~~1, 2, 3, 4, 6~~, 15 – Insufficient references and insufficient acknowledgement of previous work.

Action:

1. Include references recommended by reviewers + include proper acknowledgements.
2. Find appropriate places to include some extra references.

~~5~~, 7, ~~9~~, ~~11~~ – Insufficient information on experimental procedure

Action:

1. Include furnace graphs of the Nb3Sn coatings for samples and cavity if possible.
2. Include tumbler speed parameter to experimental section.
3. Explain the significance of using alumina particles over silica particles.
4. Include parameters of cavity such as substrate RRR and thickness. 2.8mm and 300RRR initially

~~8~~, 13 – Lacking explanation of figures

Action:

1. Refer to Figures 4 and 5 in the main text and provide detailed explanations for these figures.
2. Expand analysis of figure 8. Specifically address why the curve of the "recoated" cavity follows that of the "as coated" cavity at 4.4 K but not at 2.0 K.

~~10~~, ~~12~~, 14 – Elaborate on discussion

Action:

1. Communicate which parameters of the recoating step have been optimized and mention areas that require further research.
2. Clarify that the procedure has only been tested on a single cavity.
3. Clarify the explanation of the effects of polishing and recoating on cavity performance.

Referee 2:

This study presents a procedure to increase the performance of Nb3Sn cavities using a combination of centrifugal barrel polishing (CBP) followed by recoating. CBP results in a performance degradation while re-coating restores the low field Q to the initial conditions and significantly increases the quench field. It is suggested that CBP creates a smoother surface but exposes tin depleted areas. Tin depleted areas are then healed by the recoating process. This interpretation seems reasonable but other possible interpretations should be discussed as well. While the findings are of great interest for the development of future Nb3Sn cavities, I have several concerns, which should be addressed before I could recommend publication.

- Has it been tried to re-coat a cavity without CBP. Could the performance enhancement simply due to curing of tin depleted regions?

- Even if this could be ruled out, could it be that the performance increase was du to the thinner film and not a lower roughness. This should at least be discussed and potentially tested.

- Furthermore, could it be that the effect of the recoating was rather due to annealing and that the tin did not play the important role? While this might be unlikely, it would be good to discuss this at least.

- It would be important to know what the roughness of the substrate was for samples and cavity.

- There are some technical deficiencies in the paper. Figures 4 and 5 are not mentioned in the text and their content is not discussed to an appropriate level.

- The whole manuscript has very few citations, which are in many cases self citations. I highlight below a few suggestions where I feel more citations would be appropriate but that issue is found throughout the paper.

Specific points

I. Introduction

Paragraph 1: Some references would be appropriate here. Medical applications are not typical for SRF so especially here some references would be appropriate. It is not correct that SRF cavities yield higher gradients than normal conducting cavities.

Paragraph 2: Some low frequency Nb cavities are operated at 4K (LHC, ISAC-II…). Be more specific here. Provide a more comprehensive list of references for the maximum fields instead of a single self citation.

Paragraph 3: Provide references for the process, especially the grain size obtained. Does the Nb3Sn grain size depend on the Nb substrate grain size?

II. Sample study

A Paragraph 1 – 6 g does not look like an appropriate unit. 6G or 60N?

Paragraph 2 - The removal rate of different abrasive materials has been studied by Palczewski, et. al for Nb  mention explicitly that these studies were for Nb

II. D How was the height map obtained? It looks like it was done using confocal microscopy. Please clearly state this. What is the lateral resolution of this technique?

Fig.2: What was the roughness of the substrate without coating. Can this image be added?

Fig. 3: What is the information obtained from the lower figure. Please provide some explanation in the text.

Fig. 7 – A comparison to an as coated sample would be good. If not available, could a literature reference be given. Please provide some information how one can see from the figure that the Nb3Sn layer is disordered for readers less familiar with the technique.

III. POLISHING A NB3SN CAVITY USING CBP

How was the niobium cavity prepared before coating (EP?)? Was the cavity tested before coating? What roughness can be assumed for the substrate?