

G-probe 7 summary
July 2011
Stephen Wilson

A total of thirteen labs submitted final results during this stage of the G-probe 7 study. Technique breakdown was five labs used LA-ICP-MS, three used SEM four used EPMA and one lab used Micro-XRF. Three labs had yet to submit their final results. When results from these labs are provided their scores will be calculated but the summary results will not be modified. The glass material used in this study was made from basalt collected during the 1989 Endeavor dives along the Juan de Fuca Ridge. The starting material provided by Mike Perfet of the University of Florida was converted to a glass at the USGS using its standard glass making procedure. 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. The range of elements does not cover all those reported by participants but is limited to those elements with element concentrations quantified by USGS internal or contract analyses. 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 48**

<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 7 (BEND-1G basalt glass) Assigned values and statistical analysis of contributed results

Oxide	X _a % m/m	H _a % m/m	mean % m/m	s.d.m. % m/m	Max % m/m	Min % m/m	Element	X _a mg/kg	H _a mg/kg	mean mg/kg	s.d.m. Mg/kg	Max mg/kg	Min mg/kg
SiO2	49.8	1.11	50.31	0.56	51.34	49.38	Ge	2	0.29	2.22	0.87	3.60	1.29
TiO2	1.51	0.057	1.59	0.061	1.76	1.51	Hf	3	0.41	2.85	0.38	3.70	2.42
Al2O3	15.22	0.404	15.61	0.64	17.8	15.0	Ho	1.11	0.18	1.19	0.18	1.6	1
Fe2O3T	10.13	0.286	10.19	0.79	12.1	9.34	La	6.35	0.77	6.27	1.03	8.2	5.24
Fe(II)OT	9.12	0.262	9.36	0.36	9.79	8.82	Li	7.6	0.90	6.52	0.91	8.1	5.61
MnO	0.19	0.010	0.19	0.024	0.24	0.15	Lu	0.46	0.08	0.47	0.08	0.64	0.37
MgO	7.44	0.22	7.63	0.37	8.70	7.37	Nb	5.55	0.69	6.25	0.93	7.9	5.31
CaO	11.56	0.32	11.87	0.42	12.7	11.5	Nd	12.8	1.39	12.6	1.75	15.7	10.9
Na2O	2.89	0.098	3.05	0.132	3.38	2.78	Ni	69.8	5.90	83.2	8.47	94	68.9
K2O	0.23	0.012	0.25	0.011	0.27	0.24	Pb	2.78	0.38	2.59	0.39	3.3	1.97
P2O5	0.17	0.009	0.16	0.034	0.20	0.08	Pr	2.39	0.34	2.54	0.38	3.3	2.19
							Rb	4.25	0.55	4.48	0.29	4.8	3.97
							Sc	41	3.75	43.8	7.66	58.9	37.8
							Sm	3.9	0.51	3.83	0.41	4.5	3.27
							Sn	3	0.41	2.76	3.05	9.14	0.98
							Sr	160	11.9	172.	21.8	231	146
							Tb	0.84	0.14	0.85	0.12	1.1	0.7
							Th	0.77	0.13	0.47	0.07	0.6	0.39
							Tm	0.45	0.081	0.47	0.07	0.62	0.39
							U	0.22	0.044	0.20	0.02	0.22	0.18
							V	286	19.5	298	24.2	344	278
							Y	31.5	2.99	30.2	5.25	40	23.4
							Yb	3.1	0.42	3.12	0.49	4.17	2.52
							Zn	77.5	6.44	80.4	10.5	97.2	66.7
							Zr	112	8.81	107	18.7	142	84.9

Element	X _a mg/kg	H _a mg/kg	mean mg/kg	s.d.m. mg/kg	Max mg/kg	Min mg/kg
Ag	3.45	0.46	2.80	1.05	5	1.37
Ba	66.9	5.68	71.9	7.37	84	58.9
Ce	15.5	1.64	16.5	2.61	21.5	14
Co	40.9	3.74	43.7	5.56	54.1	37.4
Cr	302	20.4	307	17.2	333	287
Cs	0.12	0.03	0.1	0.01	0.12	0.093
Cu	57.1	4.97	66.9	6.72	74	54.3
Dy	5.23	0.65	5.53	0.82	6.9	4.42
Er	3.28	0.44	3.24	0.50	4.1	2.49
Eu	1.56	0.23	1.44	0.27	2	1.13
Ga	16.5	1.73	17.9	0.99	18.8	16.2
Gd	4.64	0.59	4.78	0.73	6.1	3.78

X_a = Target value obtained from USGS bulk analysis

H_a = Target precision calculated using modified version of Horowitz equation
for data quality 2 ($H_a = 0.01X_a^{0.8495}$)

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

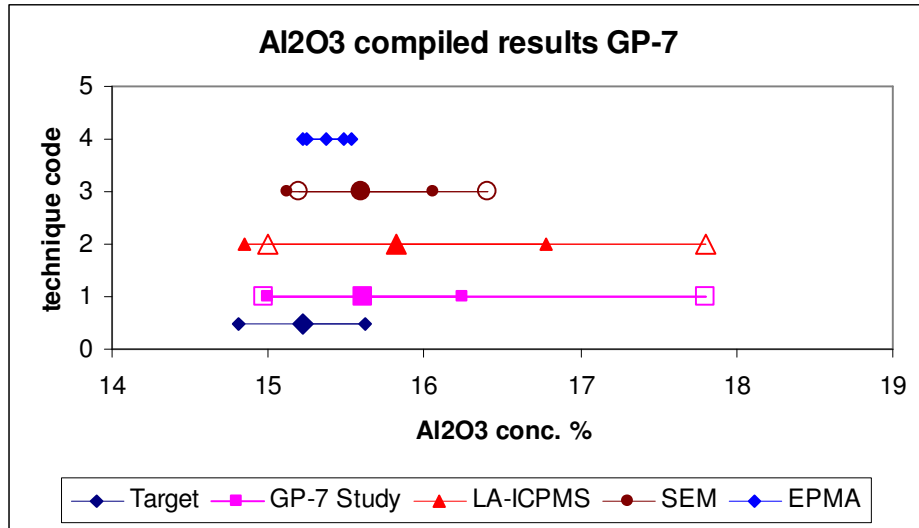


Figure 1. Al₂O₃ results for G-probe 7 study

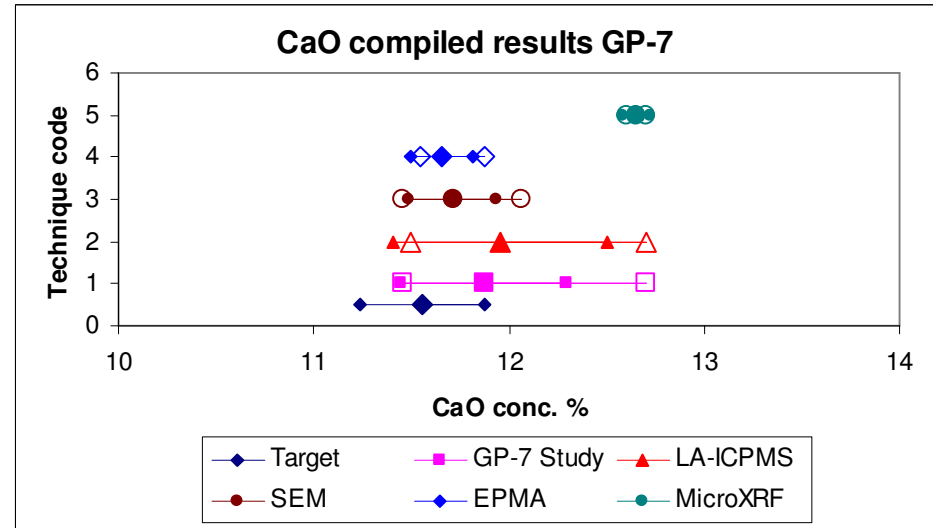


Figure 2. CaO results for G-probe 7 study

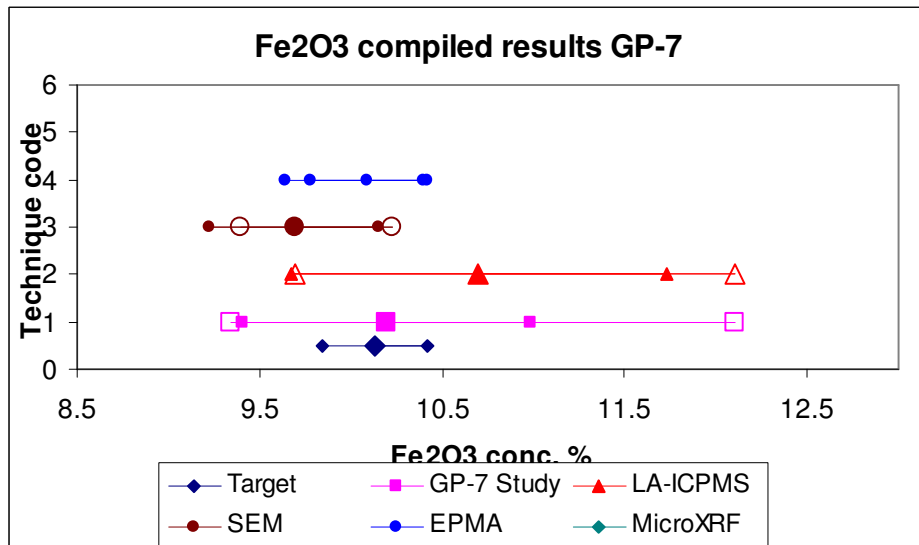


Figure 3. Fe₂O₃ results for G-probe 7 study

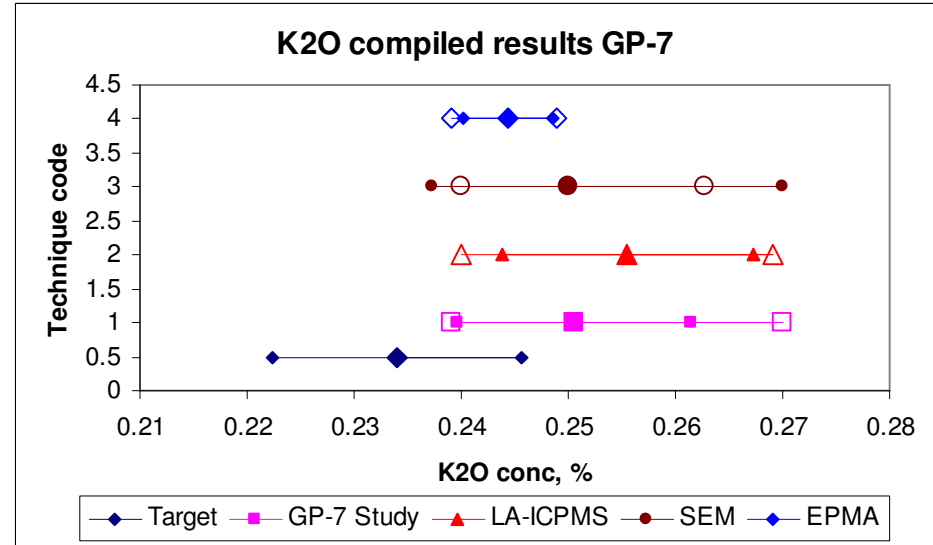


Figure 4. K₂O results for G-Probe 7 study

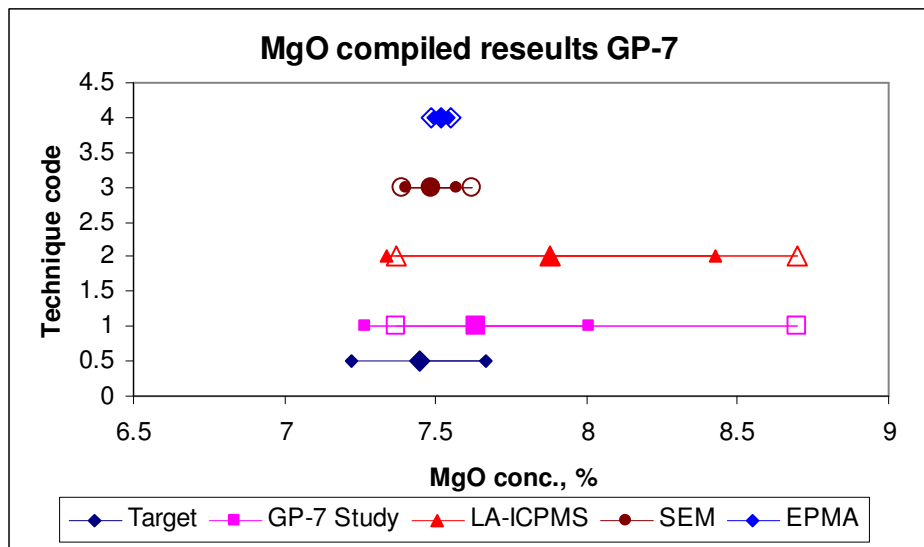


Figure 5. MgO results for G-probe 7 study

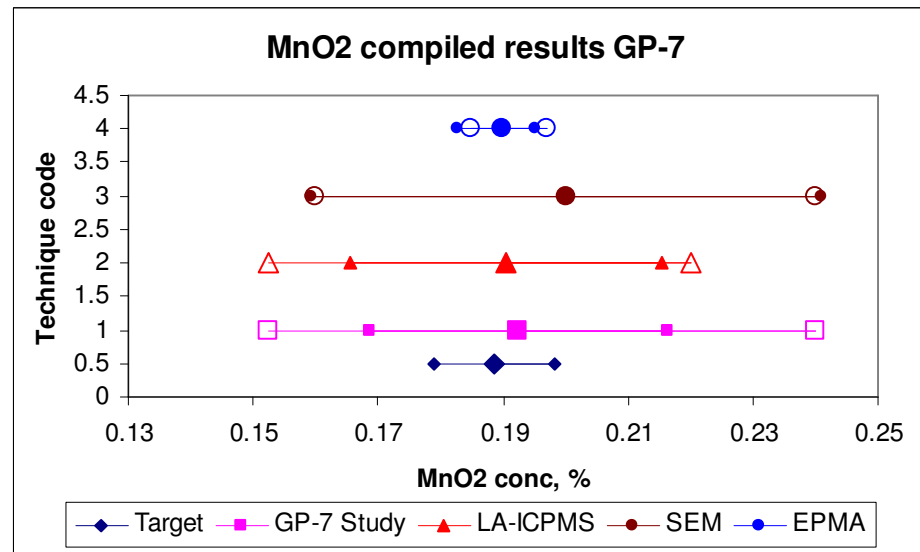


Figure 6. MnO₂ results for G-probe 7 study

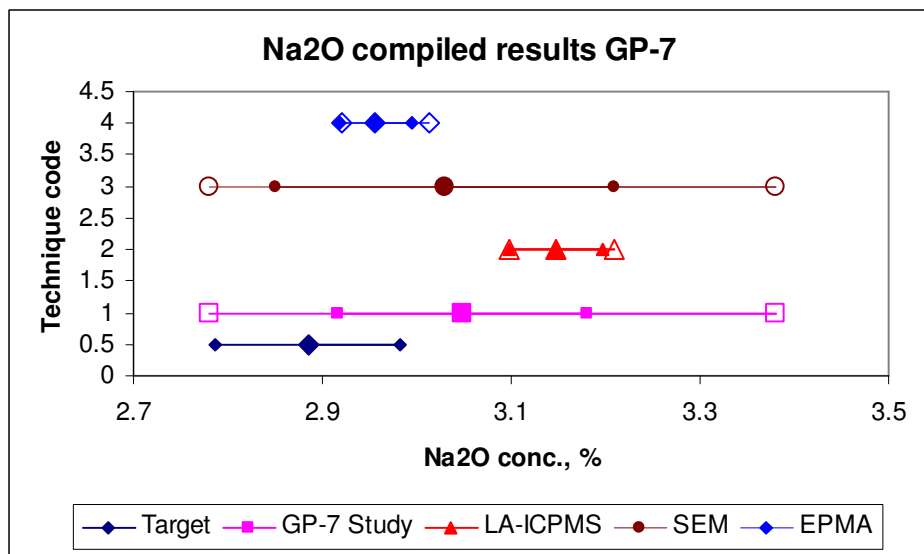


Figure 7 Na₂O results for G-probe 7 study

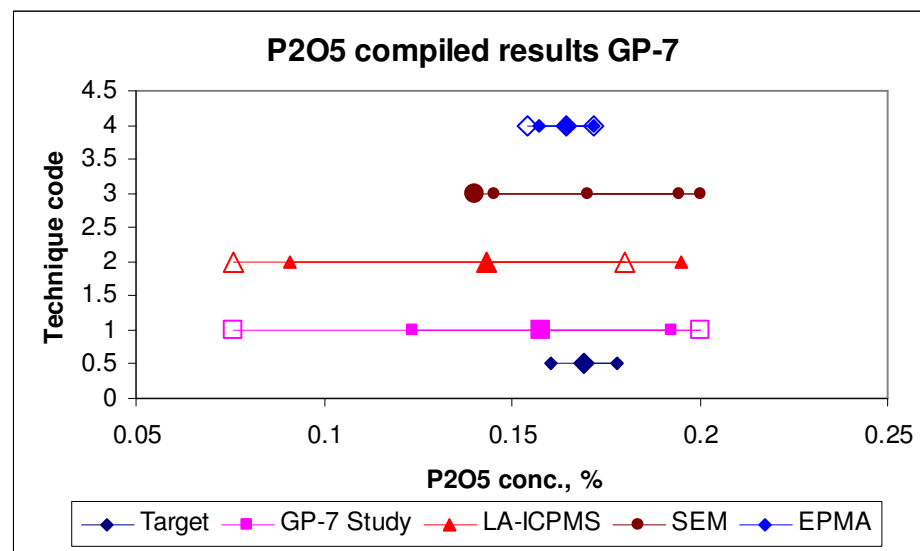


Figure 8. P₂O₅ results for G-probe 7 study

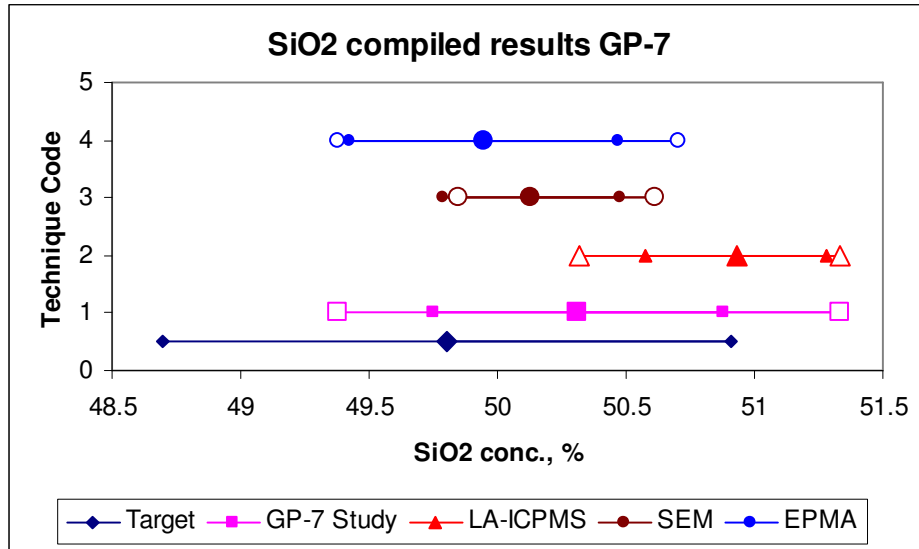


Figure 9. SiO₂ results for G-probe 7 study

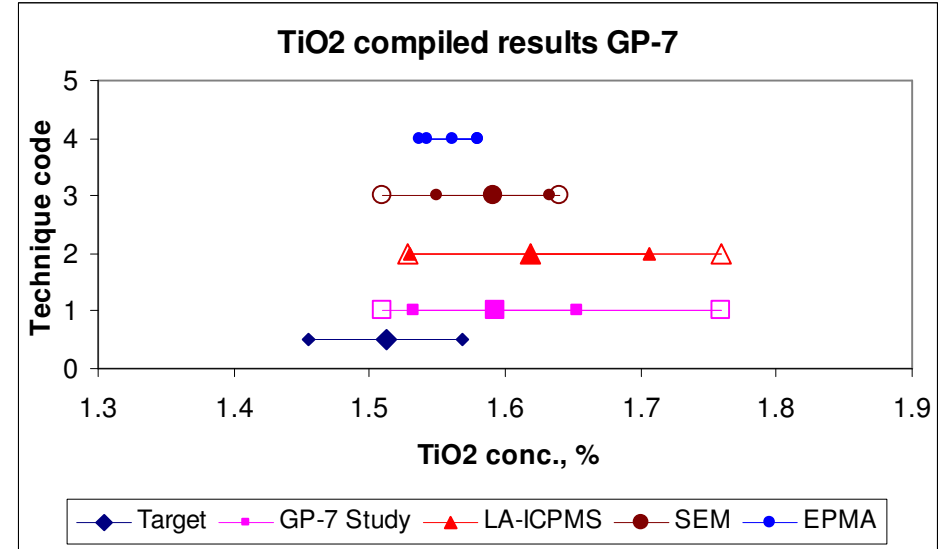


Figure 10. TiO₂ results for G-probe 7 study

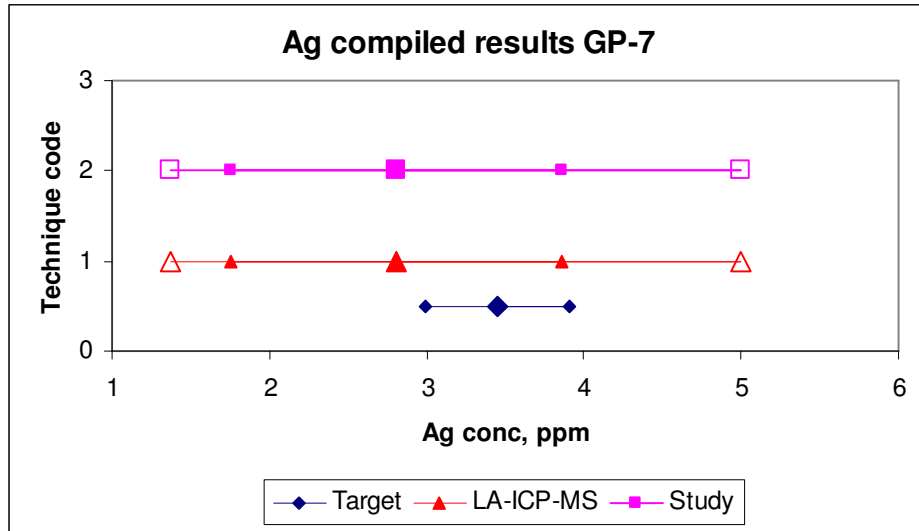


Figure 11. Ag results for G-probe 7 study

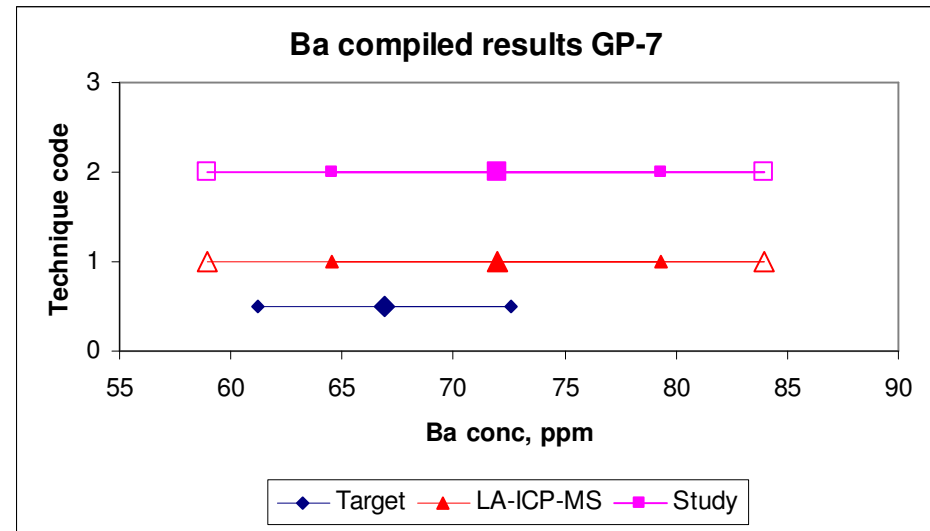


Figure 12. Ba results for G-probe 7

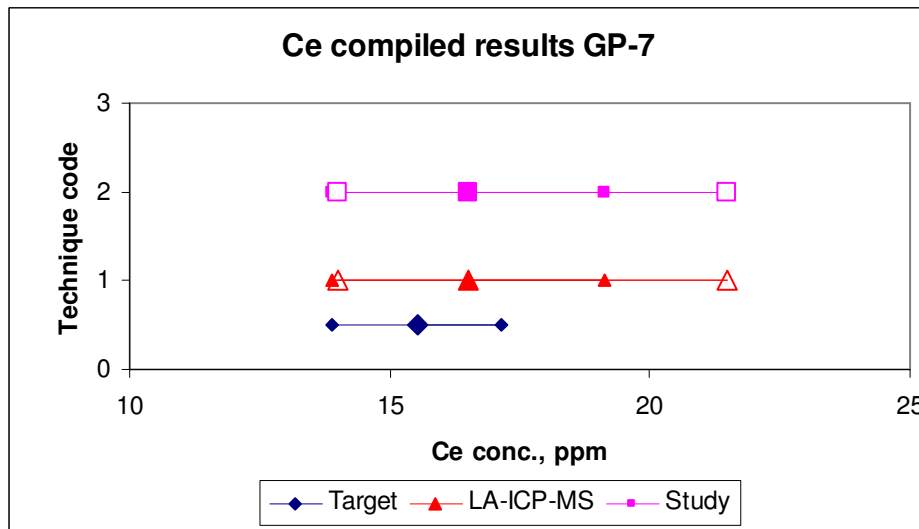


Figure 13. Ce results for G-probe 7

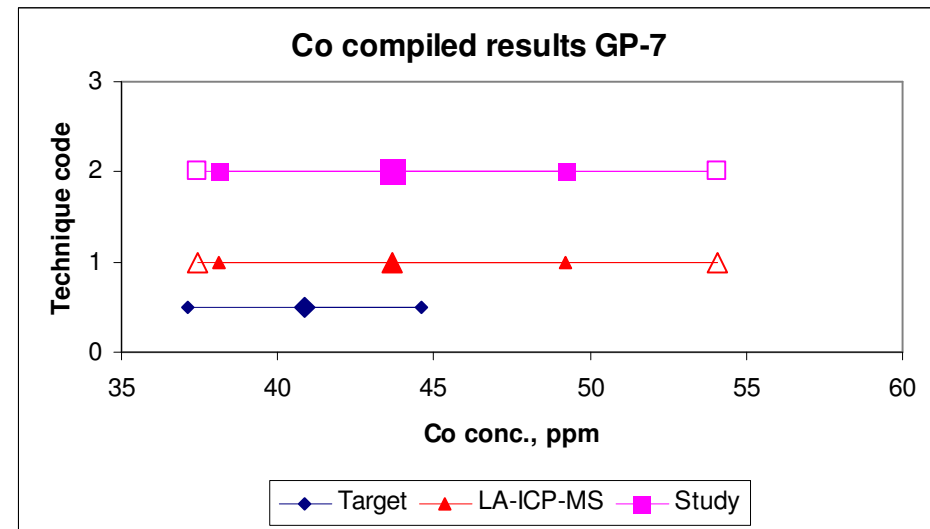


Figure 14. Co results G-probe 7 study

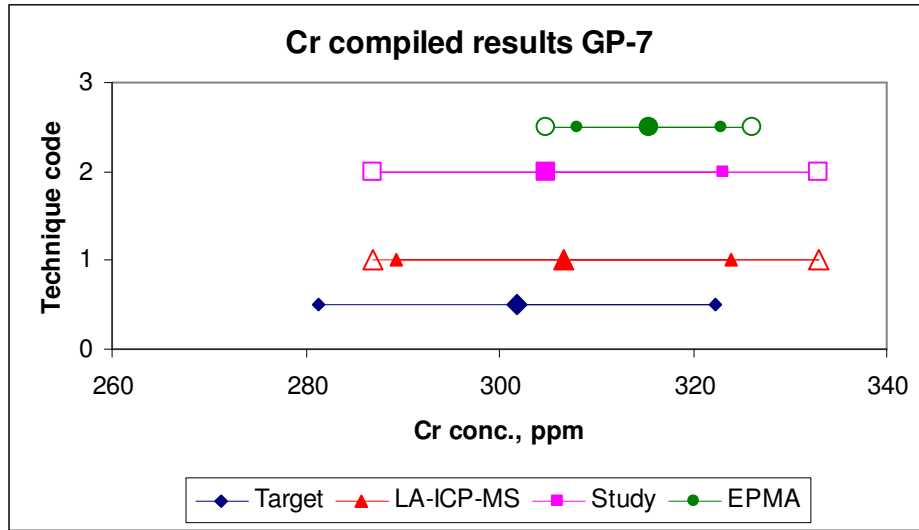


Figure 15. Cr results G-probe 7 study

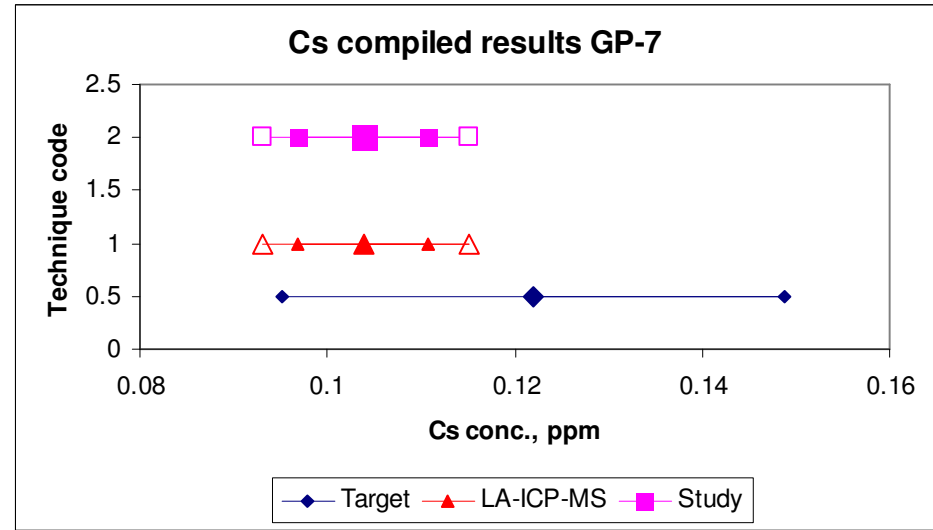


Figure 16. Cs results G-probe 7 study

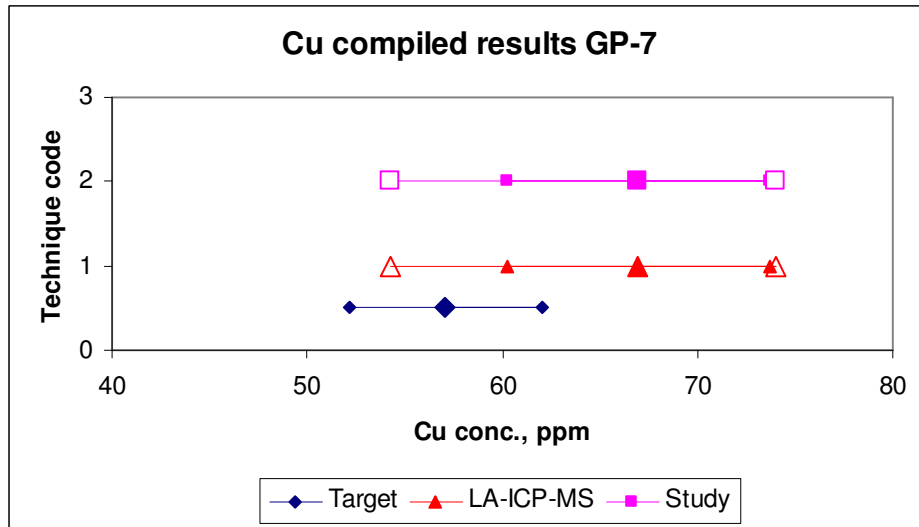


Figure 17. Cu results G-probe 7 study

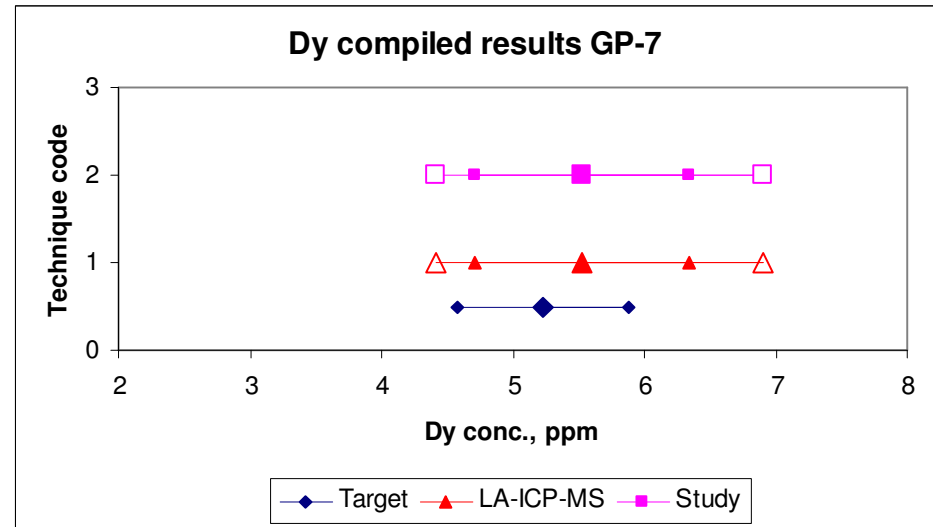


Figure 18. Dy results for G-probe 7 study

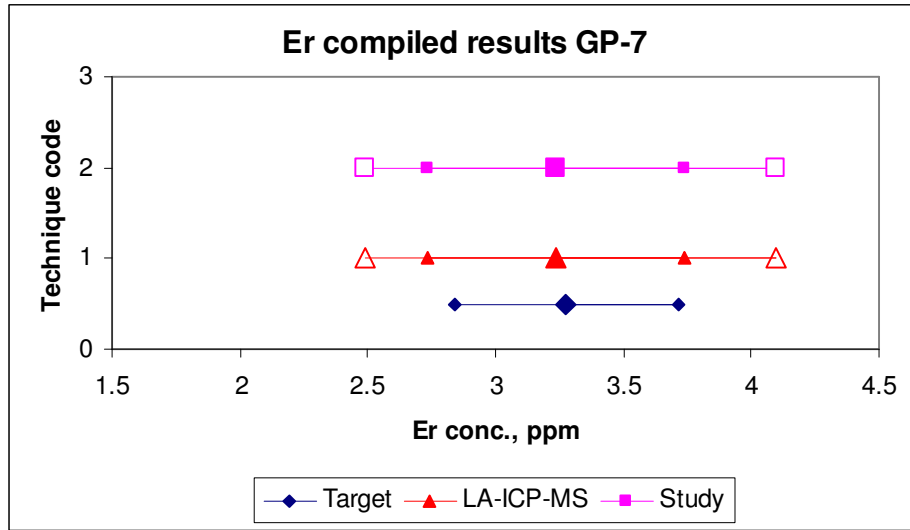


Figure 19. Er results for G-probe 7 study

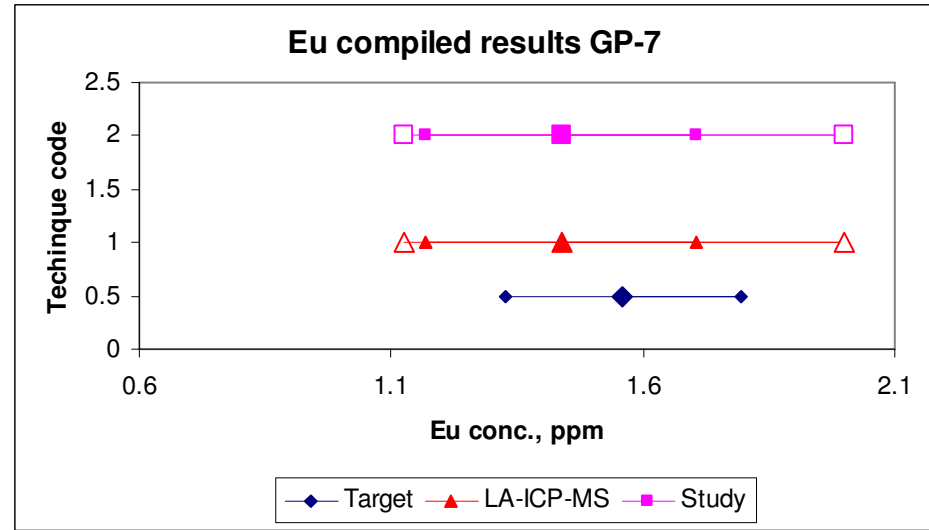


Figure 20. Eu results G-probe 7 study

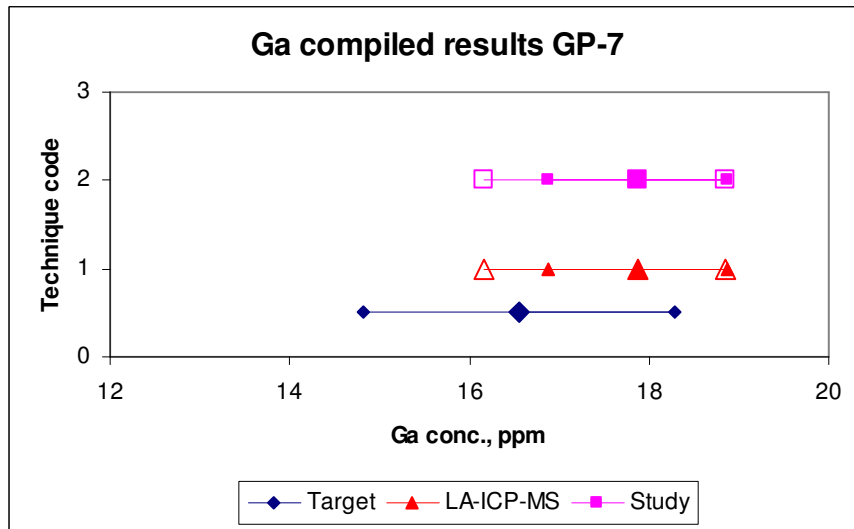


Figure 21. Ga results G-probe 7 study

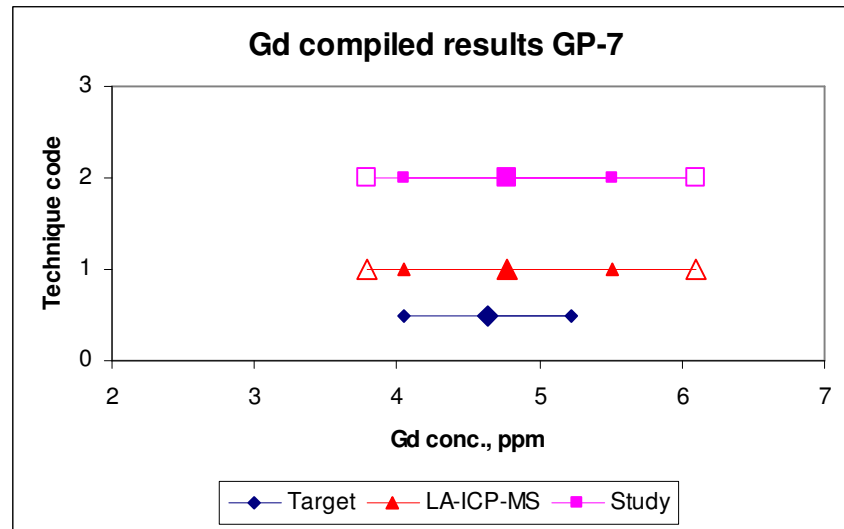


Figure 22. Gd results G-probe 7 study

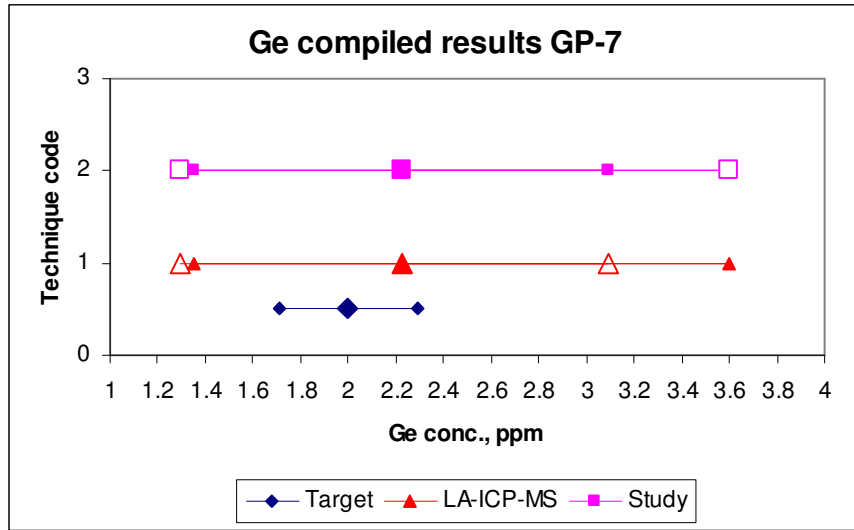


Figure 23. Ge results G-probe 7 study

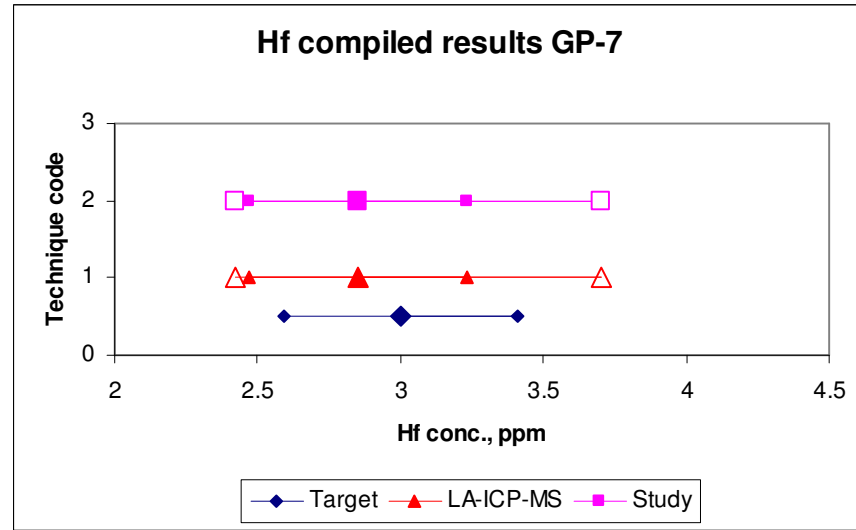


Figure 24. Hf results G-probe 7 study

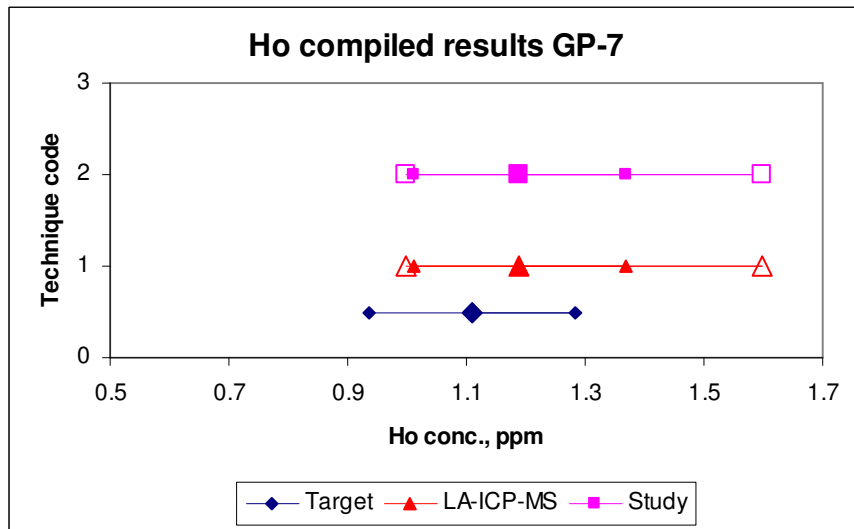


Figure 25. Ho results G-probe 7 study

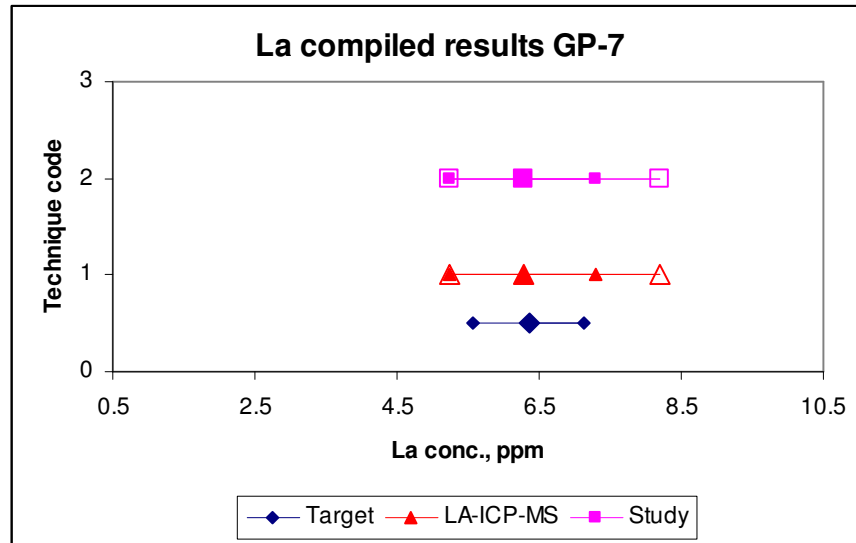


Figure 26. La results G-probe 7 study

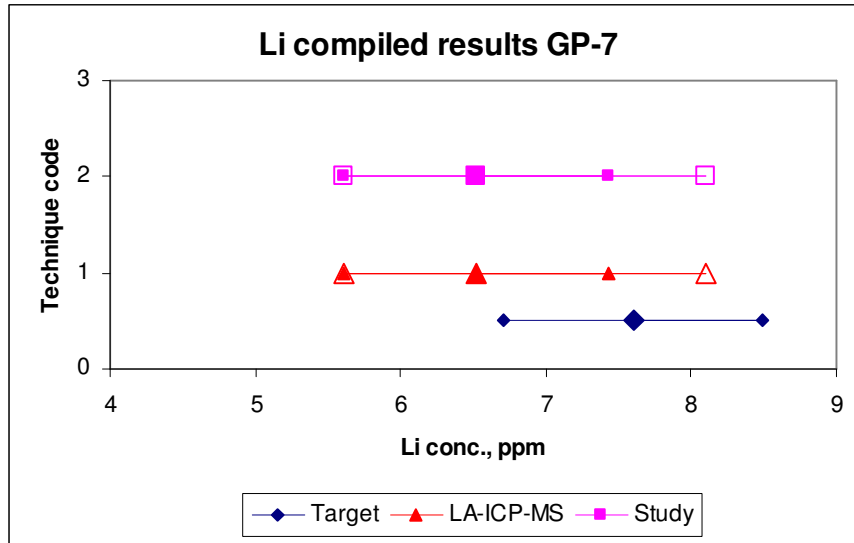


Figure 27. Li results G-probe 7 study

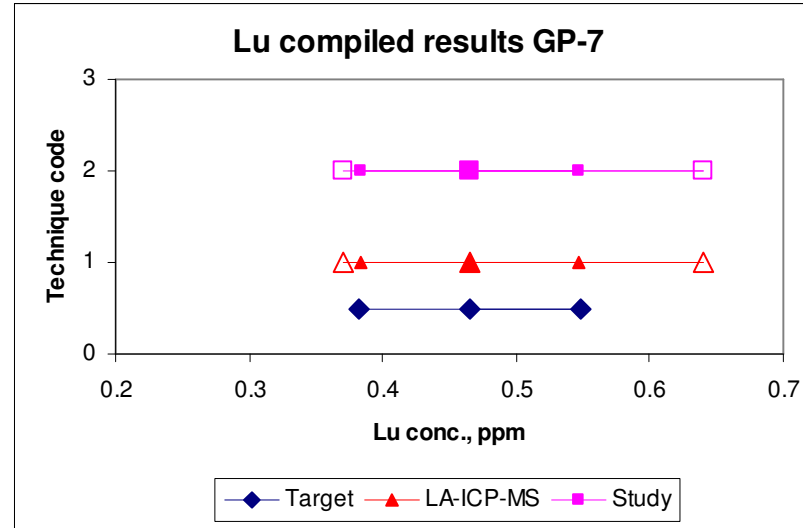


Figure 28. Lu results G-probe 7 study

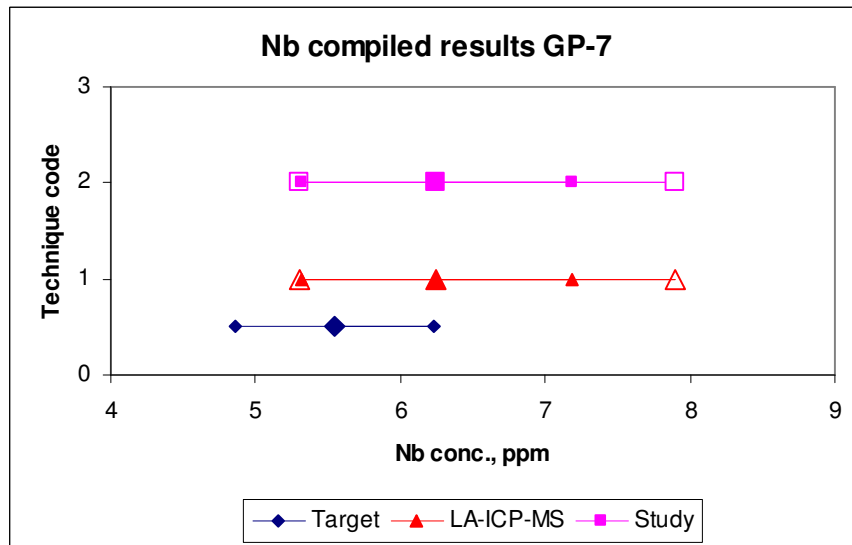


Figure 29. Nb results G-probe 7

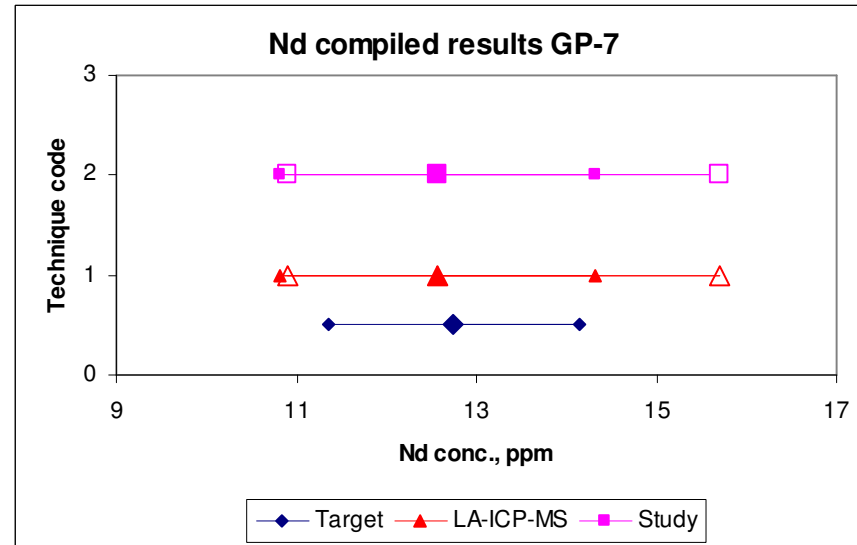


Figure 30. Nd results G-probe 7

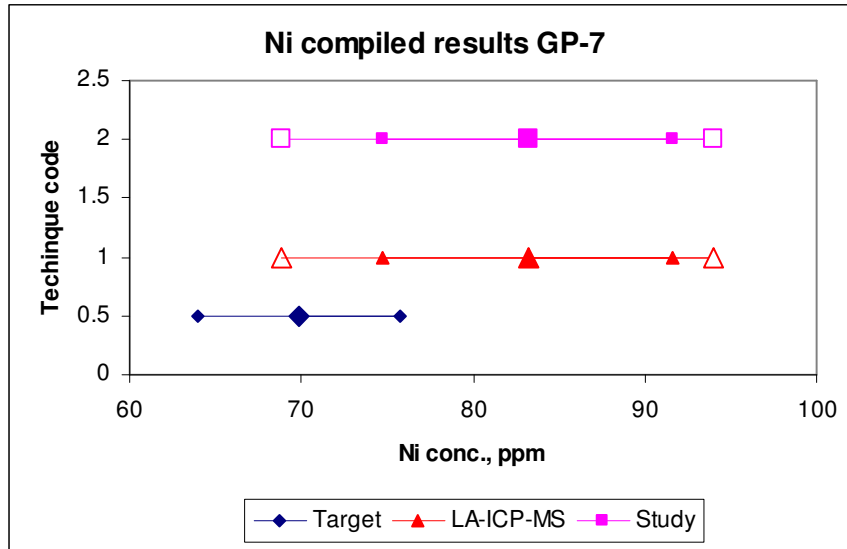


Figure 31. Ni results G-probe 7

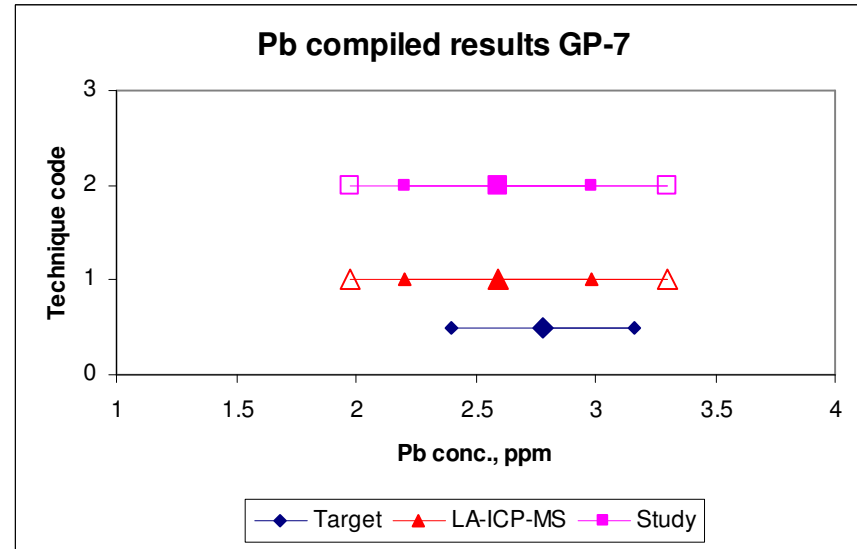


Figure 32. Pb results G-probe 7

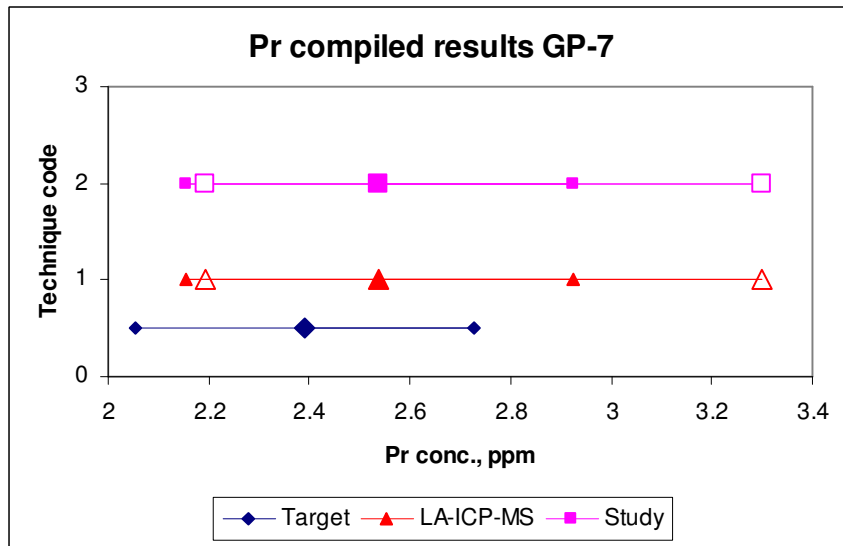


Figure 33. Pr results G-probe 7

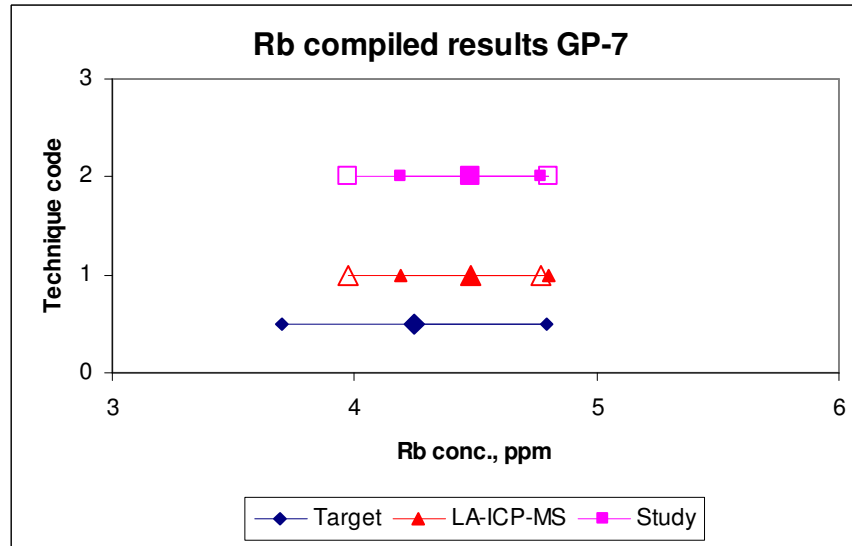


Figure 34. Rb results G-probe 7

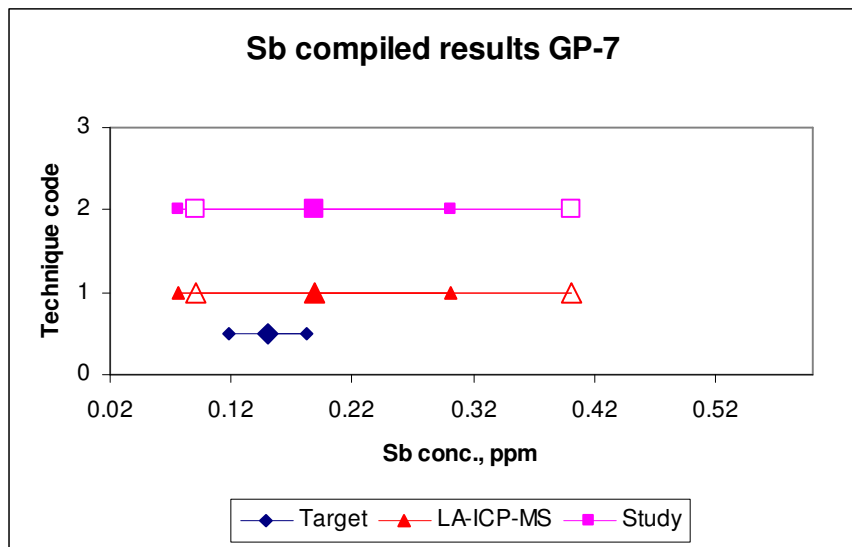


Figure 35. Sb results G-probe 7

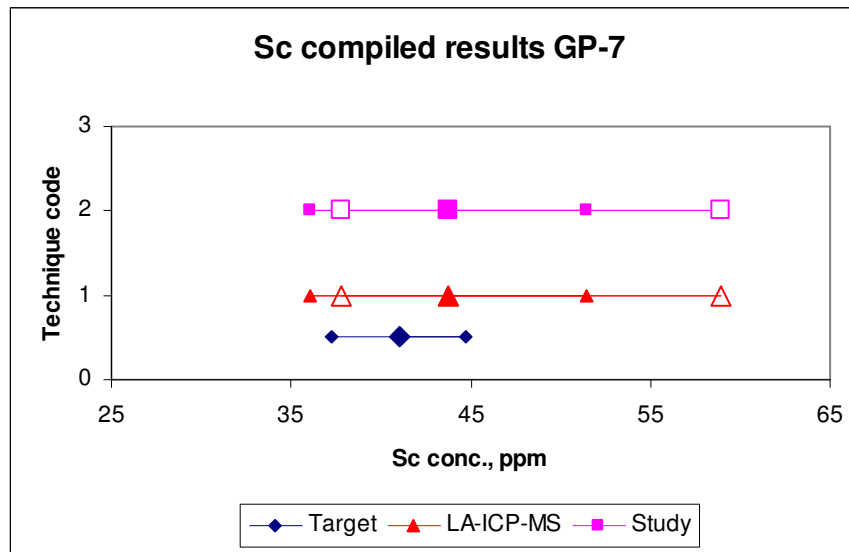


Figure 36. Sc results G-probe 7

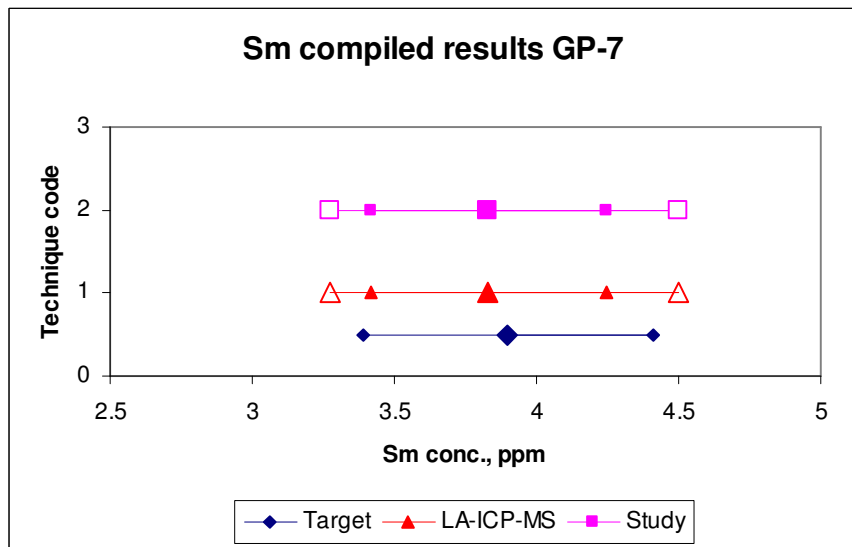


Figure 37. Sm results G-probe 7

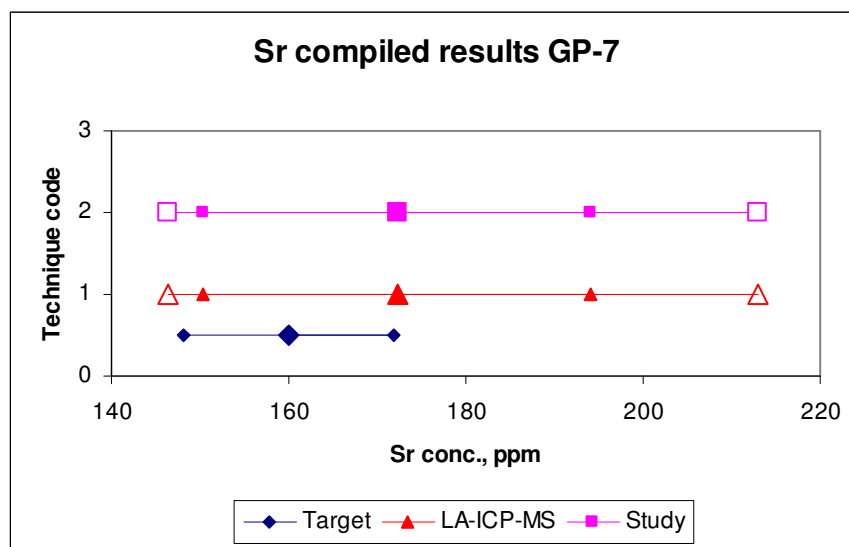


Figure 38. Sr results G-probe 7

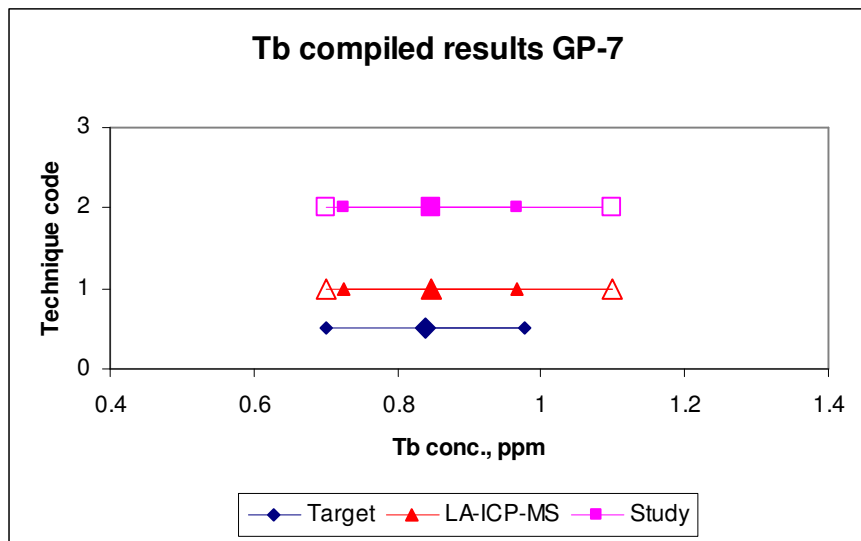


Figure 39. Tb results G-probe 7

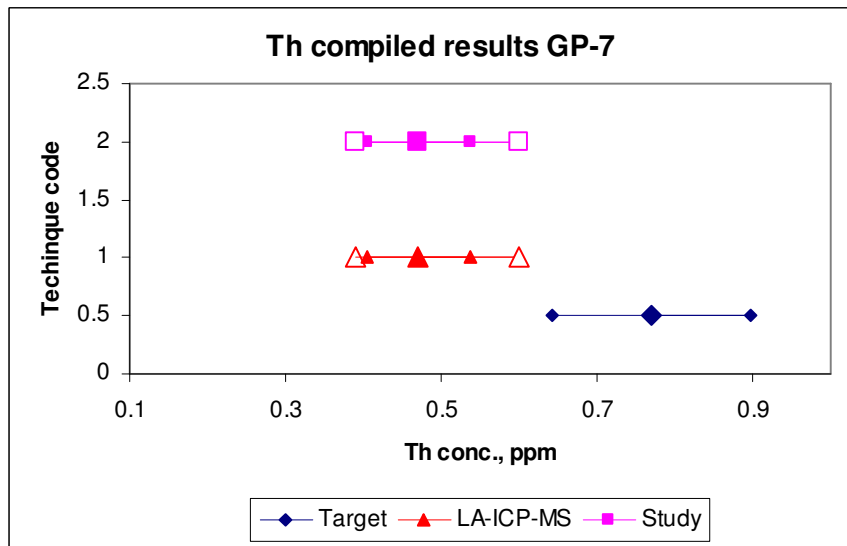


Figure 40. Th results G-probe 7

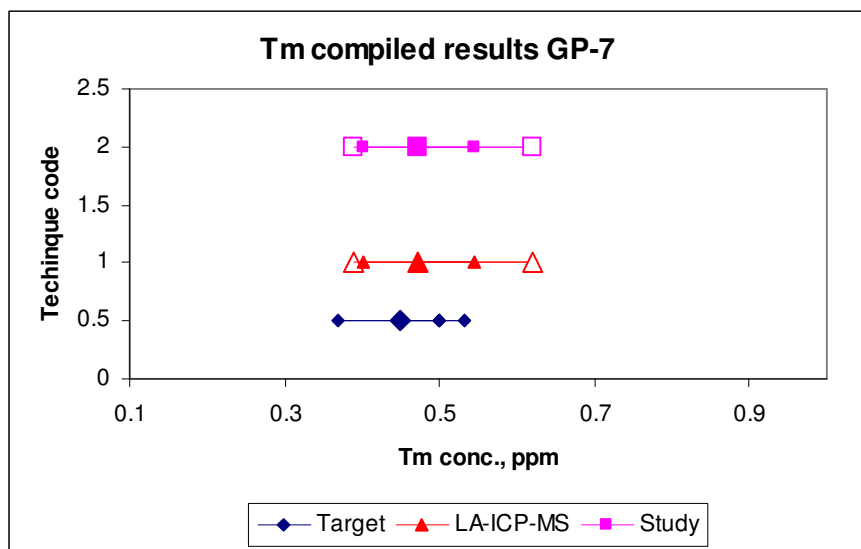


Figure 41. Tm results G-probe 7

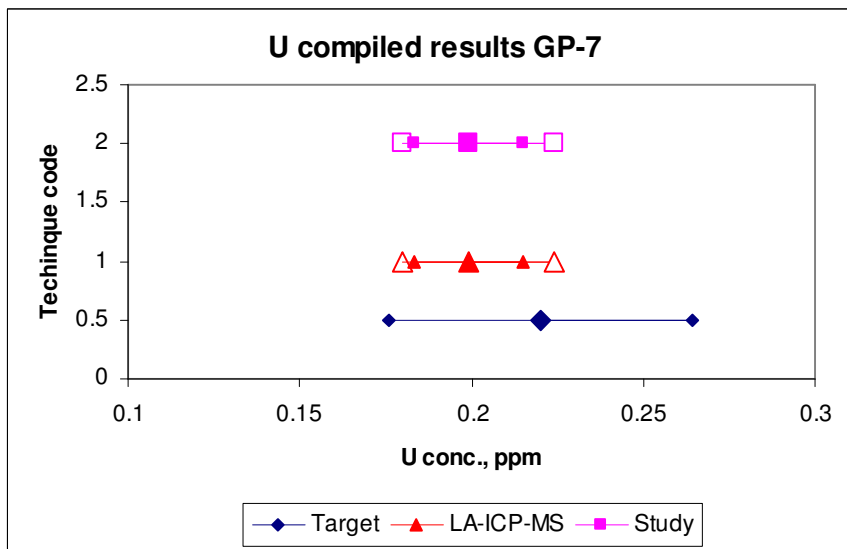


Figure 42. U results G-probe 7

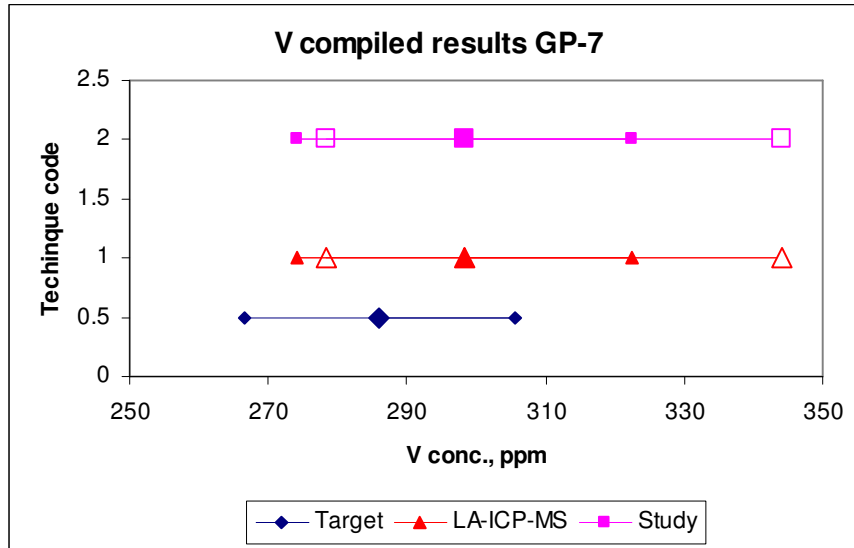


Figure 43. V results G-probe 7

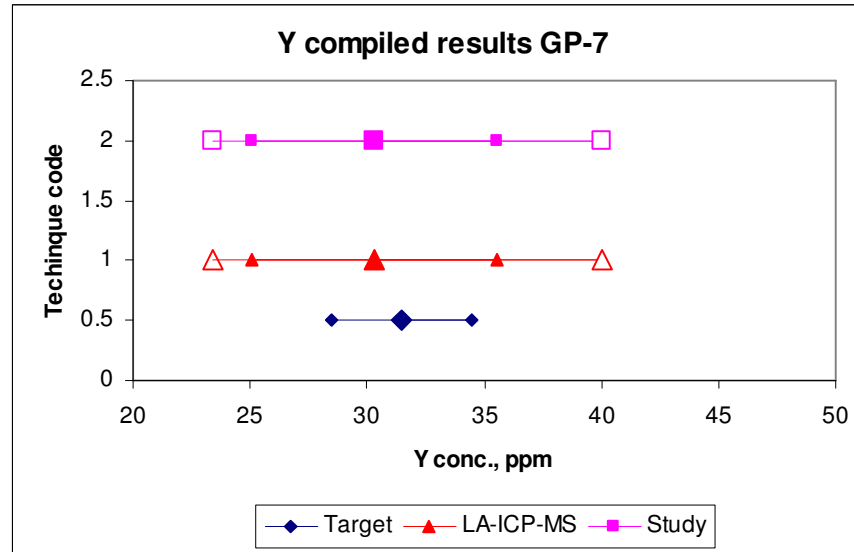


Figure 44. Y results G-probe 7

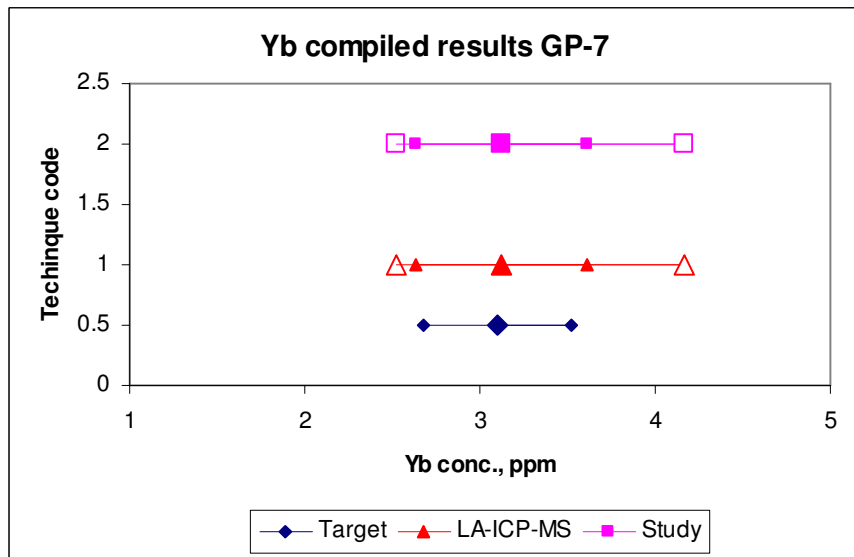


Figure 45. Yb results G-probe 7

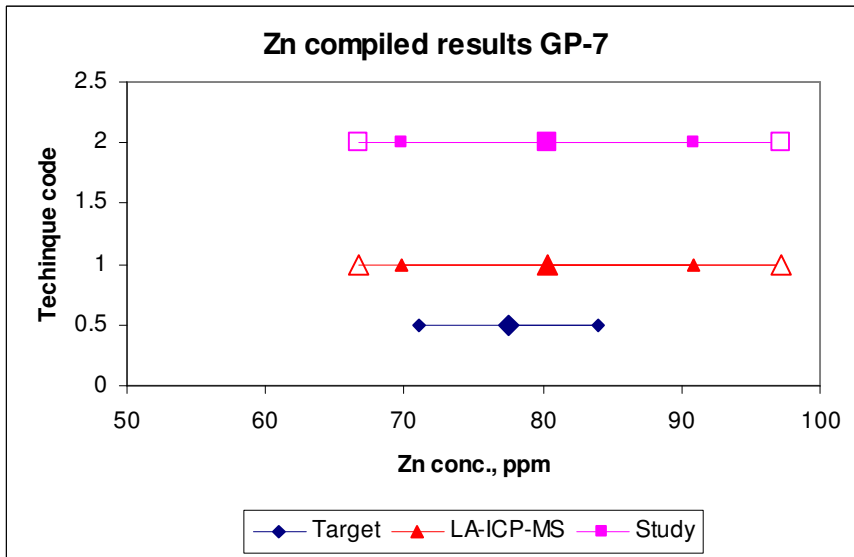


Figure 46. Zn results G-probe 7

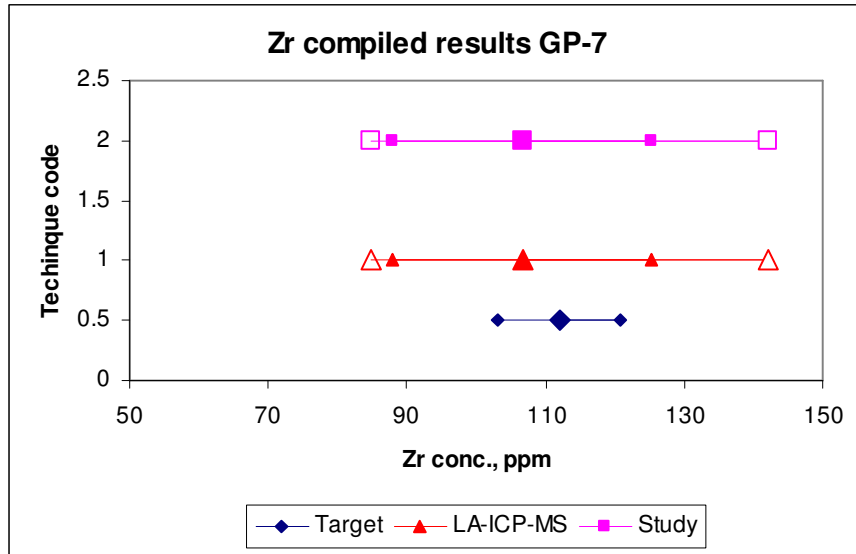


Figure 47. Zr results G-probe 7