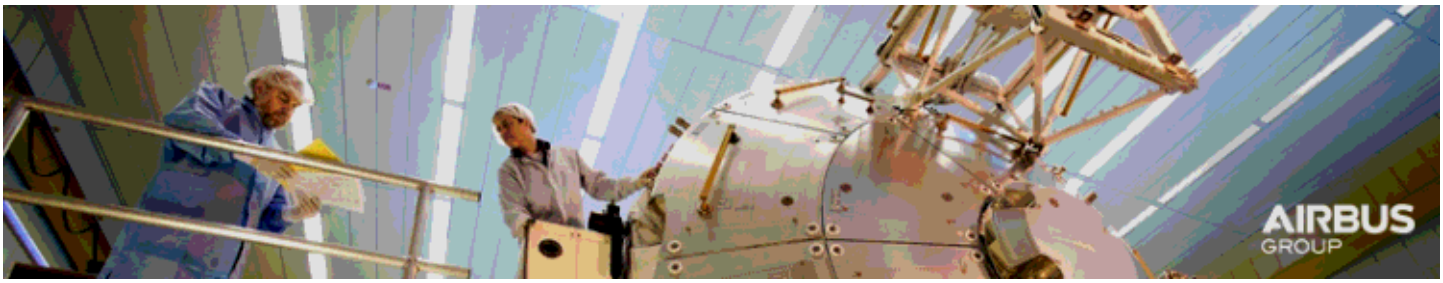

CIFRE PhD: OPTICAL IMAGE SENSORS (M/F)

Reference Code 10293914 AD EN EXT 1

- Site:	Airbus Defence & Space Toulouse (ex Astrium SL)
- Target Group:	Professional staff - engineer
- Work Contract Type / Working Time:	PHD, Research contract / Full time
- Start Date / Duration:	01.12.2015 / 3 ANS
- Work Experience:	No work experience
- Functional Area:	ENGINEERING / Design & Development
- Education:	

Airbus Defence and Space is a division of the Airbus Group, formed by combining the business activities of Cassidian, Astrium and Airbus Military. This new division is Europe's number one defence and space enterprise, the second largest space business worldwide and among the top ten global defence enterprises. It has an annual revenue of around €14 billion per year and employs approximately 40,000 people.
Airbus Group is a global leader in aeronautics, space and related services. In 2014, the Group - comprising Airbus, Airbus Defence and Space and Airbus Helicopters - generated revenues of € 60.7 billion and employed a workforce of around 138,600.

Description of the job

A vacancy for a CIFRE PhD student: OPTICAL IMAGE SENSORS (M/F) has arisen within Airbus Defence & Space in Toulouse. The successful candidate will join the microwave and optical detection engineering department of the optical instrumentation division.
The thesis proposed will take place between our department based on the ADS Toulouse site and the ISAE CIMI research team also located in Toulouse. The context of this PhD is for the growing interest in selling applications using matrix image sensors with snapshot mode, as well as the understanding and improvement of shutter performance.
The natural architecture of CMOS (called CIS for CMOS Image sensors) matrix imager being of semi-parallel type, the shooting and playback modes of these sensors are generally of the rolling shutter type within the optical imaging field. If it has undeniable intrinsic advantages, the "rolling" mode however has a considerable disadvantage, introduced by the non-simultaneous starting and stop of the integration of the optical signal of all the matrix line, which limits its use as soon as the movement of the scene is non-negligible compared with the observation time.
This limitation linked to the "rolling" mode is generally bypassed by the introduction in the pixel of at least one digital storage site (in charge or in tension), offering the possibility to start and stop simultaneously the integration of the optical signal on all the pixels of the matrix. This mode is called the "snapshot" mode. The reading of the information is then performed line by line or simultaneously during a new shooting (IWR mode for Integration While Read), or between two shots (ITR mode for Integration Then Read). The "snapshot" shooting mode has its drawbacks associated to the presence of pixel storage, mainly the reduction of filling factor and or of the maximum storage capacity per pixel, increasing the reading noise and deteriorating the integrated signal between the end of integration and its reading. Whether this is due to electrical or optical phenomena, the photonic signal continues to illuminate the pixel after the shooting when the mechanical shutter is not used upstream on the CIS. This deterioration of the useful signal is generally expressed by the manufacturers under the term of Parasitic Light Sensitivity (PLS) or Global Shutter Efficiency (GSE), while taking into account that measurement conditions and data processing methods are not standardised today.
The acquisition of improved performance in terms of PLS/GSE is one of the main challenges that CIS snapshot manufacturers are currently taking up, using either dedicated architectures or were the improvement of manufacturing methods. The use of these approaches for high-performance space applications remains nevertheless unlikely, notably because of their impact on other key performance.
With these findings, the main issue of this thesis is focused on the ability to operate a CIS and a snapshot reading mode that is suitable with satellite needs, seeking to implement efficient intra-pixel storage solutions linked to the reading chain of pixels and to make the most out of the optimised CMOS microelectronic processes for the latest generation of imaging.

Tasks

In detail, your tasks will include:
- Carrying out a bibliographic review of the state-of-the-art regarding:
¤ optimised CMOS technology for imaging
¤ snapshot reading mode solutions and their associated reading chains
- Understanding physical phenomena that govern the deterioration of the useful signal integrated in the pixel before its reading, according to the various parameters set by the system (pixel step, wavelength, temperature, storage load, etc.) or by pixel design (filling factor, use of micro-lens, shielding of the storage node, etc.) This part of the work will be based on existing components then on custom-designed CIS (incorporating dedicated elementary structures).
- From this basis, defining the possible correction levels using design and post processing that can be used to reduce the amplitude of PLS type deterioration
- Improving the associated metrics and defining the corresponding characterisation means, as well as associated processing method. Then using them for the characterisation of existing and specifically developed components to verify in particular the validity of possible PLS correction
- Designing and producing an optimised CIS snapshot matrix prototype for satellite application; Carrying out its characterisation vis-à-vis to the new metrics system implemented; using an opto-mechanical mission simulation bench, corroborating elementary result with the entire system performance.
This position will require occasional travel for business (2 times per year in Europe), and, as such, you must be able to travel accordingly.

Skills

We are looking for candidates with the following skills and experience:
- Engineering diploma (or equivalent),
- Initial experience or significant internship in the physics of semi-conductors and digital electronic and/or microelectronics
- Ideally, a specialisation in at least one of the following topics: nano/microelectronics, opto-electronics, electronic imaging, sensors, detectors
- Affinity for research and ideally initial experience in the field
- Excellent communication skills
- Good team player skills,
- Ability to organise your time and manage priorities
- Synthesis skills, independent way of working
- Meticulous, organised and methodical
- Negotiation level of French and an advanced level of English.

Contact

Please apply online.

Airbus Group is committed to achieving workforce diversity and creating an inclusive working environment. We welcome all applications irrespective of social and cultural background, age, gender, disability, sexual orientation or religious belief.

Airbus Group Recruitment Centre