View Reviews

0000276393: Open Source Instruments, Inc., Waltham, Massachusetts, United States

PI: Hashemi, Kevan

Proposal Title: Contactless Position Measurement for Highly Reflective Components

Solicitation: DE-FOA-0002991 - FY 2023 Phase II Release 2

Reviewer Category: Reviewer

By Reviewer

Collapse All

Reviewer 1

Criteria

1. Market Opportunity

Please comment on the clarity and strength of the commercialization plan's, milestones, target dates, analyses of market size, and estimated market share after first-year sales. The following optional questions are suggested to guide to your review: Has the company provided a satisfactorily explanation of how it will obtain market share? Is there evidence of customer discovery, such as, inclusion of letters of support validating need, features, opportunity and/or potential customers? Has the company demonstrated a compelling market opportunity? Is there a substantial market value for the company's proposed technology? Are there customers willing to pay for this technology?

The market opportunity for this proposal was well structured, well defined and believable. The company did an excellent job describing its market development strategy and overall plan for expansion and growth in the pursuit of market penetration. Overall a quality description of the market opportunity for this technology combined with insight into potential early market adopters. The customer discovery conducted was noted.

2. Competition/Intellectual Property (IP)

Please comment on the proposed technology's competitive landscape and whether you see it as beneficial to or an impediment to its market entry, growth, and potential for profit. The following optional questions are suggested for your review. Has the company taken steps to secure its IP rights? Does the company's IP offer it a unique or different enough ability to operate freely within a given market? Has the company demonstrated a plan to achieve sufficient IP protection to realize the commercialization stage and possibly attain at least a temporal competitive advantage?

The IP section and competitive section were well done and illustrative. It appears that the company is pursuing an aggressive strategy for IP protection and has conducted appropriate review of literature in the field. At this time it appears that the IP strategy outlined does present the firm with a somewhat unique market advantage and leaves it well positioned for growth into the space. The competitive section was well done and bolstered claims in the proposal.

3. Company/Team

Please comment on the Company/Team's ability to bring its respective innovation or technology to market. The following optional questions are provided for your consideration. Does this company's Phase II team/personnel involved in developing and bringing the innovation to market have the capable experience, proper background, and credentials? In your experience, is the current company capitalization sufficient for implementing its Commercialization Plan? As appropriate and necessary, are there additional resources from which the company can call upon to address team skills or abilities which may be currently lacking, e.g., Board of Directors, technical advisors, or retained legal counsel?

As mentioned the team is very technically focused. It would be helpful to have more business oriented or backgrounded individuals as a part of the team moving forward.

4. Finance and Revenue Model

Please comment on the applicant's projections, assumptions, and overall soundness and quality of the project's finance and revenue models. The following questions are provided for your consideration. Are the costs to complete R&D, product, and production development, design, engineering, and to produce the product or service reasonable and appropriate? Is there any revenue stream (licensing, product sales or other) associated with the Commercialization Plan? Is there evidence of commitment and/or future commitment for funding beyond the Phase II effort (i.e., do they have letters of support from strategic partners, potential customers and/or investors)?

While the finance section was well done from a process perspective, it was unclear if the investment from DOE (multiple of return) would be adequate for the investment made. This should be revisited.

Reviewer 2

Criteria

1. Scientific/Technical Approach

The following questions are suggested to guide your review:

- To what extent does the proposed work build upon or move beyond the current state-of-the-art?

- How new or unique is the idea?

- How significant is the scientific and/or technical challenge?

- Is a breakthrough possible? Has the applicant demonstrated knowledge of the subject?

- How thoroughly have the concepts been presented?

There are separate requirements for Phase II, Phase IIA, and Phase IIB. To see whether this is a Phase II, IIA or IIB application, please click on the arrow located to the left of the Proposal ID number starting with "0000" at the top of this page. This will expand the application information and the application type is listed in the first column of the expanded view.

Please comment on the strength and innovativeness of the idea and the technical approach for the Phase II, Phase IIA, Phase IIB, or Phase IIC project.

Phase II:

- Has the applicant clearly explained how the proposed Phase II research and development builds upon the scope of work originally proposed for their Phase I?

Phase IIA:

- Has the applicant clearly explained how the proposed Phase IIA research and development completes the scope of work originally proposed for their Phase II?

Phase IIB:

- Has the applicant demonstrated that the initial Phase II project will be successfully completed prior to possible receipt of the Phase IIB award? (This is a Phase IIB requirement)

- Has the applicant demonstrated that the proposed Phase IIB research and development builds upon the successful Phase II project to enhance the opportunities for commercialization?

Phase IIC:

- Has the applicant demonstrated that the Phase IIA or Phase IIB project will be successfully completed prior to possible receipt of the Phase IIC award?

- Has the applicant demonstrated that the proposed Phase IIC research and development and proposed activities supported with investor matching funds builds upon the successful Phase II project to enhance the opportunities for commercialization?

I believe OSI made enough progress in Phase I. They identified the problems and described how to tackle them such as rotational alignment of bolt holes and data analysis speed being too low. I think adding a marker at 45 degrees for rotational alignment of the flange is a good idea. Shortening the analysis time seems to be more challenging, but hopefully it can be achieved.

I am not sure if they can achieve the Phase II goals of producing a practical system for at least FNAL SRF cavity assembly in the cleanroom by the end of Phase II, but I certainly hope that it will be accomplished even if it gets delayed a little.

2. Ability to Competently Carry Out the Project

The following questions are suggested to guide your review:

- Please comment on the qualifications of the Principal Investigator (PI), other key staff, and consultants, if any, and on the level of adequacy of equipment and facilities.

- Are the labor hours, for the PI and others, sufficient to accomplish the tasks and justify the total cost? Please comment.

Phase II:

- Please comment on the soundness and level of adequacy of the Phase II work plan to meet the problem or opportunity.

- Please comment on the degree to which the Phase I objectives were met at the time the Phase II grant application was submitted. In your opinion, is the proposed R&D effort sufficient to justify the total cost (line I of the budget page, not including the fee)? E.g., is the cost consistent with that charged for comparable levels of effort by other R&D performers?

Phase IIA or Phase IIB:

- Please comment on the soundness and level of adequacy of the Phase IIA or Phase IIB work plan to meet the problem or opportunity.

- Please comment on the degree to which the Phase II objectives were met at the time the Phase IIA or Phase IIB grant application was submitted. In your opinion, is the proposed R&D effort sufficient to justify the total costs (line I of the budget page, not including the fee)? E.g., is the cost consistent with that charged for comparable levels of effort by other R&D performers?

Phase IIC:

- Please comment on the soundness and level of adequacy of the Phase IIC work plan to meet the problem or opportunity.

- Please comment on the degree to which the Phase IIA or Phase IIB objectives were met at the time the Phase IIC grant application was submitted. In your opinion, is the proposed R&D effort sufficient to justify the total costs (line I of the budget page, not including the fee)? E.g., is the cost consistent with that charged for comparable levels of effort by other R&D performers?

The PI has 27 years of experience of developing systems to measure absolute position of objects such as the Wire Position Sensor at CERN, thus well qualified for leading this project. The 5 month-year work for him seems to be adequate. The Co-PI Dr. Bensinger is a HEP physicist and worked on the experiments in collaboration wit the PI at CERN for a long time and is a board of directors member of OSI giving valuable suggestions for this project. The level of work to be done by the engineers and technicians at OSI looks appropriate. The Co-PI's at FNAL, Dr. Passarelli and Dr. Wu have been involved in the SRF cavity assemblies for a long time, thus they are well qualified for this project. The level of their effort looks reasonable. Also, the level of effort of other personnel at FNAL looks fine.

3. Impact

- Please comment on the appropriateness of the data management plan for the proposed work. Please note that if a data management plan is not included the default data management plan applies. "It is anticipated that all generated digital data will be protected as SBIR/STTR data and therefore will not be publicly shared during the applicable SBIR/STTR data protection period. If any data generated under this award are published, an effort will be made to also release any related digital data that is not protected SBIR/STTR data."

Phase II:

- Please comment on the significance of the technical and/or economic benefits of the proposed work, if successful.

- Please comment on the likelihood that the proposed work could lead to a marketable product or process, and on the size of the potential market.

- Please comment on the likelihood that the project will attract further development funding (from private sector sources or from Federal, non-SBIR/STTR sources) after the SBIR/STTR project expires.

Phase IIA or Phase IIB:

- Please comment on the significance of the technical and/or economic benefits of the proposed work, if successful.

- Please comment on the likelihood that the proposed work could lead to a marketable product or process, and on the size of the potential market.

- Please comment on the likelihood that the project will attract further development funding (from private sector sources or from Federal, non-SBIR/STTR sources) after the SBIR/STTR project expires.

Phase IIC:

- Please comment on the significance of the technical, economic, and/or societal benefits of the proposed work, if successful.

- Please comment on the likelihood that the proposed work, and the work accomplished with matching funds, could lead to a marketable product or process, and on the size of the potential market.

- Please comment on the likelihood that the project will attract further development funding (from private sector sources or from Federal, non-SBIR/STTR sources) after the SBIR/STTR project expires.

- Please comment on the expectations of the third party investor providing the matching funds.

In the future, we need to assemble SRF cavities in the cleanroom without any human activities to improve the reliability of cavity performance since most of the cavity performance degradation is due to the particulates generated by human activities. In this sense, this project and resulting system to detect and record the positions of shiny objects such as SS flanges without human activities in the cleanroom will be an important part of this future goal and it has a high impact on the reliable final production of SRF accelerator modules.

Reviewer 3

Criteria

1. Scientific/Technical Approach

The following questions are suggested to guide your review:

- To what extent does the proposed work build upon or move beyond the current state-of-the-art?

- How new or unique is the idea?

- How significant is the scientific and/or technical challenge?

- Is a breakthrough possible? Has the applicant demonstrated knowledge of the subject?

- How thoroughly have the concepts been presented?

There are separate requirements for Phase II, Phase IIA, and Phase IIB. To see whether this is a Phase II, IIA or IIB application, please click on the arrow located to the left of the Proposal ID number starting with "0000" at the top of this page. This will expand the application information and the application type is listed in the first column of the expanded view.

Please comment on the strength and innovativeness of the idea and the technical approach for the Phase II, Phase IIA, Phase IIB, or Phase IIC project.

Phase II:

- Has the applicant clearly explained how the proposed Phase II research and development builds upon the scope of work originally proposed for their Phase I?

Phase IIA:

- Has the applicant clearly explained how the proposed Phase IIA research and development completes the scope of work originally proposed for their Phase II?

Phase IIB:

- Has the applicant demonstrated that the initial Phase II project will be successfully completed prior to possible receipt of the Phase IIB award? (This is a Phase IIB requirement)

- Has the applicant demonstrated that the proposed Phase IIB research and development builds upon the successful Phase II project to enhance the opportunities for commercialization?

Phase IIC:

- Has the applicant demonstrated that the Phase IIA or Phase IIB project will be successfully completed prior to possible receipt of the Phase IIC award?

- Has the applicant demonstrated that the proposed Phase IIC research and development and proposed activities supported with investor matching funds builds upon the successful Phase II project to enhance the opportunities for commercialization?

This phase II proposal is a clear extension of the phase I work, going from proof-of-concept to prototype.
This prototype would be a break through for HEP string assembly. The concepts have be thoroughly and clearly presented.

2. Ability to Competently Carry Out the Project

The following questions are suggested to guide your review:

- Please comment on the qualifications of the Principal Investigator (PI), other key staff, and consultants, if any, and on the level of adequacy of equipment and facilities.

- Are the labor hours, for the PI and others, sufficient to accomplish the tasks and justify the total cost? Please comment.

Phase II:

- Please comment on the soundness and level of adequacy of the Phase II work plan to meet the problem or opportunity.

- Please comment on the degree to which the Phase I objectives were met at the time the Phase II grant application was submitted. In your opinion, is the proposed R&D effort sufficient to justify the total cost (line I of the budget page, not including the fee)? E.g., is the cost consistent with that charged for comparable levels of effort by other R&D performers?

Phase IIA or Phase IIB:

- Please comment on the soundness and level of adequacy of the Phase IIA or Phase IIB work plan to meet the problem or opportunity.

- Please comment on the degree to which the Phase II objectives were met at the time the Phase IIA or Phase IIB grant application was submitted. In your opinion, is the proposed R&D effort sufficient to justify the total costs (line I of the budget page, not including the fee)? E.g., is the cost consistent with that charged for comparable levels of effort by other R&D performers?

Phase IIC:

- Please comment on the soundness and level of adequacy of the Phase IIC work plan to meet the problem or opportunity.

- Please comment on the degree to which the Phase IIA or Phase IIB objectives were met at the time the Phase IIC grant application was submitted. In your opinion, is the proposed R&D effort sufficient to justify the total costs (line I of the budget page, not including the fee)? E.g., is the cost consistent with that charged for comparable levels of effort by other R&D performers?

The PI and key staff are qualified based on their past experience and projects in this area. The equipment and facilities are adequate to complete the work of Phase II.

Labor hours are sufficient to accomplish the Phase II tasks.

This proposal outlines a competent and logical plan for phase II. The first year will be building a manual prototype to test and gain feedback in the field. The second year will be a full autonomous prototype that incorporates the feedback from the field tests. The field tests will be completed in collaboration with a active High Energy Physics location that does string assembly.

Phase I was adequately completed by successfully demonstrating a proof of concept. In my opinion, the R&D effort is sufficient to justify the total cost.

3. Impact

- Please comment on the appropriateness of the data management plan for the proposed work. Please note that if a data management plan is not included the default data management plan applies. "It is anticipated that all generated digital data will be protected as SBIR/STTR data and therefore will not be publicly shared during the applicable SBIR/STTR data protection period. If any data generated under this award are published, an effort will be made to also release any related digital data that is not protected SBIR/STTR data."

Phase II:

- Please comment on the significance of the technical and/or economic benefits of the proposed work, if successful.

- Please comment on the likelihood that the proposed work could lead to a marketable product or process, and on the size of the potential market.

- Please comment on the likelihood that the project will attract further development funding (from private sector sources or from Federal, non-SBIR/STTR sources) after the SBIR/STTR project expires.

Phase IIA or Phase IIB:

- Please comment on the significance of the technical and/or economic benefits of the proposed work, if successful.

- Please comment on the likelihood that the proposed work could lead to a marketable product or process, and on the size of the potential market.

- Please comment on the likelihood that the project will attract further development funding (from private sector sources or from Federal, non-SBIR/STTR sources) after the SBIR/STTR project expires.

Phase IIC:

- Please comment on the significance of the technical, economic, and/or societal benefits of the proposed work, if successful.

- Please comment on the likelihood that the proposed work, and the work accomplished with matching funds, could lead to a marketable product or process, and on the size of the potential market.

- Please comment on the likelihood that the project will attract further development funding (from private sector sources or from Federal, non-SBIR/STTR sources) after the SBIR/STTR project expires.

- Please comment on the expectations of the third party investor providing the matching funds.

Data management is adequate. All data will be publicly available on the company's website. All work is open source.

If successful, this work will have a significant impact on the area of HEP. And potential future impact in the area of fusion reactors.

The final product is marketable to HEP locations, which is a smaller but active market.

It seems that if Fusion Reactor research continues on it's path, that is an avenue for further development that could attract outside funding.

OSI has a path forward for marketing this new product that they have already begun working on.

Reviewer 4

Criteria

1. Scientific/Technical Approach

The following questions are suggested to guide your review:

- To what extent does the proposed work build upon or move beyond the current state-of-the-art?

- How new or unique is the idea?

- How significant is the scientific and/or technical challenge?

- Is a breakthrough possible? Has the applicant demonstrated knowledge of the subject?

- How thoroughly have the concepts been presented?

There are separate requirements for Phase II, Phase IIA, and Phase IIB. To see whether this is a Phase II, IIA or IIB application, please click on the arrow located to the left of the Proposal ID number starting with "0000" at the top of this page. This will expand the application information and the application type is listed in the first column of the expanded view.

Please comment on the strength and innovativeness of the idea and the technical approach for the Phase II, Phase IIA, Phase IIB, or Phase IIC project.

Phase II:

- Has the applicant clearly explained how the proposed Phase II research and development builds upon the scope of work originally proposed for their Phase I?

Phase IIA:

- Has the applicant clearly explained how the proposed Phase IIA research and development completes the scope of work originally proposed for their Phase II?

Phase IIB:

- Has the applicant demonstrated that the initial Phase II project will be successfully completed prior to possible receipt of the Phase IIB award? (This is a Phase IIB requirement)

- Has the applicant demonstrated that the proposed Phase IIB research and development builds upon the successful Phase II project to enhance the opportunities for commercialization?

Phase IIC:

- Has the applicant demonstrated that the Phase IIA or Phase IIB project will be successfully completed prior to possible receipt of the Phase IIC award?

- Has the applicant demonstrated that the proposed Phase IIC research and development and proposed activities supported with investor matching funds builds upon the successful Phase II project to enhance the opportunities for commercialization?

The proposal describes a natural next step to take the conceptual work completed during Phase 1 and expand it into a physical prototype within Phase 2. The proposer demonstrates a clear proof-of-concept for the idea of silhouette-based object identification of the highly reflective objects required in SRF cavity assembly, and expanding to utilize that approach into a directly useful application for cavity assembly with a working prototype is an important engineering step towards development of a viable product.

Given the challenges of dealing with vision systems and highly reflective components, this is an extremely significant challenge, and the proposal does well to highlight the technical issues present with the application. The results of the Phase 1 work presented demonstrate solid progress towards the original goals laid out in the proposal, and the system does appear to be adaptable to the proposed SRF assembly problem, although there remain some large challenges to solve with the approach.

Based on the information presented, and the work completed in Phase 1, I do believe a breakthrough is possible within this proposal, although some of the proposed solutions would likely present issues with eventual commercialization of the system.

2. Ability to Competently Carry Out the Project

The following questions are suggested to guide your review:

- Please comment on the qualifications of the Principal Investigator (PI), other key staff, and consultants, if any, and on the level of adequacy of equipment and facilities.

- Are the labor hours, for the PI and others, sufficient to accomplish the tasks and justify the total cost? Please comment.

Phase II:

- Please comment on the soundness and level of adequacy of the Phase II work plan to meet the problem or opportunity.

- Please comment on the degree to which the Phase I objectives were met at the time the Phase II grant application was submitted. In your opinion, is the proposed R&D effort sufficient to justify the total cost (line I of the budget page, not including the fee)? E.g., is the cost consistent with that charged for comparable levels of effort by other R&D performers?

Phase IIA or Phase IIB:

- Please comment on the soundness and level of adequacy of the Phase IIA or Phase IIB work plan to meet the problem or opportunity.

- Please comment on the degree to which the Phase II objectives were met at the time the Phase IIA or Phase IIB grant application was submitted. In your opinion, is the proposed R&D effort sufficient to justify the total costs (line I of the budget page, not including the fee)? E.g., is the cost consistent with that charged for comparable levels of effort by other R&D performers?

Phase IIC:

- Please comment on the soundness and level of adequacy of the Phase IIC work plan to meet the problem or opportunity.

- Please comment on the degree to which the Phase IIA or Phase IIB objectives were met at the time the Phase IIC grant application was submitted. In your opinion, is the proposed R&D effort sufficient to justify the total costs (line I of the budget page, not including the fee)? E.g., is the cost consistent with that charged for comparable levels of effort by other R&D performers?

The qualifications of the proposer are adequate to complete the work as described. The support of key stakeholders as end users of accelerators is an important endorsement of the proposer's ability to execute the work described within the proposal. The proposer's prior and ongoing experience with the ATLAS system at Tufts represents invaluable hands on experience with similar systems.

The work described here is sufficiently similar to the work already completed in Phase 1, that I believe there should be no issues with the facilities/deployment of the technology by the proposer. The work plan does describe a reasonable distribution of labor hours that are justifiable and reasonable for the work scope presented.

The Phase 2 proposal does well to highlight the tangible milestones achieved during Phase 1 and the ongoing work being completed to progress towards the original goal. These milestones are reasonable and the proposer demonstrates reasonable progress towards achieving them within this proposal.

3. Impact

- Please comment on the appropriateness of the data management plan for the proposed work. Please note that if a data management plan is not included the default data management plan applies. "It is anticipated that all generated digital data will be protected as SBIR/STTR data and therefore will not be publicly shared during the applicable SBIR/STTR data protection period. If any data generated under this award are published, an effort will be made to also release any related digital data that is not protected SBIR/STTR data."

Phase II:

- Please comment on the significance of the technical and/or economic benefits of the proposed work, if successful.

- Please comment on the likelihood that the proposed work could lead to a marketable product or process, and on the size of the potential market.

- Please comment on the likelihood that the project will attract further development funding (from private sector sources or from Federal, non-SBIR/STTR sources) after the SBIR/STTR project expires.

Phase IIA or Phase IIB:

- Please comment on the significance of the technical and/or economic benefits of the proposed work, if successful.

- Please comment on the likelihood that the proposed work could lead to a marketable product or process, and on the size of the potential market.

- Please comment on the likelihood that the project will attract further development funding (from private sector sources or from Federal, non-SBIR/STTR sources) after the SBIR/STTR project expires.

Phase IIC:

- Please comment on the significance of the technical, economic, and/or societal benefits of the proposed work, if successful.

- Please comment on the likelihood that the proposed work, and the work accomplished with matching funds, could lead to a marketable product or process, and on the size of the potential market.

- Please comment on the likelihood that the project will attract further development funding (from private sector sources or from Federal, non-SBIR/STTR sources) after the SBIR/STTR project expires.

- Please comment on the expectations of the third party investor providing the matching funds.

The proposed market for SRF cavity assembly is limited, as there are a limited number of accelerators in operation and the technology is specialized to challenges required specifically by accelerator components. While it is possible that the use of a similar silhouette-based object recognition system could be applied to alternate components, it seems likely that in that case the end user would alter the assembly/inspection process to use a more traditional or widely available vision system for inspection.

The proposer appears to recognize this limitation, and does target further expansion of the system into fusion applications, although some of the proposed solutions to the bolt alignment problem require specialized mechanical alterations that would obviate their use in commercial applications outside of ones specialized to the use of the system. Requiring the use of an external alignment pin to identify the orientation of a bolt alignment pattern would be possible given the proposed problem of clean room assembly of SRF cavitiy assemblies, but would likely rule out their use in applications involving in situ inspections of fusion components or similar. Inspecting high precision components within an extremely controlled environment as described in the scope of work is a significantly different problem than some of the potential applications discussed.

However, the specialized nature of the problems faced by the accelerator industry do create the need for specialized solutions such as the one proposed. Even if there may not be a large market outside of accelerators and that the accelerator market will be highly dependent upon construction of a new accelerator, the proposal does a good job of targeting that niche and providing a necessary solution.

Reviewer 5

Criteria

1. Scientific/Technical Approach

The following questions are suggested to guide your review:

- To what extent does the proposed work build upon or move beyond the current state-of-the-art?

- How new or unique is the idea?

- How significant is the scientific and/or technical challenge?

- Is a breakthrough possible? Has the applicant demonstrated knowledge of the subject?

- How thoroughly have the concepts been presented?

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Please comment on the strength and innovativeness of the idea and the technical approach for the Phase II, Phase IIA, Phase IIB, or Phase IIC project.

Phase II:

- Has the applicant clearly explained how the proposed Phase II research and development builds upon the scope of work originally proposed for their Phase I?

Phase IIA:

- Has the applicant clearly explained how the proposed Phase IIA research and development completes the scope of work originally proposed for their Phase II?

Phase IIB:

- Has the applicant demonstrated that the initial Phase II project will be successfully completed prior to possible receipt of the Phase IIB award? (This is a Phase IIB requirement)

- Has the applicant demonstrated that the proposed Phase IIB research and development builds upon the successful Phase II project to enhance the opportunities for commercialization?

Phase IIC:

- Has the applicant demonstrated that the Phase IIA or Phase IIB project will be successfully completed prior to possible receipt of the Phase IIC award?

- Has the applicant demonstrated that the proposed Phase IIC research and development and proposed activities supported with investor matching funds builds upon the successful Phase II project to enhance the opportunities for commercialization?

This proposal is for the development of an imaging system for finding the location of the highly reflective flange holes when assembling large number of superconducting radiofrequency (SRF) cavity assembly. When performed by humans, they tend to contaminate the surfaces. The proposal suggests ways to align the flanges by using silhouette images instead of direct lighting that causes reflections. The back lighting is provided by infrared lights. They propose to use two silhouette cameras and triangulations to obtain the position of the flange hole locations. Since the cameras have infrared filter, it ignores any regular lighting that is present.

In obtaining the silhouette images, the author proposes to use back lighting and in all the descriptions, the lighting is directly behind the object, or the axis of the flange (cavity) and the light are aligned. In Figure 2, however, the two axes are orthogonal. How do you get a

silhouette image of the holes when the flanges are coming together, and you are no longer at an angle to view the holes? Also, there is no description of how a motorized stage will bring the holes into alignment. One also needs to bring the flanges together robotically (remotely) without banging into each other. What is the feedback mechanism? Is there a position sensor on the translating stage?

I really like the work on calibration and use of backlight for reflective surfaces, but for this to work, the silhouette camera needs to be behind the axis of the cavity which makes it impractical. Figure 5 is not realistic once you move to cavity alignment problem.

Also, angular rotational alignment of the holes will be very challenging. The author is suggesting fiducials on the cavities (IR light or a pin). Once they are aligned, the holes are aligned as well. You can also chamfer the holes to provide some passive compliance along the axis of cavity to help in assembly rather than rigidly attaching them to motors when robotically aligned. This will require buy in from stakeholders (labs) to change the design of the cavities to help align the flange holes.

2. Ability to Competently Carry Out the Project

The following questions are suggested to guide your review:

- Please comment on the qualifications of the Principal Investigator (PI), other key staff, and consultants, if any, and on the level of adequacy of equipment and facilities.

- Are the labor hours, for the PI and others, sufficient to accomplish the tasks and justify the total cost? Please comment.

Phase II:

- Please comment on the soundness and level of adequacy of the Phase II work plan to meet the problem or opportunity.

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Phase IIA or Phase IIB:

- Please comment on the soundness and level of adequacy of the Phase IIA or Phase IIB work plan to meet the problem or opportunity.

- Please comment on the degree to which the Phase II objectives were met at the time the Phase IIA or Phase IIB grant application was submitted. In your opinion, is the proposed R&D effort sufficient to justify the total costs (line I of the budget page, not including the fee)? E.g., is the cost consistent with that charged for comparable levels of effort by other R&D performers?

Phase IIC:

- Please comment on the soundness and level of adequacy of the Phase IIC work plan to meet the problem or opportunity.

- Please comment on the degree to which the Phase IIA or Phase IIB objectives were met at the time the Phase IIC grant application was submitted. In your opinion, is the proposed R&D effort sufficient to justify the total costs (line I of the budget page, not including the fee)? E.g., is the cost consistent with that charged for comparable levels of effort by other R&D performers?

The authors have many years of experience in building silhouette optical systems. I like the idea of silhouette images to get away from stray reflections of polished surfaces, but I think they need to get some sort of approval from the SRF end users for their change in design of the cavity. I am confident that the authors will be able to conduct the result and qualify the alignment strategy they are proposing.

I don't see much information on the automation part of the assembly process. I think a significant portion of Phase II should be devoted to automation and integration of the design to make this a viable option for CRF assembly.

3. Impact

- Please comment on the appropriateness of the data management plan for the proposed work. Please note that if a data management plan is not included the default data management plan applies. "It is anticipated that all generated digital data will be protected as SBIR/STTR data and therefore will not be publicly shared during the applicable SBIR/STTR data protection period. If any data generated under this award are published, an effort will be made to also release any related digital data that is not protected SBIR/STTR data."

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- Please comment on the likelihood that the project will attract further development funding (from private sector sources or from Federal, non-SBIR/STTR sources) after the SBIR/STTR project expires.

Phase IIA or Phase IIB:

- Please comment on the significance of the technical and/or economic benefits of the proposed work, if successful.

- Please comment on the likelihood that the proposed work could lead to a marketable product or process, and on the size of the potential market.

- Please comment on the likelihood that the project will attract further development funding (from private sector sources or from Federal, non-SBIR/STTR sources) after the SBIR/STTR project expires.

Phase IIC:

- Please comment on the significance of the technical, economic, and/or societal benefits of the proposed work, if successful.

- Please comment on the likelihood that the proposed work, and the work accomplished with matching funds, could lead to a marketable product or process, and on the size of the potential market.

- Please comment on the likelihood that the project will attract further development funding (from private sector sources or from Federal, non-SBIR/STTR sources) after the SBIR/STTR project expires.

- Please comment on the expectations of the third party investor providing the matching funds.

I do agree that when systems with hundreds of CRF assemblies are required, automating the alignment process without human help will be beneficial to increase the power output of these devices. Hence, Phase II should focus on automation of the CRF flange assembly automation. Automatic alignment of the flanges when demonstrated will enable the end users to have confidence about the feasibility of the process you are proposing.

External Notes

No comment to display

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