

Note: Draft v4 reached me in the middle of reading v4. This is why my comments up to and including Section 7.3 are on v3, while everything starting from Section 7.4 refers to v4.

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Line-by-line comments on v3:

- Abstract: "new upgraded" seems redundant → ok, removed „new“
- L68: do you want to include the extension of LS2 until May 2021 → changed to 2021
- Table 1: spurious comma in z position of L2 → fixed
- L136: of course, also L3/4 will stay operational → changed sentence also for FPIX.
- Table 2: remove white space at the end of units in square brackets → fixed
- L170: make spelling consistent with what SINTEF have on their web page: SINTEF Micro-systems and Sensors (capitalization and hyphenation) → ok
- L170: to achieve optimal yield (remove an) → ok
- L231: add comma after  $\mu\text{m}$  → ok
- L282: main changes compared to? → added „compared to PSI46“
- L292: please use correct name of the company and the cyclotron that is used: proton beam at ZAG Zyklotron AG in Karlsruhe, Germany (or: proton beam at the Karlsruher Kompaktzyklotron KAZ) → ok
- L306: maybe: double column unit? → ok
- L328: the section on the PROC600 could be more balanced in two aspects: 1) the discussion of the timing error is much more detailed than anything else in this chapter and could be shortened. 2) the high in-time threshold problem is only discussed much later (L1438) and could be moved here. → Prefer to keep as is. The details for 1) have been added based on previous comments by the reviewers. For 2) we prefer to keep the discussion, in Section 10, since this is where the values of the measured thresholds are discussed.
- L416: use a better verb than to have? e.g. contain? feature? → ok, feature
- L434: remove hyphens in center to center (only needs hyphens if used as adjective) → ok
- L588: remove hyphens in pixel to pixel → ok
- L592: these days most scientific text speak of standard deviation instead of RMS → ok
- Fig 15: axis titles and labels could be larger → ok, increased
- L678/9: two consecutive sentences with "is at", consider rewording → ok, rephrased
- L715: several months (plural) → ok
- L744: a CO<sub>2</sub> cooling plant (don't know how many there are at FNAL) → ok
- L745: suggest to add cross reference to cooling chapter → prefer not to put a reference to the cooling section, since this specific setup is not described there.
- L747: the discussion of the dynamic range of the camera would fit better to the caption of Fig. 21 → ok, moved.
- L922: suggest to remove "so-called" → ok
- L926: Finally, electromagnetic shielding → ok
- Fig. 27: adjust pictures to exactly the same height → ok
- L1044: suggest "mixture returns to the cooling plant" → ok
- L1082: remove hyphen in "in between" (twice) → ok

- L1087: manifolds distribute the liquid (present tense, not present continuous) → ok
- L1092: remove hyphen in "in between" → ok

#### Line-by-line comments on v4:

- L1101: is "intensive" the right word to characterize the tests? → changed to „extensive“
- L1133: suggest to expand "A pilot system for the Phase 1 pixel detector" → ok
- L1135: The pilot system consisted... → ok
- L1183: suggest past tense everywhere: The hub address ... was set → ok
- L1211: unclear what "All components" relates to, better specify this → ok, changed to „All electronics parts of the BPIX readout and power system“
- L1369: "cosmic data" is jargon, suggest at least "cosmic-ray data" → ok
- L1418: RMS -> standard deviation → ok
- L1420: RMS -> standard deviation → ok
- L1438: suggest to introduce the time walk and in-time threshold issue in Section 3.2 → keep it here, but rephrased, such that it does not sound as if we were talking about time walk for the first time here: „Because of time walk, low amplitude signals are delayed beyond the 25 ns time window between LHC collisions. Thus, they appear in the next bunch crossing and are lost for reconstruction...“
- L1506: from pp collisions (just to be clear) → ok
- Fig 43: readers may have difficulties to identify the axis title "Time Delay (ns)" with the term "clock phase" in the caption, suggest to explain this briefly in the caption → changed to „time delay with respect to the LHC clock“
- L1520: mention that this is the replacement for Run 3 → ok, added
- L1524: cosmic-ray and pp collision data → ok
- L1528: microns -> micrometers → ok
- L1529: "ladder/panel level" is a little too concise for the uninitiated reader to bear with you, suggest to expand on this. → instead removed this sentence.
- L1561: in the reconstruction algorithm/step? → step
- L1572: suggest: from the other layers → ok
- L1576: what does "It" relate to? → changed to „the measurement uses..“
- L1589: introduce abbreviation LA here → is introduced already on L231, changed to LA here
- L1590: The LA depends... → ok
- L1628: I would prefer a more quantitative statement than "still far lower" → prefer to keep as is. Just meant as a note, not a quantitative statement.
- L1634: The position resolution is sensitive... → ok
- L1637: In this method, the tracks ... are used to predict... → ok
- L1638: remove hyphen in "in between" → ok
- Fig 48: the light green of the Student-t fit may not display well on projectors, suggest to change into darker green color → to be followed up with Danyyl, will be done if possible.