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Wearable Radio Frequency Weapon Exposure Detector

Agency:	Department of Defense
Branch:	Defense Health Agency
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The official link for this solicitation is: https://rt.cto.mil/rtl-small-business-resources/sbir-sttr/ (https://web.archive.org/web/20240115033048/https://rt.cto.mil/rtl-small-business-resources/sbir-sttr/)

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Description:

RT&L FOCUS AREA(S): General Warfighting Requirements (GWR); Directed Energy

TECHNOLOGY AREA(S): Bio Medical; Sensors

OBJECTIVE: Develop a low cost, low weight, small size wearable radio frequency (RF) weapon exposure detector.

DESCRIPTION: Directed energy weapons, including radio frequency (RF) weapons, are a growing threat on the battlefield. Determinants of RF weapon antipersonnel effects are multifactorial and RF injuries will be situation dependent and very hard to predict. Without known patterns of RF injury to guide diagnosis, it will be difficult to differentiate RF injury from other common sources of illness and injury such as heat stroke. This ambiguous symptomology is aggravated by the transient nature of RF energy. Without a sensor it is possible that no residual evidence of RF attack will be available. A wearable RF detector to signal and document exposure to injurious levels of RF energy will allow personnel to take timely and appropriate protective measures, enable confident diagnoses of RF exposure injury, and serve as a critical intelligence resource for defining current battlefield threats. However, to be useful, the wearable RF weapon exposure detector must, in order of importance, have an extremely small footprint in terms of space, weight and power (SWaP), be very low cost, have a very low false positive rate, and be easy to interpret. The topic does not seek a replacement for sophisticated instruments used for measuring occupational hazards. This RF detector concept is analogous to passive M8 and M9 paper used in the detection of chemical weapon hazards.

PHASE I: Analyze RF bioeffects in relation to common US and ally military RF equipment and potential enemy weapon system emission levels and frequencies. The spectrum of interest includes IEEE UHF through Ka bands. Determine optimal detector threshold sensitivity for signaling immediately dangerous to life and health (IDLH) exposure while minimizing false positives. Because irradiance levels needed to injure personnel are orders of magnitude higher than required to damage electronics, designing a broad band absorber with appropriate response characteristic will require substantial innovation. Integration of an antenna into an affordable system which will survive in the extreme irradiance environment is a significant challenge, therefore the offeror may need to identify novel broad band RF detection materials and alarm/signaling mechanisms. Design a low cost, low SWaP, low false positive, easily readable, wearable RF weapon exposure detector that can widely distributed on the battlefield. An unobtrusive wearable detector would be smaller than a M4 magazine pouch and attach to a tactical vest by the Pouch Attachment Ladder System/MOLLE mount. High cost, high complexity sensors are not desired for this solicitation.

PHASE II: Develop and test sensor components. Model expected system performance from component testing. Integrate components into breadboard/brassboard level prototype and compare measured performance against modeled predictions. Review non-open source information regarding military RF systems and RF bioeffects provided by government. Refine design and build production representative prototypes and validate detection performance in laboratory environment. Provide prototypes for operational utility evaluations. Conduct environmental testing.

PHASE III DUAL USE APPLICATIONS: If there is a proliferation of RF weapons, it is expected that a Wearable RF Weapon Detector will be generally useful for a wide variety of military operations. In Phase III the contractor will work with a program office, such as the Air Force Medical Readiness Agency's Advanced Development Office or PEO Soldiers' Program Manager for Soldier Survivability to finalize the detector as a military product. Desired end state would be to establish the Wearable RF Weapon Detector as a standard military equipment supply item distributed through Defense Logistics Agency. Additional commercial applications include medical, industrial, manufacturing, and test facilities in which personnel may be inadvertently exposed to high power RF sources.

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