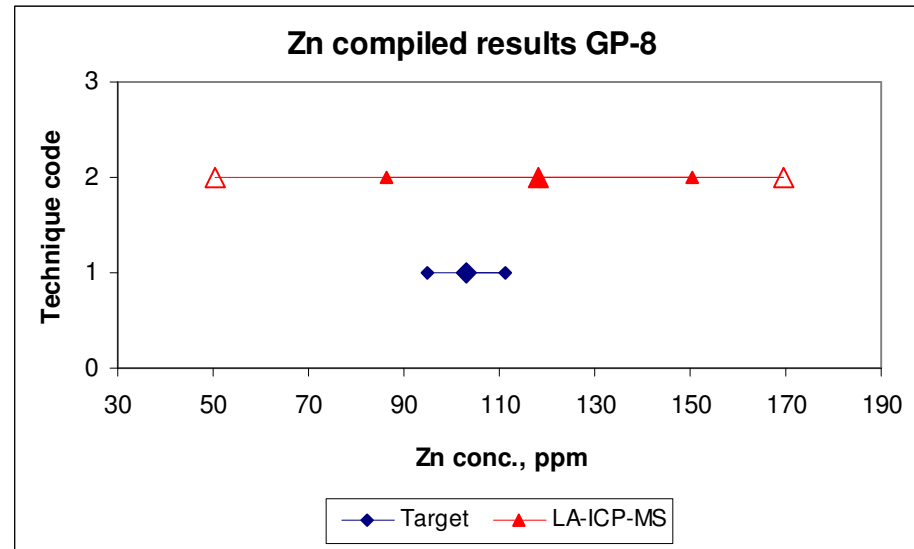


Figure 58. Zn G-probe 8

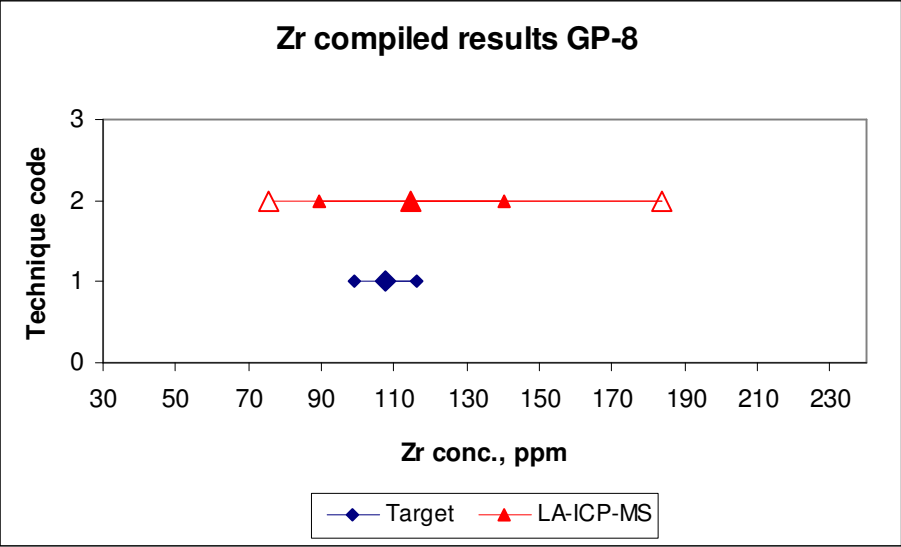


Figure 59. Zr G-probe 8