11-TTAG-017

Company Name	Arkansas Power Electronics International, Inc.
NAICS	541712
Address	535 W. Research Center Blvd., Suite 209
City	Fayetteville
State	AR
ZIP	72701
County	Washington
Number of Employees	30
Year Established	1997
Company Web Site	http://www.apei.net
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Resource Provider	Arkansas Power Electronics International, Inc.
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RP City	Fayetteville
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Project Area	Advanced Materials and Manufacturing Systems - 1 - Electronics
Project Area Brief Description	1
Federal Agency	National Aeronautics and Space Administration
Project Title	11-TTAG-017 - Extreme Environment SiC Wireless Sensor Suite for Nuclear Thermal Propulsion Engines
Competitive Challenges	Although almost all current space crafts are powered by chemical propulsion systems, the nuclear thermal propulsion (NTP) is a very attractive option for future space exploration due to very high specific impulse and relatively light weight propellant. However, to achieve high efficiencies, NTP systems must operate at high temperature (over 2,200 °C) and high pressure (500-1500 psi) in the reactor chamber and nozzle. It is important to monitor critical engine components and structures to determine operational status and to assess damage. Integrated real-time structural health monitoring (SHM) is a vital capability for thermal barrier-coated engine components exposed to high temperatures. Embedded sensors that can detect temperature, pressure, neutron flux, propellant flow rate, etc. provide much needed engine health status as well as prognosis for future missions. The ability to embed such sensors in highly critical, extreme environment component systems, and gain access to that data in real-time with little additional system complexity will become increasingly important as NTP powered space missions increase in length and complexity.
Specific Problem	NASA SBIR Phase I Topic#: X2.03 -Nuclear Thermal Protection
Solution	The objective of this proposal is to develop a silicon carbide (SiC) based integrated wireless sensor-transmitter suite for extreme temperature operation in nuclear thermal propulsion (NTP) engines. These sensors will allow for the real–time monitoring of critical engine components, reducing the risk of catastrophic failure and

	decreasing the inherent risk associated with NTP operation. Arkansas Power Electronics International, Inc. (APEI, Inc.) will prove the feasibility of the concept and design through the successful demonstration of a prototype SiC wireless sensor operating in excess of 450 °C at the conclusion of Phase I.
Implementation Plan	The immediate application of the proposed hash environment SiC wireless transmitter is the health monitoring of turbine engine for both military and commercial aircraft. The ability to have imbedded sensors (in both aircraft and spacecraft) that can detect temperature, strain, vibration, cracks, etc. will provide much needed engine health status as well as prognosis for possible or eminent in-flight failures. This technology will enable nearly continuous on-board situational awareness of the vehicle health state for use by the flight crew, ground crew, and maintenance depot, and contribute to the reduction of aircraft system and component failures and malfunctions that cause and contribute to aircraft accidents and incidents.
Maintenance Plan	By the completion of Phase II, extended reliability testing of the sensor suites under emulated NTP engine environment will be completed in a laboratory test bed. Phase III will then focus on transitioning the developed technology from a laboratory test-bed environment to field test systems. The team's partnerships with Pratt & Whitney will be utilized to this effect.
Step 1	These TTAG funds will be used for the Bid and Proposal labor cost associated with the PI working on researching the information needed for the proposal and writing the proposal. The total estimated time for writing this proposal is between 80-85 hours. The PI hourly rate is $47.24 and this TTAG funds will pay for ~62hours of B&P. The rest of the B&P time will be paid by the Enterprise (which is APEI, Inc.).
Step 1 Time	62.00
Step 1 Budget	$3,750
Step 2	
Step 2 Time	0.00
Step 2 Budget	$1,250
Step 3	
Step 3 Time	0.00

Step 3 Budget	$0
Increased Sales	$0
Retained Sales	$0
CS Inventory	$0
CS Labor	$0
CS Materials	$0
CS Other	$0
II Plant	$0
II IS	$0
II Workforce	$0
II Research	$100,000
II Other	$0
AUI	$0
SOI	$0
Job Retention	2
Job Creation	0
YN 90Days	Yes
YN Affiliation	Yes
YN Agreement	Yes
YN Total Project Price	Yes
Explain Total Project Price	
YN Cash Match Agreement	Yes
Copied	No
TTAG ID	11-TTAG-017
Signature Panel - RP AR Name	Sharmila Mounce
Signature Panel - RP AR Email	smounce@apei.net
Signature Panel -	Alex Lostetter

Enterprise AR Name	
Enterprise - Email	.-.-.-.-.-.
Signature Panel - Enterprise AR Email	alostet@apei.net
Include in Batch	Yes
Batch Number	NA
Application Status	Pending
Organization	ASTA
BatchTest	Processed
Batch Date	
Set Batch Number	
Lvl4	No
Application Description	6-Advanced Materials & Production
SBIR-STTR	Yes