

ePIC Detector Requirements

Discrepancy Report: Chapter 2 preTDR vs. Official EIC Requirements

April 29, 2026 | Prepared with Claude Code

This report documents discrepancies identified in *Chapter 2 (Detector Requirements), Revised Version, April 2026* of the ePIC preTDR. Two classes of discrepancy are reported: **internal** inconsistencies (within the chapter itself) and **external** inconsistencies (between the chapter and the official EIC Detector System Requirements maintained at eic.jlab.org/Detector/, requirement set accessed April 29, 2026).

Internal Discrepancies (within Chapter 2)

D-INT-1 Central Detector η coverage (acknowledged by authors)

Location	Chapter 2 body text, p. 4, line 27–28
Statement in text	“covering the pseudorapidity range $(-3.5, 3.5)$ ”
Conflicting statement	Blue NOTE immediately following: “ <i>in the Project Requirement table the range is -4 to 4</i> ”
Severity	High — scope of the central detector
Notes	The authors have explicitly flagged this as unresolved. The summary table (Fig. 2.1) uses $\eta \in (-4, 4)$ row structure, consistent with the official requirement. The body text must be updated.

D-INT-2 Backward PID momentum reach (text vs. summary table)

Location	Section 2.1.4 text vs. Figure 2.1 summary table
Statement in text	“ $p > 10$ GeV/ c in the backward region”
Statement in table	Backward $\pi/K/p$ separation momentum range: 1–7 GeV/ c
Severity	Medium — the text overstates the backward PID reach by ~ 3 GeV/ c relative to the chapter’s own summary table
Notes	The 7 GeV/ c figure in the table is also consistent with the pFRICH technology described in Section 2.1.4 (proximity-focused RICH with aerogel radiator). The 10 GeV/ c figure in the text appears to be an error.

External Discrepancies (Chapter 2 vs. Official EIC Requirements)

Official requirements are from the EIC Detector System Requirements document (eic.jlab.org/Requirements/DE) which is maintained by the EIC Systems Engineering Group and represents the approved project baseline.

D-EXT-1 Central Detector η coverage

Official requirement	G-DET.5: Central detector covers $\eta \in (-4, +4)$
Chapter 2 text	$\eta \in (-3.5, +3.5)$
Severity	High — same as D-INT-1; the official requirement is the authoritative source
Resolution	Update Chapter 2 body text to $\eta \in (-4, +4)$ throughout

D-EXT-2 Backward PID momentum reach

Official requirement	Backward RICH: $3\sigma \pi/K$ separation up to 7 GeV/ c
Chapter 2 text	Section 2.1.4: “ $p10$ GeV/ c ”
Chapter 2 table	Fig. 2.1: 1–7 GeV/ c (consistent with official)
Severity	Medium — narrative text conflicts with both the official requirement and the chapter’s own table
Resolution	Correct Section 2.1.4 text to read “ $p7$ GeV/ c ”

D-EXT-3 Backward EM calorimetry sampling term

Official requirement	$\sigma_E/E \sim (2--3)\%/\sqrt{E} \oplus (1--2)\%$
Chapter 2 text	$\sigma_E/E \approx 2\%/\sqrt{E} \oplus (1--2)\%$
Severity	Low — the chapter pins the sampling term at 2% rather than the official range of 2–3%; it is more demanding than the official floor
Notes	This may intentionally reflect the chosen PbWO ₄ crystal technology, which exceeds the minimum spec. If so, the chapter should note this explicitly.

D-EXT-4 Barrel/forward EM calorimetry constant term

Official requirement	$\sigma_E/E \sim 10\%/\sqrt{E} \oplus (1--3)\%$
Chapter 2 text	Barrel: $10\%/\sqrt{E} \oplus (2--3)\%$; Forward: $(10--12)\%/\sqrt{E} \oplus (2--3)\%$
Severity	Low — the chapter requires a constant term of at least 2%, while the official spec allows as low as 1%
Notes	As with D-EXT-3, this may reflect technology-driven precision beyond the official minimum. No action required unless the 1% floor is intentional in the official spec (e.g., for a future upgrade scenario).

Summary Table

ID	Type	Parameter	Severity
D-INT-1	Internal	Central detector η coverage (-3.5 vs. -4 to 4)	High
D-INT-2	Internal	Backward PID reach (10 vs. 7 GeV/ c , text vs. table)	Medium
D-EXT-1	External	Central detector η coverage vs. G-DET.5	High
D-EXT-2	External	Backward PID reach vs. official 7 GeV/ c	Medium
D-EXT-3	External	Backward ECAL sampling term (2% vs. $2-3\%$)	<i>Low</i>
D-EXT-4	External	Barrel/fwd ECAL constant term ($2-3\%$ vs. $1-3\%$)	<i>Low</i>

Recommended actions:

1. (**High priority**) Update the Chapter 2 body text to use $\eta \in (-4, +4)$ for the Central Detector coverage, consistent with G-DET.5 and the chapter’s own summary table (D-INT-1 / D-EXT-1).
2. (**Medium priority**) Correct Section 2.1.4 to read “ $p7$ GeV/ c ” for backward PID, consistent with the official requirement and Fig. 2.1 (D-INT-2 / D-EXT-2).
3. (**Low priority**) Clarify whether D-EXT-3 and D-EXT-4 represent intentional technology-driven tightening of the official spec, and if so, add an explanatory note in the chapter.

Sources: *Chapter 2, ePIC preTDR, Revised April 2026*; EIC Detector System Requirements, <https://eic.jlab.org/Requirements>, accessed April 29, 2026.