

**HR0011SB20254-P01**  
**Spectrum Monitoring and Awareness in Real-Time (SMART)**  
**Frequently Asked Questions (FAQs)**

1. SDR Replacement: May we replace the existing reconfigurable SDR with a different device if it meets the same size, weight, and power (SWaP) constraints?  
**A: Yes, the replacement of DoD SDRs with another SDR is acceptable. However, the SDR Replacement should meet the same SWaP constraints and must retain the functionality of the original radio (i.e., the ability to communicate and share data using the SDR must be retained).**
2. PED Connectivity and Multi-Node Geolocation: Is it permissible to connect to PED (Processing, Exploitation, and Dissemination) systems via tactical-communications/JICD interfaces, thereby enabling collaborative processing and multi-unit geolocation?  
**A: The SBIR is focused on leveraging edge compute resources that are common with tactical end users. This is often a tablet running TAK Government-off-the-Shelf (GOTS) software (e.g., Samsung Tablet running ATAK).**
3. Edge-Only in DDIL: Should we assume that the solution must operate exclusively at the edge in a denied, degraded, intermittent, or limited (DDIL) communications environment? Or can we partially rely on reach-back or cloud-based resources when available?  
**A: Yes, assume that the solution should operate at the edge in DDIL communications environment.**
4. SDR Development Framework: Are you seeking the development of an SDR framework?  
**A: We are seeking a variety of innovative solutions to the problem described in the solicitation and not specifically looking for an SDR Development Framework.**
5. It was our interpretation that the man-packed system that is being discussed in the call has three interconnected parts:
  - ATAK tablet
  - Tactical comms radio(e.g. L3Harris AN/PRC-117G or AN/PRC-152A)
  - Generic SDR (e.g. Hedgehog SDR)

Where we might replace the generic SDR with a novel solution. Is our interpretation of the man-packed system being described correct?

**A: The man-packed system consists of only two interconnected parts:**

**a. ATAK Tablet**

**b. Tactical comms radio, in the form of an SDR. Examples of this radio would be the AN/PRC-117G or AN/PRC-152. The generic SDR listed (Hedgehog SDR) is an example of a recent advancement in SDR technology that could be leveraged as a part of a SMART solution. The tactical comms radio could be replaced in this scenario with an SDR that can execute the**

**same primary functions as the tactical radio it is replacing and meets the same SWaP constraints.**

6. Can you share the specific SWaP constraints for the perspective replacement SDR?

**A: The AN/PRC-152 and AN/PRC-117G are representative examples of tactical radios. The replacement radios should have similar SWaP characteristics/capabilities.**

7. Can you clarify what is meant by “the ability to communicate and share data using the SDR must be retained”. Does this mean the generic SDR will need to integrate with a tactical radio to communicate and share data?

**A: No. There is no generic SDR. If the tactical SDR is being replaced as a part of the solution, it must be capable of performing the same functions as the primary tactical SDR.**

8. Is proposing a new SDR-based hardware sensor product for the dismounted warfighter in scope for the topic? Modifying a third-party SDR product (hardware or software) is not practical since only the company who built it can do that. Replacing the SDR suggests replicating the communications and data sharing functions of products like the AN/PRC-117G (also not practical).

a. If the Q1 answer is “yes,” then it would seem to be incongruous with “introducing an additional sensor/antenna/radio/tablet is not [acceptable].”

b. If the Q1 answer is “no,” then it would seem like any SDR-related proposal would need to be limited to software enhancements of third-party SDR products (not practical).

**A: As stated in the solicitation, “The Defense Advanced Research Projects Agency (DARPA) solicits technologies that, leveraging advancements in SDR technology, and handheld or tablet-based compute, optimize warfighter capabilities in one or more of the three technical capability areas described above.” The L3 Harris AN/PRC-117G and AN/PRC-152A were used as an example of a man-portable tactical SDRs commonly employed in the DoD, and the Hedgehog SDR was provided as an example of a recent advancement in SDR technology that enables rapid reconfiguration and/or adaptation for various tasks. By “replacement” we mean that proposers may introduce a surrogate SDR capable of voice communications and data sharing that replicates comparable functionality, and SWaP, to tactical SDR solutions like the AN/PRC-117G. Replication of the exact functionality (e.g., proprietary waveforms, encryption capabilities, etc.) is not required, nor expected; however, surrogate capabilities must be considered to demonstrate that the proposed solution does not degrade or interfere with the primary function of the SDR to provide tactical communication capability to the warfighter. Introduction of additional SDR-based hardware is not in scope for SMART.**

9. Is proposing a software-modified Android smartphone (vs. tablet) in scope for the topic? The topic description mentions Android tablets four times but only refers to a “handheld... compute” device tangentially.

**A: Yes. Handheld compute solutions (phone/tablet) capable of running ATAK/WinTAK are in scope for SMART.**

10. Would an ideal prototype in Phase II involve SDR (like Hedgehog) interfaced with A-TAK ? Or Are there other transition platforms or programs you have in mind beyond Phase II?

**A: The solicitation identifies the target user, “military dismounted ground tactical units,” common hardware configurations employed by ground tactical units in the DoD (i.e., SDR and tablet running ATAK), and states that “The Defense Advanced Research Projects Agency (DARPA) solicits technologies that, leveraging advancements in SDR technology, and handheld or tablet-based compute, optimize warfighter capabilities in one or more of the three technical capability areas described above.” Additionally, the solicitation states that “Solutions can be algorithmic, software, hardware, and/or material in nature; however, hardware/material solutions should not introduce a new physical burden on the warfighter (i.e., modifying or replacing an antenna/SDR is acceptable, but introducing an additional sensor/antenna/radio/tablet is not). Moreover, proposed solutions should not interfere with the primary function of the equipment (i.e., warfighter communication capability must not be degraded).” For clarity, by “replacement” we mean that proposers may introduce a surrogate SDR capable of voice communications and data sharing that replicates comparable functionality, and SWaP, to tactical SDR solutions like the AN/PRC-117G [e.g., hardware-agnostic (yet aware)].**

11. Is DARPA interested in other COTs SDRs too, for example, GPU-embedded SDRs from Deepwave or CMOSS aligned SDR that the Army prefers? In general, is a hardware-agnostic (yet aware) solution preferred? For example, hardware agnostic would imply the solutions work across multiple hardware in Phase II.

**A: The solicitation identifies the target user, “military dismounted ground tactical units,” common hardware configurations employed by ground tactical units in the DoD (i.e., SDR and tablet running ATAK), and states that “The Defense Advanced Research Projects Agency (DARPA) solicits technologies that, leveraging advancements in SDR technology, and handheld or tablet-based compute, optimize warfighter capabilities in one or more of the three technical capability areas described above.” Additionally, the solicitation states that “Solutions can be algorithmic, software, hardware, and/or material in nature; however, hardware/material solutions should not introduce a new physical burden on the warfighter (i.e., modifying or replacing an antenna/SDR is acceptable, but introducing an additional sensor/antenna/radio/tablet is not). Moreover, proposed solutions should not interfere with the primary function of the equipment (i.e., warfighter communication capability must not be degraded).” For clarity, by “replacement” we mean that proposers may introduce a surrogate SDR capable of voice communications and data sharing that replicates comparable functionality, and SWaP, to tactical SDR solutions like the AN/PRC-117G [e.g., hardware-agnostic (yet aware)].**

12. What is the expected real-time processing latency for detection, characterization, and geolocation to be considered operationally relevant?

**A: The SMART SBIR is an Open topic and does not have specific metrics associated with the three technical capability areas. Our goal is to determine the limits of what is possible in the three technical areas using the hardware described in the solicitation, or a surrogate (as described above). In other words, we don't have a metric for processing latency to define operational relevance, a time constraint for POL, or frequency range expectations. We expect proposers to identify, and provide technical justification for, what they believe is feasible. From the solicitation: "Proposals should include the RF bandwidth covered by the proposed solution and, if targeting the POL technical capability, the timeframe for POL required to gain specific insights."**

13. For Pattern of Life (POL) analysis, what timeframe of RF observations is considered useful for actionable insights for the envisioned mission? Minutes, hours, or days? In other words, what would be the time constraint for POL?

**A: The SMART SBIR is an Open topic and does not have specific metrics associated with the three technical capability areas. Our goal is to determine the limits of what is possible in the three technical areas using the hardware described in the solicitation, or a surrogate (as described above). In other words, we don't have a metric for processing latency to define operational relevance, a time constraint for POL, or frequency range expectations. We expect proposers to identify, and provide technical justification for, what they believe is feasible. From the solicitation: "Proposals should include the RF bandwidth covered by the proposed solution and, if targeting the POL technical capability, the timeframe for POL required to gain specific insights."**

14. What are the specific RF bandwidth and frequency range expectations for a viable solution? Are there priority bands of interest?

**A: The SMART SBIR is an Open topic and does not have specific metrics associated with the three technical capability areas. Our goal is to determine the limits of what is possible in the three technical areas using the hardware described in the solicitation, or a surrogate (as described above). In other words, we don't have a metric for processing latency to define operational relevance, a time constraint for POL, or frequency range expectations. We expect proposers to identify, and provide technical justification for, what they believe is feasible. From the solicitation: "Proposals should include the RF bandwidth covered by the proposed solution and, if targeting the POL technical capability, the timeframe for POL required to gain specific insights."**

15. For clarity, in regards to "dismounted tactical ground units" is the term "dismounted" more or less synonymous with "human beings on foot"?

**A: Yes**

16. Other than the implied, broad requirement that any resulting implemented solution has to be usable and transportable by the above-mentioned dismounted units, are there any hard SWaP requirements that the government can share at this time?

**A: The solicitation describes hardware configurations common to dismounted tactical ground units (i.e., “man-portable software defined radios” and “Android tablets running the Android Tactical Assault Kit”), proposed solutions should have similar SWaP constraints.**

17. Does the government intend for this application to be applied to an existing RF collection front-end or would the offerer’s solution inform this? By “RF collection front-end” we mean everything from the antenna(s) through the receiver/tuners/filters and finally through digitization (ADC).

**A: The SMART SBIR is aimed at developing “advanced capabilities that provide military dismounted ground tactical units real-time awareness of the radio frequency (RF) spectrum” using hardware commonly employed by ground tactical units. It should be noted that the solicitation also allows proposers to replace specific components. By “replacement” we mean that proposers may introduce a surrogate SDR capable of voice communications and data sharing that replicates comparable functionality, and SWaP, to tactical SDR solutions like the AN/PRC-117G. Replication of the exact functionality (e.g., proprietary waveforms, encryption capabilities, etc.) is not required, nor expected; however, surrogate capabilities must be considered to demonstrate that the proposed solution does not degrade or interfere with the primary function of the SDR to provide tactical communication capability to the warfighter.**

18. Would the government consider solutions that employ, small aerial drones as RF collection platforms?

**A: No. The proposals including drones or other additional components or equipment are out of scope.**

19. Does the government have a set of preferred signals and RF environment scenarios for this effort? If so would the government be willing to provide exemplar data sets for test and demonstration?

**A: No**

20. If field data is not available, would testing with realistic synthetic or lab generated data be acceptable for Phase I?

**A: Yes**

21. What is the governments understanding of the term “communication protocol”? Does this term include modulation type (e.g. FSP, QPSK, QAM), access type (e.g. TDMA, CDMA), something else or all of the above?

**A: Identification of characteristics like modulation type and access type are important; however, as stated in the solicitation, “information should be presented in an intuitive manner that enhances situational awareness and does not impose an additional cognitive burden on the warfighter who does not have expertise in the**

field of RF spectrum operations.” As such, identification of protocols like (list non-inclusive) 802.11, Bluetooth Low Energy (BLE), Global System for Mobile communications (GSM), etc. is what was meant by “communications protocol.”

22. Given the three goals of 1) RF spectrum characterization, 2) pattern-of-life (POL) recognition and 3) localization or geolocation, does the government have some prioritization of these three? For example, is it better to know some information about all three or is it better to know a great deal about one or two of them even if it means knowing little or nothing about the last? Or is this left completely to the offerer?

**A: This is left to the proposer.**

23. In addition to on/off times and potential emitter motion, are there any other signatures that the government is particularly interested in as POL that it can share at this time?

**A: This is left to the proposer to identify what is possible.**

24. Do we know the frequency ranges or the extent of the spectrum (lowest/highest frequencies) for the potential RF signal source? Can we assume the existing hardware (antenna frontend and SDR) is capable of sensing the entire spectrum? If not, is it allowable to propose a hardware (pluggable to a given SDR) to sense/scan the spectrum?

**A: The SMART SBIR is an Open topic and does not have specific metrics associated with the three technical capability areas. Our goal is to determine the limits of what is possible in the three technical areas using the hardware described in the solicitation, or a surrogate. In other words, we don't have a metric for processing latency to define operational relevance, a time constraint for POL, or frequency range expectations. We expect proposers to identify, and provide technical justification for, what they believe is feasible. From the solicitation: “Proposals should include the RF bandwidth covered by the proposed solution and, if targeting the POL technical capability, the timeframe for POL required to gain specific insights.” As stated in the solicitation, the SMART SBIR is aimed at developing “advanced capabilities that provide military dismounted ground tactical units real-time awareness of the radio frequency (RF) spectrum” using hardware commonly employed by ground tactical units. It should be noted that the solicitation also allows proposers to replace specific components. By “replacement” we mean that proposers may introduce a surrogate SDR capable of voice communications and data sharing that replicates comparable functionality, and SWaP, to tactical SDR solutions like the AN/PRC-117G. Replication of the exact functionality (e.g., proprietary waveforms, encryption capabilities, etc.) is not required, nor expected; however, surrogate capabilities must be considered to demonstrate that the proposed solution does not degrade or interfere with the primary function of the SDR to provide tactical communication capability to the warfighter. Introduction of additional SDR-based hardware is not in scope for SMART.**

25. Does the existing/target hardware have an array of antennas or just a single omnidirectional antenna?

**A: Existing tactical SDRs use multiple antennas depending on the operational mission. These antennas can be directional or omnidirectional. Some tactical SDRs,**

**like the PRC-163, are multi-channel and will employ multiple antennas simultaneously.**

26. Is there any known power budget for spectrum sensing?

**A: SWaP constraints should be comparable to existing tactical SDR solutions like the AN/PRC-117G. Proposers should identify the power budget required for the proposed solution.**

27. For POL, can we assume the portable units will eventually put the data in a server capable of AI-enabled processing and analysis?

**A: No**

28. Will the portable units work individually or in the form of a group or swarm?

**A: Individually.**

29. Can the portable units exchange small information in real-time in peer-to-peer communication fashion or through infrastructure-based communication (base-station based, similar to 802.11/wifi)?

**A: No**

30. SDR Replacement: Regarding the FAQ on SDR Replacement, it was said that *'the replacement must retain the functionality of the original radio'*. Can you elaborate on what is meant by "retain functionality of the original radio"? Does this functionality need to be integrated/ demonstrated as part of the Ph 1 and 2 SOW along with the proposed spectrum monitoring and awareness capability? Or can this occur in a Ph 3? As the exact cryptographic core is unknown, is it suitable to reserve space on the SDR for a communication IP core to be added at a later date to enable that full communication and data sharing functionality?

**A: As stated in the solicitation, the SMART SBIR is aimed at developing “advanced capabilities that provide military dismounted ground tactical units real-time awareness of the radio frequency (RF) spectrum” using hardware commonly employed by ground tactical units. It should be noted that the solicitation also allows proposers to replace specific components. By “replacement” we mean that proposers may introduce a surrogate SDR capable of voice communications and data sharing that replicates comparable functionality, and SWaP, to tactical SDR solutions like the AN/PRC-117G. Replication of the exact functionality (e.g., proprietary waveforms, encryption capabilities, etc.) is not required, nor expected; however, surrogate capabilities must be considered to demonstrate that the proposed solution does not degrade or interfere with the primary function of the SDR to provide tactical communication capability to the warfighter. Introduction of additional SDR-based hardware is not in scope for SMART.**

31. Regarding addressing capability 1 ("Detect, separate from background noise, and characterize signals of interest..."), must the solution address all three of these components or is it acceptable to focus on specific components of this capability?

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