

**Doc ID:**

**Request for Proposal  
For  
Detectors for Neuromorphic Camera for  
Lightning Detection**



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## **A. Brief Introduction:**

SAC is engaged in the technology development of Neuromorphic Camera for Lightning detection. Lightning is a matter of global concern and requires systematic observations from space borne platforms to map and characterize lightning events at synoptic scale. In view of this, feasibility of a LEO & GEO Lightning Mapper is studied. Various Technologies for Lightning mapping will be evaluated in this evaluation phase with Engineering model detectors. Post evaluation, successful detector candidate will be proposed for the flight model configuration. In this context, potential suppliers are invited to offer their techno-commercial bids to meet SAC requirements for the detectors.

## **B. Bid selection and order placement criteria:**

Potential suppliers are requested to provide with following information along with their offer. In the absence of mandatory supporting information, bid will be rejected.

- 1.1. Part specific point-by-point Compliance Matrix, lead time, Minimum Order Quantity (MOQ), export license requirement, if any
- 1.2. Compliance to test report submission is mandatory (wherever required)
- 1.3. Requirements given in this document may be modified by SAC before the finalization of the contract. After the award of the contract, any modification will be done as per terms of the contract.
- 1.4. Bidders are requested to submit their technical and commercial offers separately. It is very important for evaluation of the offer that the proposals include sufficient technical data on form, fit and function.
- 1.5. The Bidder shall also submit a blank Price Bid (All the price numbers shall be masked) with the technical proposal.
- 1.6. Supplier must provide Datasheet of the sensor with all the requested parameters along with the deliverables
- 1.7. Two different detector technologies are part of the specifications of the RFP. Split Order can be placed for each category of Detectors based on the L1 in each category.

## C. Detector Category

Two types of Detectors are being procured through this RFP and are defined as follows:

- Category A: Event Based Contrast detection vision sensor

This Sensor will consist of Pixel Level Intelligent Analog Pixel circuitry for carrying out the Contrast detection within each pixel. Detailed specifications are defined in the section below. This Sensor will be used for all applications where change detection is important.

- Category B: High Frame Rate Detector for Lightning Imager

This detector is based on the concept of High Frame rate, High Full well capacity detector having high Responsivity in the NIR region. This Sensor will be used for evaluation of Imaging as well as High Speed algorithms based Lightning mapping.

## D. Category A: Event Based Contrast detection vision sensor

Event-based contrast-detection vision sensors constitute a new paradigm for acquiring dynamic visual information. The main advantages of these vision sensors, compared to frame-based image acquisition techniques, are low-latency response, wide-dynamic range operation and pixel-level data redundancy suppression. This frame-free operation directly reduces data volume at the sensor output. The immediate benefits of temporal redundancy suppression are reductions in bandwidth, memory and computing power requirements for data transmission and post-processing.

The in-pixel change detector is built around a fast continuous-time logarithmic photoreceptor with asynchronous event-driven signal processing. It continuously monitors photocurrent for changes and responds with polarity-discriminated events that represent a relative increase or decrease in light intensity that exceeds tunable thresholds.

Sr no	Parameter	Minimum Specifications
1.	Pixel Format	$\geq 640*480$

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2.	Pixel Size	$\geq 15 \text{ um}$ and $\leq 30 \text{ um}$
3.	Pixel Feature	Event-based contrast-detection within each Pixel
4.	Dynamic Range	$\geq 120 \text{ dB}$
5.	Latency	$\leq 10000 \text{ us}$
6.	Supply Voltage	1.8 V – 5 V
7.	Readout Throughput	$\geq 10 \text{ Mevents/s}$
8.	Programming Interface	SPI / I2C
9.	Data Interface	Parallel Output
10.	Package	PGA / BGA Ceramic with Glass lid
11.	Transmission protocol for Event data	AER
12.	Contrast Detection	Positive and negative contrasts
13.	Contrast Threshold	Programmable through Programming Interface
14.	Contrast threshold non-uniformity	$\leq 5 \%$

## E. Category B: High Frame Rate Detector for Lightning Imager

The detector for Lightning Mapper is based on the concept of High Frame rate, High Full well capacity detector having high Responsivity in the NIR region. The technical specifications of the detector are as per the below table:

Sr no	Parameter	Minimum Specifications
1	Pixel Size	$\geq 4.5 \mu\text{m}$ and $\leq 25 \mu\text{m}$
2	Effective Photosensitive Area	$\geq 18 \times 18 \text{ mm}$
3	Full Well Capacity	$\geq 7 \text{ ke- per } \mu\text{m}^2$
4	Read Noise	$\leq 40 \text{ e-}$
5	Frame Rate	$\geq 500 \text{ FPS}$
6	Quantum Efficiency	$\geq 20\%$ at $777.4 \text{ nm}$
7	Detector type	CMOS with Digital Output at least 8 bit or more
8	Dark Signal	$\leq 1 \text{ ke-}/\text{Pixel} / \text{Frame}$
9	Shutter Type	Global
10	Dynamic Range	$\geq 65 \text{ dB}$
11	FPN	$\leq 3\text{e-}$
12	PRNU	$\leq 5\%$
13	Grade	Engineering Model
14	Package	PGA Ceramic Package with Glass Lid
15	Additional Modes	ROI , Binning , Programmable Exposure Control
16	Power Consumption	$\leq 10 \text{ W}$

## F. General Terms & Conditions

Sr no	Parameters	Specifications
1	Evaluation boards	<ul style="list-style-type: none"> <li>• Vendor shall supply Evaluation boards for device characterization.</li> <li>• Vendor shall also provide reference schematic of the detector front end &amp; back end circuit</li> <li>• The Evaluation board shall permit the Change of Sensor parameters on the fly and capture of Sensor data through USB / LAN interface through PC interface.</li> </ul>
2	Acceptance	Vendor shall share the test reports as per the technical specifications of the Sensor
3	Deliverables	<p>A. Category A: Event Based Contract detection vision sensor</p> <ul style="list-style-type: none"> <li>• Detectors: 5 pcs</li> <li>• Evaluation boards: 1 pcs</li> </ul> <p>B. Category B: High Frame Rate Detector for Lightning Imager</p> <ul style="list-style-type: none"> <li>• Detectors: 5 pcs</li> <li>• Evaluation boards: 1 pcs</li> </ul>
4	OEM Certificate & Warranty	1 year from the delivery date. As long as Vendor is able to provide warranty , OEM certificate is not mandatory.
5	Delivery time	6 months from the receipt of Purchase order
6	Compliance Table	Vendor should provide compliance against the requirement of each specification with justifications
7	Documents	Vendor shall provide sufficient technical details in the form of datasheet, white papers, application note etc. against the quoted part numbers. SAC reserves the right to reject the Vendor in case of lack of technical information

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8	Testing	Vendor shall ensure that the components are tested before delivery to SAC (wherever testing is mentioned). The test parameters should be defined with the specifications. In order to carry out the component testing, vendor shall develop their own test unit.
9	Support	<ul style="list-style-type: none"> <li>• Vendor shall provide dedicated support to SAC team to develop their own electronics using this image sensor.</li> <li>• During the support phase the Vendor shall review the Design schematic &amp; layout and suggest feedback for successful design of the Electronics</li> <li>• During the support phase, the vendor shall also provide guidance in setting the various parameters required for electro-optical evaluation of the sensor</li> <li>• The support duration shall be valid for at least 1 year from acceptance of PO.</li> <li>• Estimated Man-hours for Support &amp; consultancy through meetings/ email are 100 hours</li> </ul>