Technology Offer Form – V2.0

Title	*The title of the offer should be clear and meaningful for persons who are not experts. Readers should easily be able to find out if the Technology Offer is interesting for them.*
Mandatory *1-255 characters*	**ELFIS (HDR or image sensor)**

Technology Keywords	
Mandatory	Radiation hard design, Image sensor, Low Flux Image Sensor .. Backside illumination, stitching, high dynamic range (HDR), global shutter

Notes:

- Boxes marked in blue will be published on ESA online marketplace and on EEN online marketplace.
- Boxes marked in grey are mandatory, confidential and for EEN internal use only.
- The Form should be filled in English.
- Text in *blue* was added to support filling in the Form.

Entity Profile (Technology Provider)

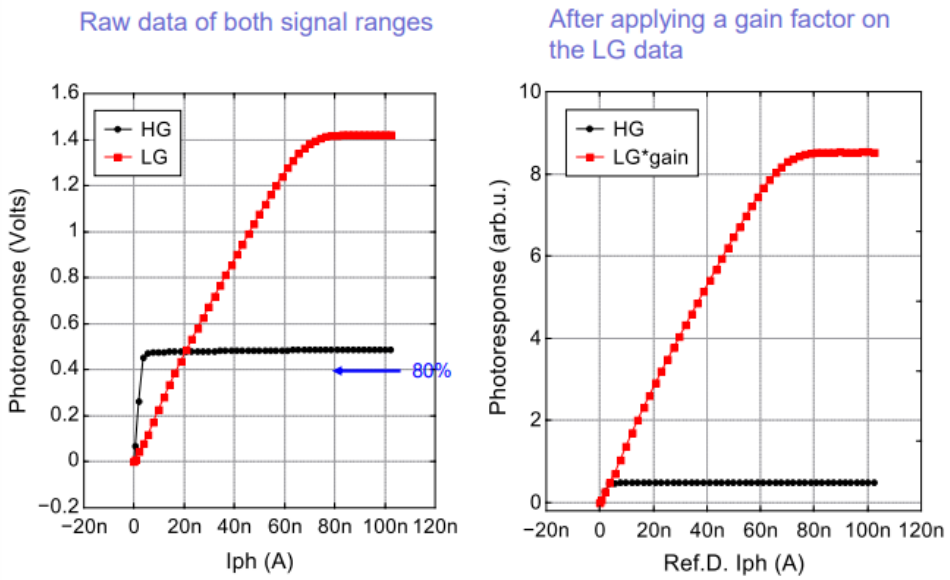
Entity	Caeleste	**Contact Person**	Jan Vermeiren
City	Mechelen	**Position**	Business developer manager Caeleste
Country	Belgium	**Contact Person Email**	
Street	Hendrik Consciencestraat 1B	**Telephone**	+32 15 71 05 03
Postal Code	2800	**Fax**	
URL	https://caeleste.be/contact-us/	**General Email**	info[@]caeleste.be
Year established		**Entity NACE (CAE)**	

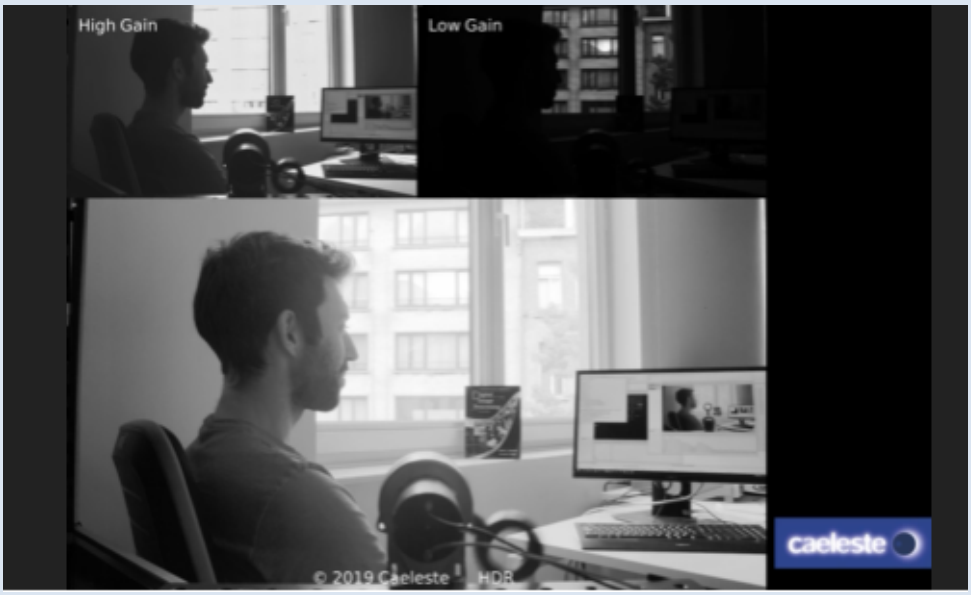
Type and size of entity *Mandatory* *Select 1 option only*	X SME	☐ Inventor
	☐ Large Company	X R&D institution
	☐ Multinational	☐University
	☐ Other	

Technology Offer

Abstract of the Offer	*The abstract of the offer should answer:* *- Where (geographically) is it from?* *- What sort of organization is offering it?* *- What is being offered?* *- What can it be used for?* *- What are the main advantages?* *- What sort of deal is sought?*
Mandatory *1-500 characters*	[JDB] Caeleste (Mechelen, Belgium) has an accumulated experience in image sensor design and development of over 250 years. They create "beyond state of the art" custom designed CMOS image sensors with a unique combination of properties. The technology can be used in applications for (scientific) imaging and instrumentation, medical imaging (next gen x-ray devices), industrial, life sciences and automotive The ELFIS2 image sensor wafer scale technology can be used in next generation custom developed devices that require low noise, high dynamic range up to waferscale or 9kx9k pixels. Deals can include but are not limited to custom development, technology transfer, integration, design services, standard platform, demonstrator, research.[] (The ELFIS image sensor combines a unique set of desired image sensor features, the result of a "beyond state of the art" design legacy and LFoundry's LF11 technologies with BSI.)

Description	*Provide background information or a short introductory text:* *Describe the technology or product. Try to provide quantitative data and describe any potential application of the technology, perhaps considering more than one field* *Provide information about the expertise or know-how behind the offer* *Do not include sales promotion or brand names* *Do not include advantages of your technology or product, this will come below*
Mandatory *100-4000 characters*	HDR in combination with true global shutter: the rotating black ring "cuts through" the dark interior background as well as through the sunlit outside background. The motion blur is not affected by the local light intensity. The two upper frames are the HG (high gain = high QFW range) and LG (low gain= "low QFW range) sub-frames as recorded



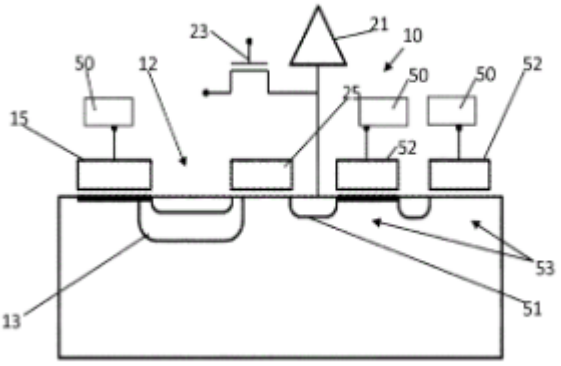


IWR tframe=tint = 30ms thus fframe=33Hz
Looking through the lab's window to sunlit buildings in the Michiel Coxystraat
Nikon 28mm lens, diaphragm set to 22 (sic! this is a 15µm BSI pixel!)
On-chip CDS and dark frame subtraction
No PRNU correction, no linearization was done. Two defect rows were corrected
The HDR image is created by a weighted interpolation between the HG and the LG frames

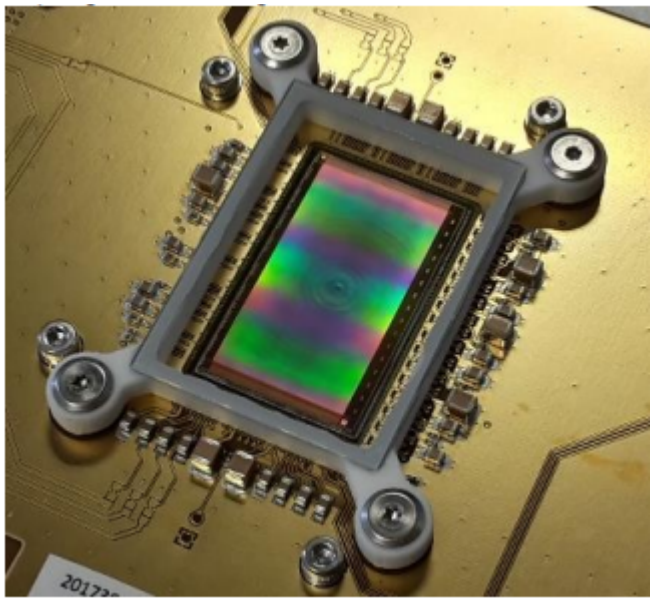
Advantages and Innovations	*Describe the innovative aspects of the technology. Avoid generalities such as best or unique, but try to specify innovation by comparison with prevailing technologies. Give the main economic advantages / benefits of the technology (if possible in a quantitative way), regarding such elements as performance, ease of use, need of specific know-how, or expertise to adopt your technology.*
Mandatory *50-2000 characters*	**Global shutter**: for fast moving object imaging. E.g. imaging for industries where high-speed vision is used in the manufacturing process, quality control, etc. Economic benefits: larger volumes with less defects. **Higher Dynamic Range**: the very high dynamic range (>100db) offers a low-noise high-detailed image readout in a single pass. This allows applications where exact true color is needed with the highest details in low or high light conditions. Economic benefits: lower processing cost, lower power consumption, more detail, one technology can be used in applications in different light conditions. **Custom wafer scale technology**: the technology is stitchable from 1k x 0.5k pixels up to waferscale or 9k x 9k pixels. Economic benefits: state of the art high-end imaging devices. High-performance devices (Giga-pix devices) can be developed to create imagery way more efficient than traditional aerial imagery devices.

Further Information regarding technical performance	*Provide additional information that might help a prospective technology receiver to judge the usefulness of the technology, for example performance parameters or operational limits.*
Optional *50-2000 racters*	▪ 1920x1080 pixels ▪ 15 µm pixel pitch ▪ Global shutter using a "GS" CMOS technology with buried storage node ▪ TID, SEU and SEL rad-hard design ▪ QE > 90% by backside illumination ▪ Read noise using CDS 2.5 e-RMS ▪ QFW in HDR mode 250000 e- ▪ "True" High Dynamic Range method based on the patented "3-level TG" method, reaching a single exposure, single integration time, synchronous dynamic range > 100dB The evaluation kit includes: ▪ Ceramic packaged ELFIS sensor, thick HIRES epi BSI flavor ▪ PCB board with socket and CMOUNT lens holder ▪ ADC and frame grabber on PCB ▪ GiGe interface ▪ Demonstration program running on PC via GiGe interface

IPR Status	*IPR - Intellectual Property Rights*	
Mandatory *Select 1 or more*	☐ Copyright	☐ Patent(s) applied for but not yet granted
	☐ Design Rights	X Patents granted
	☐ Exclusive Rights	☐ Secret Know-how

	☐ Granted patent or patent application essential	☐ Trademarks
	☐ Other (registered design, plant variety, etc.)	
Comments	*If the patent is applied for, list the countries* *If the patent is granted, enter the countries that have granted the patents* *If possible, indicate the year a patent was granted and its reference number.*	
Mandatory	US patent US10.497.737 entitled "enhanced dynamic range imaging" was granted on Dec 3, 2019 It describes a pixel and methods to reach a very high dynamic range (HDR) by integrating the same photo charge on multiple capacitors synchronously. The concept reminds other Caeleste HDR methods (patents US9.780.138, US9.699.398, US9.819.882, BE1023468), yet uses a conceptually different approach.  	

Pictures	*Add maximum 5 pictures, max 4MB each, max 50 characters for the file name including blank space. Also include a brief caption for each picture.*

.jpg, .jpeg or .gif	 This figure shows a FSI (fronside illuminated version of) the ELFIS on its characterization CoB (Chip on Board).

Pictures	*Add maximum 5 pictures, max 4MB each, max 50 characters for the file name including blank space. Also include a brief caption for each picture.*
.jpg, .jpeg or .gif	

Target technology receiver

Stage of Development for non-space applications		
Mandatory *Select 1 option only*	☒ Already on the Market	☐ Project in negotiations - urgent
	☐ Available for Demonstration	☐ Proposal under development
	☐ Concept Stage	☐ Prototype available for demonstration
	☐ Field Tested/Evaluation	☐ Under development / lab tested
	☐ Project already started	

Current and Potential Domain(s) of Application	*Clearly define the potential domain(s) of application of the technology.*
Mandatory	(1) Space missions earth observation, (2) Space missions sky observation, (3) Scientific high speed imaging, (4) Imaging in nuclear environment, (5) Imaging in medical, (6) Machine vision and industrial imaging (7) Inspection in harsh environments and conditions. (8) Underwater (pressure /space vacuum,) (9) Biometrics (10) Automotive vision (autonomous vehicles), (11) Security, traffic, citizen monitoring.

Type and role of Partner sought	*Type of partner sought: industry, academia, research centre, private company, etc.* *Specific area of activity of the partner (e.g. manufacturer of plastic packages, distributor of plastic packages, user of plastic packages, disposal of plastic packages)* *Tasks to be performed (e.g. Evaluate offered technology followed by negotiation for exclusive or non-exclusive license agreement, etc.)* *The more focused the definition, the higher the chances of finding a partner.*

Mandatory
1 to 4000 characters
	Type of partner: manufacturers of imaging equipment within specified domains of application (e.g. medical, space,... cfr. the list above)
	- Manufacturers of scientific CDDs
	  - That want to take advantage of the unique ELFIS features
	- Medical devices manufacturer
	  - Microscopy devices, chirurgical vision,
	  - X-ray
	- Medical system integrator
	  - Role: partnership, broker, mediator
	- Machine vision manufacturers
	  - Inspection, machine learning, ...
	  - Robotics
	- Research centre: facilitate technology matching with applications
	- Academia: fundamental research partner
	  - Research if the technology can be used in other domains, outside the imaging/vision technology applications.
	Examples:
	- Industry: Siemens medical devices, Panasonic, etc.
	TBD:
	- Type of license agreement, IP, ...

	- How can distributors of image devices help with matching? - Evaluation is need to validate the assumption of requirements and feasibility.

Type of partnership	*Specify the type of partnership that you are interested in.*	
Mandatory	☐ Acquisition agreement	☐ License agreement
	☐ Commercial agreement	☐ Outsourcing agreement
	☐ Commercial agreement with technical assistance (joint further development, testing of new applications, adaptation to specific needs)	☐ Manufacturing agreement - (transfer of knowledge, new way to use, change in partner's currently used technology, absolutely novel process)
	☐ Distribution services agreement	☐ Reciprocal production
	☐ Financial agreement	☐ Services agreement
	☐ Franchise	☐ Subcontracting
	☐ Joint venture	

SPACE Heritage

Description of Space Heritage	*What motivated the development of this technology for Space? What was the technology innovation that stemmed from its use in Space? Describe the investments in the Space technology, particularly by ESA.*
Mandatory for spin-outs *100 to 4000 characters*	ESA contract 4000116089 "European Low Flux Image Sensor", in collaboration with LFoundry (I) and Airbus (F).

EUROfusion Heritage

Description of Space Heritage	*What motivated the development of this technology for Space? What was the technology innovation that stemmed from its use in Space? Describe the investments in the Space technology, particularly by ESA.*

Mandatory for spin-outs *100 to 4000 characters*	This image sensor can be applied for fusion activities but there is no link with EUROfusion yet.

Other technical expertise's of the technology donor	*In order to generate side opportunities, precise the other domains of expertise of the technology donor (related to the technology or know-how description)*
Optional	

Broker Company Name:	**Country**	**Date:**
Verhaert	Belgium	
Broker Individual Name:	**Telephone:**	**E-mail**
Luisa Leroy		Luisa.leroy@verhaert.com

Comments on the technology by the broker	
1 to 500 characters	

END OF FORM