**General Comments**

1. Yuri, this is a very interesting project. It seems that there are broad applications for new realms of semiconductors. You also have a lot of preliminary work. Congrats on that. For this first round of writing, I have focused primarily on structure. You have much of the text written, but I think if we focus on organization, we can improve the impact of the proposal. Once we have worked together on the overall organization, we can focus on details like grammar and flow. I hope this sounds acceptable.

2. Nevertheless, I tried to compact the writing throughout to simplify for reviewers and save space. Please read through the draft to be sure I have not altered any intent.

3. **Background section**

Lines 38 - 62 seem like an extension of the Background section, especially because the text referenced. I suggest incorporating these lines into the Background section, including line 62, which seems to state your overall goal.

4. **For Research Objectives and Expected Significance (line 37).**

I strongly suggest making this section more explicit. I suggest starting with an opening paragraph stating the overall goals of the research. You plan to achieve these goals via your objectives. For clarity, I suggest a numerical list of your major objectives. I suggest three main objectives if this is a three-year proposal.

For example, “Objective 1. Measuring PB phase metasurfaces. We propose to measure these surfaces using a combination of techniques including approaches A, B, and C”.

Under each numbered Objective, I suggest explicitly stating three items: the objective, a few sentences about how the objective will be achieved experimentally, and a statement of significance for that Objective.

I would end the Objectives section with a statement about how these objectives, in total, will support your overall goal and their significance to the broader field. For example, “Overall, through these objectives, we will understand the physics of TMD that will provide a foundation for practical applications such as x, y and z.” This text will place the major objectives into a focused context for reviewers.

I hope this all makes sense! Being more explicit vis organized lists will simply review. When I review a grant, I often refer to the Objectives list while reading the detailed research plan. This helps to organize my thoughts and clarify whether the experimental plans address the stated objectives.

5. **The Hypotheses section**. This section should explicitly state the hypotheses being addressed by the planned research. For example, “Our three major objectives are designed to test several important hypotheses. First, we hypothesize that by more detailed analysis of TMDs properties we understand the limits of current TMDs. Second, this increased knowledge will permit us to theorize new TMDs with desirable properties”. This is naive language, but the point is to have a proposal that is hypothesis-driven and whose objectives and experimental plan address those hypotheses.

At the end of the Hypotheses section, I suggest stating briefly how the proposal will address these hypotheses and your broader objectives. For example, “By testing these hypotheses, we will determine both the physical properties of our TMDs and develop practical applications”. This connects the hypotheses back to your objectives and introduces for the Proposed Research and Preliminary Results section for a smooth flow of reading.

6. **Proposed Research and Preliminary Results.**

At the beginning of your Proposed Research section, I strongly suggest introductory sentences stating that you will achieve the numbered objectives listed in the Objectives section through a set of specific aims. This would be a numbered list.

For example, “Specific Aim1. Theoretical modeling of the plasmonic metasurface.” You can then provide a one or two-sentence overview of the specific aim.

Overall, I would break down the research plan as a set of Specific Aims. The Specific Aims can also serve as subheadings within the Proposed Research section. I suggest inserting the appropriate preliminary results within each appropriate specific Aims subsection. This will associate specific preliminary results with the corresponding specific proposed research. Discussing specific preliminary results followed by the corresponding planned research under each subheading provides more clarity. As written, the preliminary results are extensive but a bit vague as to how the preliminary results relate to specific research plans. I suggest that an overall tighter organization will permit reviewers to know where they are in the proposal and permit them to reference the Specific Aims list to orient themselves.

As an aside, there is a significant amount of preliminary data presented. A tighter organization may identify Preliminary Results that do not relate directly to the research plan and thus might be removed for simplicity.

7. **Future Plan and Outlook section.**

This section is nicely written and detailed! However, I interpret this section to be future research prospects, if the current proposal is successful. As written, this section is the proposal research plan. Lines 247 - 300 seem like part of the Research Plan and Preliminary Results. If correct, I suggest moving this text to the Research Plan and Preliminary Results section. You can then associate the appropriate proposed research with its preliminary data/figures within the section.

I would then suggest re-writing the Future Plan section to be more forward-thinking in terms of research and applications (beyond the current proposal). This will demonstrate for reviewers your understanding of the broader context of the research, which is an essential component of success.

8. **Research Design and Methods**

This section seems a bit redundant with the Research Plan and Preliminary Results where there should be enough detail to understand the approaches and methods. I suggest therefore that this section may be optional unless there are specific items to be included such as an extended method or permissions that would be long and disrupt the reading flow within the Research Plan and Preliminary Results.

9. **Expected Outcomes and Pitfalls**

I suggest stating what the technical or theoretical pitfalls might be and how you would address them. You very clearly have strong expertise, but reviewers want to see that you understand the risks of the proposal and can address them. As written, the section does not explicitly address pitfalls.

10. **Current Research Infrastructure**

For this section (lines 301 – 341), I suggest making it clear which equipment is required for the project. If it is all needed, then perhaps state that, “We have all equipment and facilities required to make this proposal a success”. If there is unique equipment that enhances the ability of your lab to do this work over others, I suggest noting the equipment (good selling point). To save space, I suggest a numbered list of the equipment, rather than bullet points. This could save half a page of space.

There are two facilities for nanofabrication. For the benefit of reviewers, are they redundant to ensure success or are they utilized for specific types of fabrication?

The personnel and their time commitments would be in the Budget section. Are they redundant here?

11. **Organization more generally (summary)**.

More broadly and incorporating Comments 3 - 6, I strongly suggest tighter organization.

A. Incorporate lines 38-62 as part of the Background.

B. The Research Objectives and Preliminary data section could be re-written using a numerical list of objectives, a summary of how that objective will be achieved, and the Significance of that objective.

C. I would incorporate lines 215 - 232 into the Research Plan and Preliminary data as it seems like a logical extension of that section.

D. I suggest a re-write of the Hypotheses section to state explicitly the hypotheses being tested experimentally. Although ISF directions show a Hypotheses section after the Research Plan, this does not make much sense. Reviewers want to know your hypotheses, and then the conceptual and experimental plans to address them. I suggest placing the Hypotheses section between the Background section and the list of Specific Research Objectives. Alternatively, the Hypotheses can proceed the Research Plan or be incorporated into the Research Plan and Preliminary Results near the beginning of the section.

E. All sections and subheadings should be numbered/lettered for reviewer reference.

12. **Abstract**

We have not added this yet, but for the Abstract, I would suggest some key points.

A. Avoid making the abstract overly technical. Mention key approaches but not detailed methodologies unless they are integral to the proposal.

B. State the significance of the research in the beginning. What are the critical questions?

C. State your hypotheses and how the research addresses them.

D. Provide an overview of the research proposal in terms of objectives and approaches in the middle section.

E. End with a statement of the research contribution to the field and the boarder significance and potential of the research for science or society (ie, better semiconductors).

**Other comments/questions**

1. What is the length of the proposed grant, three years?

2. Currently, the breakdown of section lengths is:

a. Background 1 to 2 pages

b. Research Objectives and Expected Significance 1 page

c. Research Plans and Preliminary Results. 6 pages

d. Hypotheses 0.5 pages

e. Future Research 0.5 pages

3. In terms of overall target emphasis:

a. Background ` 2 or 3 pages

b. Research Objectives and Expected Significance 1 to 2 pages

c. Hypotheses 0.5 to 1 page

d. Research Plan and Preliminary Results 5 to 7 pages

e. Research Design and Methods 1 or pages to provide detail if needed

f. Future Plan and Outlook 1 page or less

g. Current Research Infrastructure 1 to 2 pages

h. Expected outcomes and Pitfalls 1 to 2 pages

i. timeline and misc 1 page

The limit is 15 pages in A4.