

A Sample of Data Testing with ANL Suite of ZPR/ZPPR As-Built Models

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Introduction

- About 130 of the ANL ZPR/ZPPR critical assemblies have now been modeled in “As-Built” geometry for Continuous-Energy Monte Carlo analyses
- Two types of assemblies
 - Clean Physics Benchmarks
 - EMC (Engineering Mock-up Cores)
- Various physics measurements
 - K_{eff} , Control Rod and Control Rod Positions, Na Void Reactivities, β_{eff} , spectral indices, ...

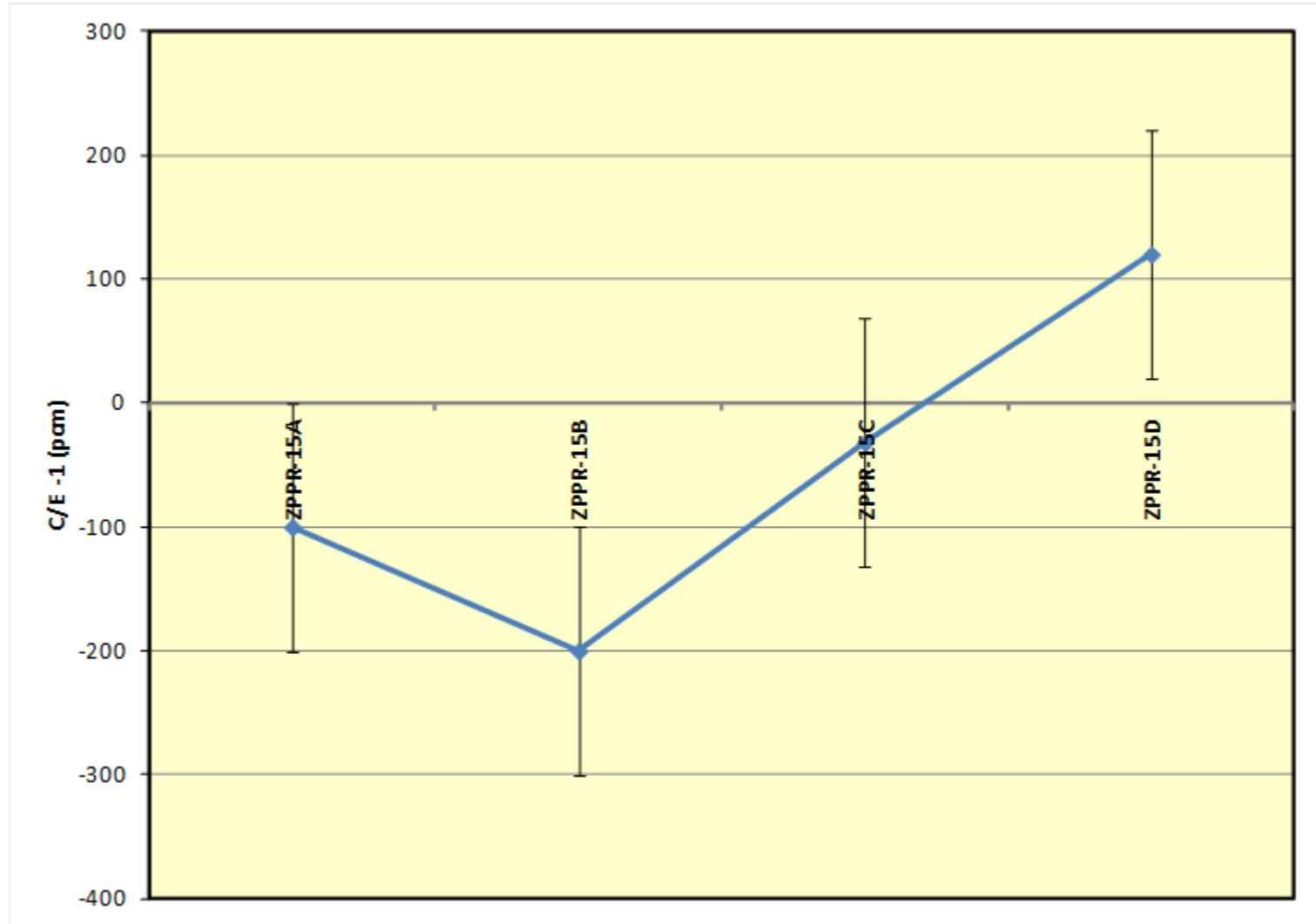


Performance of ENDF/B-VII.0 for Reference Critical and Subcritical Configurations of ZPPR-15C and -15D

Reference Configuration Loading	Measured Excess Reactivity $\pm 1\sigma$ (ϕ)	Measured Excess Reactivity $\pm 1\sigma$ (pcm)	Calculated Excess Reactivity $\pm 1\sigma$ (pcm)	$[C/E - 1] \pm 1\sigma$ (%)
15C L-166	9.2 \pm 0.1 ^(a)	52 \pm 1.0 ^(a) 100 ^(b)	20 \pm 3	-0.032 \pm 0.003 ^(a) 0.100 ^(b)
15C L-167	-35.84 \pm 0.1	-183 \pm 1.0 ^(a) 100 ^(b)	-215 \pm 3	-0.033 \pm 0.003 ^(a) 0.100 ^(b)
15D L-185	9.8 \pm 0.1	67 \pm 1.0 ^(a) 100 ^(b)	182 \pm 3	0.115 \pm 0.003 ^(a) 0.100 ^(b)
15D L-184	-7.1 \pm 0.1	-46 \pm 1.0 ^(a) 100 ^(b)	80 \pm 3	0.126 \pm 0.003 ^(a) 0.100 ^(b)



Trend in the C/E bias on k_{eff} for the four phases of ZPPR-15

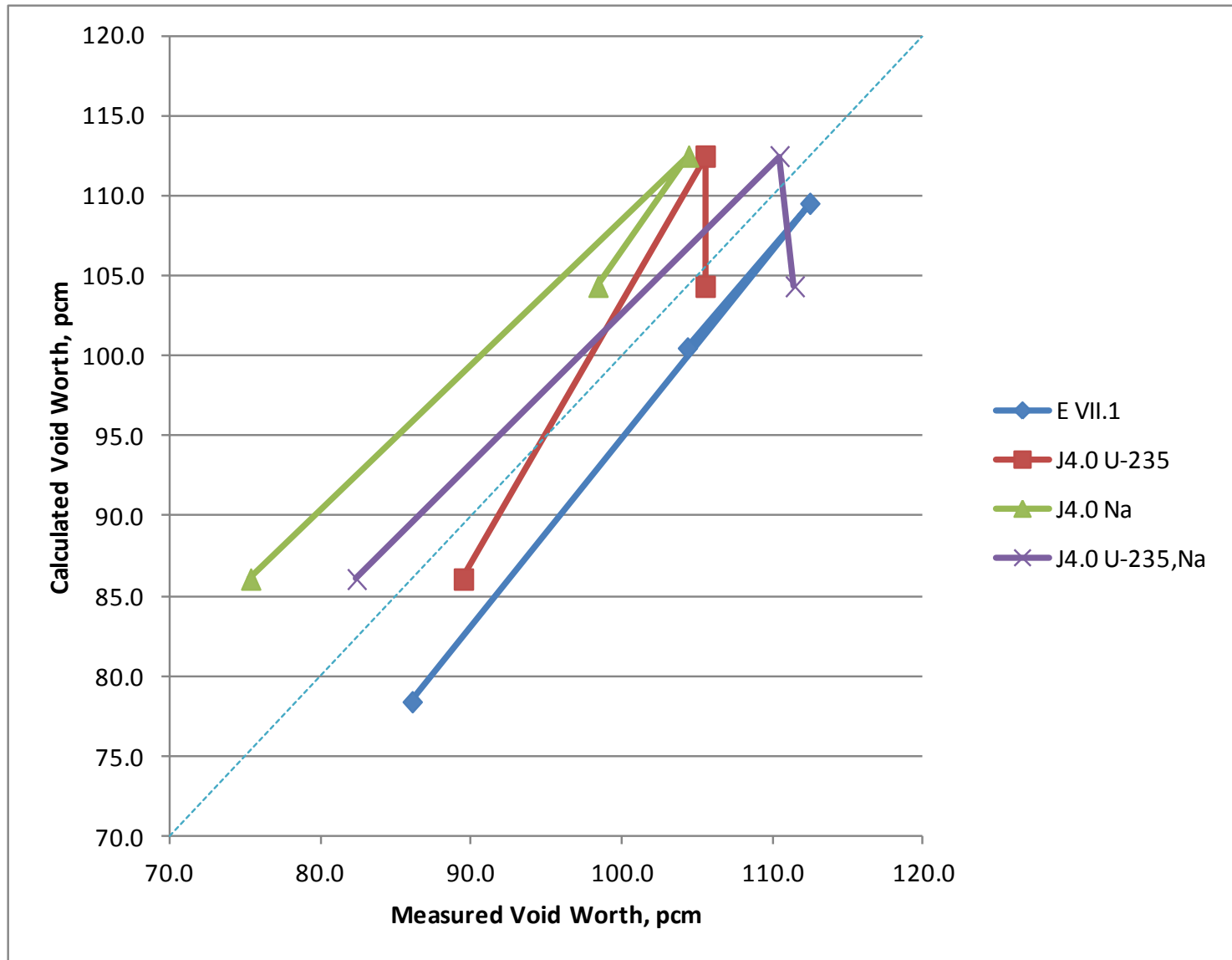


Sodium Void Worth - ENDF/B-VII.1 vs. JENDL-4.0 U-235, Na

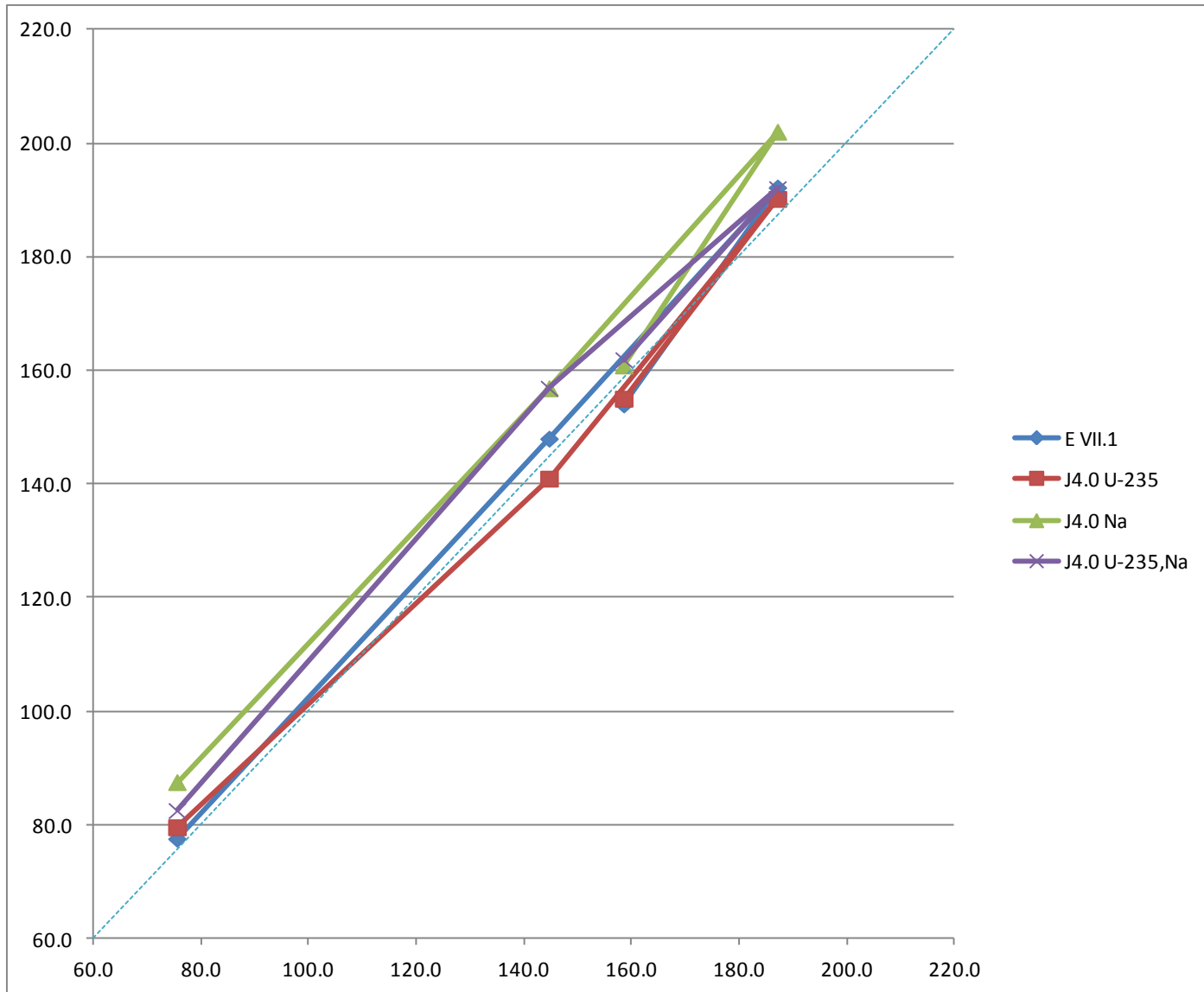
Assembly	Data	EALF, MeV	Exper. Worth, pcm		Calcul. Worth, pcm		C/E -1, %				
			$\Delta k/k_1 k_2$	σ	$\Delta k/k_1 k_2$	σ	C/E-1	σ			
ZPPR-9 L039	E VII.1	1.2518E-01	104.33	1.81	100.48	4.26	-3.69	4.41	8 in./20.32 cm Na void i		
ZPPR-9 L037	E VII.1	1.2652E-01	112.46	1.88	109.51	4.26	-2.62	4.12	20 in./50.80 cm Na void		
ZPPR-9 L038	E VII.1	1.2672E-01	86.05	1.46	78.39	4.26	-8.90	5.19	27 in./68.58 cm Na void		
ZPPR-9 L039	J4.0 Na	1.2245E-01	104.33	1.81	98.39	4.26	-5.69	4.40	8 in./20.32 cm Na void i		
ZPPR-9 L037	J4.0 Na	1.2381E-01	112.46	1.88	104.41	4.26	-7.16	4.09	20 in./50.80 cm Na void		
ZPPR-9 L038	J4.0 Na	1.2402E-01	86.05	1.46	75.32	4.26	-12.47	5.17	27 in./68.58 cm Na void		
ZPPR-9 L039	J4.0 U-235	1.2512E-01	104.33	1.81	105.51	4.26	1.13	4.44	8 in./20.32 cm Na void i		
ZPPR-9 L037	J4.0 U-235	1.2647E-01	112.46	1.88	105.51	4.26	-6.18	4.10	20 in./50.80 cm Na void		
ZPPR-9 L038	J4.0 U-235	1.2666E-01	86.05	1.46	89.45	4.26	3.95	5.26	27 in./68.58 cm Na void		
ZPPR-9 L039	J4.0 U-235,Na	1.2237E-01	104.33	1.81	111.46	4.26	6.83	4.48	8 in./20.32 cm Na void i		
ZPPR-9 L037	J4.0 U-235,Na	1.2380E-01	112.46	1.88	110.45	4.26	-1.79	4.13	20 in./50.80 cm Na void		
ZPPR-9 L038	J4.0 U-235,Na	1.2399E-01	86.05	1.46	82.36	4.26	-4.29	5.21	27 in./68.58 cm Na void		
ZPPR-10A L033	E VII.1	1.1485E-01	75.53	0.88	77.57	4.27	2.70	5.78	8 in./20.32 cm Na void i		
ZPPR-10A L034	E VII.1	1.1576E-01	144.68	1.56	147.99	4.27	2.29	3.15	8 in./20.32 cm Na void i		
ZPPR-10A L037	E VII.1	1.1735E-01	187.12	2.07	192.20	4.27	2.71	2.55	16 in./40.64 cm Na void		



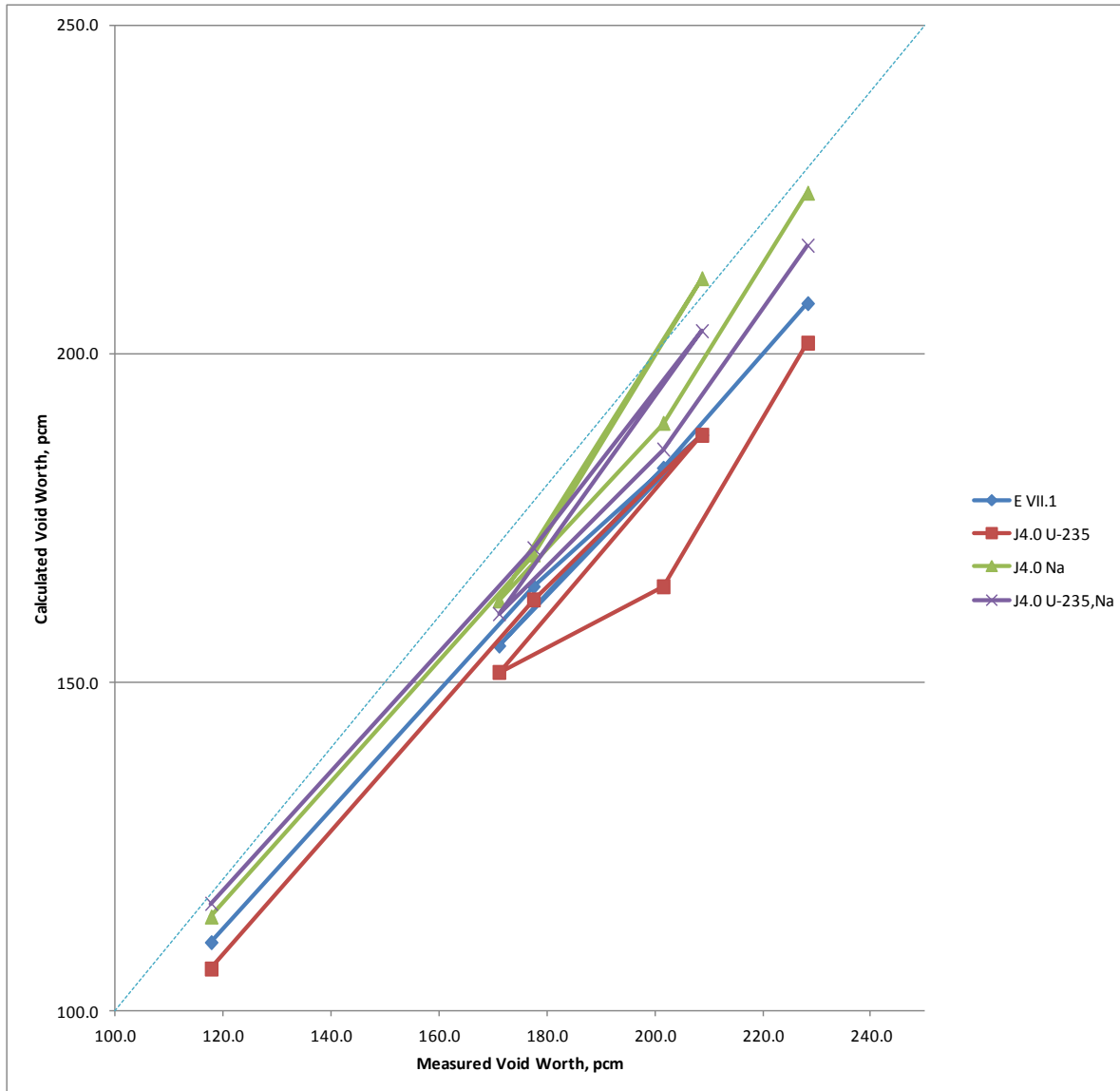
ZPPR-9 Sodium Void Worth



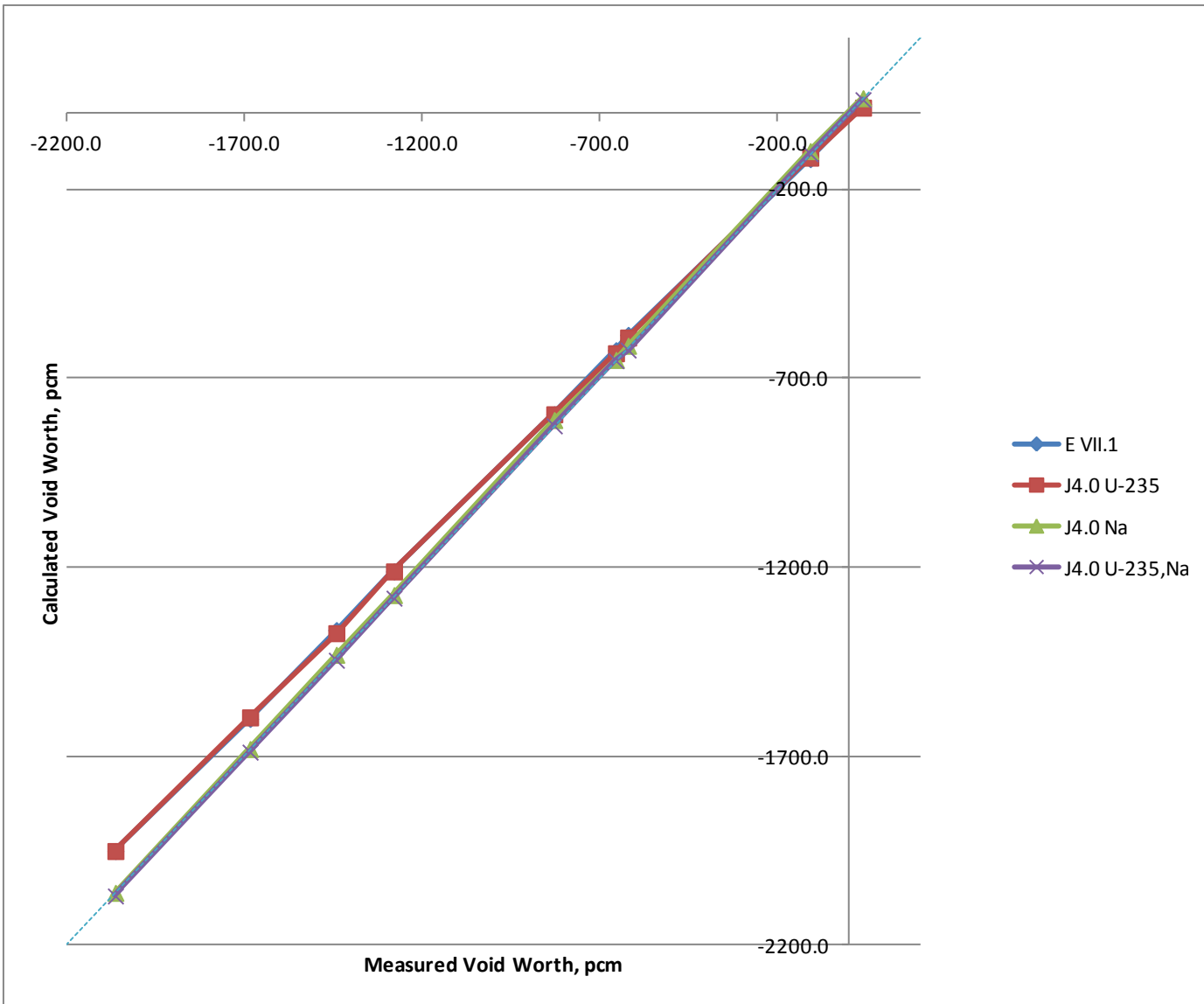
ZPPR-10A Sodium Void Worth



ZPPR-13A Sodium Void Worth



ZPPR-12 Sodium Void Worth



Summary

- Although very limited results have been presented herein, this activity is a “work-in-progress”
- Availability of these high fidelity models can provide sensitive tests of evaluated data libraries.

