Reviewer #1: Advancing detector technology in the direction of extremely high timing resolution is one of the key avenues we need to take in order to get ready for the challenges of the next generation of high luminosity machines (HL-LHC, FCC, …). This is true for tracking detectors, but it is even more important for calorimeters where exploiting precision timing is probably the only hope we have to be able to disentangle energy depositions coming from different primary collisions in the same bunch crossing. To be able to do that effectively, we need to obtain timing resolutions of tens of picoseconds or less. This is going to be extremely challenging technologically. To me, this paper is very interesting because it shows that such an extreme timing resolution is not science fiction, but it is possible in practice, at least for a small detector (6x6 mm). So it will still be a long journey before we can demonstrate we can get similar performances from a full size detector,

but this is a very encouraging, very good start.

The paper is well written and easy to read. The scope and the importance of this R&D activity is well justified in the introduction. The characteristics of the detector, how it is operated, the test beam layout, the electronics setup, the procedures for data taking and data analysis are described in detail in the following sections.

I have only a couple of minor suggestions:

1. I suspect that some text on some of the pictures might not be easily readable. It is readable on the printed copy that I have, but I am not sure how it will look on the journal pages. I refer, in particular, to the black on green insert in figure 1 and the vertical and horizontal scale labels in the same figure. Also the font used for all the captions looks a bit too small to me, but this is more a question to the editor than to the authors.

* **Gino made Fig. 1, can he fix this?**
* **Font used in the captions is controlled by Latex, and we hope will be corrected during production.**

2. In the captions for figures 11 and 12, I think one should add the information of the energy of the electron beam. Also the text is not crispy clear for the data shown in fig 11 and that information could be explicitly added somewhere in the paragraph beginning on line 185 at page 9.

* **Done**

Finally, I compliment the authors for a very nice piece of work and I strongly support the publication of this paper.

I leave the decision of whether to follow up on my suggestions to the judgement of the authors and to the editor. I do not need to review this paper further.

* **Thank you!**

Reviewer #2: The paper describes a test-beam study of a prototype calorimetric detector for simultaneous measurement of energy and timing in high-density conditions, suitable for use at the HL-LHC. The problem being addressed is important in the field, and the results reported are relevant, and as far as I know not covered by existing publications, so it is definitely a relevant paper for Nuclear Instruments and Methods A.

The manuscript is extremely clear and complete, and very well written. It describes all needed details of the experimental procedure and the data obtained, and includes a summary discussion of the relevant points. I definitely recommend the paper for acceptance.

Below is a list of minor recommended improvements.

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L46 : should note that this assumes no overlap of multiple events in the same cell.

* **Done, added a footnote**

L53 : here it would be appropriate to cite the work of the CALICE collaboration as well.

* **Done**

L140: could be more clear on what the mentioned electron requirements actually are, and how the quoted purity was determined.

* **Done**

Fig. 8: it would be good to show also the distribution before the correction described in Fig.10 is applied.

* **The difference in time resolution between before and after correction can be seen in Figure 9. We added a sentence “We verify that the time calibration flattens the dependence of the time measurement on the integrated charge, as shown on the right panel of Figure 8, and improves the time resolution measurement by 30-35%.”**

Fig. 9: please specify the number of events entering the plot, and for the right graph, whether these data include the correction of fig.10

* **Added the sentence “Since the electron beam profile and purity varies at different beam energies, we collected between 10 and 50 thousand events for each beam energy, in order to ensure sufficiently large data samples.”**
* **Added sentence “This correction is applied to all time resolution measurements in the rest of this study, unless specified otherwise.”**

L184: I assume the reported resolution is obtained after correcting for signal size as in Fig.10 - please make this explicit in the text, as it is relevant for the practical implementation.

* **See above. We have clarified that all plots are made after correction.**

L188: again it is necessary to explicitly say whether the data in Fig. 11 are already corrected for the effect of Fig.10; and to specify the beam energy as well.

* **Done**

L212-L220: in the final discussion, the need for a correction based on the size of the signal to achieve the quoted time resolution should be mentioned, and some comment made about its possible implementation.

* **We also added a sentence “We find that the time response of the amplifier needs to be well calibrated in order to achieve this result”**

Also, could lateral leakage play any role in the final achievable resolution?

* **Yes, it can. If the shower is not well centered on the active element, the fluctuations will be larger. Since the Moliere radius of Tungsten is about 0.9 cm, we are able to minimize such effects.**

L222 please comment on the comparison of the quoted result with previous literature.

* **TODO: add reference from CERN testbeam**

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