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Université de Bordeaux & CNRS (UMR 5804)
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Ref. : SKA/PB/2017-07-16
Subject : declaration of interest in the Square Kilometer Array (SKA) project (updated)

Dear Dr. Ferrari,

Since 2000, the Laboratoire d'astrophysique de Bordeaux (LAB) has been conducting an intensive instrumentation program on the digitization and digital processing of large-band radio-astronomical signals in the millimeter and sub-millimeter ranges.

For the 1st-generation instrumentation of the Atacama Large Millimeter Array (ALMA), a project of the European Southern Observatory (ESO), we have developed:

1. The interferometric correlation electronical sub-system (2000-2008). A total of 540 boards were then manufactured by FEDD, our industrial partner in Dordogne (France), and tested at LAB;
2. Detector-close, robust, and cost-efficient, high-speed analog-to-digital converters in collaboration with the Intégration du matériau au système (IMS) laboratory in Bordeaux (2000-2011). More than 280 digitizer modules were delivered to ALMA from 2008 to 2011.

We still have the maintenance contracts for the correlation and digitization boards with ESO.

These achievements were followed by a Research & Development program on high-speed links with data transfer rates up to 16 Gbits/s for the connection of Application Specific Integrated Circuits (ASIC) to Field-Programmable Gate Arrays (FPGA), or for the interconnection of FPGAs.

Based on these successes, we believe we are now well positioned to take an active and significant role in the development of ALMA's 2nd-generation instrumentation.

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More recently, our expertise in large-band electronical sub-systems for radio-astronomy has gotten us interested in SKA. In 2012, LAB took responsibility for the digitization sub-system in the Aperture Array Integrated Receiver (AAIR) project funded by the French national research agency (ANR) and led by Paris Observatory's radio-astronomy laboratory in Nançay (France). The goal of AAIR is to build mid-frequency (300-1450 MHz) detectors for the SKA Aperture Array Mid Frequency (AAMID) consortium. LAB is also involved in SKA through the Wideband Single Pixel Feeds (WBSPF) consortium for which we are in charge of the B band (4-24 GHz) receiver.

In 2016, LAB was approached by the SKA Dish consortium for a contribution to the SKA-MID receiver in bands 4 (2.8-5.2 GHz) and 5 (4.6-13.8 GHz), the latter now being the second highest priority receiver band for SKA. This led the LAB to submit, at the end of 2016, a formal application to join the Dish consortium, for which we received recently (May 2017) the support of Philip Diamond, Director-General of the SKA Organisation.

On the astrophysical side, we have identified two areas where SKA would be especially valuable to LAB researchers: stellar formation and very long baseline interferometry.

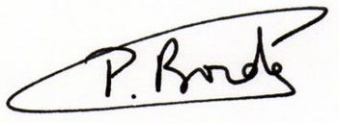
The following three topics would be of interest to our stellar formation team:

1. High-angular resolution and high-sensitivity mapping of the Galaxy and resolved galaxies in the H I emission line at 1.4 GHz;
2. Study at centimetric wavelengths of the populations of young radio sources in close massive clusters, and more distant ones towards the inner Galaxy;
3. Search for complex prebiotic molecules around 15 GHz.

Concerning fundamental astronomy, SKA will offer a new set of long baselines for VLBI with an unprecedented sensitivity (μJy) that will make it possible to detect a population of extragalactic sources currently out of reach, thus opening a wealth of new applications. Used in astrometric mode, SKA-VLBI will then make it possible to massively densify the International Celestial Reference Frame (ICRF), with the additional benefits of mapping radio sources, and more systematically identifying radio counterparts of the quasars of the Gaia optical reference frame.

In summary, LAB fully supports R&D activities for SKA in synergy with 2nd-generation ALMA instrumentation, has taken steps to join SKA consortia, and has identified several areas for scientific contributions.

Best regards,



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