



NNL ENDF/B-VIII.1(β 2) Validation Testing – ICSBEP Suite

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a wholly owned subsidiary of Fluor Corporation.

NNL Validation

- NNL ICSBEP benchmark suite: 108 benchmarks, 579 cases

- Validation comparisons:

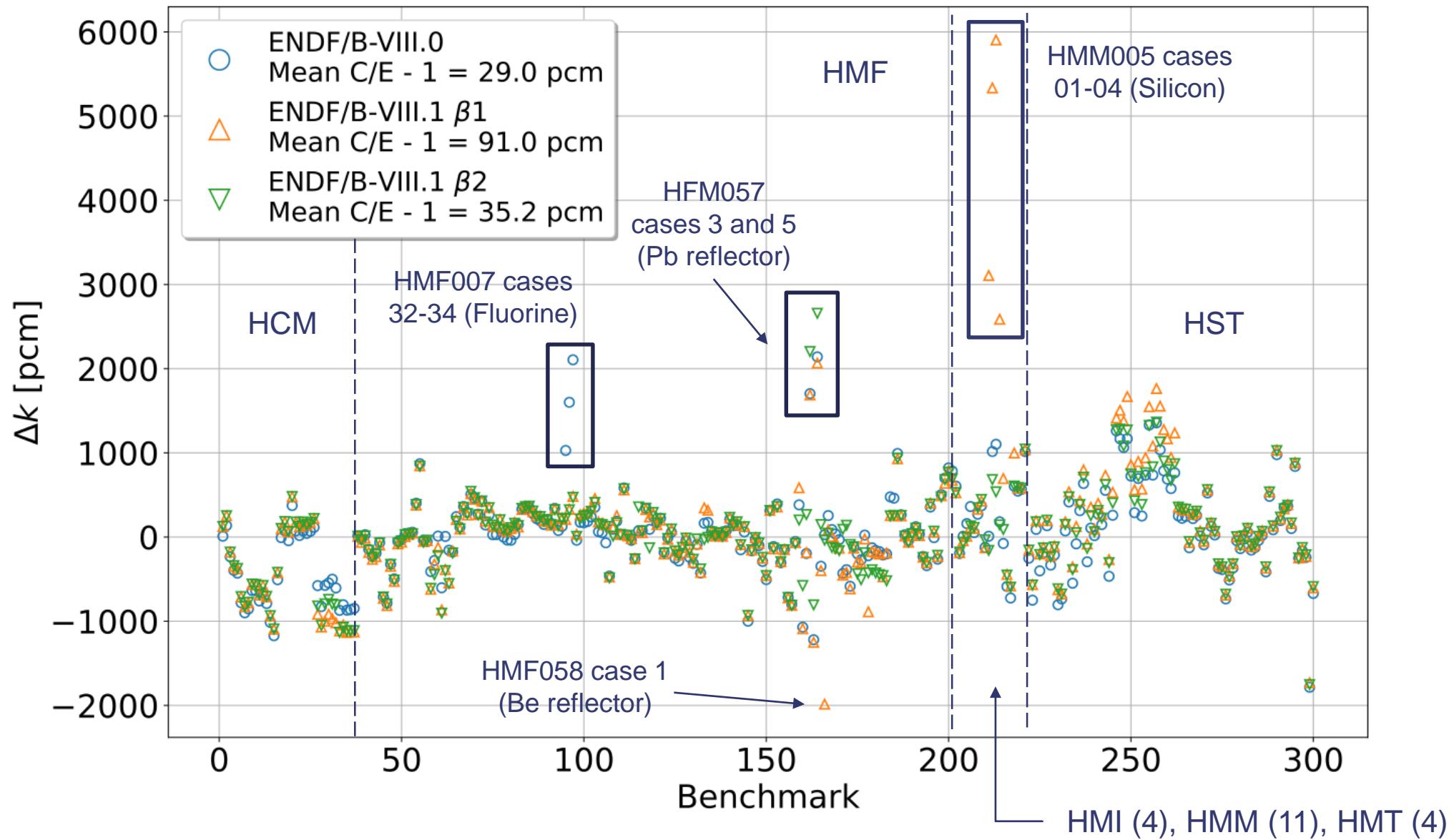
1. Reactivity change (Δk) relative to benchmark k_{eff}
2. Figure of merit indicating change in $\frac{C}{E} - 1$
 - Positive FOM: 8.1 βX closer to benchmark k_{eff}
 - Negative FOM: 8.1 βX further from benchmark k_{eff}
3. Correlation of $\frac{C}{E} - 1$ with ATLF, ATFF

$$\Delta k = k_{calc} - k_{bm}$$

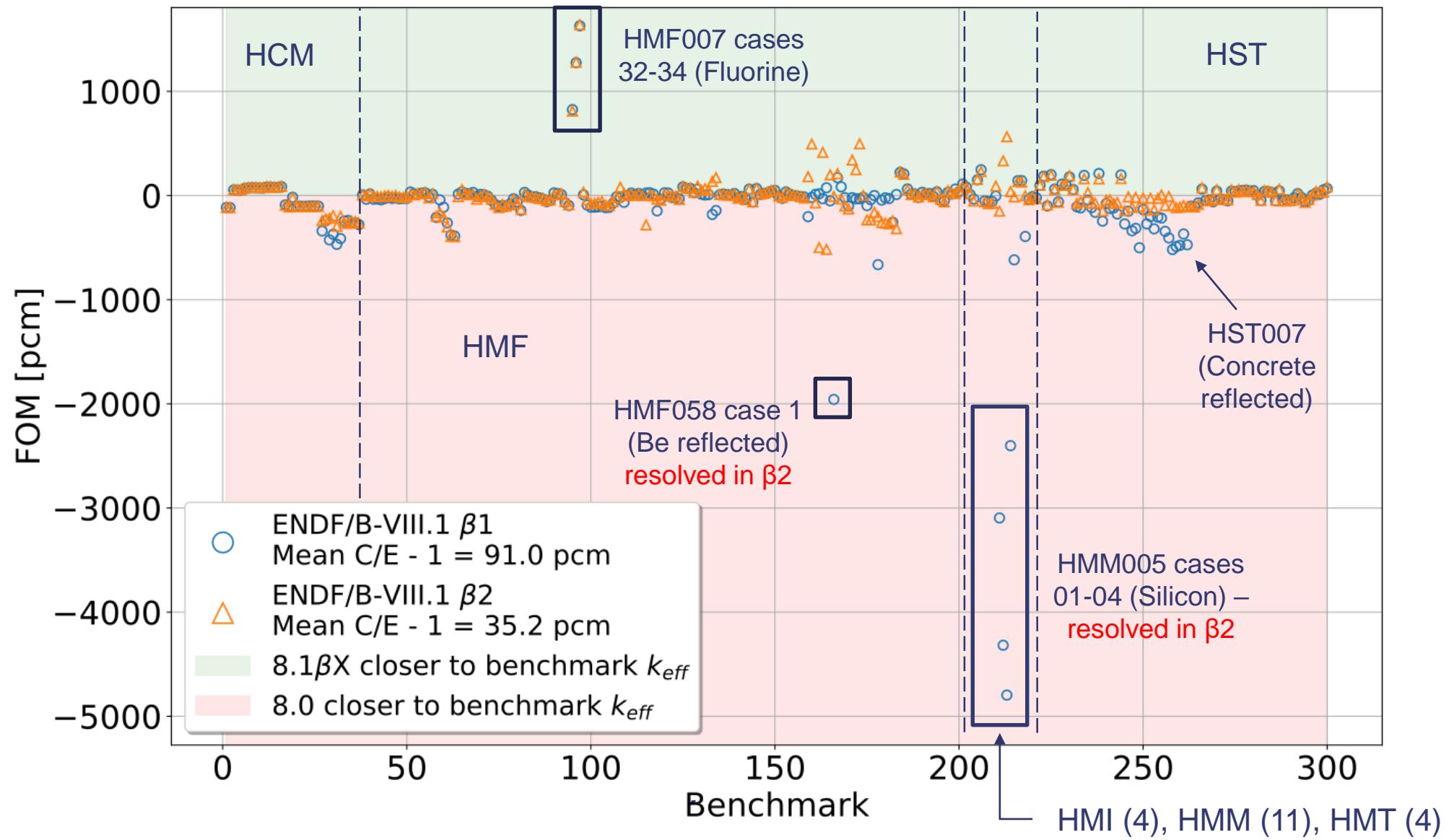
$$FOM = \left| \frac{C}{E} - 1 \right|_{8.0} - \left| \frac{C}{E} - 1 \right|_{8.1\beta X}$$



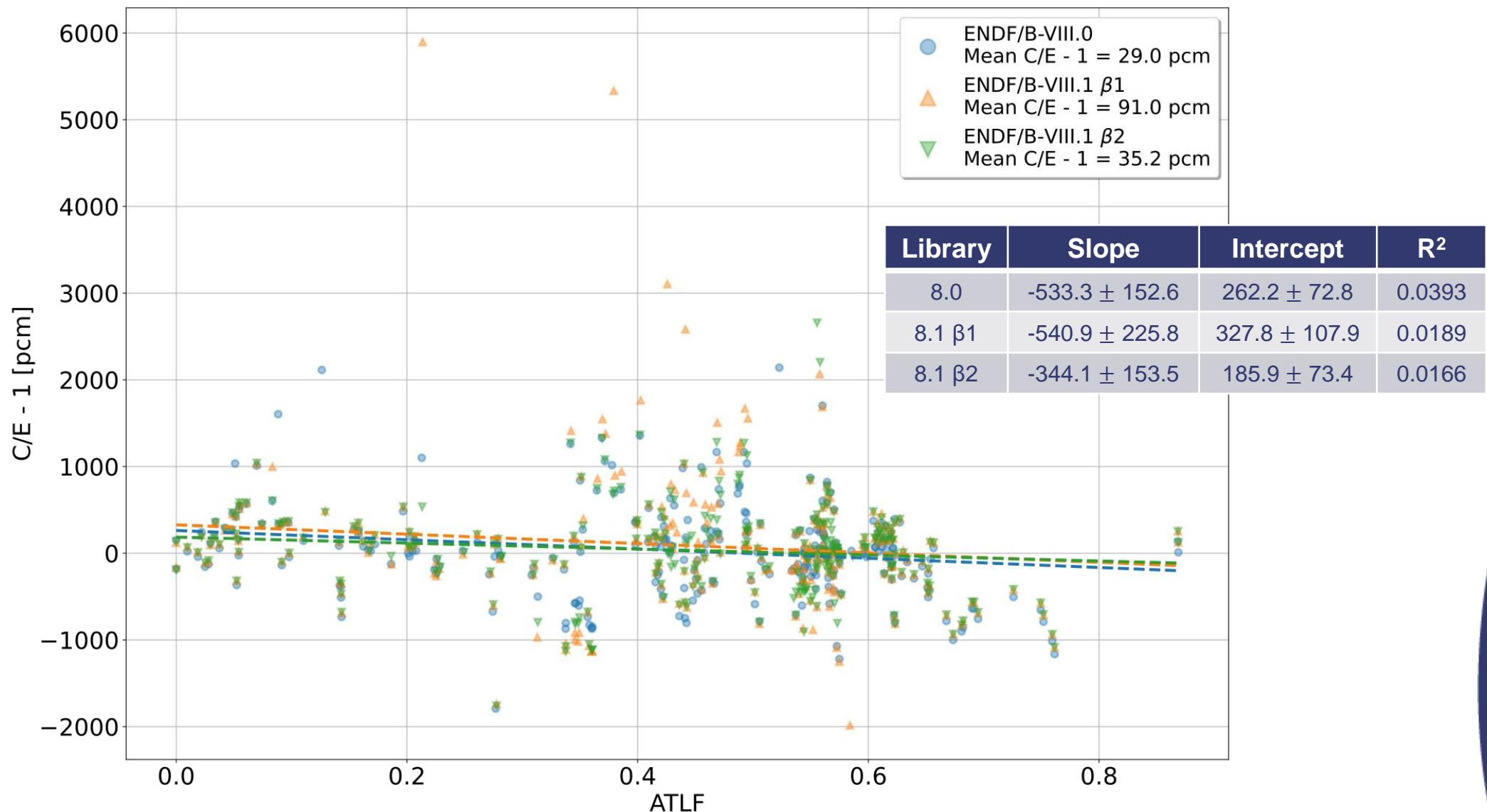
HEU Benchmarks Δk



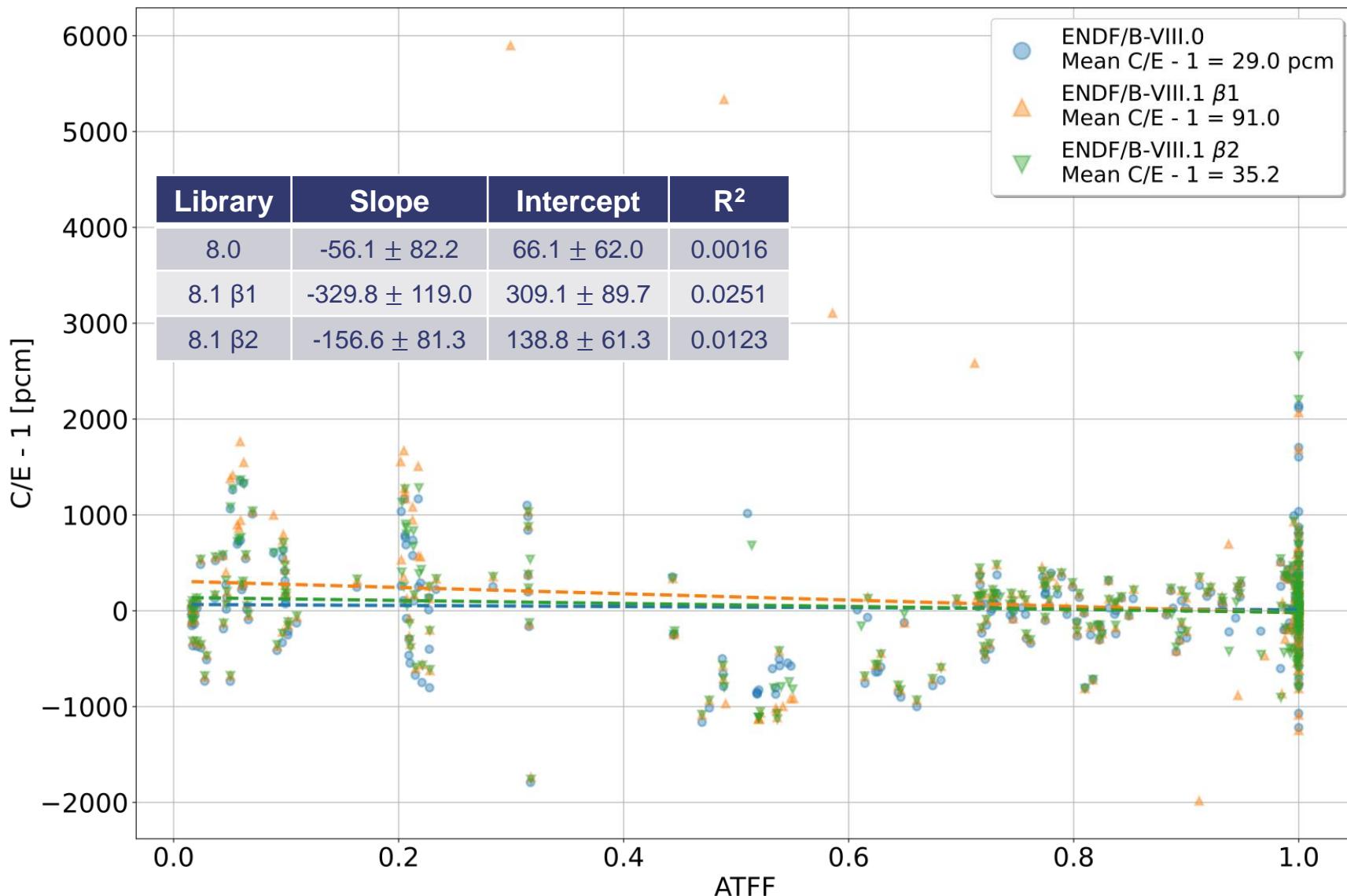
HEU Benchmarks FOM



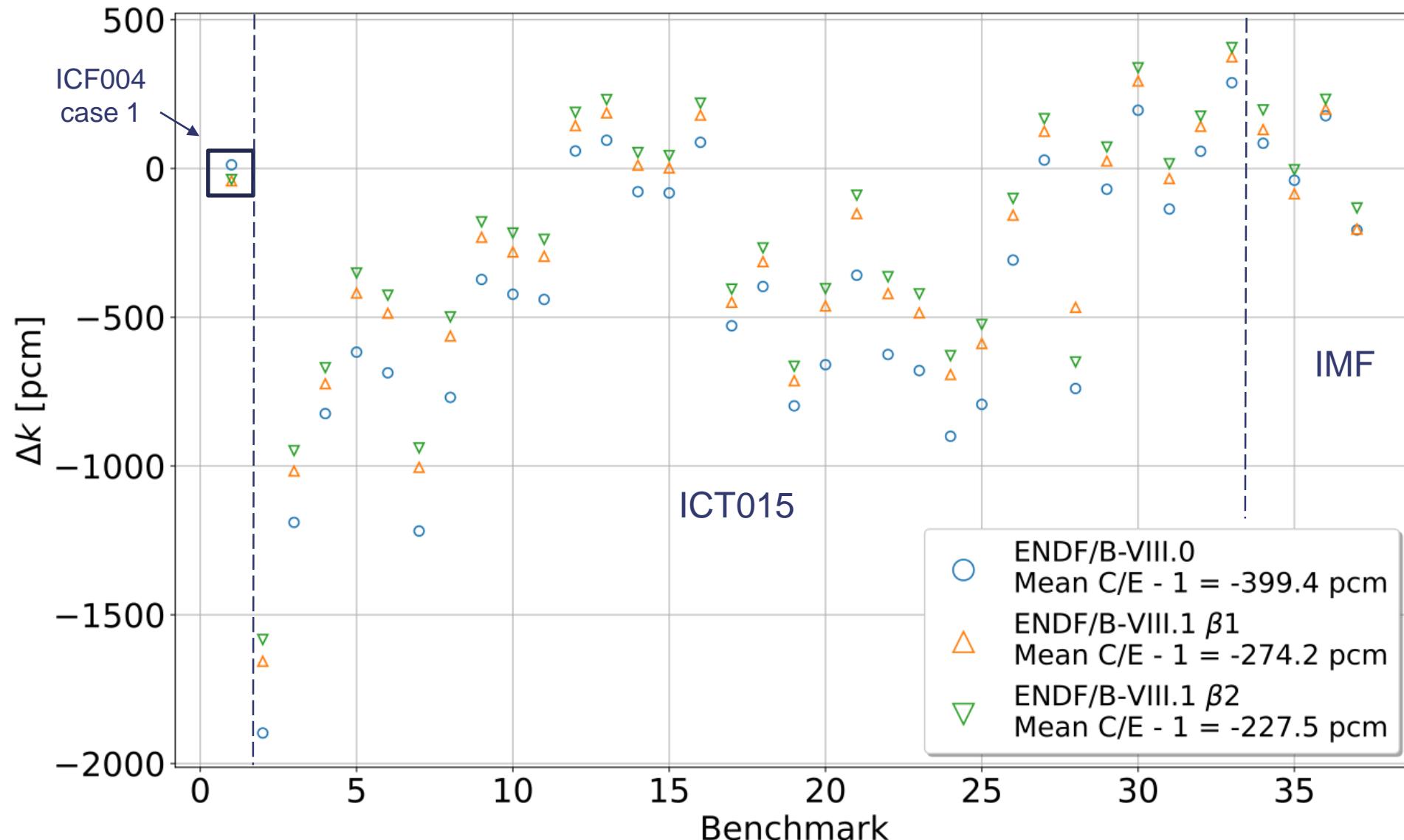
HEU Benchmarks ATLF vs. C/E – 1



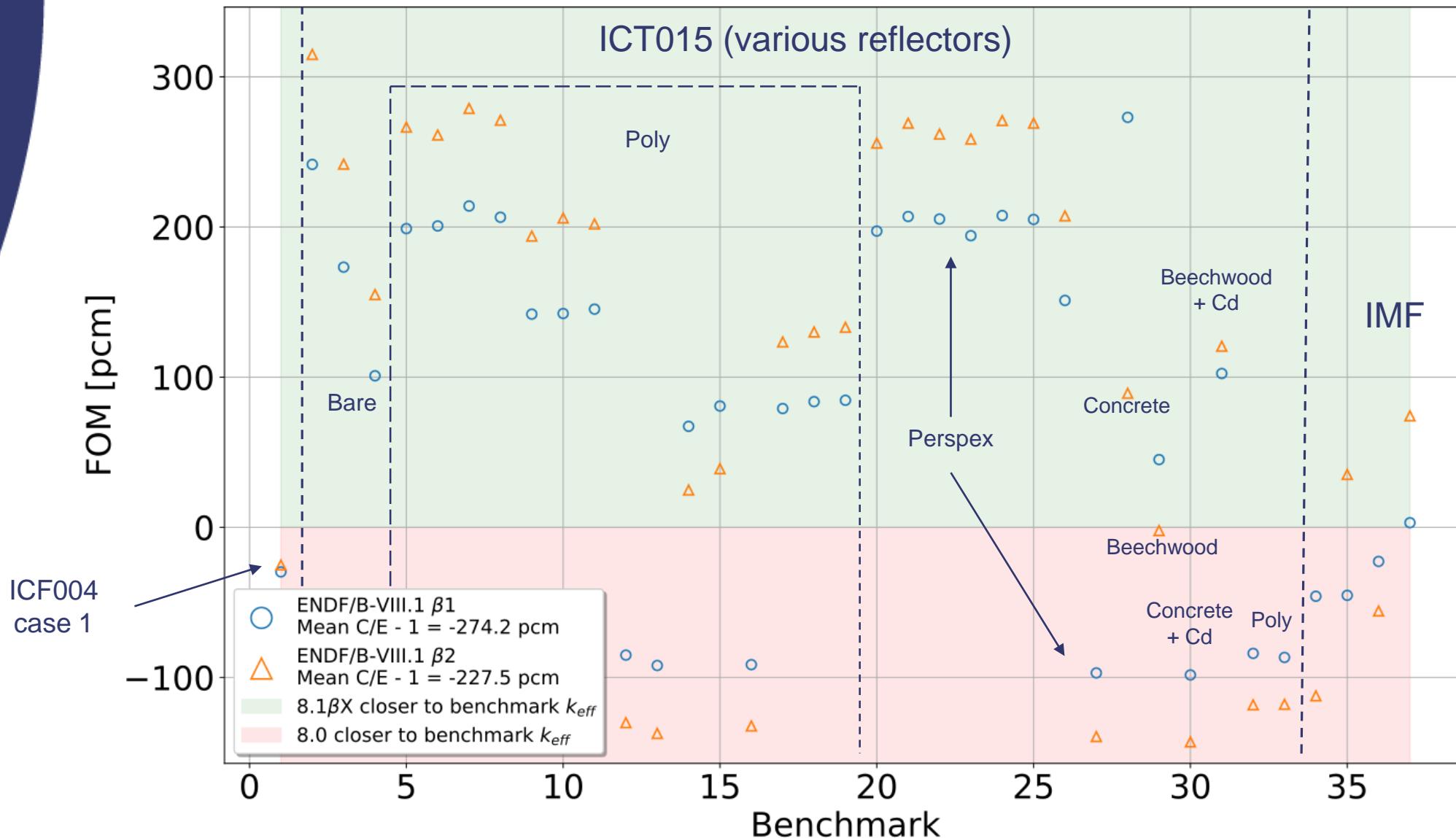
HEU Benchmarks ATFF vs. C/E - 1



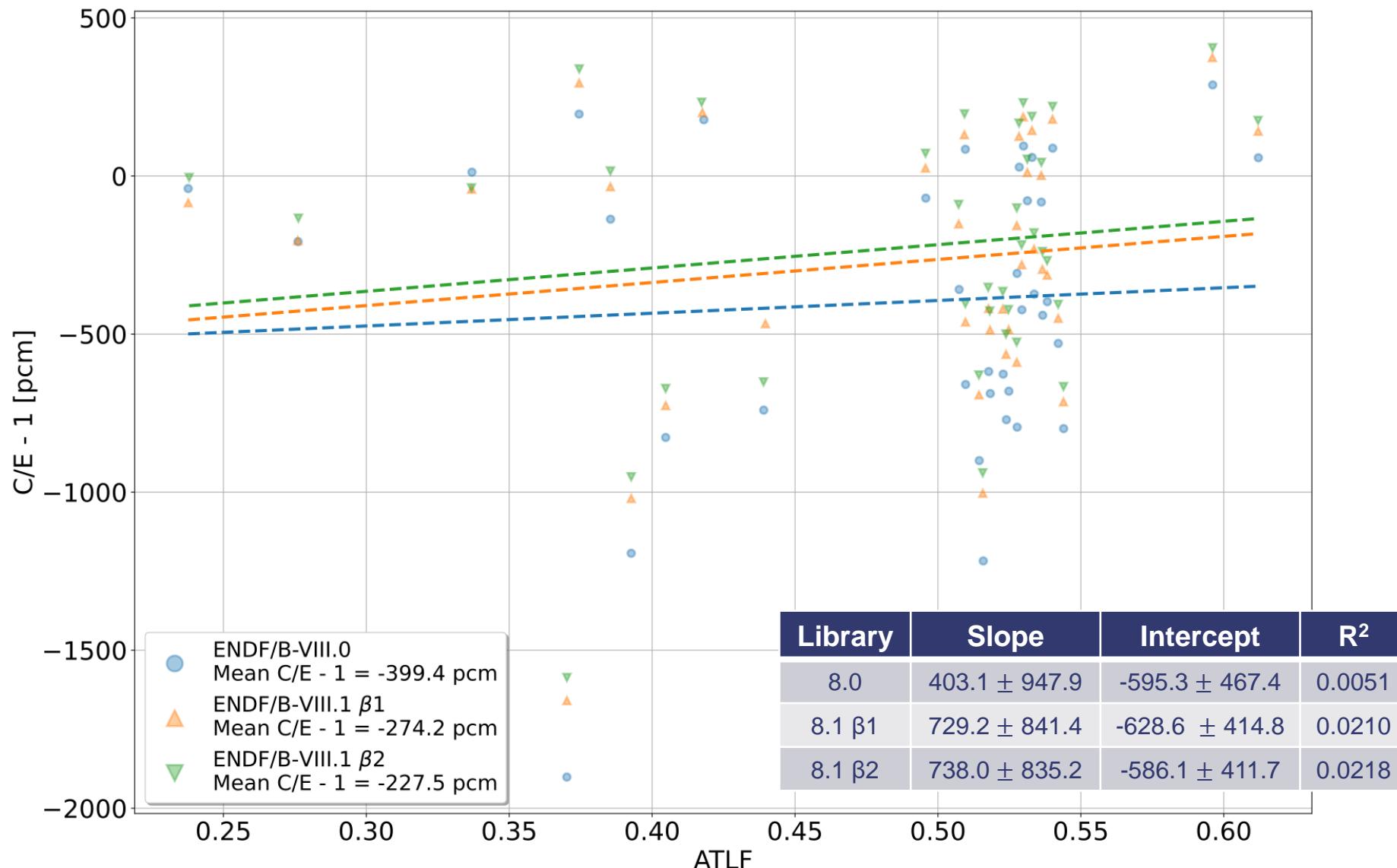
IEU Benchmarks Δk



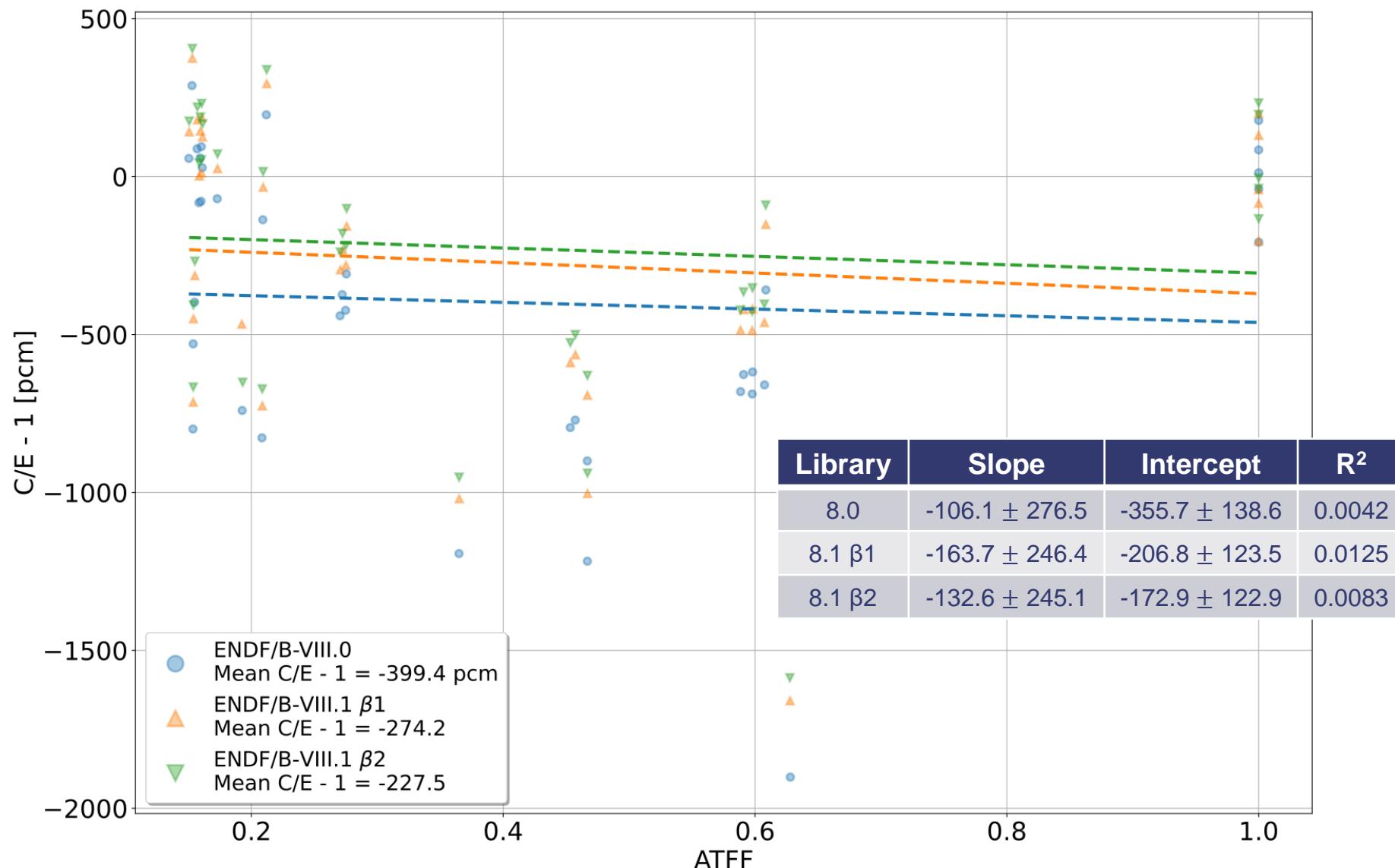
IEU Benchmarks $\Delta|C/E - 1|$



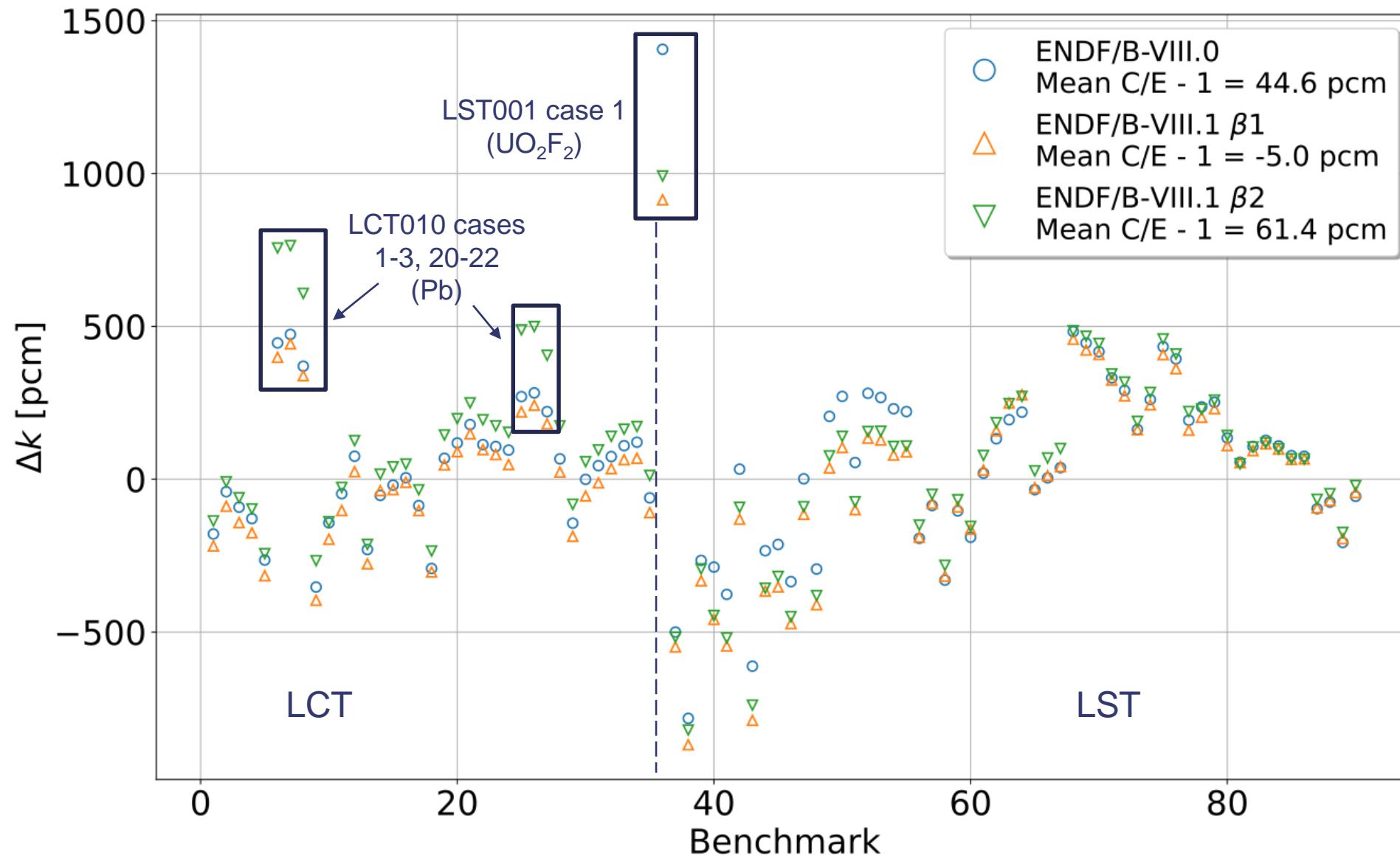
IEU Benchmarks ATLF vs. C/E - 1



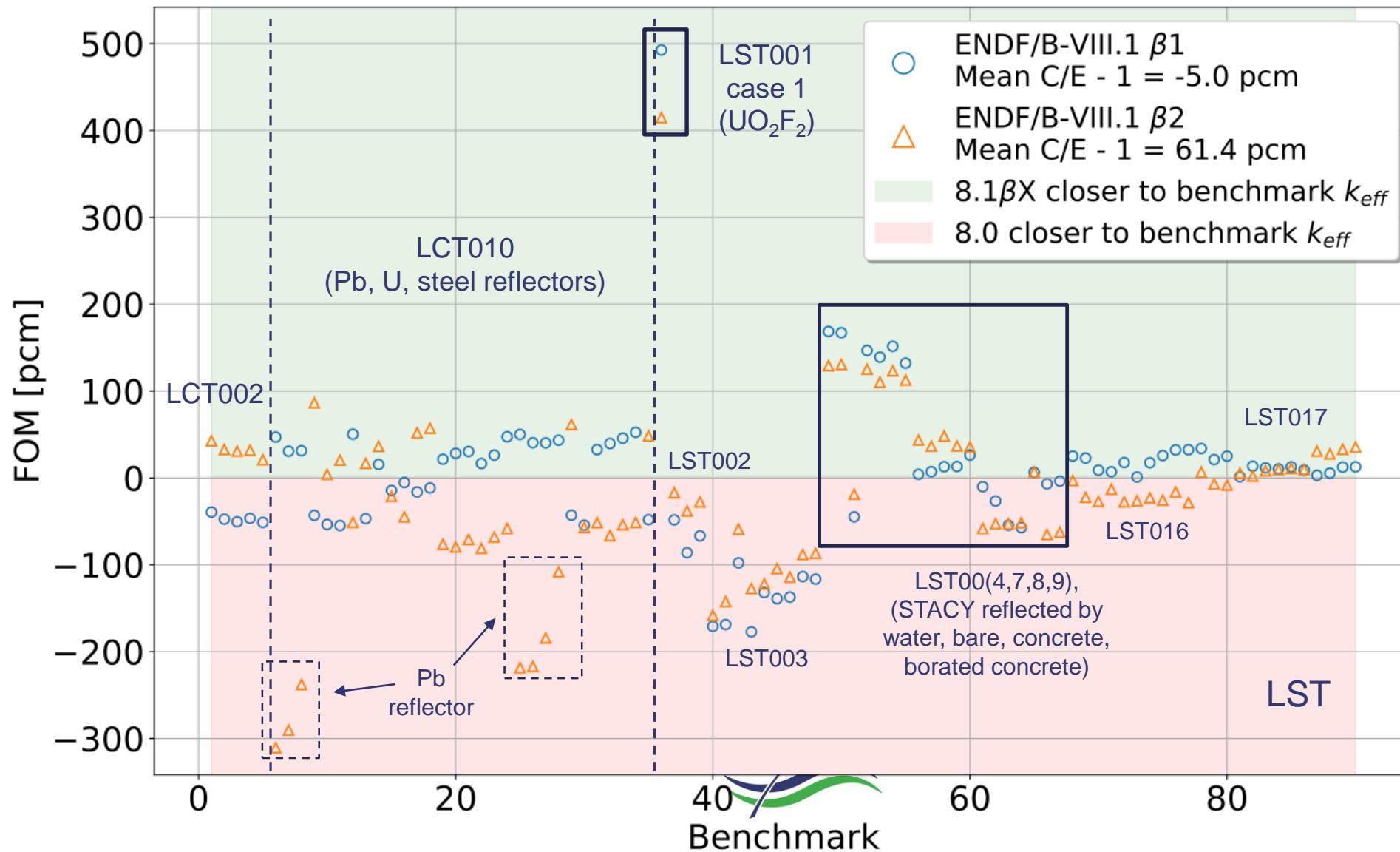
IEU Benchmarks ATFF vs. C/E - 1



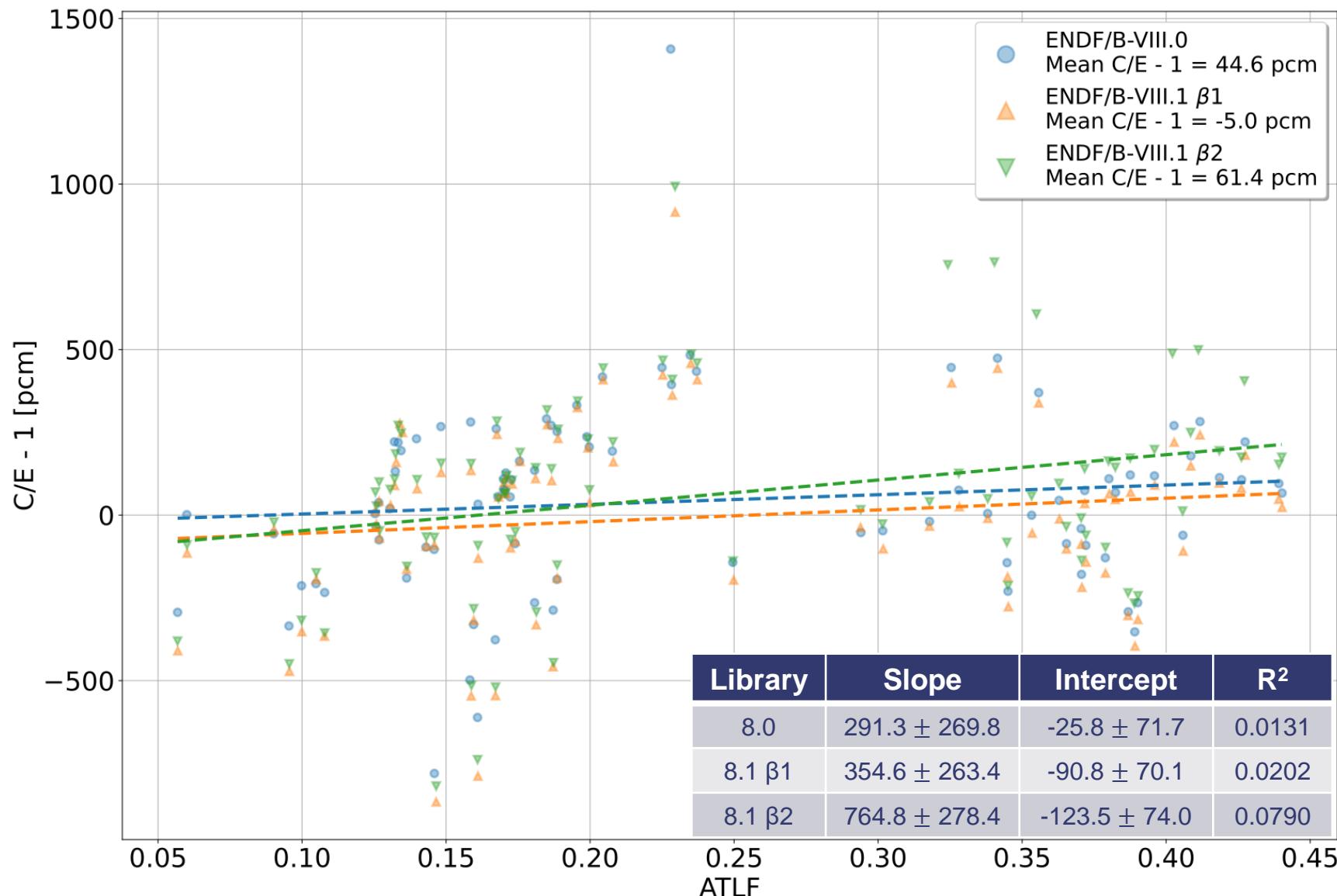
Thermal LEU Benchmarks Δk



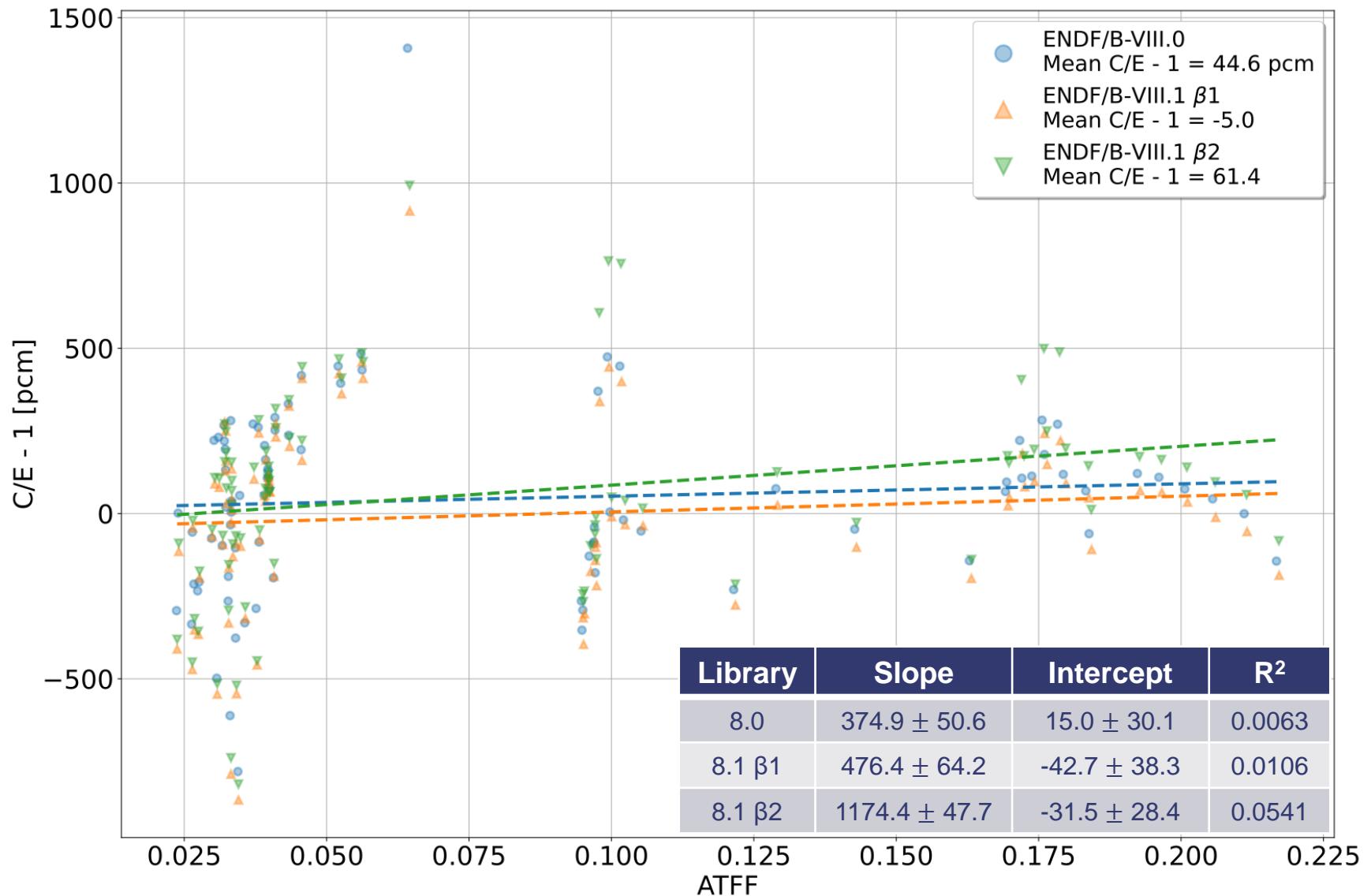
Thermal LEU Benchmarks FOM



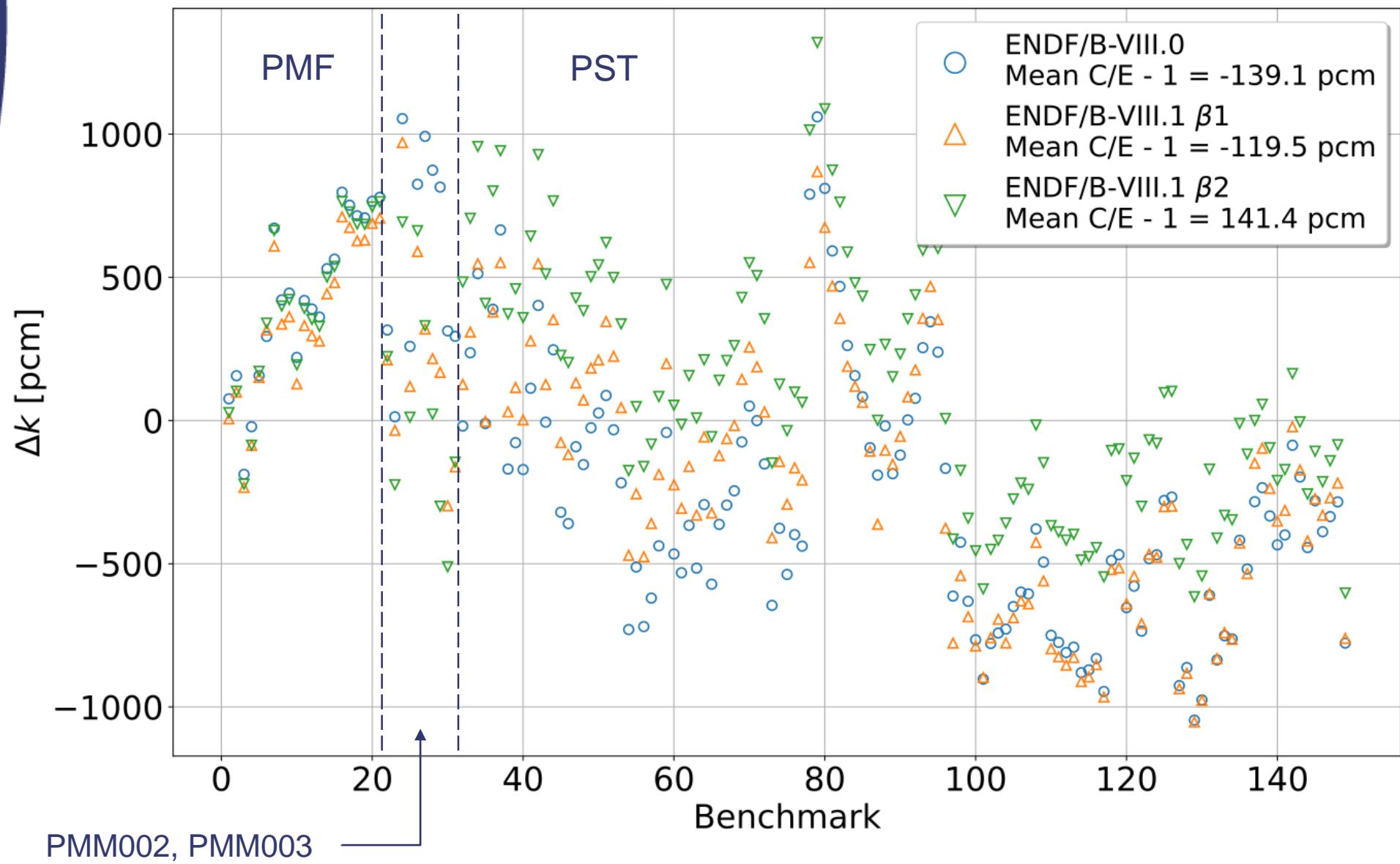
Thermal LEU Benchmarks ATLF vs. C/E - 1



Thermal LEU Benchmarks ATFF vs. C/E - 1



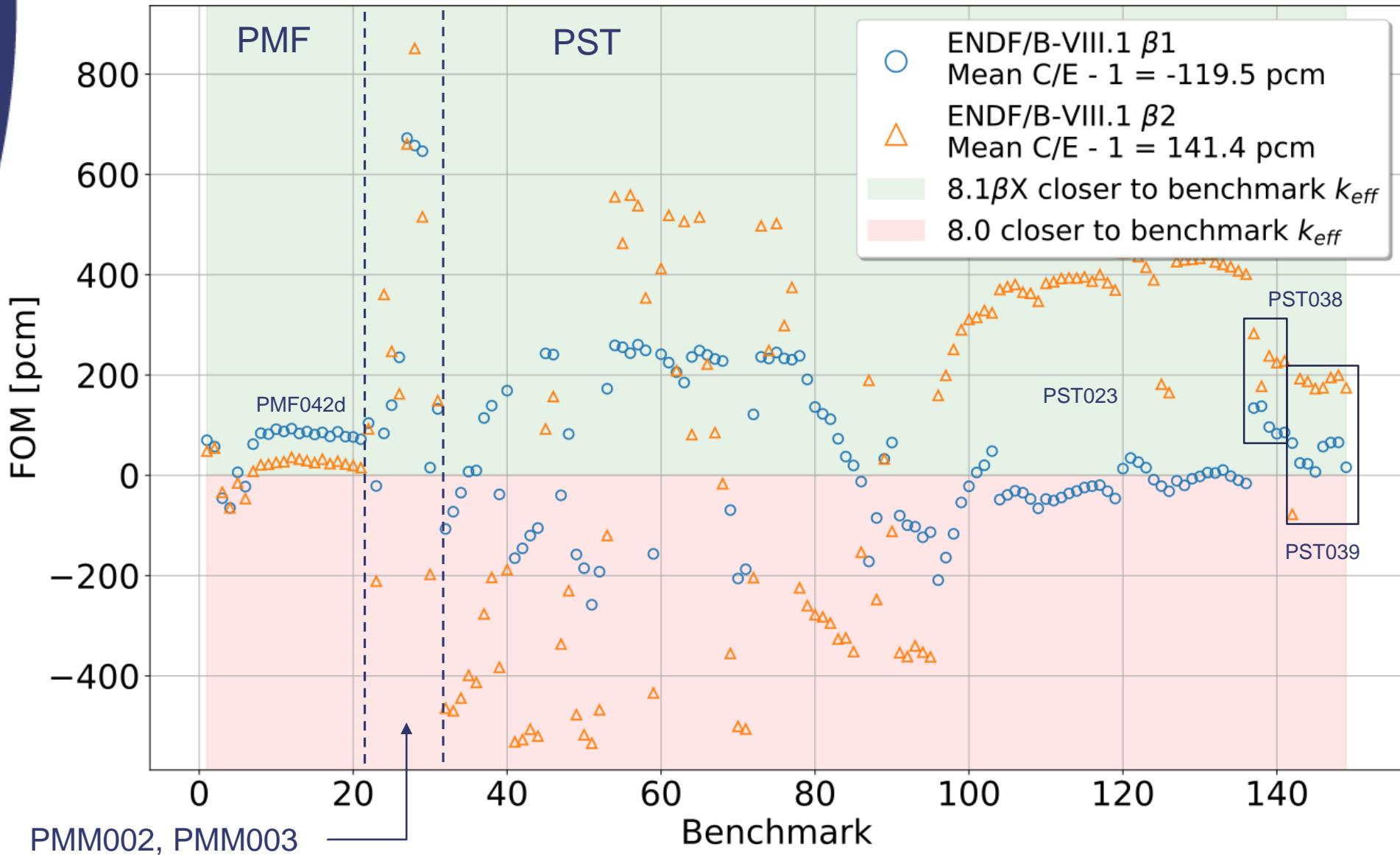
Pu Benchmarks Δk



PST:

- PST001 (6)
- PST002 (7)
- PST003 (7)
- PST004 (13)
- PST005 (9)
- PST006 (3)
- PST018 (9)
- PST022 (17)
- PST023 (33)
- PST038 (5)
- PST039 (8)

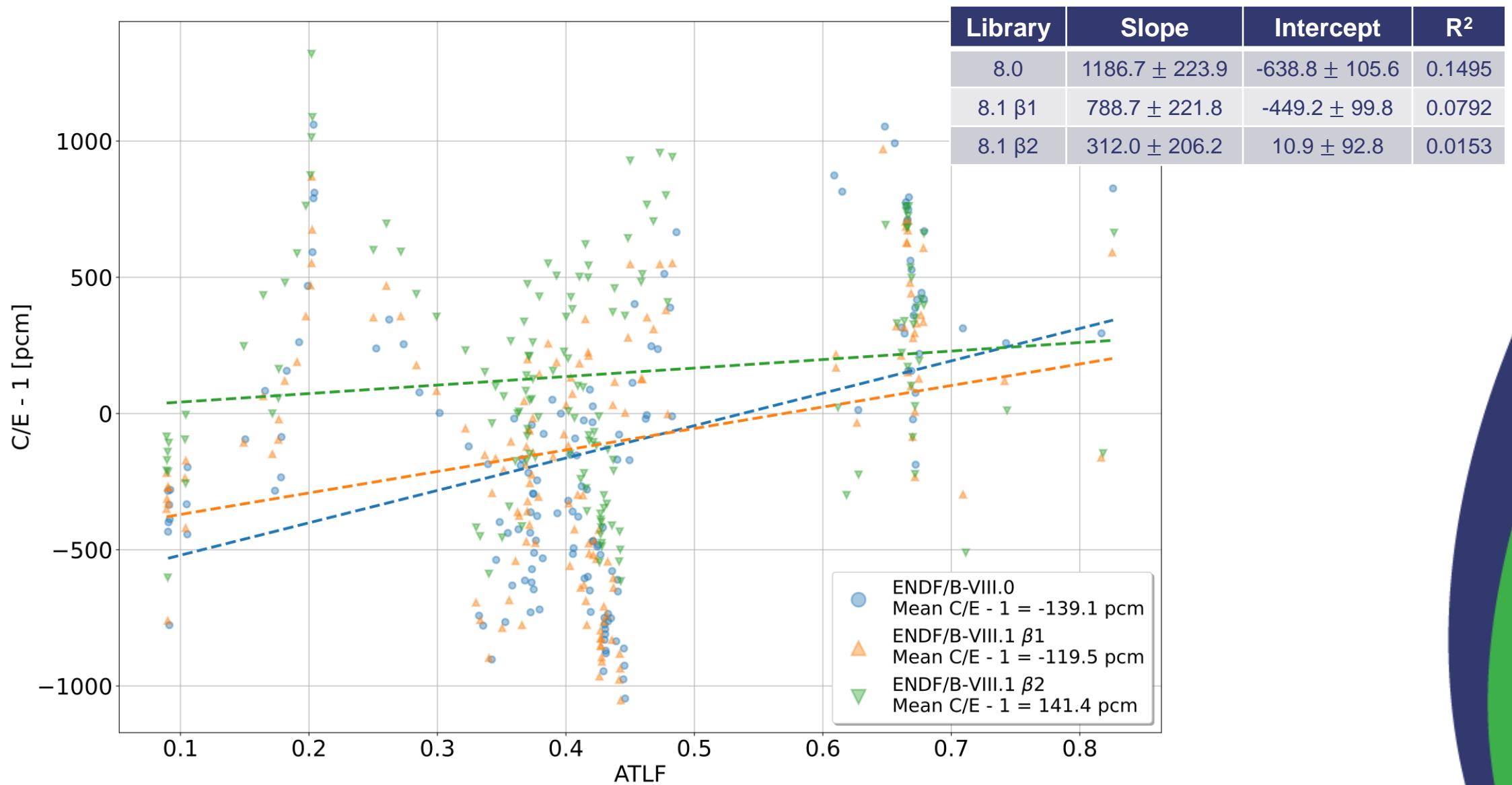
Pu Benchmarks $\Delta|C/E - 1|$



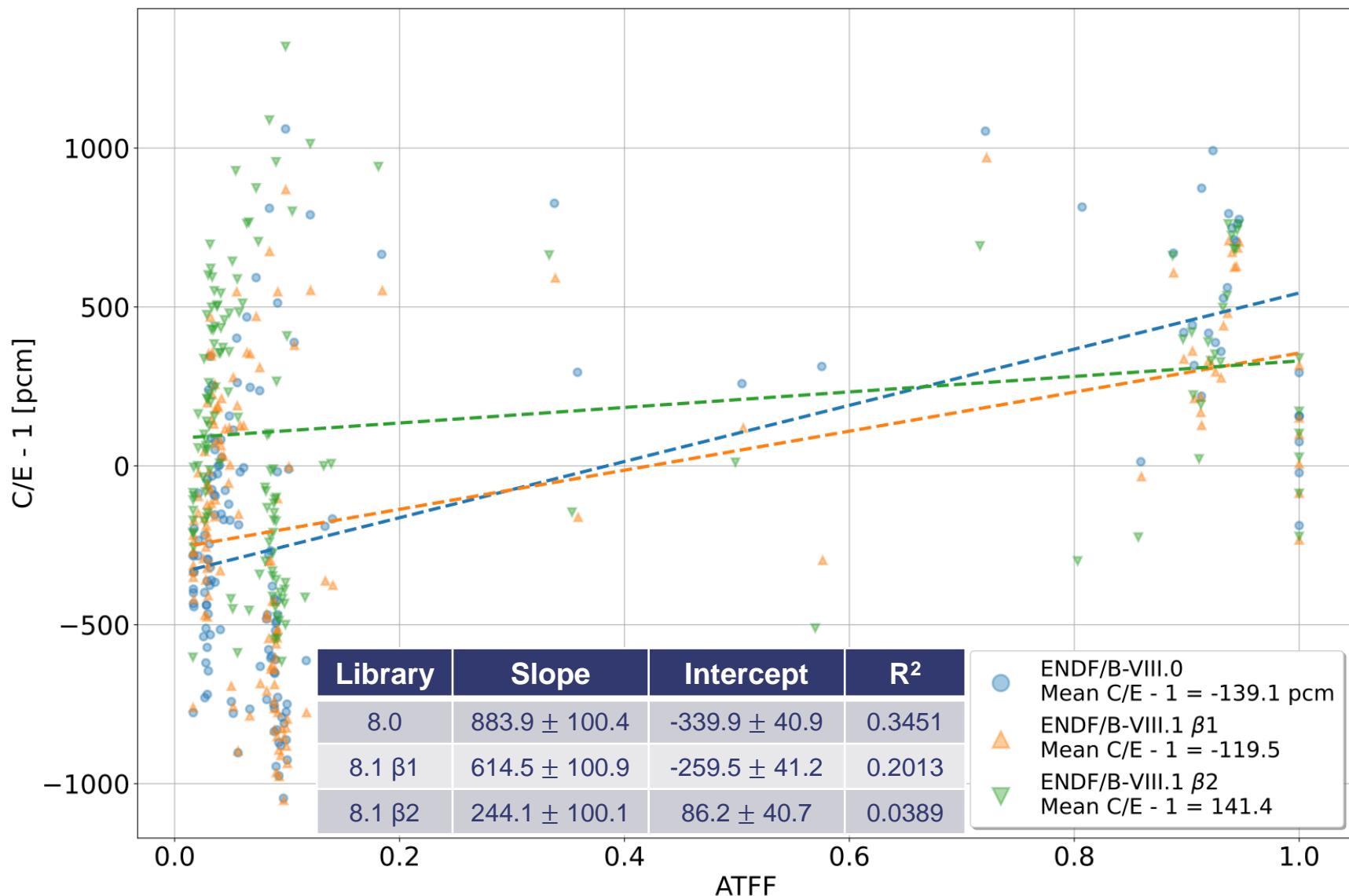
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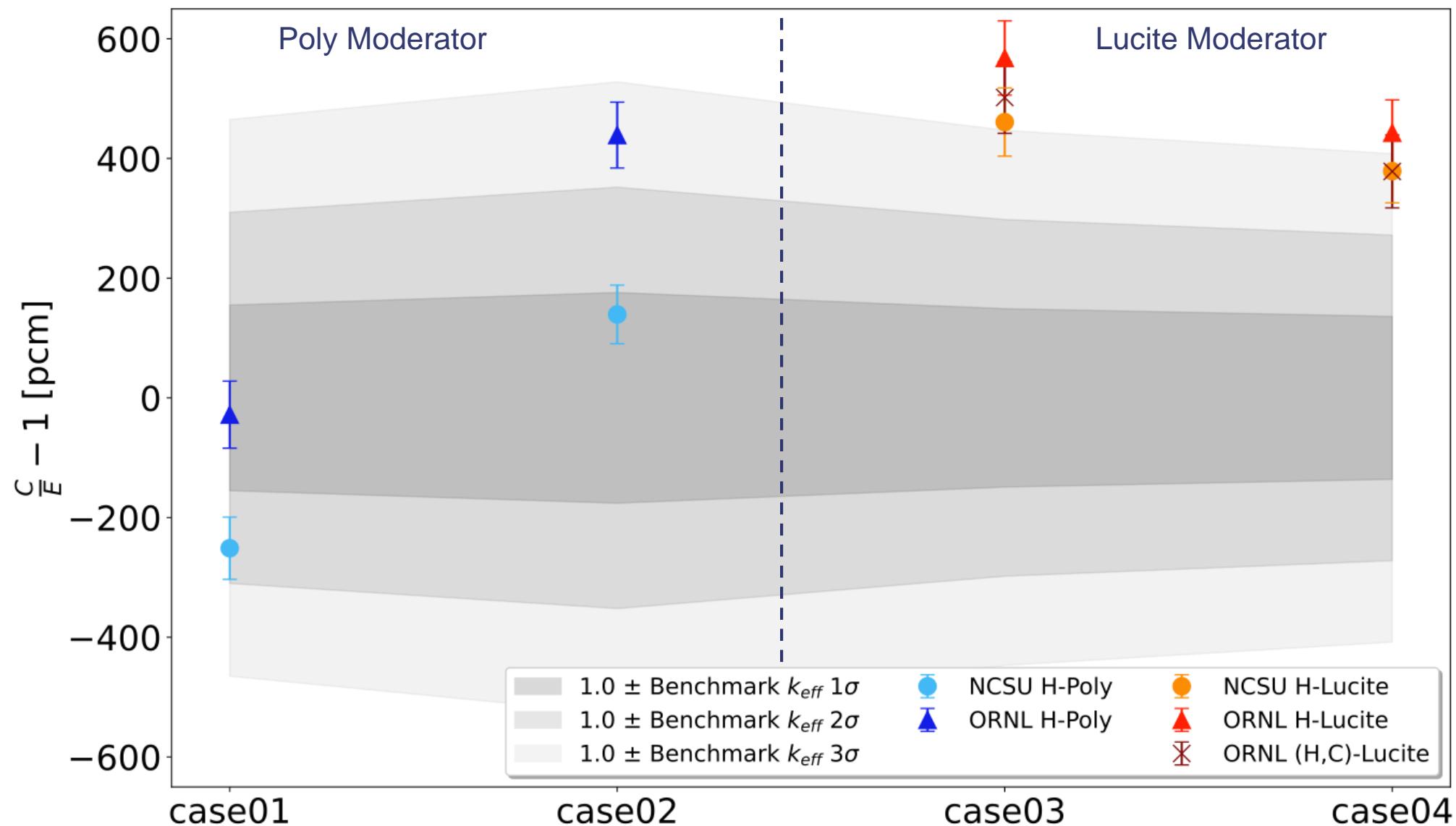
Pu Benchmarks ATLF vs. C/E - 1



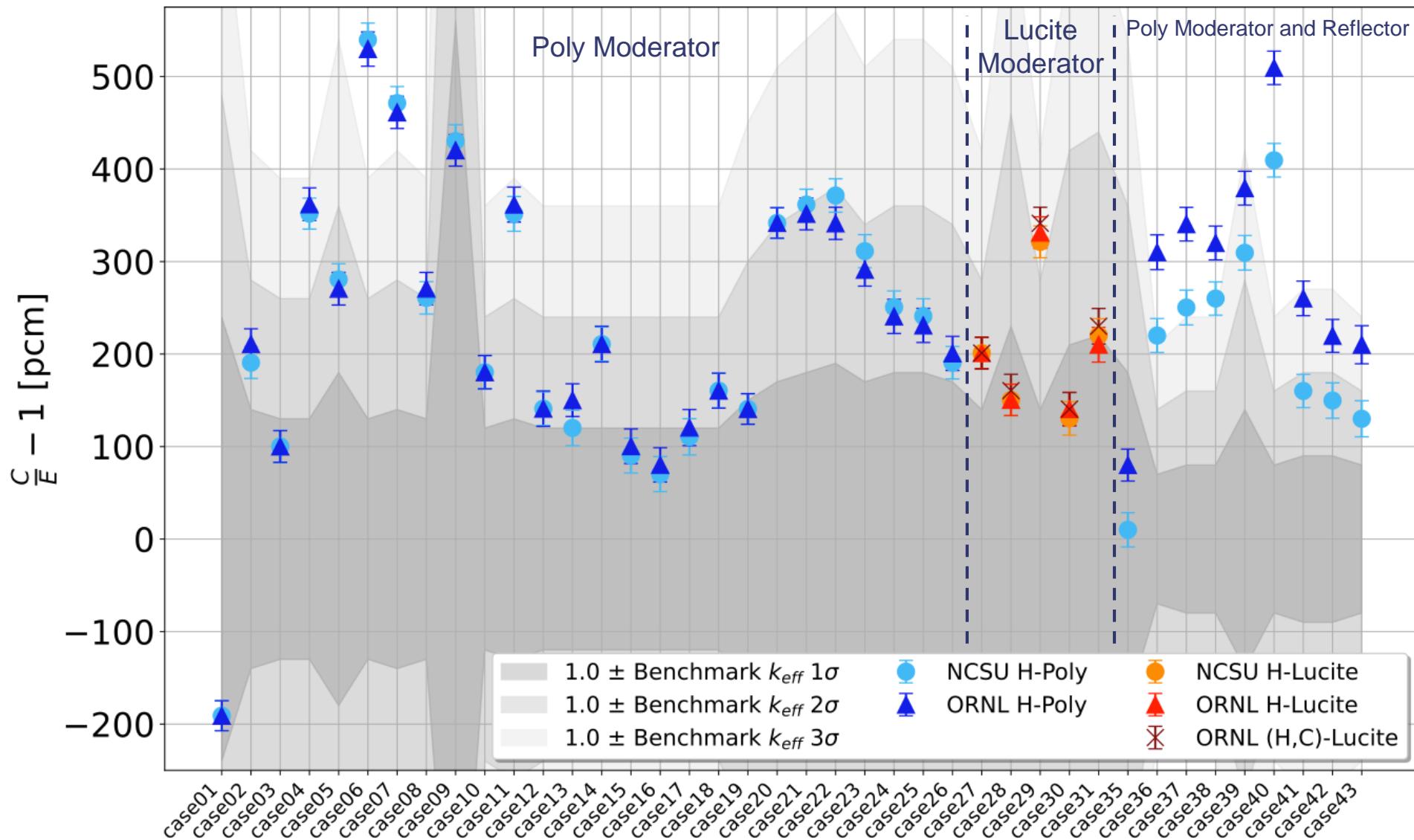
Pu Benchmarks ATFF vs. C/E - 1



Poly and Lucite TSL – PMT004



Poly and Lucite TSL – HMF007



Conclusions

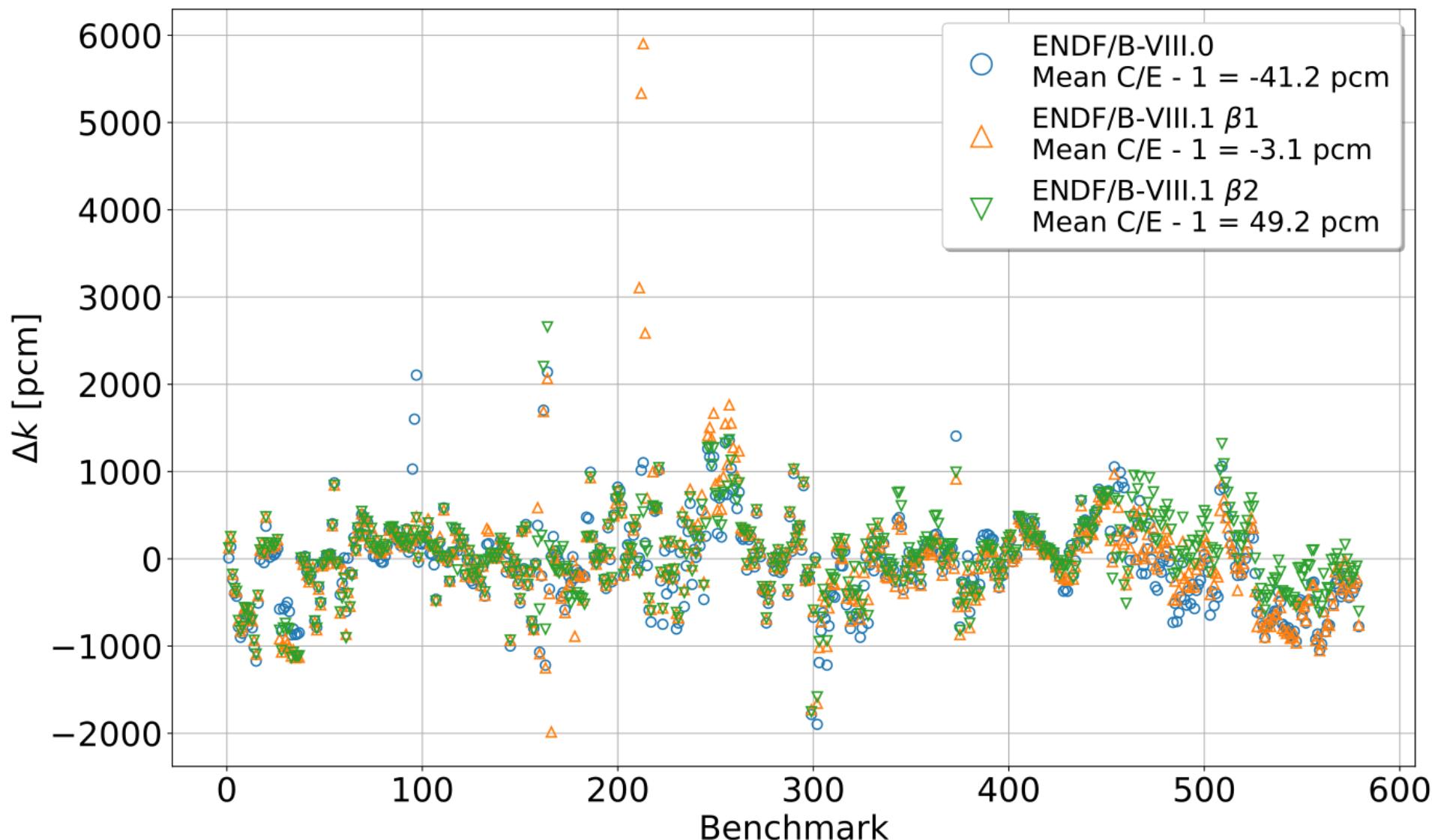
- Updates to fluorine in β 1 and β 2 yield significant improvements over 8.0
- Errors introduced in beryllium and silicon in β 1 resolved in β 2
 - Be: HMF058
 - Si: HMM005, HMF057
- Noted increased bias in LCT010 Pb-reflected cases
- Reduction in mean C/E – 1 for HEU and IEU benchmarks, increase for LEU and Pu benchmarks in β 2
 - Increase in LEU suite mean C/E – 1 due in part to degraded LCT010 performance
 - Pu benchmark suite bias flipped from under-predication to over-prediction on average



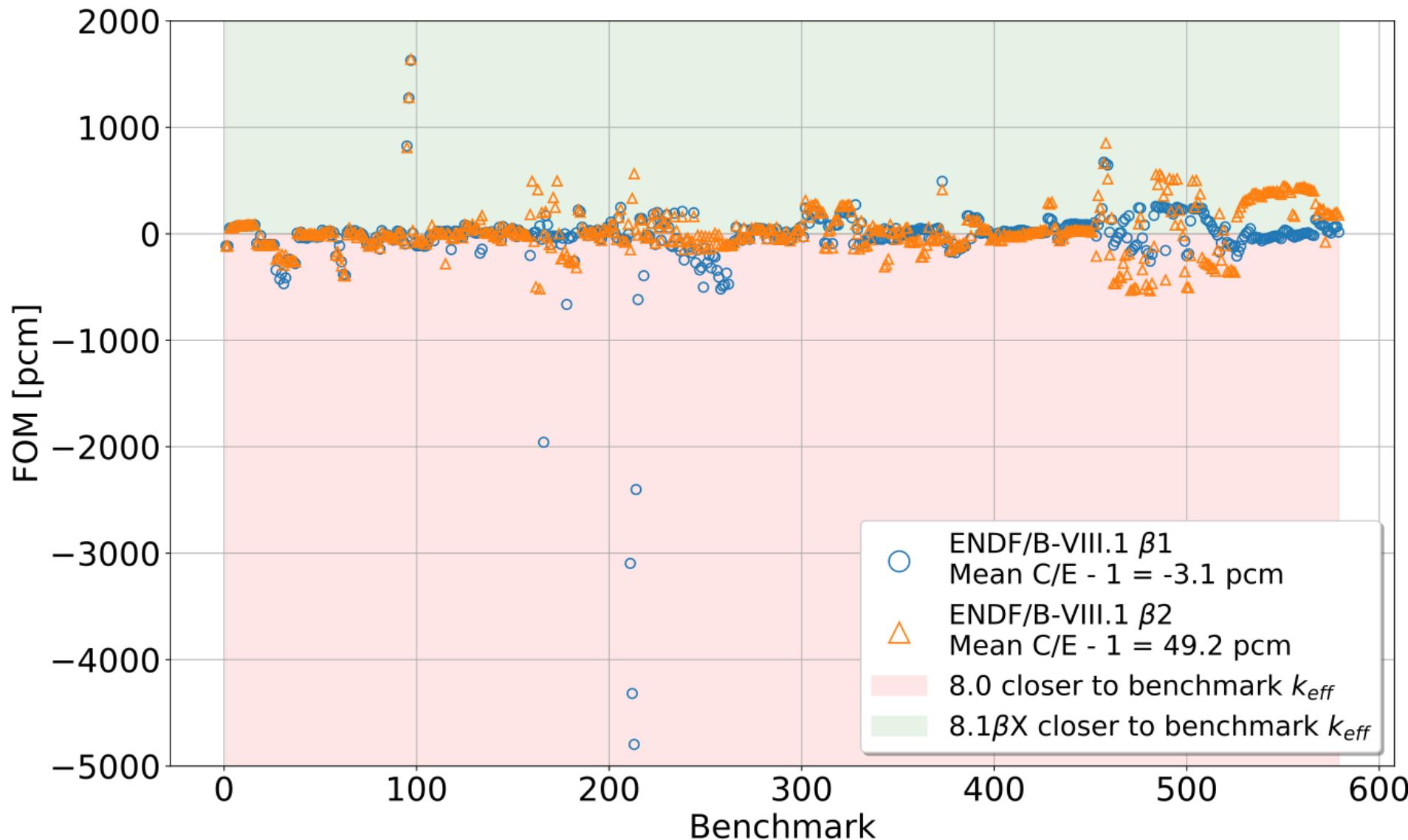
Additional Slides



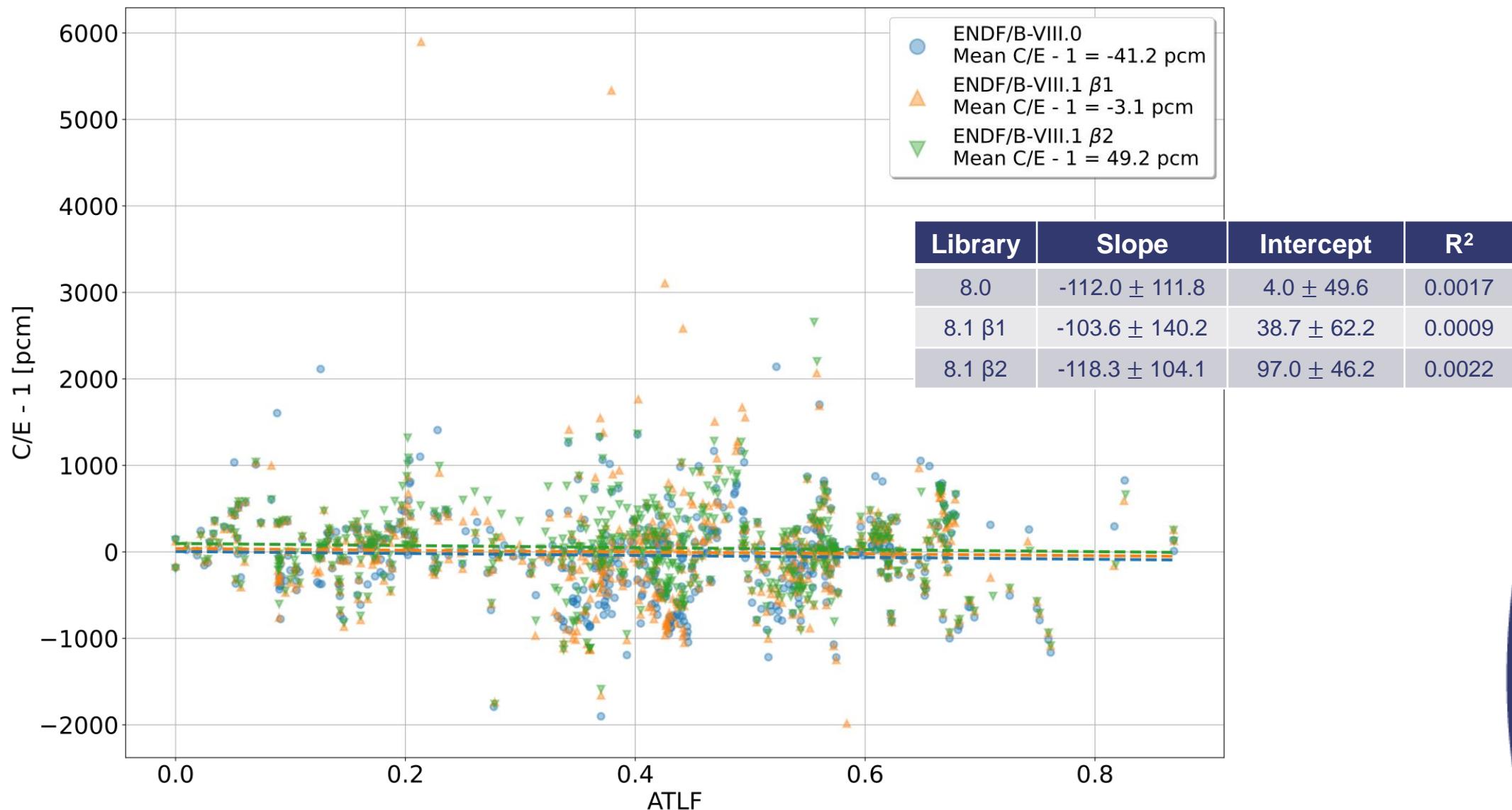
All Benchmarks Δk



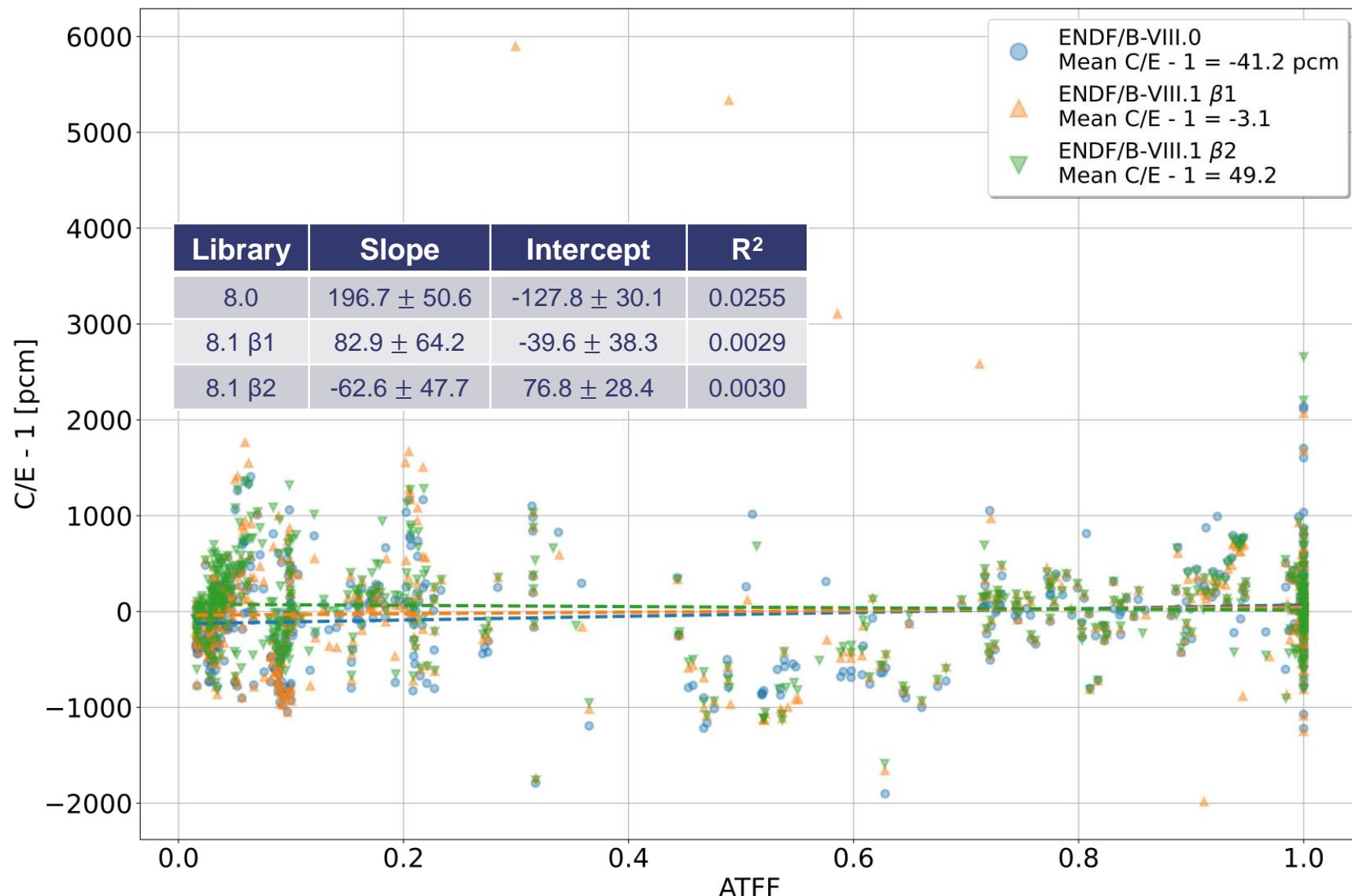
All Benchmarks FOM



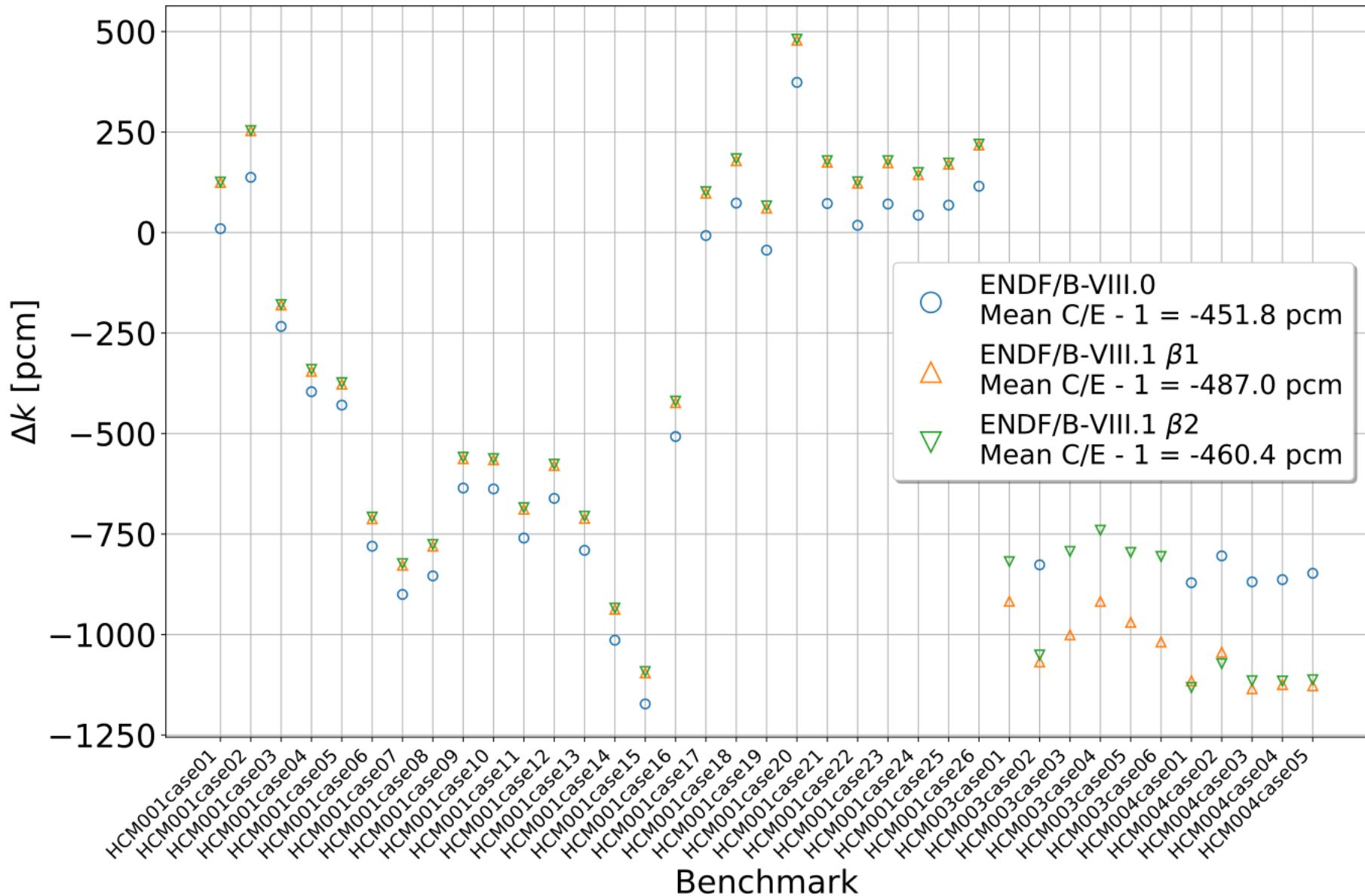
All Benchmarks ATLF vs. C/E - 1



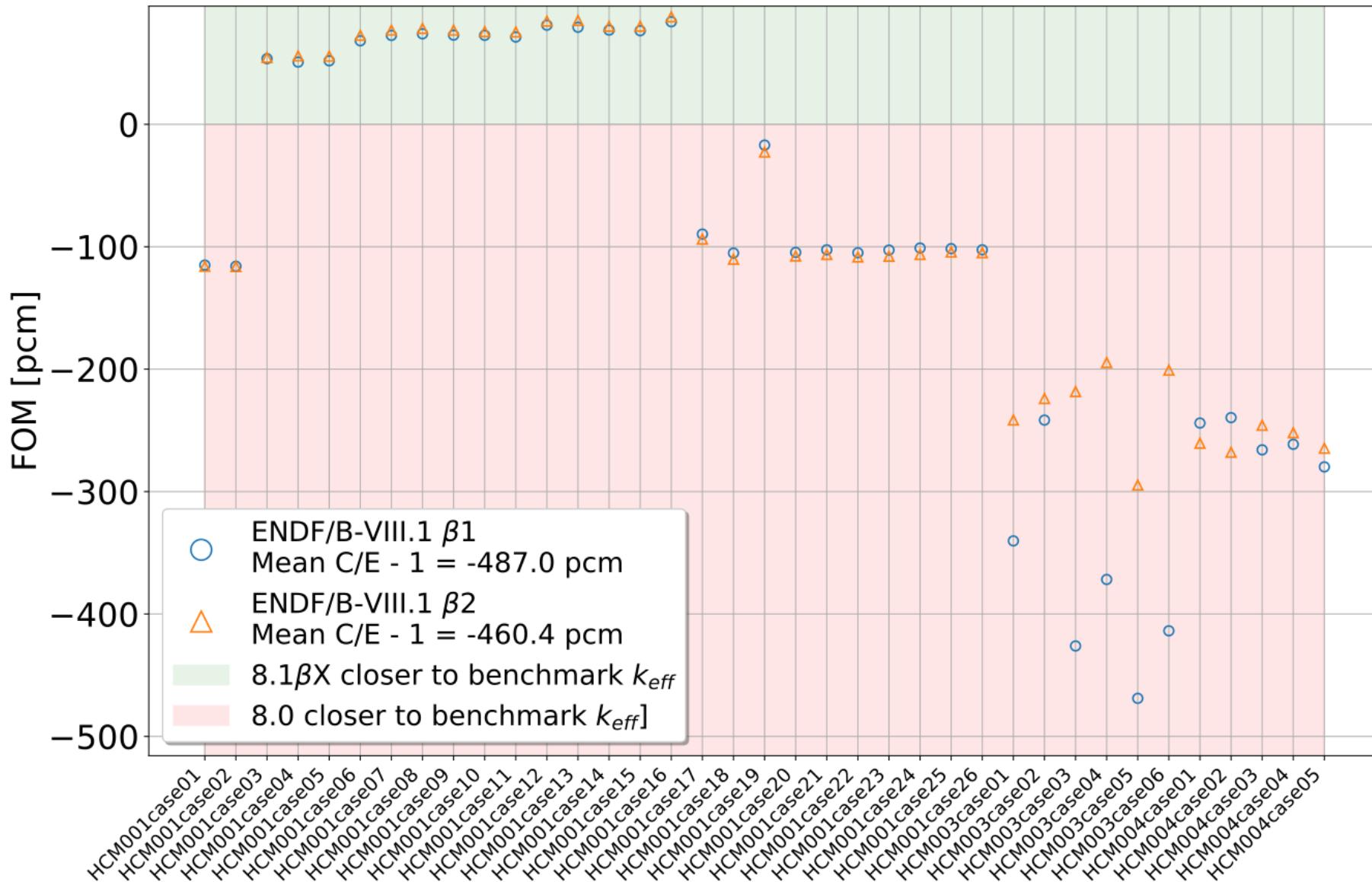
All Benchmarks ATFF vs. C/E - 1



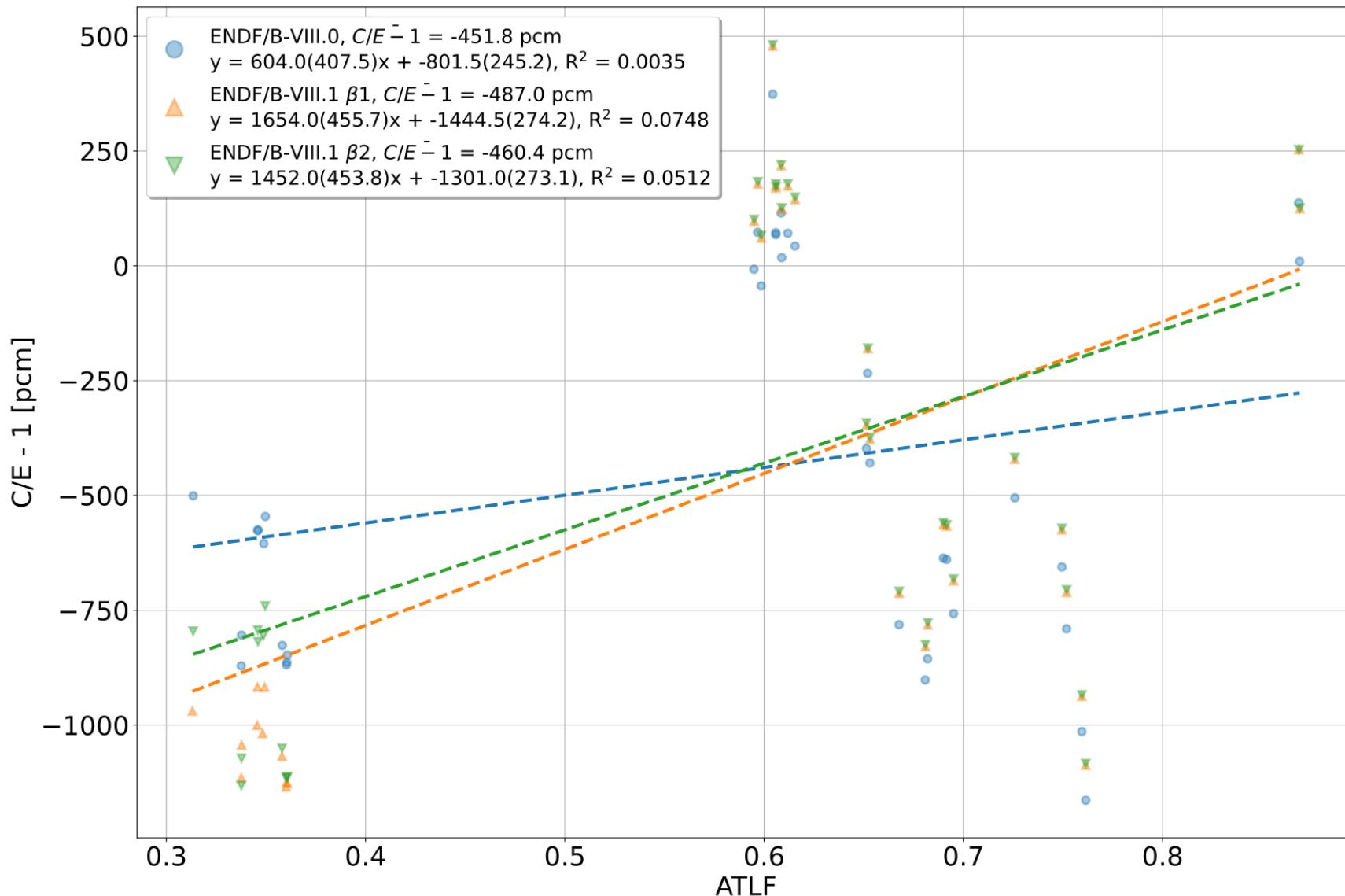
HCM Benchmarks Δk



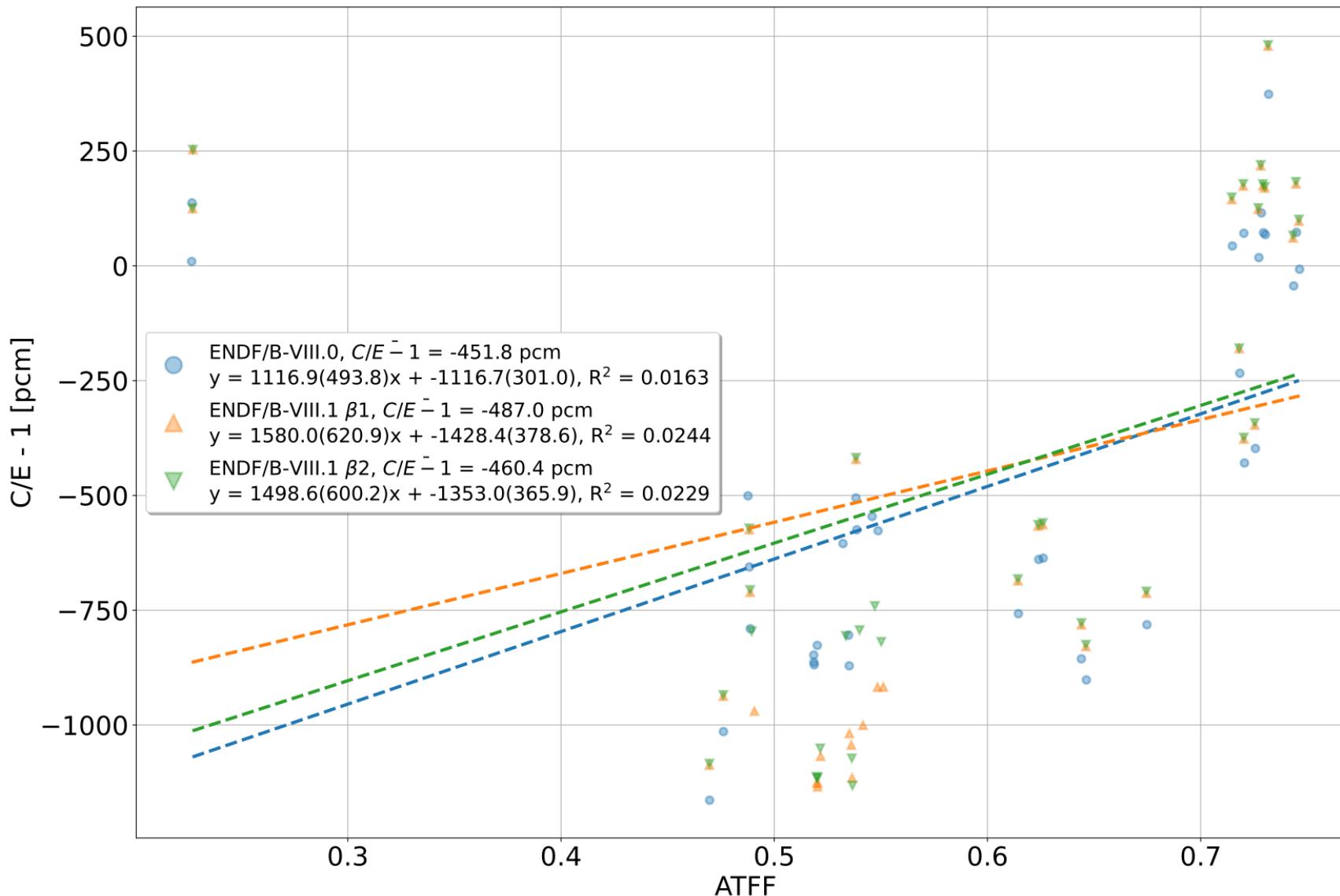
HCM Benchmarks FOM



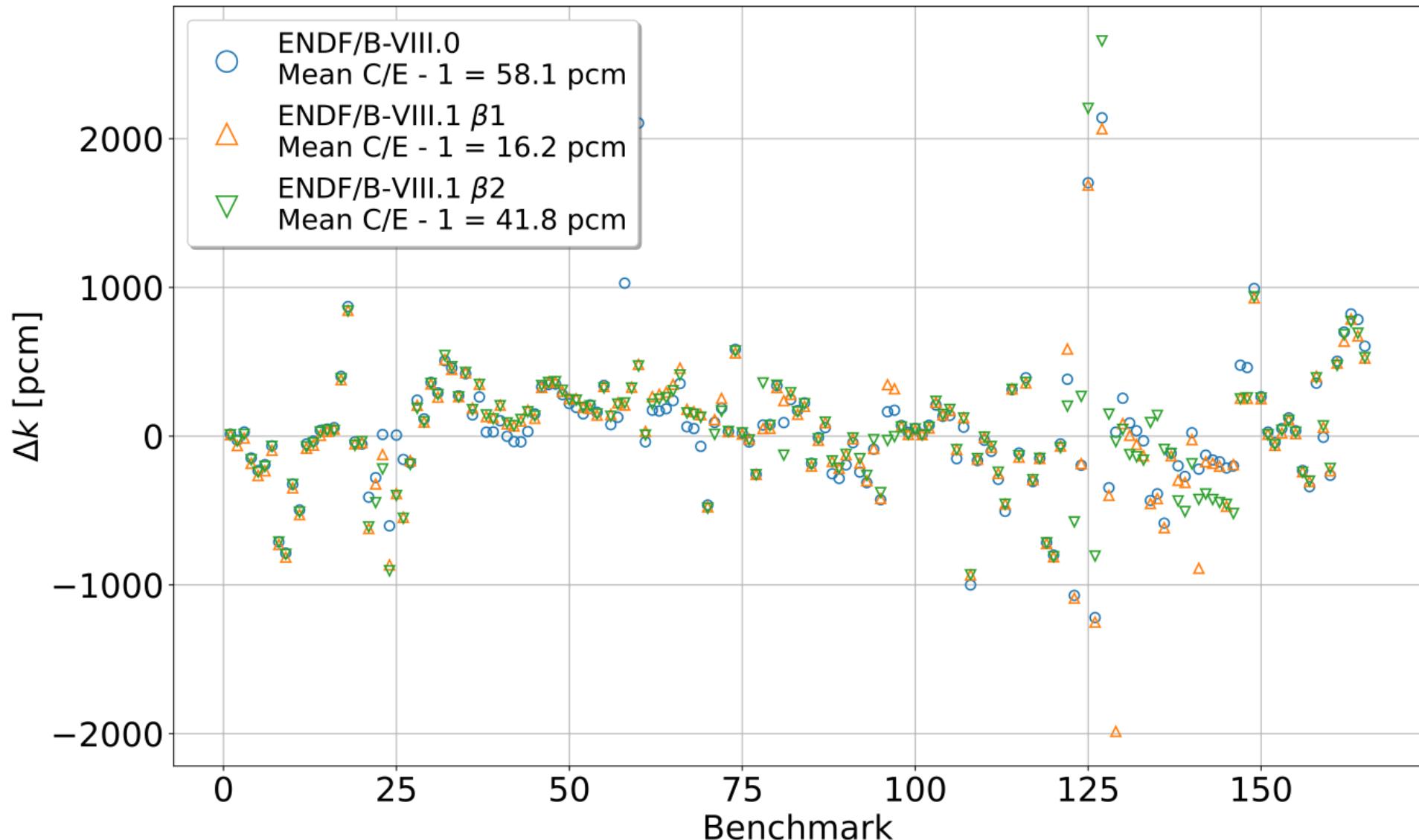
HCM Benchmarks ATLF vs. C/E - 1



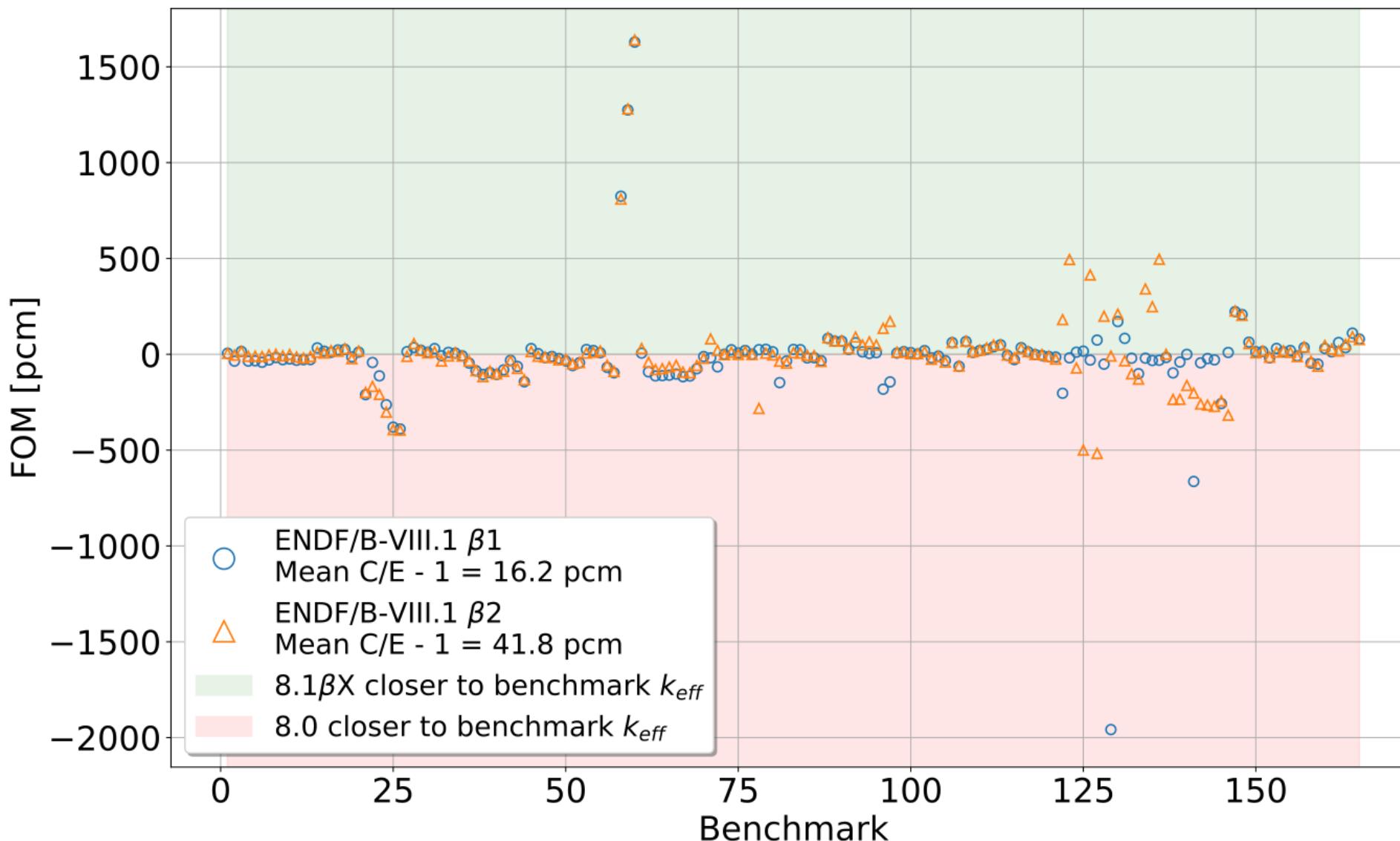
HCM Benchmarks ATFF vs. C/E - 1



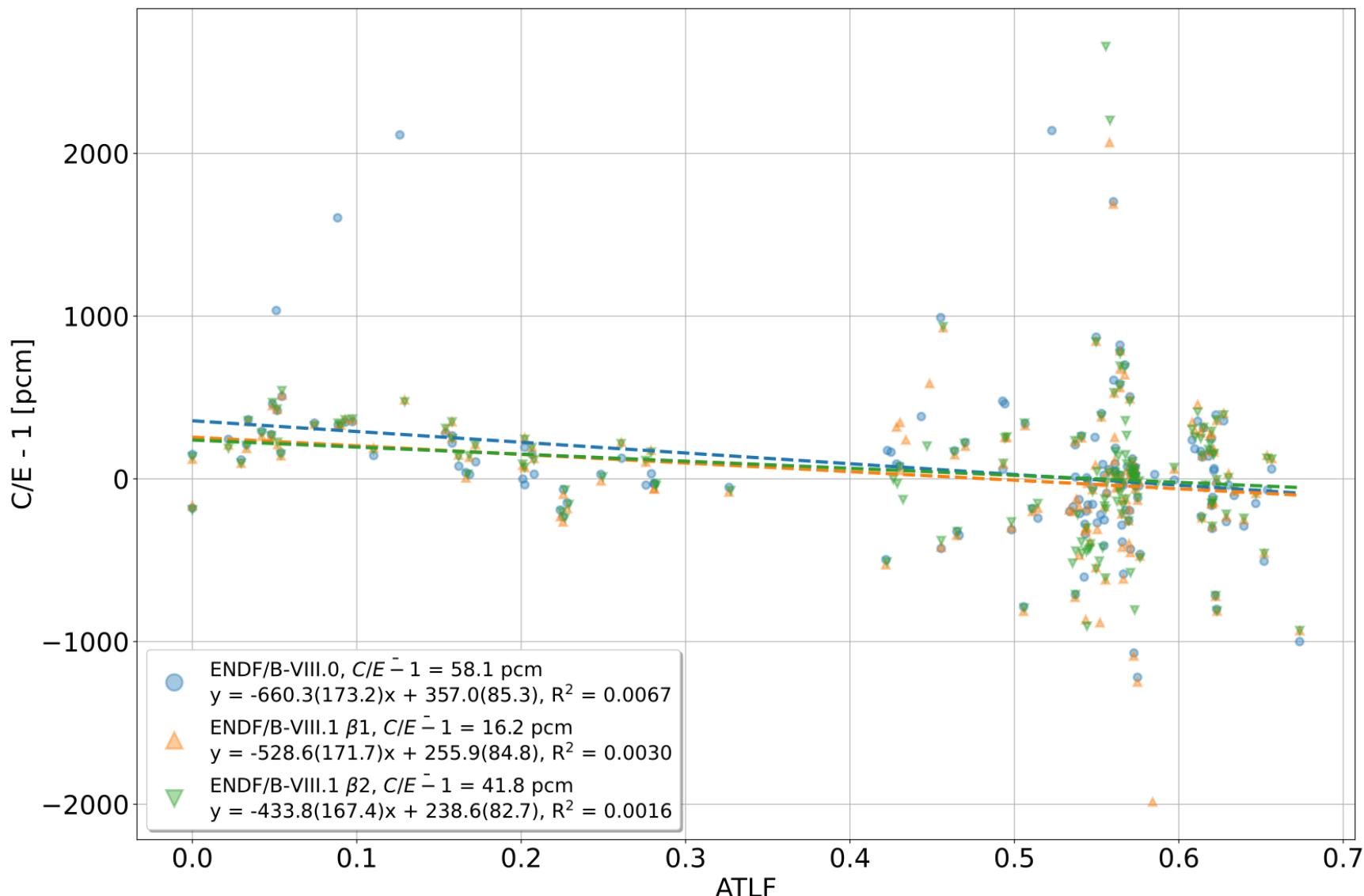
HMF Benchmarks Δk



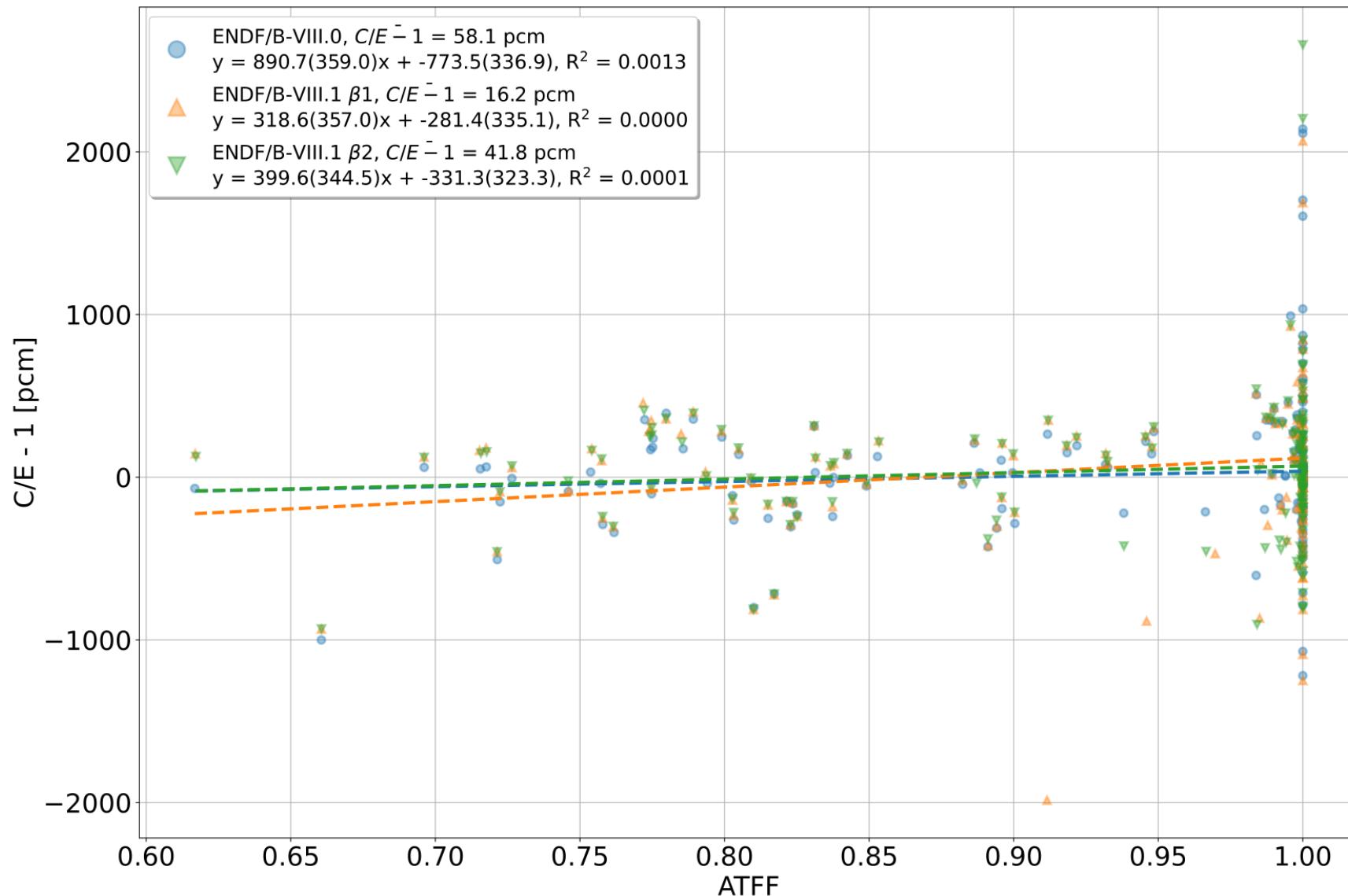
HMF Benchmarks FOM



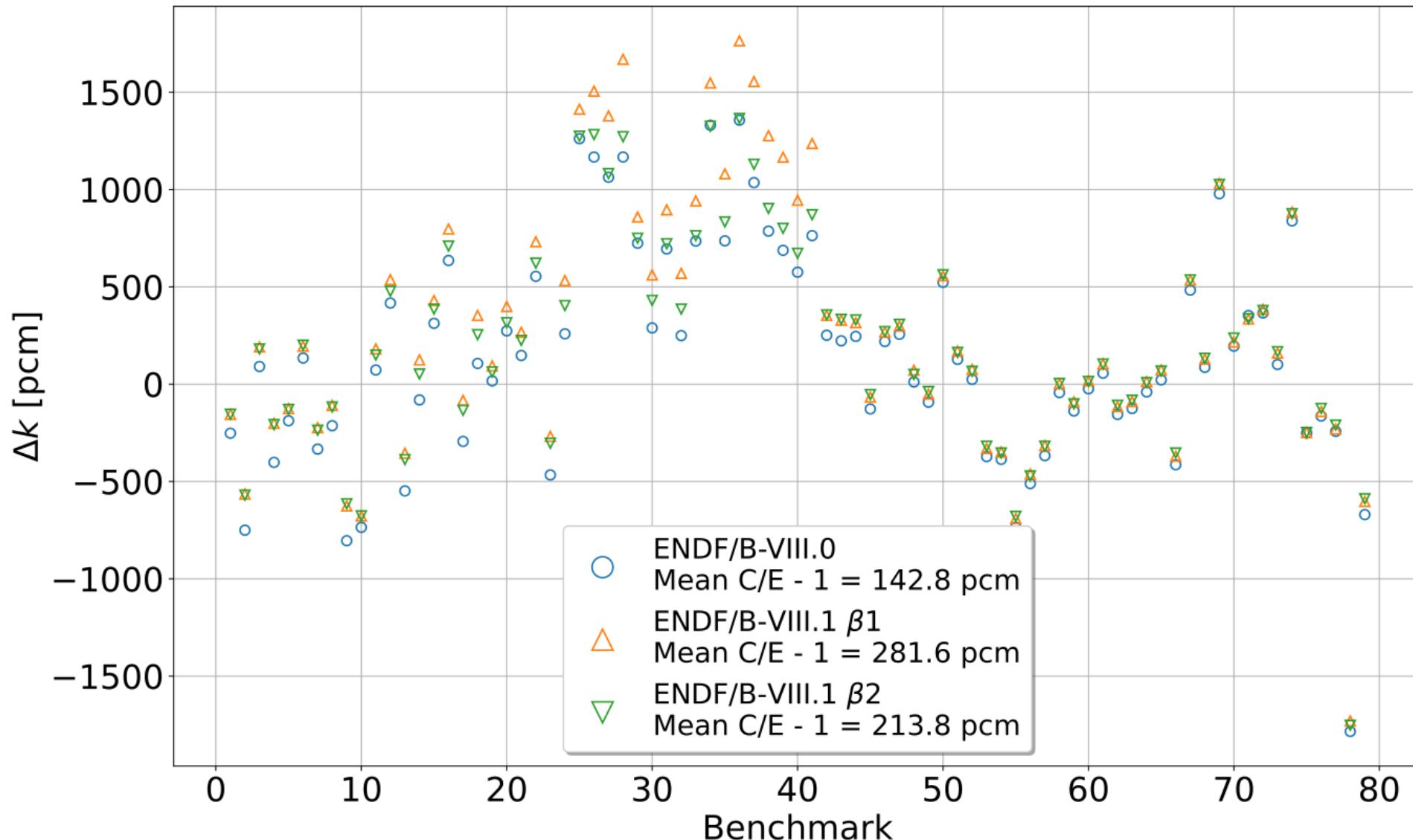
HMF Benchmarks ATLF vs. C/E - 1



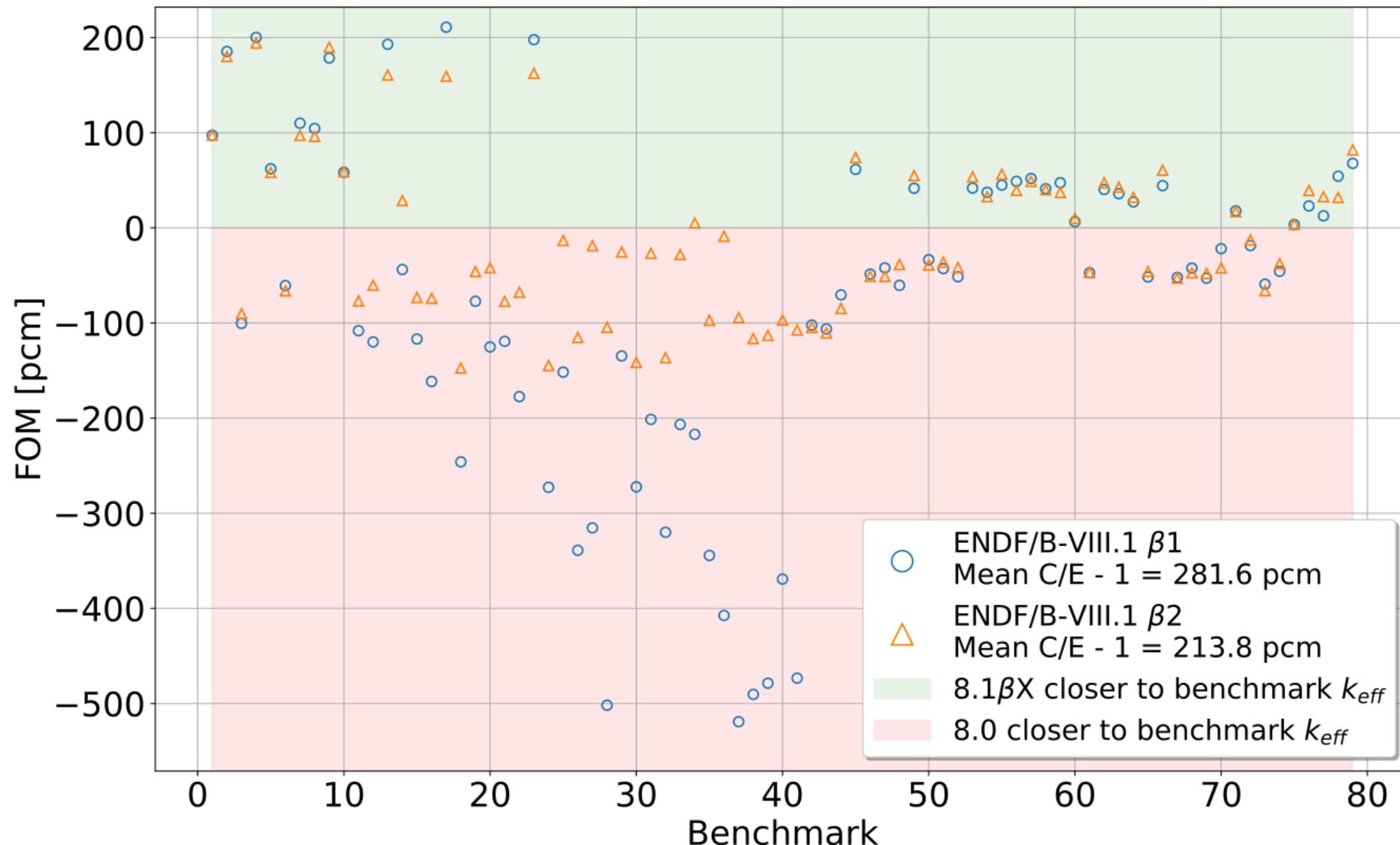
HMF Benchmarks ATFF vs. C/E - 1



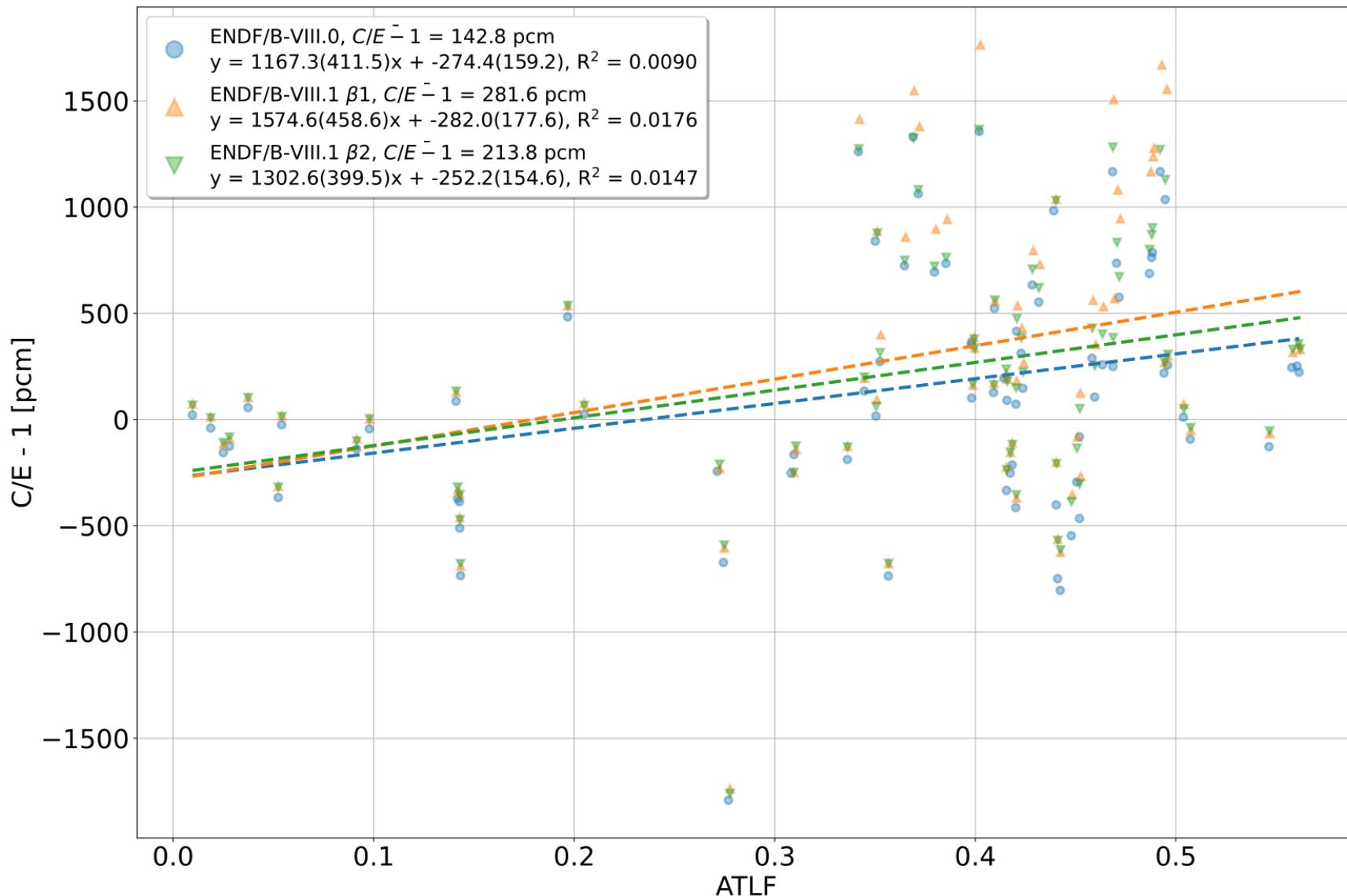
HST Benchmarks Δk



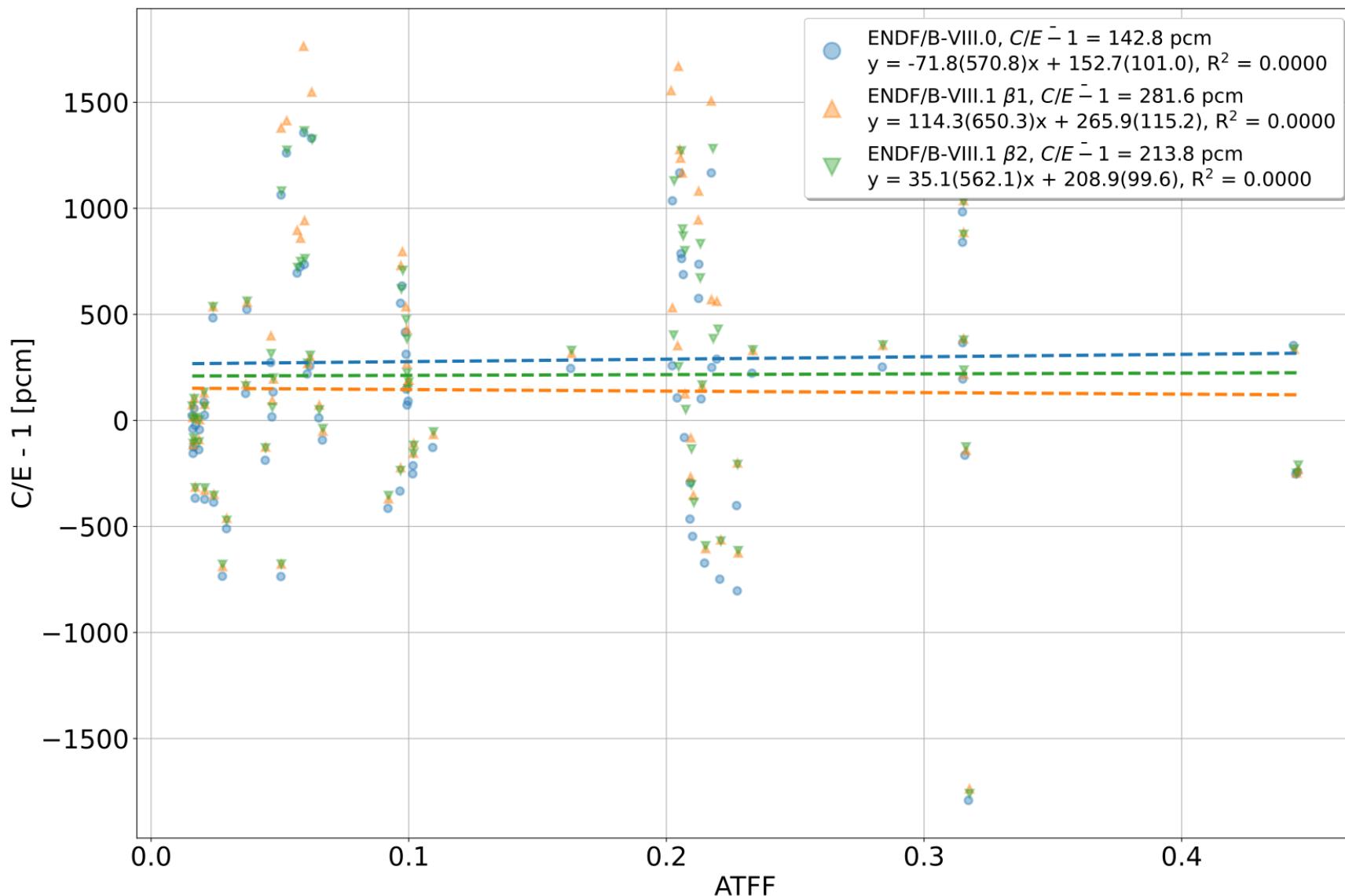
HST Benchmarks FOM



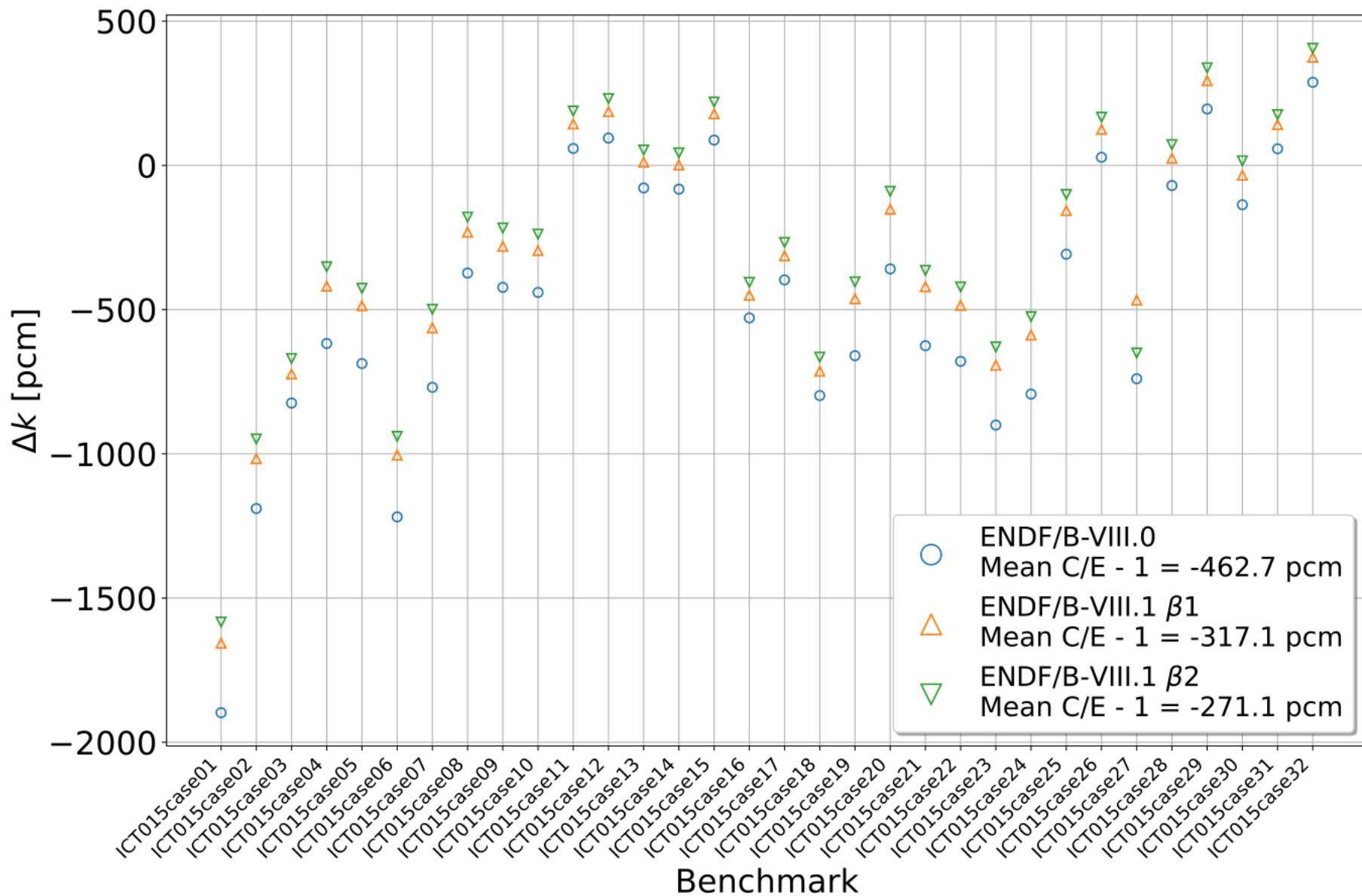
HST Benchmarks ATLF vs. C/E - 1



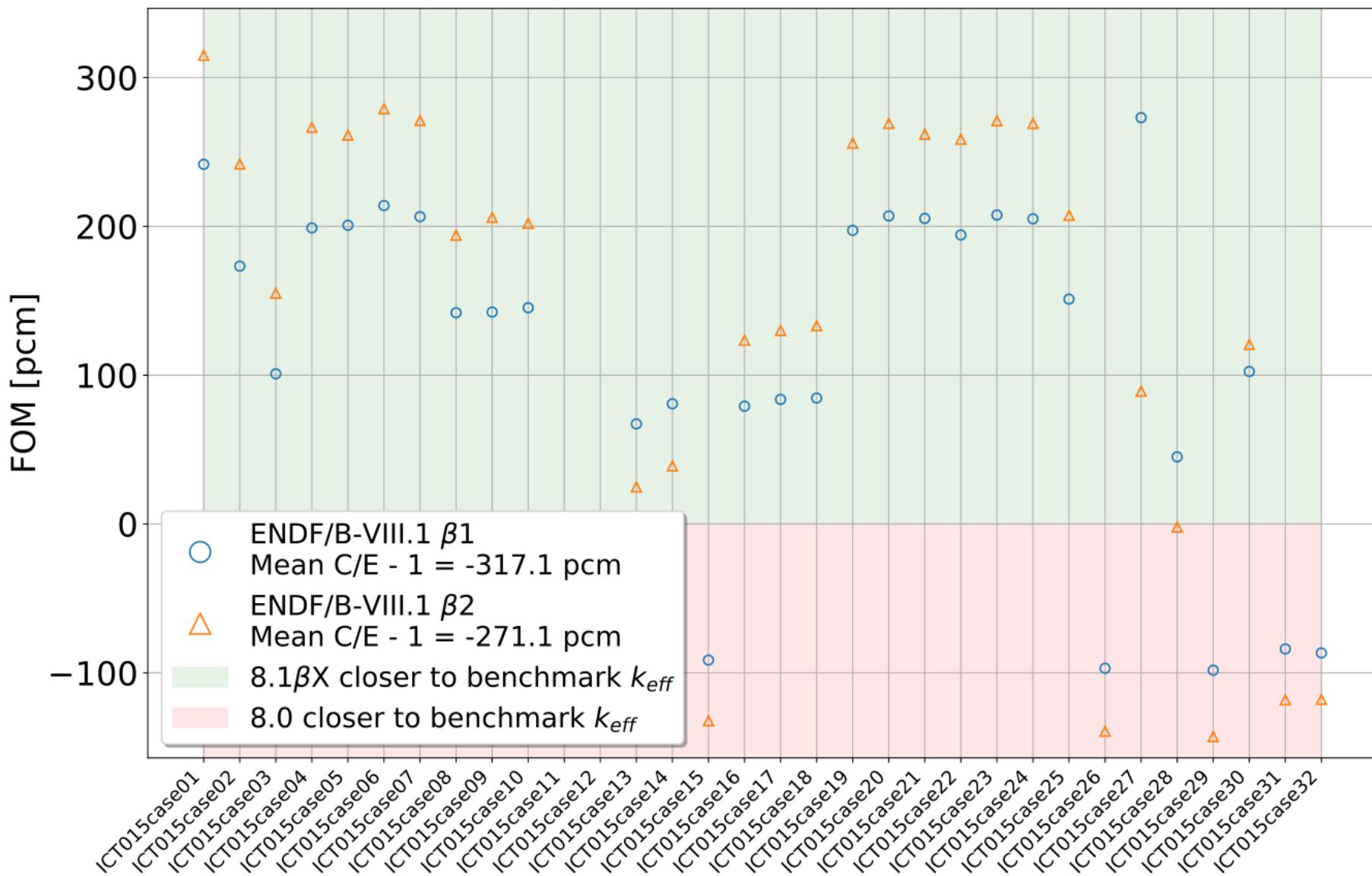
HST Benchmarks ATFF vs. C/E - 1



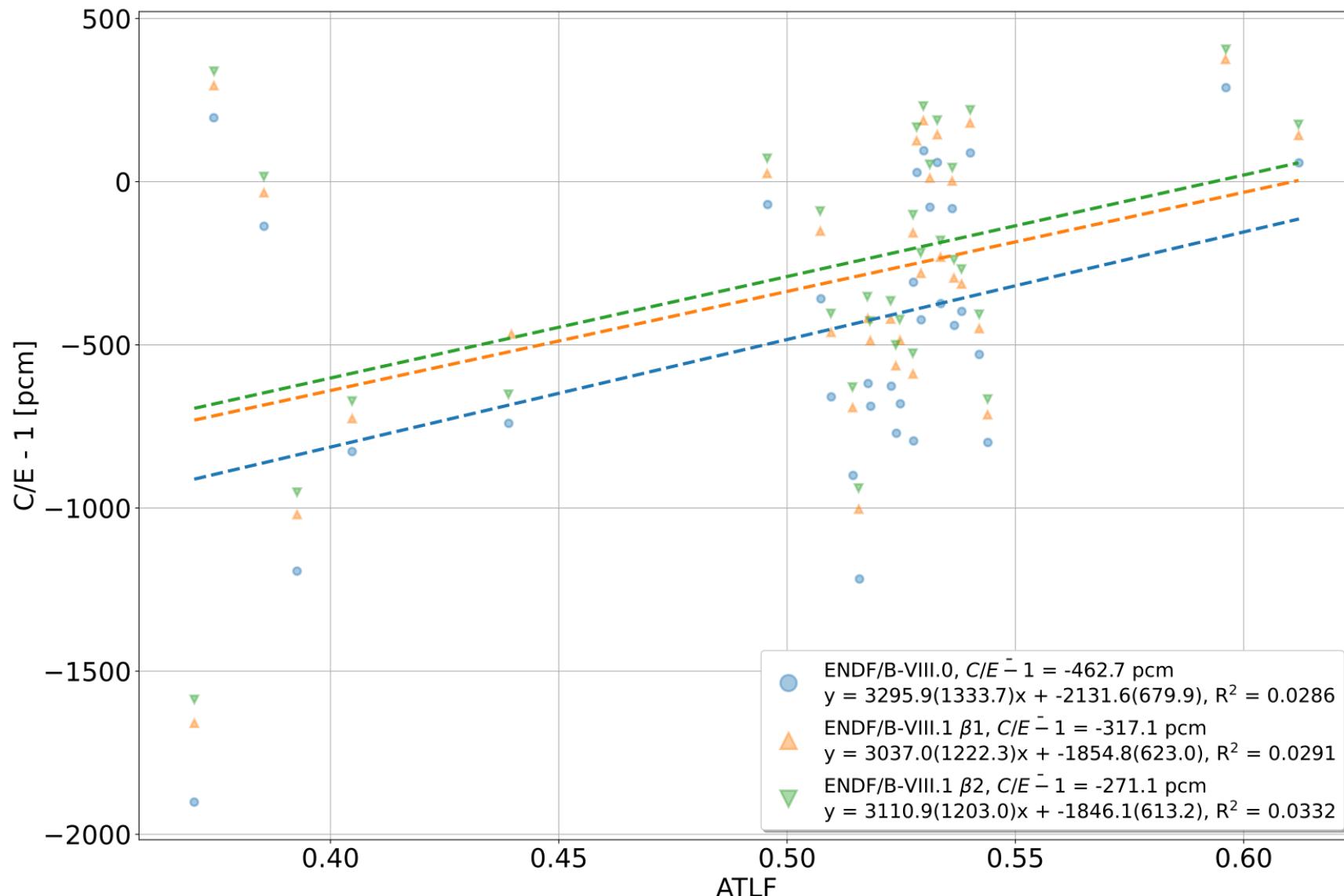
ICT Benchmarks Δk



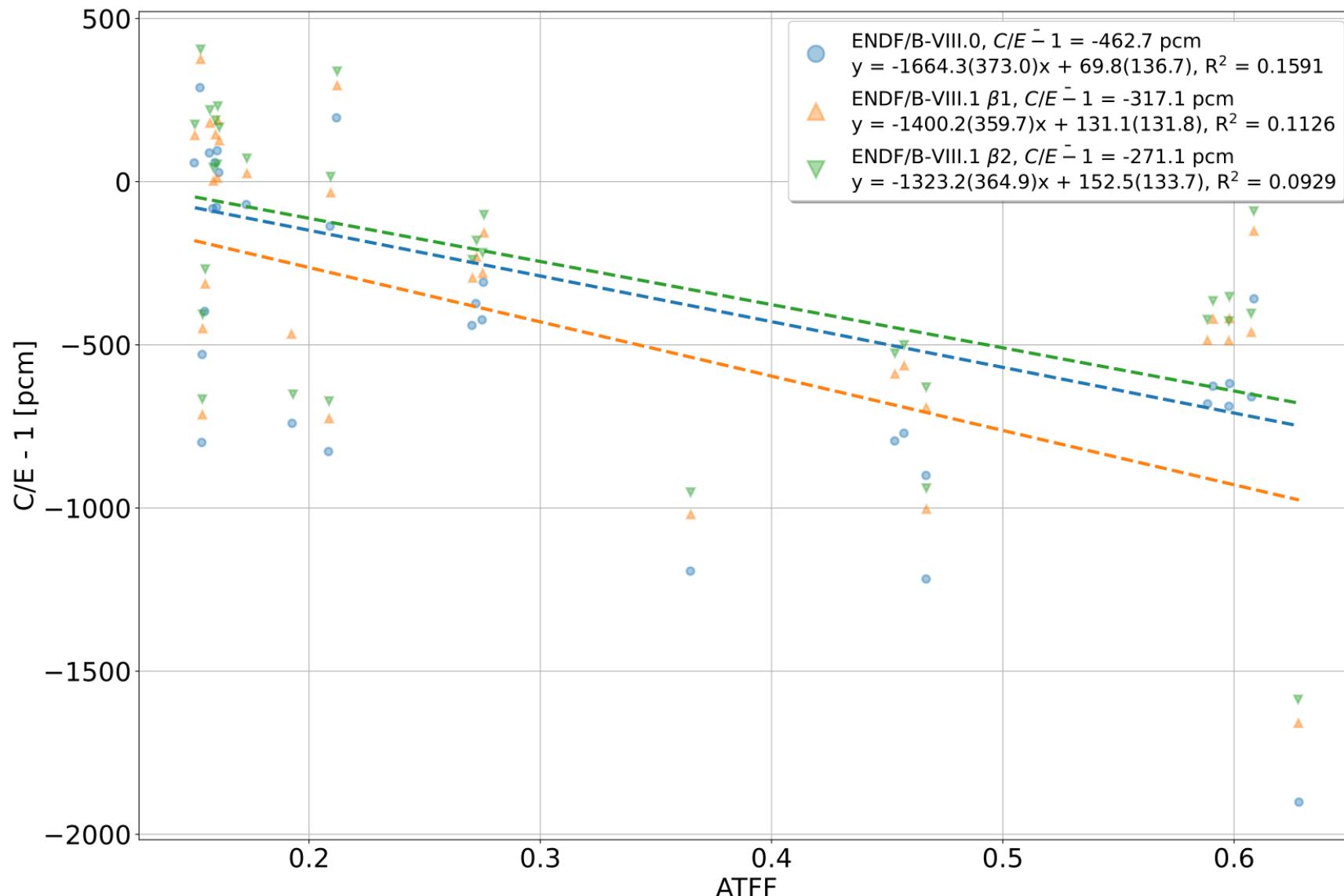
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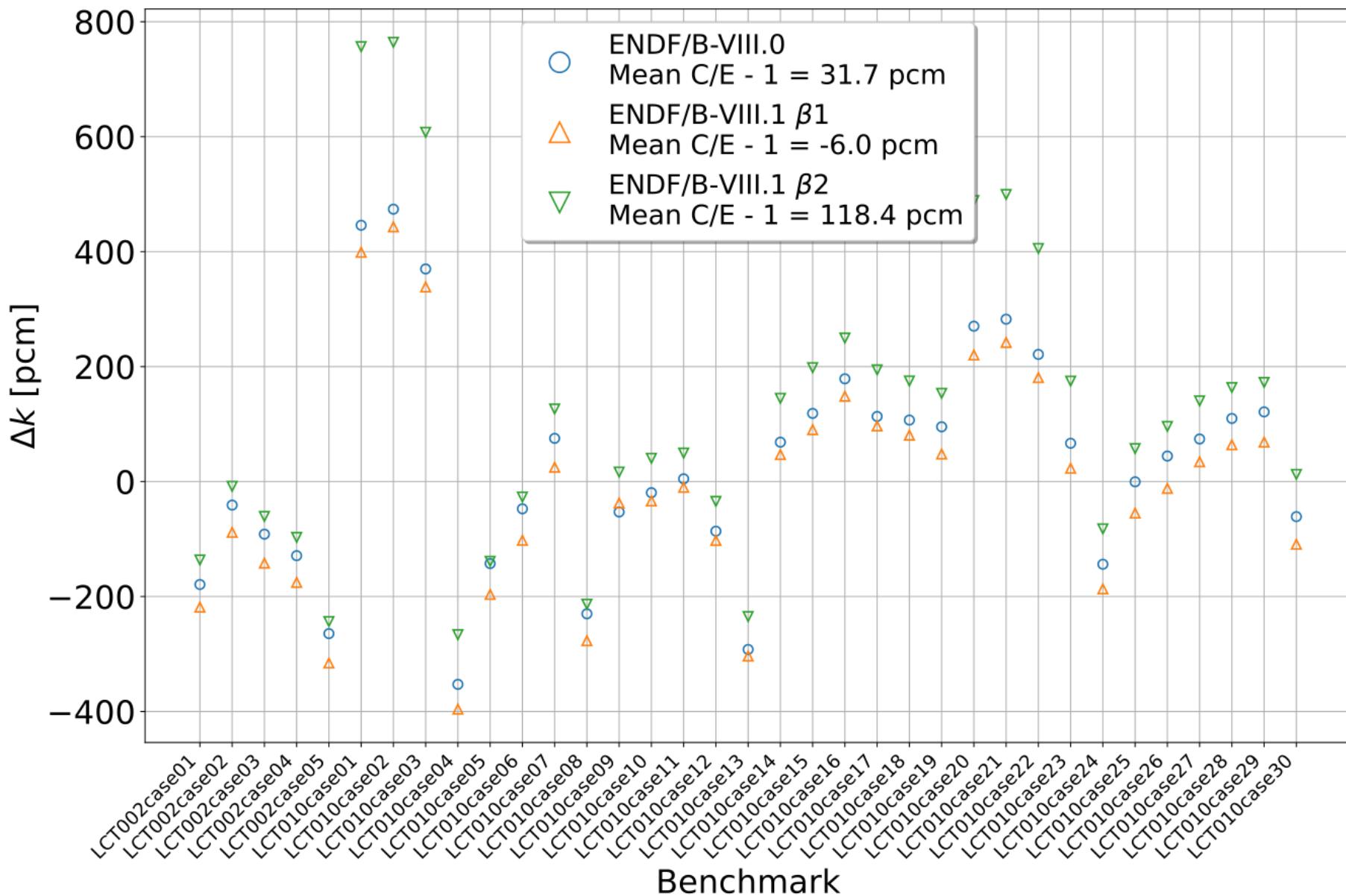
ICT Benchmarks ATLF vs. C/E - 1



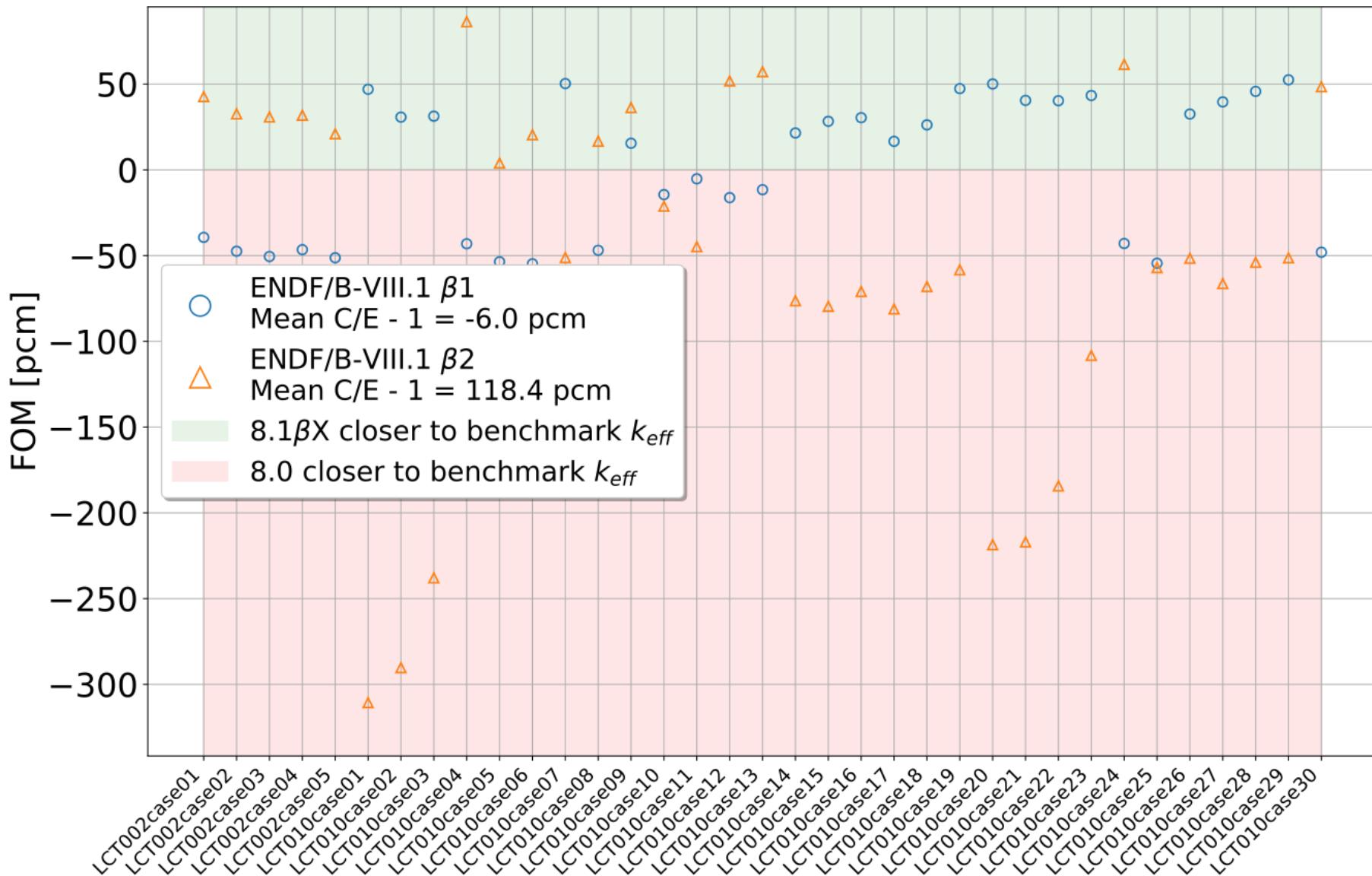
ICT Benchmarks ATFF vs. C/E - 1



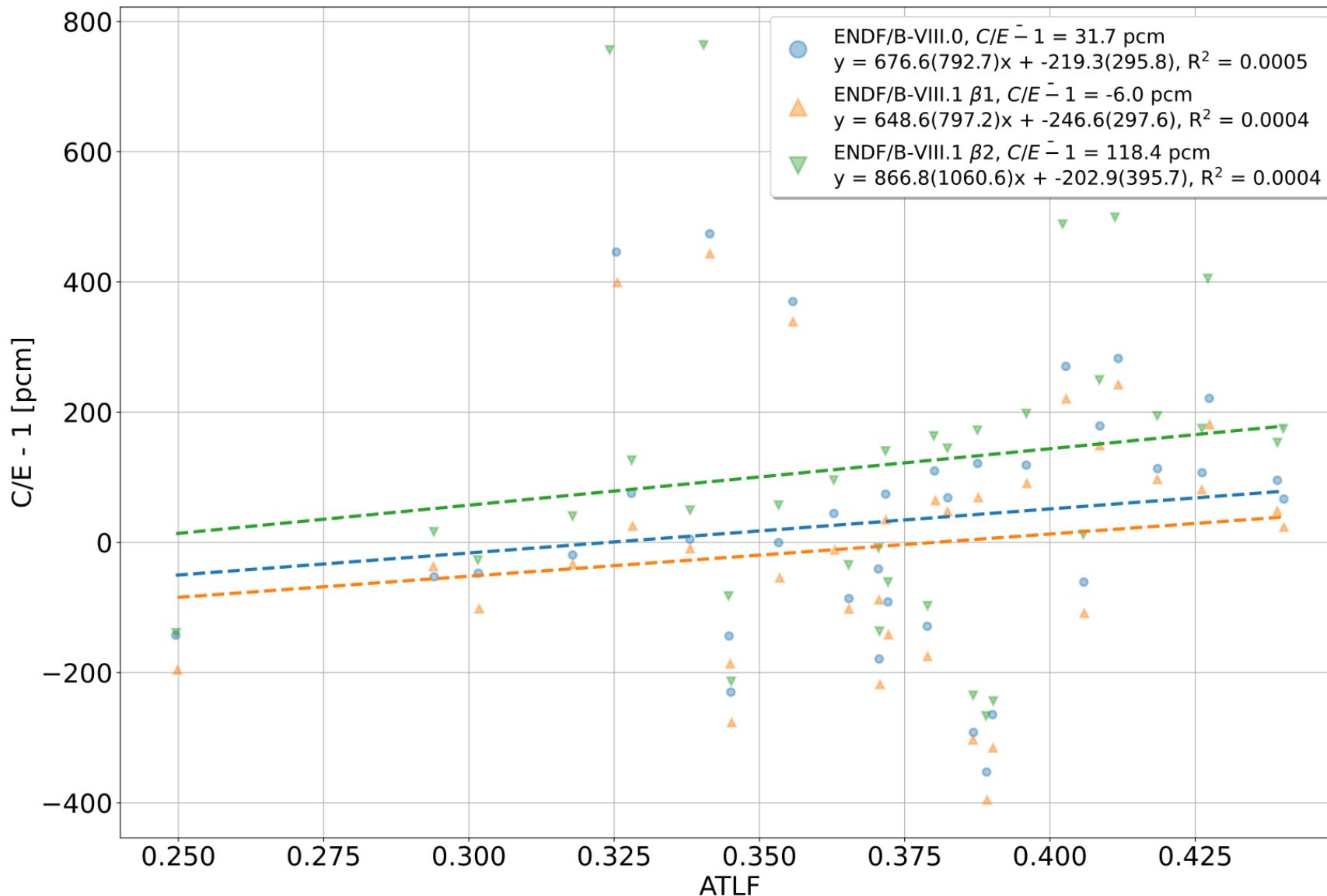
LCT Benchmarks Δk



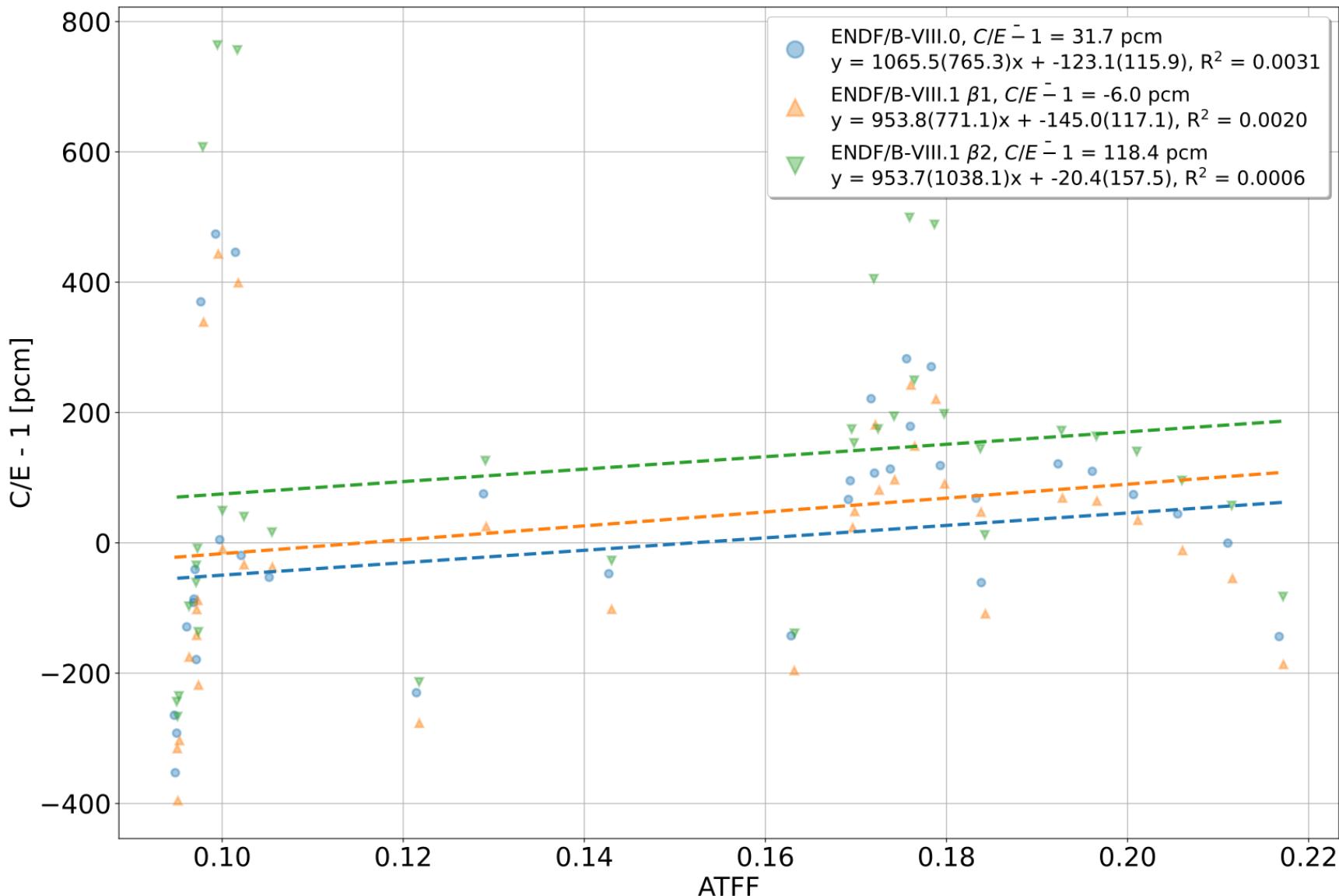
LCT Benchmarks FOM



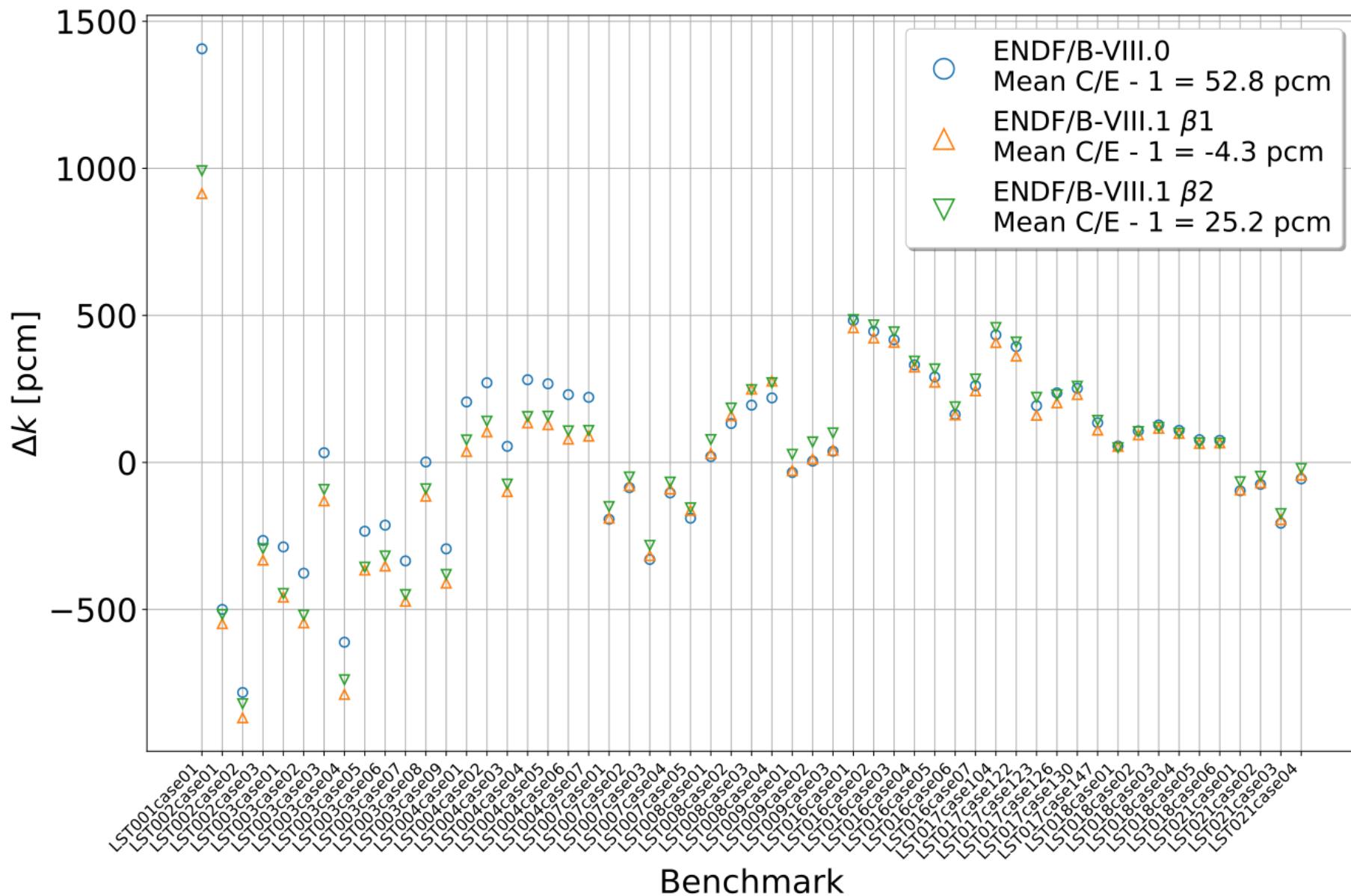
LCT Benchmarks ATLF vs. C/E - 1



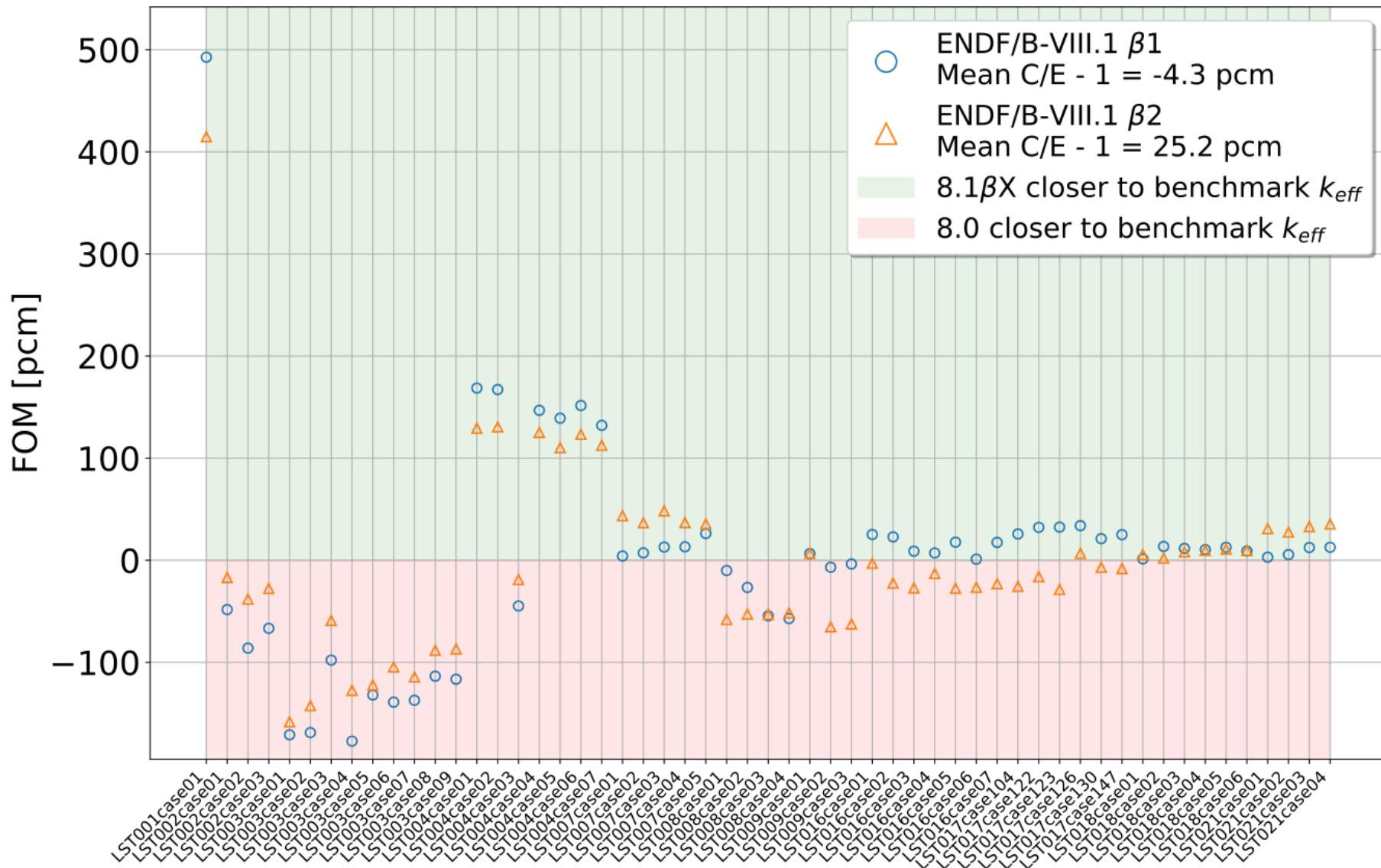
LCT Benchmarks ATFF vs. C/E - 1



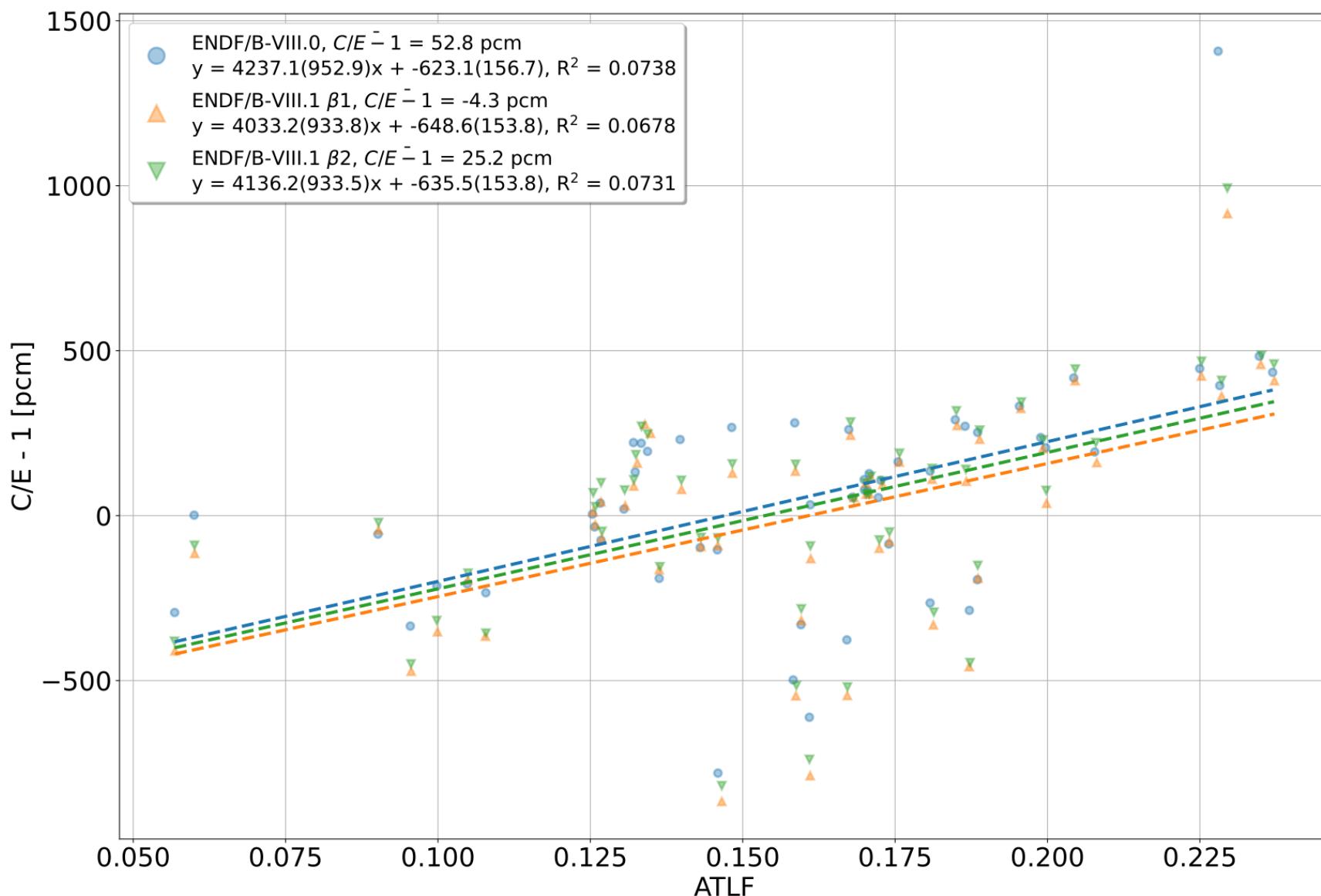
LST Benchmarks Δk



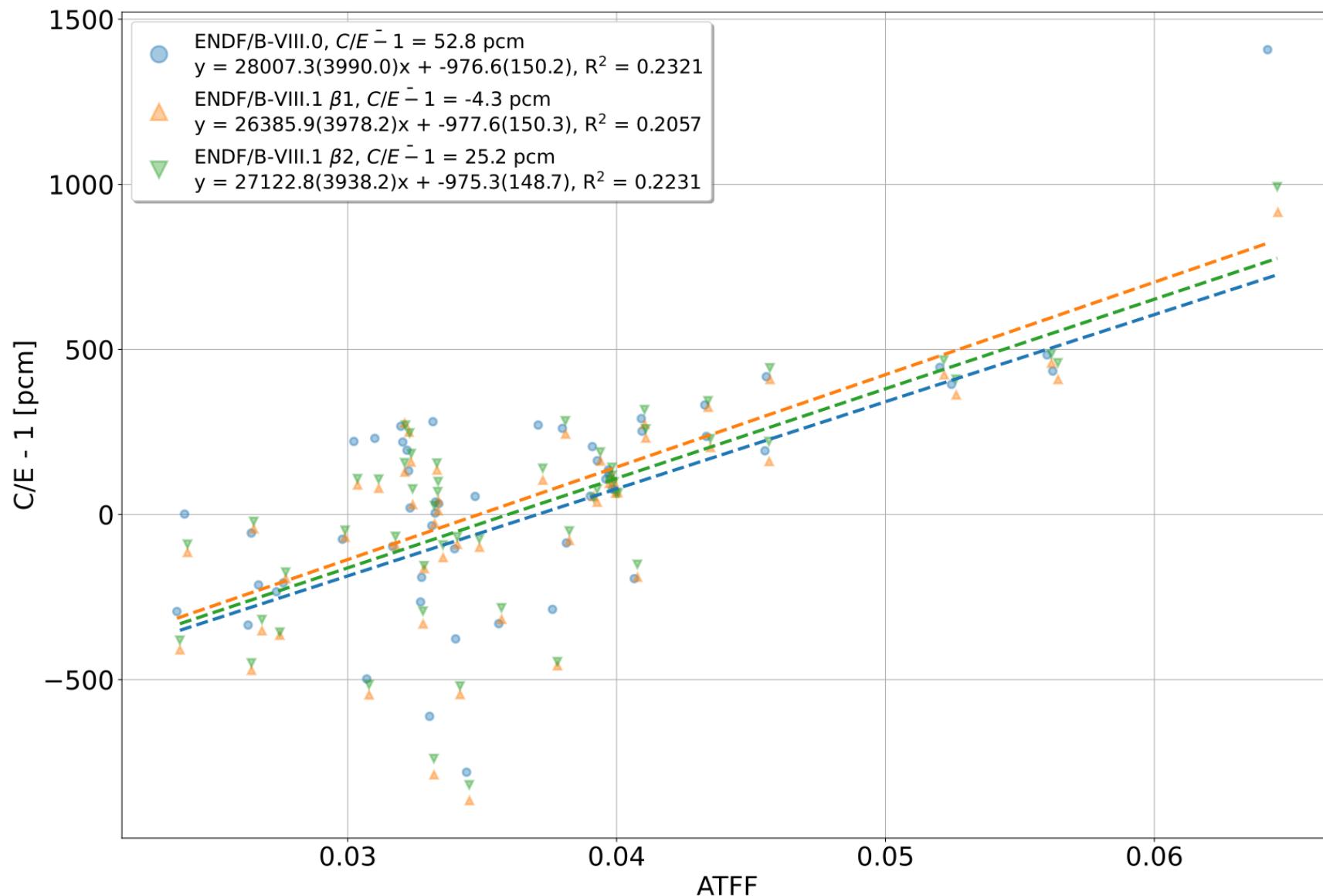
LST Benchmarks FOM



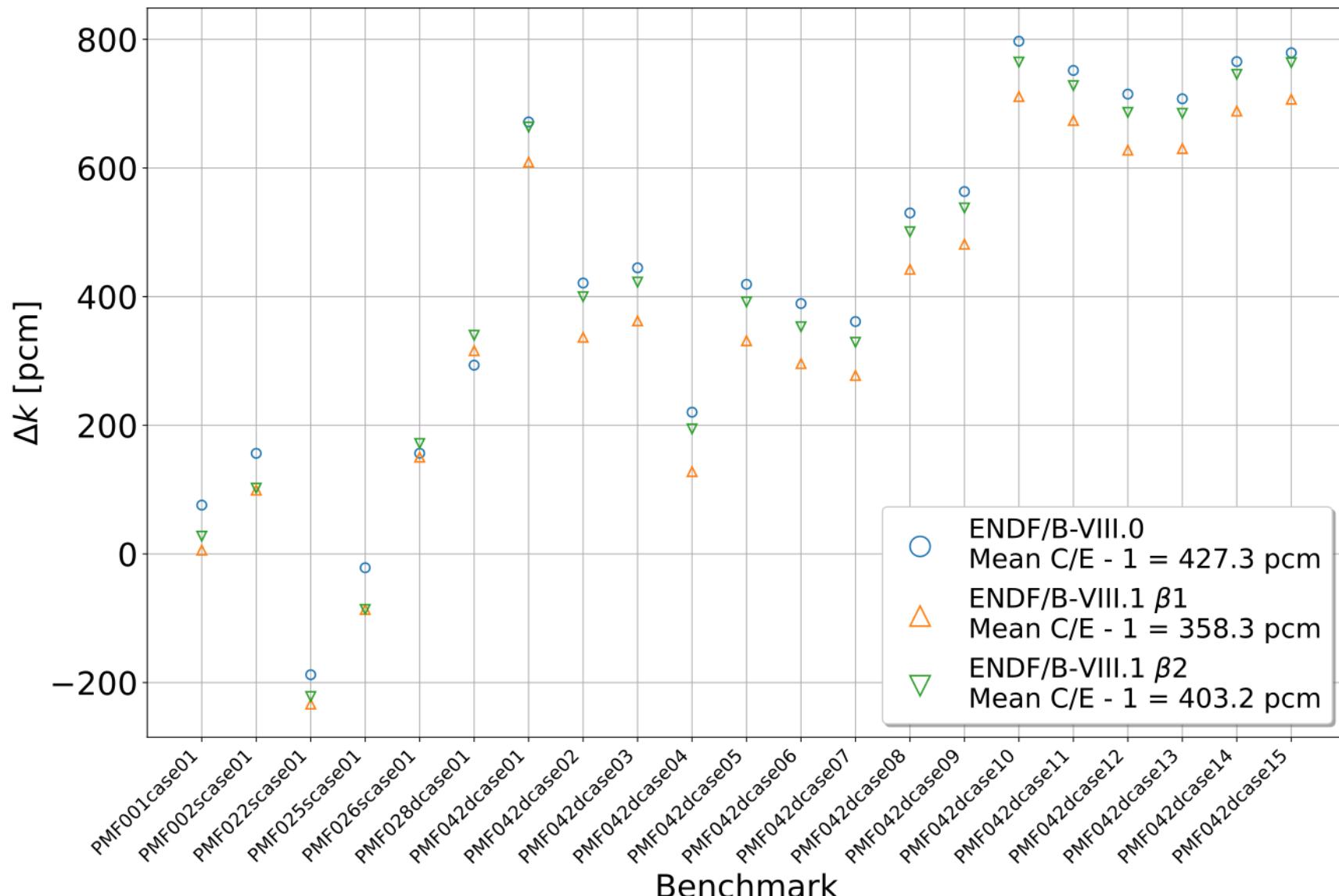
LST Benchmarks ATLF vs. C/E - 1



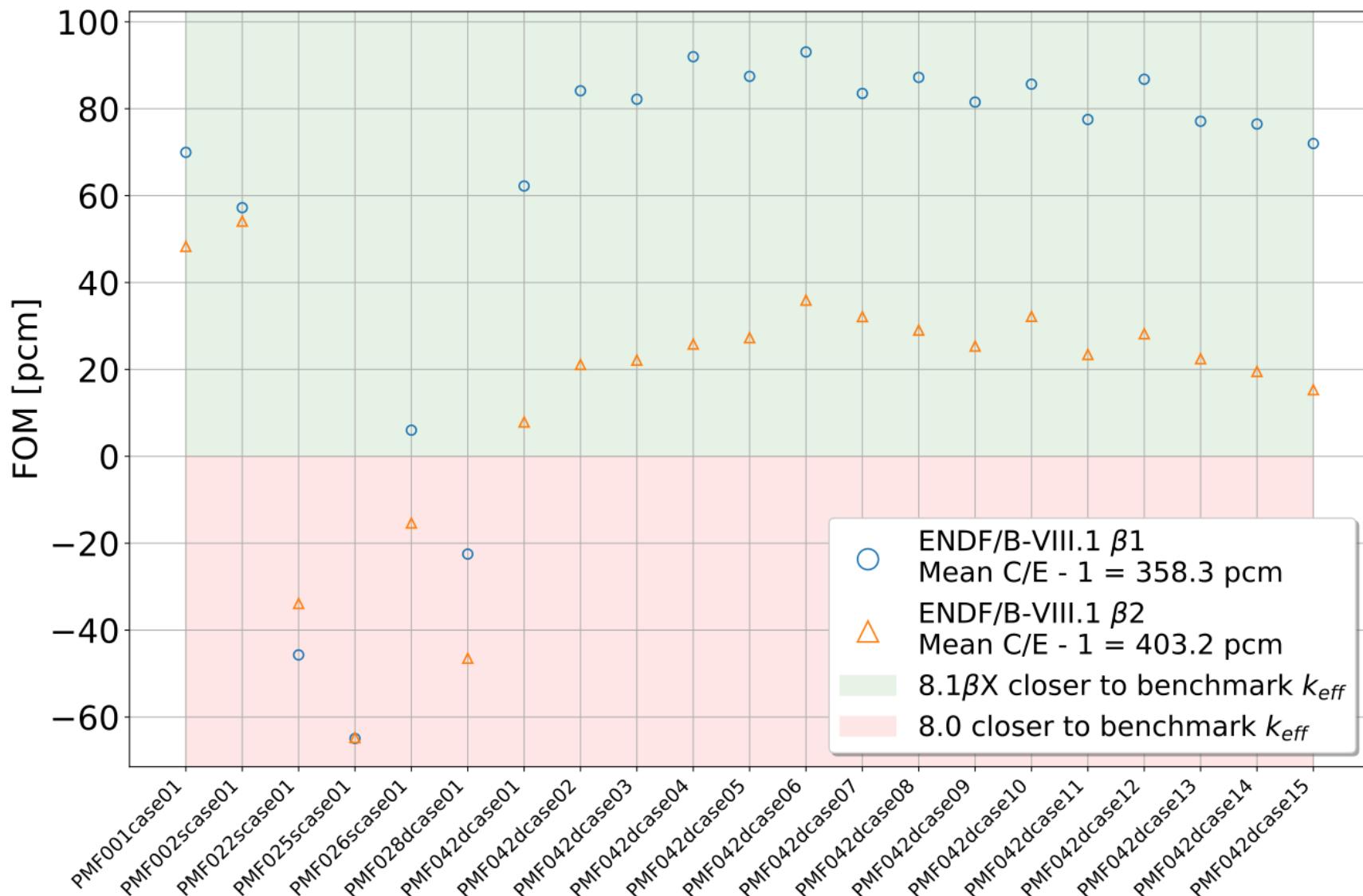
LST Benchmarks ATFF vs. C/E - 1



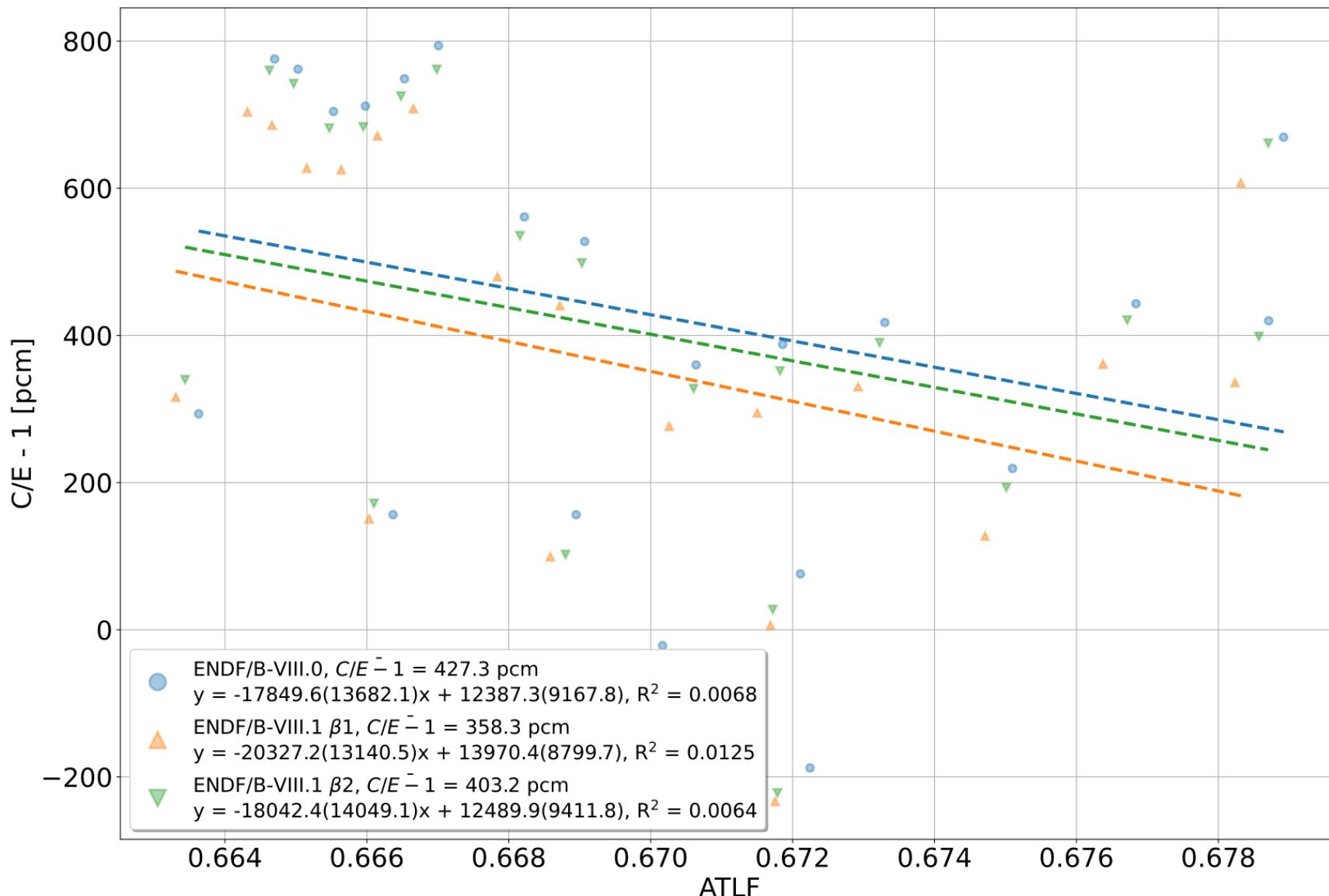
PMF Benchmarks Δk



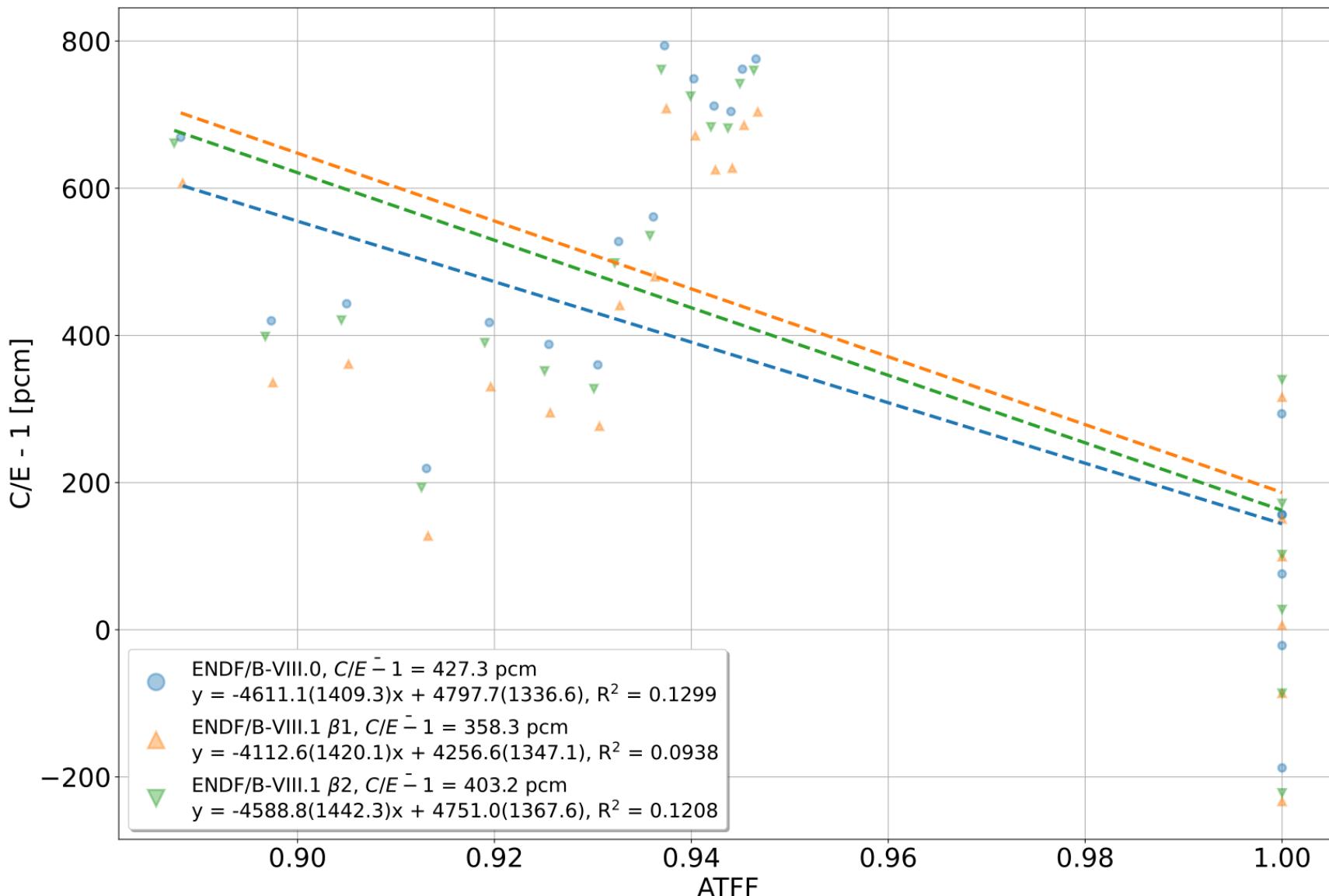
PMF Benchmarks FOM



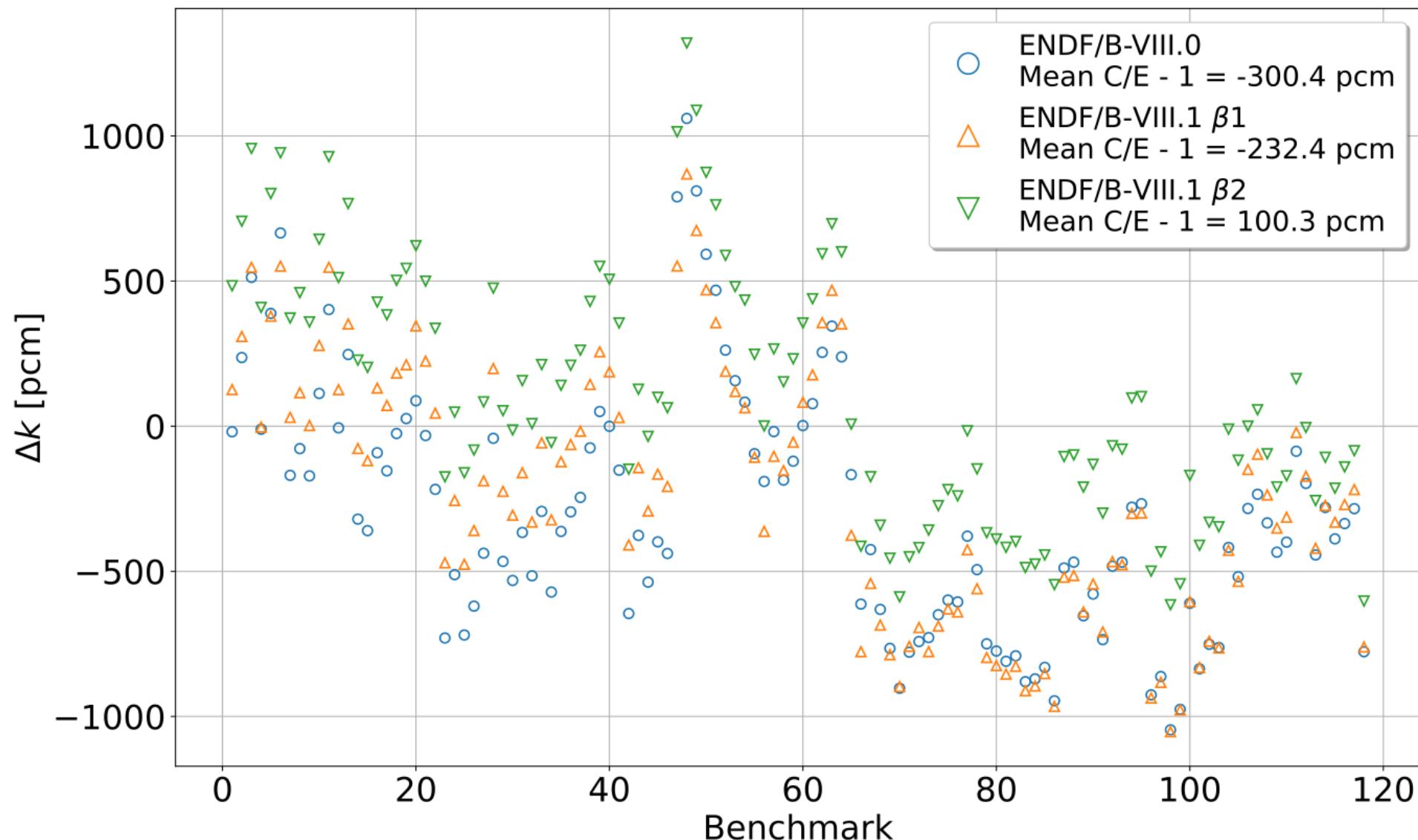
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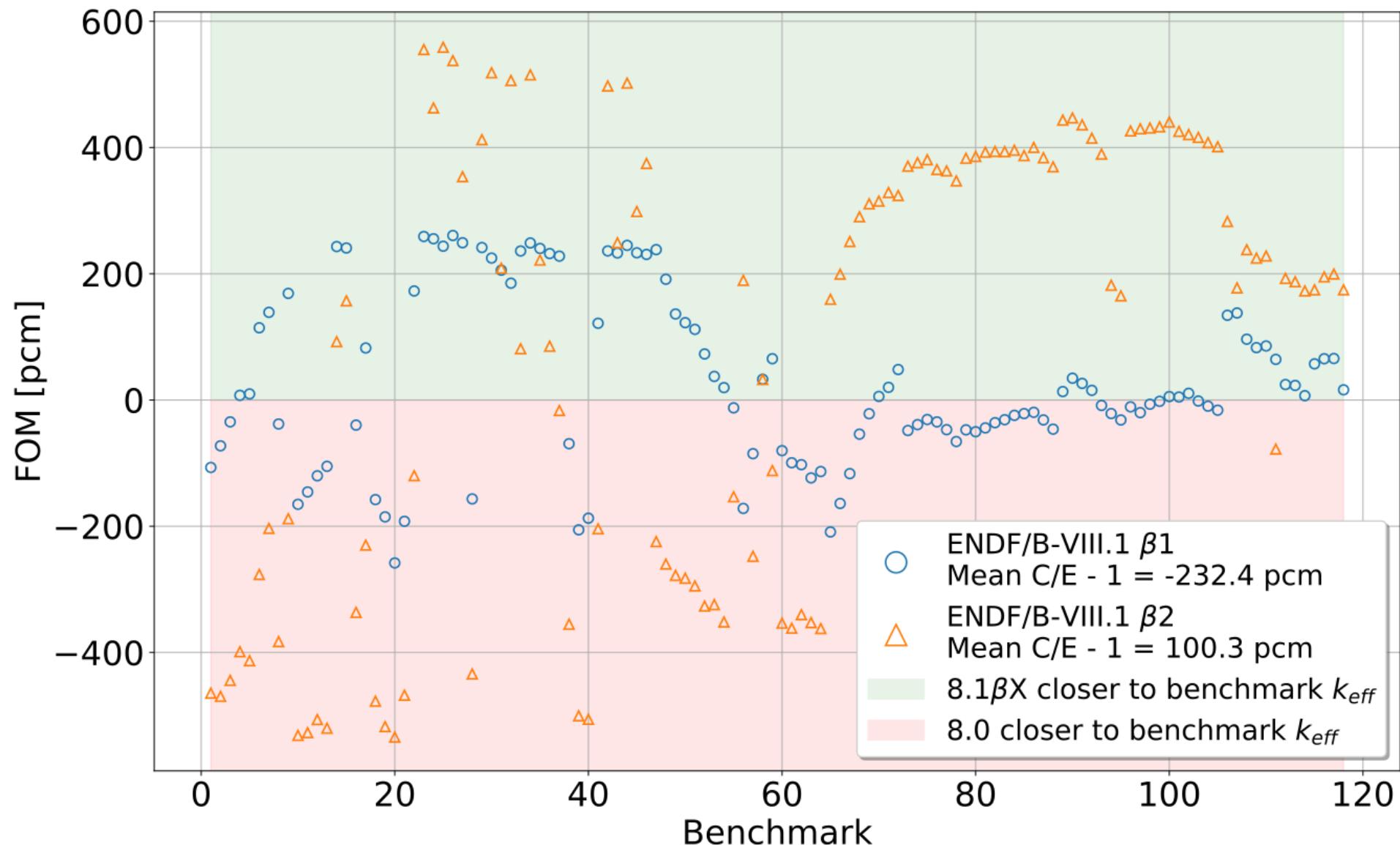
PMF Benchmarks ATFF vs. C/E - 1



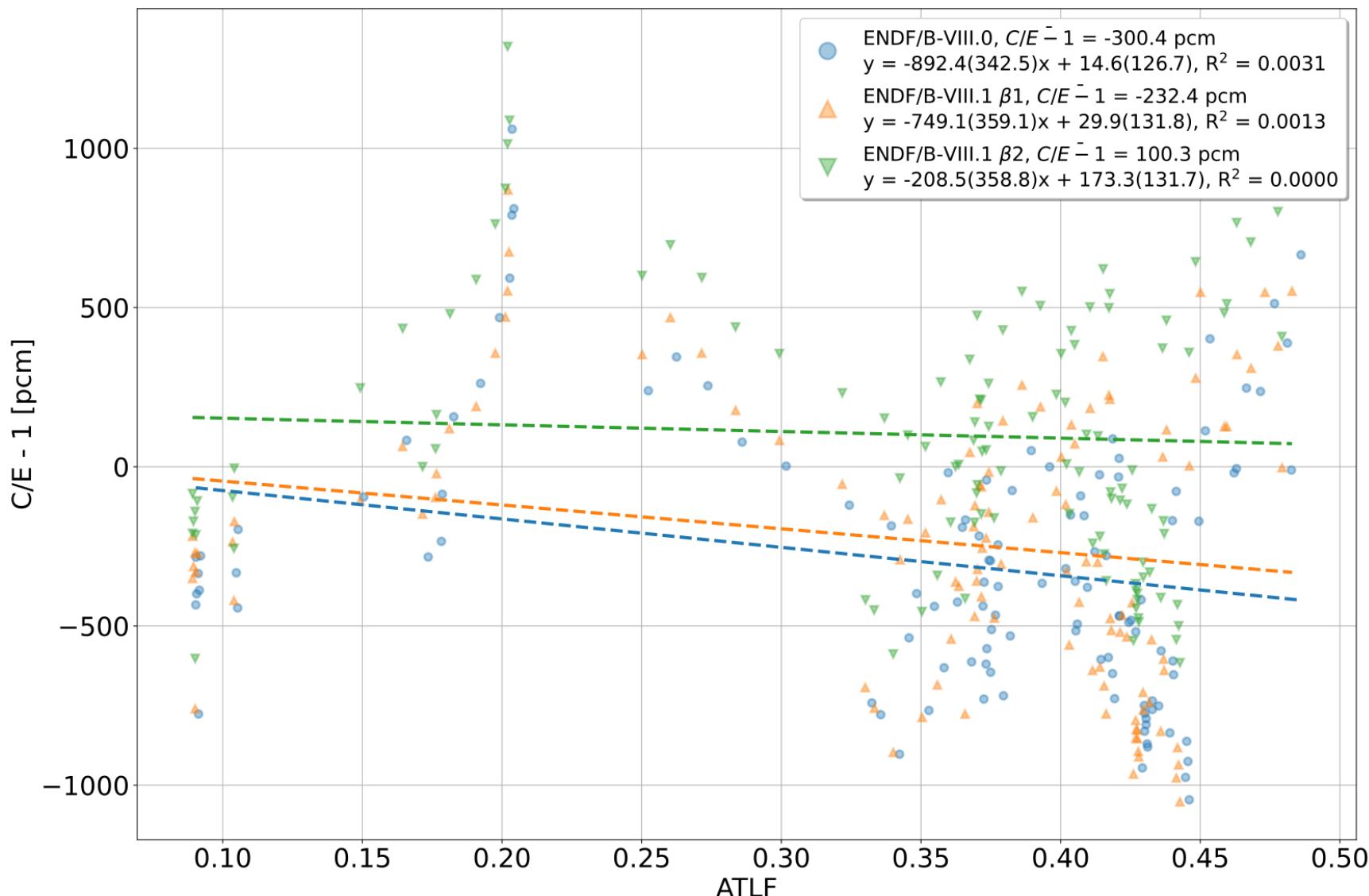
PST Benchmarks Δk



PST Benchmarks FOM



PST Benchmarks ATLF vs. C/E - 1



PST Benchmarks ATFF vs. C/E - 1

