DARPA-PA-24-04-05 HORCREX
Frequently Asked Questions (FAQs)
as of 2/4/2025

18Q: Are private institutions of higher education eligible to apply for DARPA-PA-24-04-05?

18A: See Section 7 of DARPA-PA-24-04 for information on who may be eligible to respond to this announcement.

17Q: Could you clarify what is meant by "Proposers should focus on meeting the existing metrics requirements?" (2Q below) in the context of approaches that develop high-frequency MEMS sensors with good shock resilience but do not have poor sensitivity, and do not use mechanical mode locking to achieve high sensitivity?

17A: The proposers are encouraged to propose their own metric in this situation, as the existing metric requirements may not be directly applicable to alternative approaches that do not employ mechanical mode locking. Proposers should provide a clear explanation of how their proposed approach will meet the program's goals and objectives, and define relevant metrics that demonstrate the performance and capabilities of their proposed solution.

----------⬆⬆⬆New Q/A⬆⬆⬆----------

16Q: Can you elaborate on the term "fundamental mode operation" in Phase 2, and will the testing conditions remain the same as Phase 1?

16A: In Phase 2, the focus shift towards scaling the design to achieve operation at the fundamental sensing mode frequency. Phase 2 requires the device to operate in a more extreme shock/vibration environment and to generate a data log of its operation during a high-g test.

15Q: What is the definition of "mode locking" in the Disruption Opportunity (DO), and is it referring to generating a phononic comb or using parametric conversion for multi-mode sensing?

15A: The document defines mode locking in the context of the HORCREX program as a way to prevent low-frequency modes from deviating or becoming unstable, enabling operation in high-shock environments. The document does not explicitly specify whether mode-locking involves generating a "phononic comb" or using "parametric conversation for multi-mode sensing, "but rather describes mode-locking as a mechanism to stabilize a multiple-mode mechanical sensing platform.

14Q: Are there any qualitative requirements for defining shock resistance in Phase 1, beyond demonstrating mode locking?

14A: The explicit requirement of maintaining frequency lock during 10-g, 50-Hz vibration provides a quantitative metric for evaluating shock resistance.

13Q: What does the 8 kHz reference in the sensitivity requirement for Phase 2 refer to - sensing frequency, frequency drift, or something else?

13A: The 8 kHz reference refers to the target frequency of the fundamental sensing mode of the device, not frequency drift or some other parameters.

12Q: What is the difference between the Phase 1 goal of "Laser Doppler Vibrometer (LDV) testing" and the Phase 2 goal of "demonstration of operation data log", and does it involve constructing an oscillator?

12A: Phase 1 involves using LDV to assess the performance of the device, with corresponding video data or datasets provided to evaluate its potential. Phase 2 goal involves a demonstration of

operation during high-g test, which will require the device to function in a more realistic, high-stress environments and to produce a data log its operation. Both phases require experimental validation and measurements, which would necessitate the construction of a functional oscillator.

11Q: Is the device limited to a MEMS integrated device, or can it be combined with RF circuitry to dispersion engineer the nonlinear response?

11A: There is no language that specifically restricts the device to a MEMS integrated device only. The document does not explicitly state that combining it with RF circuitry is required or prohibited. The program seeks to explore innovative approaches.

10Q: Is there interest in using optical combs in conjunction with mechanical combs to achieve better performance metrics than those specified in the call?

10A: The focus of the DO is on developing and demonstrating micromechanical frequency comb and exploring different methods for transducing multiple vibration modes of a sensing proof-mass. The document also encourages proposals to explore alternative methodologies to achieve the program's goals, as long as it aligns with the program's goals.

9Q: Is it acceptable to propose developing and testing devices with higher fundamental mode frequencies (e.g. 100's of MHz) in Phase 1, with the goal of demonstrating a device with a lower fundamental mode frequency (< 8 kHz) in later years?

9A: Proposing to develop and test devices with higher fundamental mode frequencies in Phase 1, with the goal of demonstrating a device with a lower fundamental mode frequency in Phase 2, is acceptable.

8Q: What specific requirements or documentation are needed for national laboratories to participate as subcontractors, including any potential letters or agreements regarding their participation?

8A: Proposers should note that national laboratories participating as subcontractors may require separate funding arrangements, as they cannot accept an Other Transaction (OT) agreement for prototype projects. However, there are no specific requirements or documentation for national laboratories to participate as subcontractors, beyond the standard subcontracting requirements. If a proposer intends to include a national laboratory as a sub-contractor, they should be aware of this potential funding requirement.

7Q: Will DARPA consider extending the deadline for the HORCREX opportunity due to the impact of the Los Angeles wildfire situation on potential performers, including those who are experiencing disruptions to their operations and collaborations?

7A: DARPA will not be extending the proposal deadline.

6Q: Does DARPA have contact information for interested parties who are working on precision inertial sensors and would be potential collaborators for a joint proposal in response to the DO?

6A: No, DARPA does not provide contact information for interested parties who are working on precision inertial sensors and may be potential collaborators for a joint proposal in response to the Disruption Opportunity announcement.

5Q: Is a proposed solution that modifies a commercial inertial platform to include high and low range gyroscopes and accelerometers, and can survive high-stress environments while maintaining precision navigation, within the scope of the DO?

5A: If the proposal is for a single multi-axis sensor that uses the high and low range gyros and accelerometers in a single sensing element rather than as an array, it may still be in scope, as the program aims to develop sensors that can survive high-stress environments and main precision navigation.

4Q: Would DARPA consider a solution that uses a single, multi-axis MEMS chip with built-in shock resistance, rather than an array of sensors with different bandwidths and dynamic ranges?

4A: Yes, DARPA would consider such a solution. The document also emphasizes that solutions that use arrays of sensing elements are out of scope for this effort. The aim is to move away from using sensor arrays by exploring "the nonlinearities in mechanical sensor and suspension design".

3Q: Is a 6DoF MEMS inertial sensor architecture that does not employ mechanical frequency combs to improve dynamic range eligible for consideration under the DO?

3A: The focus of the program is on developing a single inertial sensor that has increased dynamic range, is resilient to shock and vibration and maintains functionality across a broad range of velocity and acceleration. The document does state that the program seeks to "explore alternative methodologies to achieve the program's goal and encourage approaches that are supported by "robust analysis and validation".

2Q: Is DARPA interested in approaches that develop high-frequency MEMS sensors with good shock resilience but do not have poor sensitivity? If alternative approaches are of interest, should performers define their own metrics as part of their proposal?

2A: Yes, DARPA is interested in approaches that develop high-frequency MEMS sensors with good shock resilience and do not have poor sensitivity. Proposers should focus on meeting the existing metrics requirements.

1Q: Is DARPA interested in approaches that achieve the goal of developing an inertial sensor with dramatically increased dynamic range, enabling resilience to shock and vibration while maintaining functionality across a broad range of velocity and acceleration, if the approach does not employ mechanical mode locking and/or frequency combs?

1A: Yes, DARPA is interested in such approaches. While the document mention that HORCREX will exploit the nonlinearities in mechanical sensor and suspension design using mechanical frequency combs, it also states that "while mode locking in one approach, proposals are encourage to explore alternative methodologies to achieve the program's goals, supported by robust analysis and validation." This indicates that alternative approaches to achieving the program's goals are welcomed, even if they don't employ mechanical mode locking or frequency combs.