

JUSTIFICATION FOR OTHER THAN FULL AND OPEN COMPETITION (JOFOC)
(In accordance with Federal Acquisition Regulation (FAR) 6.3 – Other than Full and Open Competition)
August 14, 2014

1. This document is a justification for other than full and open competition prepared by NASA's Goddard Space Flight Center (NASA's GSFC):

The NASA/Goddard Space Flight Center (GSFC) proposes to procure a Mercury-Cadmium-Telluride (HgCdTe) electron-avalanche photodiodes (e-APD) focal plane array (FPA) for a methane lidar development to measure global methane distribution from the International Space Station. The HgCdTe e-APD FPA was originally developed by DRS Network & Imaging LLC under NASA Contract NNG11HP07C. The purposes of this solicitation is to procure an identical unit of the above detector system using residual parts and materials and fabrication techniques from the prior contract to reduce risk and cost.

2. The nature and/or description of the action being approved:

This program will select one of the pre-tested HgCdTe e-APD FPA developed for NASA under NNG11HP07C and integrate it into a closed-cycle cooling system that can fit into a standard instrument rack and fly on a NASA test airplane to atmosphere methane concentration from an 11 km altitude to demonstrate the technology readiness level (TRL) of the methane lidar before the full instrument development for International Space Station. The requirements for the HgCdTe e-APD FPA system are identical to those given in the NNG11HP07C. An abbreviated list of requirement is also listed below:

- Quantum efficiency: >85% from 0.9 to 4.3 um wavelength range
- 4x4 pixels, 80 micron square per pixel, 160 micron pitch, and >75% fill factor
- Maximum e-APD gain >600 at 12 V APD bias voltage
- Dark current <0.1 nA per pixel at 10 V APD bias (gain=150) and 77K temperature
- APD excess noise factor <1.05
- Integrated read-out integrated circuit (ROIC) on the same chip carrier as the HgCdTe e-APDs
- Variable preamplifier gain, max 3.2e5 V/A, capable of capacitor only feedback to allow integrated dark current measurement
- Electrical bandwidth >6 MHz, with pulse rise and fall time <= 0.5 microseconds
- Noise equivalent power (NEP) < 1 fW/(Hz)^{1/2} per pixel at 12 V APD bias
- Uniformity better than +/-5% among all 16 pixels in terms of the APD responsivity and NEP
- Proton radiation damage: NEP and APD gain unchanged after 30krad(Si) proton irradiation and annealing
- Closed cycle cooler to fit into an instrument rack with <50W electrical power consumption at room temperature, suitable to use in an airborne methane lidar measurement.
- Infrared window on the cooler to allow direct optical signal coupling
- Cold filter and cold shield inside the cooler and support F/1.5 numerical aperture
- Integrated cooler control and APD bias control circuit
- Fault protection to prevent detector damage due to high temperature
- Remote control from a personal computer (PC) over a universal serial bus (USB)

3. Description of the supplies or services required, including an estimated value:

Build, characterize, and deliver a low noise low bandwidth 4x4 pixel array HgCdTe e-APD FPA system with integrated ROIC in a closed cycle cooler (Dewar) per specifications described in Section 2.

Task 1

Closed-cycle cooler development – (3 months after effective date of contract)

Procure the cooler and support electronics, install cold shield, cold filter, and infrared window, test and verify cooler operations.

Task 2

Configure the LMPC ASCENDS Command Control Electronics (LACCE), a residual circuit board from prior contract.

Task 3

Install a 4x4 pixels HgCdTe e-APD sensor chip, a pretested residual units from the prior contract (NNG11HP07C), in the cooler and verify the system performance.

The total estimated value of this procurement is \$165,000, with the use of residual components from prior contract (NNG11HP07C).

4. Statutory authority permitting other than full and open competition:

The statutory authority permitting other than full and open competition is 10 U.S.C 2304 (c) (1), as sited under FAR 6.302-1 “When the supplies or services required by the agency are available from only one responsible source, or, for DoD, NASA, and the Coast Guard, from only one or a limited number of responsible sources, and no other type of supplies or services will satisfy agency requirements.”

5. A demonstration that the proposed contractor’s unique qualifications or the nature of the acquisition requires use of the authority cited:

After conducting an in-house survey and numerous purchases and tests of a wide range of avalanche photodiode detectors from several vendors, including Raytheon Vision Systems and CEA in France, we found that DRS is the only supplier that has demonstrated the required detector performance for our methane lidar for the potential mission on board the International Space Station.

DRS has successfully delivered the first system under contract NNG11HP07C which is now used in our airborne CO2 lidar with satisfactory performance. DRS has also successfully delivered a duplicated system and conducted two proton radiation tests to this type of HgCdTe e-APDs under contract NNH12CR35C.

The HgCdTe APD arrays produced by DRS uses a company proprietary design with a lateral cylindrical geometry with the p-n junction and n- multiplication region around the central via interconnect, which has

unique advantages of high gain, low dark current, and high fill factor. DRS has been producing this type of HgCdTe APDs since 2006 and has published many technical articles about the devices in scientific journals and conference proceedings. DRS has demonstrated that they can successfully produce this type of devices at low risk and on schedule.

6. Description of the efforts made to ensure that offers are solicited from as many potential sources as practicable, including whether a notice was or will be publicized as required by Federal Acquisition Regulation (FAR) 5.2:

A notice to the Federal Business Opportunities (FedBizOpps) will be posted for 15 days as required by FAR Subpart 5.2.

7. A determination by the contracting officer that the anticipated cost to the Government will be fair and reasonable:

The Contracting Officer (CO) has determined that the anticipated cost to the Government will be fair and reasonable for the scope of work. CO will conduct an analysis of all cost elements to assure the Government obtains a fair and reasonable price relying on historical rates and costs, along with review of the most recent and available Defense Contract Audit Agency documentation of labor and indirect cost rates.

8. Description of the market research conducted, and the results, or a statement of the reasons market research was not conducted:

Market research was conducted and several purchases and tests of HgCdTe avalanche photodiode detectors were done. Based on this research, the Government could not find a manufacturer of time-resolved infrared focal plane array with photo-electron multiplication gain >600 at less than <13V, a noise equivalent power spectral density of <1fW/rtHz, and a spectral response from 0.9 to 4.3 um. Additionally, a sole-source synopsis will be released on or about October 1, 2014.

9. Other facts supporting the use of other than full and open competition:

[Redacted]

[Redacted]	[Redacted]
[Redacted]	[Redacted]

10. Sources, if any, that expressed an interest, in writing, in the acquisition:

This requirement will be synopsisized and posted on the NASA Acquisition Internet Site (NAIS) on or around July 1, 2012. Firms desiring consideration will be requested to fully identify their interest and capabilities within 15 days of the date of publication of the synopsis. The 15-day response period expired on October 16, 2014 and there were no responses.

11. The actions the Agency may take to remove or overcome any barriers to competition before any subsequent acquisition for the supplies or services required:

There are no barriers to overcome and no action is necessary by NASA to remove barriers to competition. No further procurements are anticipated for these types of items.

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TECHNICAL DIRECTORATE: I certify that the facts presented in this justification are accurate and complete.

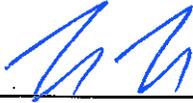


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Signature

Date

**CONTRACTING OFFICER:
(APPROVAL)** I certify that this justification is accurate and complete to the best of my knowledge and belief.



Signature

9/10/14

Date

This signature page is to be used for all JOFOC's requiring Contracting Officer Approval (see GSFC Procurement Circular 10-1). Add page number to top right.