

The II National Workshop of SKA science and technology

Monday, 3 December 2018 - Wednesday, 5 December 2018

Programme

Monday 03 December 2018

General: The SKA Project [chair: M. Tavani] (3 Dec 2018, 09:30-10:55)

time title

09:30	Welcome from host - 5' <i>Presenter: VENTURI, Tiziana</i>
09:35	Welcome from INAF - 10' <i>Presenter: TAVANI, Marco</i>
09:45	The SKA Project and its Science - 45' <i>Presenter: BRAUN, Robert</i> The current status of the SKA Project will be summarised, highlighting progress toward a completed design, establishment of the Observatory and consolidation of a construction and commissioning plan. The many science areas in which the SKA is anticipated to make major contributions will be briefly reviewed, together with a discussion of the SKA Data Challenges that are now underway to maximise community engagement with SKA data products and the optimised science extraction from them.
10:30	The SKA project from the SEAC perspective - 25' <i>Presenter: FERRARA, Andrea</i>

coffee break (11:00-11:30)

SKA-related technology and HPC activities: [chair: D. Fierro] (3 Dec 2018, 11:30-13:00)

time title

11:30	The SKA project: the engineering perspective - 15' <i>Presenter: FIERRO, Davide</i>
11:45	The SKA Project: technical requirements and challenges - 25' <i>Presenter: STRINGHETTI, Luca</i> The short presentation will present what we consider to be most important technical challenges for the SKA project. Before doing that, we need to put some context around and the current status of the project. The bridging phase and the adoption process to get to a successfully System CDR will be presented. The bridging phase will cover the gap between the Element CDRs and the System CDR, its main objective is to feed and support the system CDR of the observatory, currently plan for the end of next year. Because of the very high number of capabilities requested by the scientific community on the observatory we are facing many challenges starting from the availability of the observatory itself for the next 50 years of life. The availability requirement must be fulfilled with high quality hardware production, high stable hardware, easy to maintain and to verify. Each of this point is translated in one or more system requirements that are translated in technical and technical challenges for the specific element that comprises the system. The presentation will explore what "reliability" really means when we are dealing with high tech components and their high production number, offering a few examples for further discussion in the bridging phase.
12:10	LFAA experiences in Italy - 20' <i>Presenter: MONARI, Jader</i> The Italian contribution within the SKA1-LOW instrument and in particular on the Low Frequency Aperture Array (LFAA) Element has been important since the conception of the Square Kilometer Array project. The Low Frequency Aperture Array is a key component of the SKA. Combining 128 thousands of antennas into up to 2048 stations, with multiple beams and an instantaneous frequency coverage of 50 to 350 MHz, it allows to observe this spectral region with unprecedented spatial and spectral resolution, but constitutes also a formidable technical challenge. In this talk, I will present the experience that the INAF group has gained in the design of various parts of LFAA from the antenna to digitizer, including special test benches as UAV system. We participated to the system engineering aspects of the project, with a complete integrated solution for the signal processing sub-element. In the last year a prototype array (AAVS1) was deployed at the SKA site. Experience gained in installation and operation of this facility has been essential in finalizing the instrument design. National collaborations with Universities, research institutes and industries participating to those activities, will be highlighted during the talk.

12:30	<p>The SKALA4-AL antenna: the Italian solution for SKA1-LOW - 15'</p> <p><i>Presenter: BOLLI, Pietro</i></p> <p>This contribution deals with the SKALA4-AL antenna developed by INAF in collaboration with CNR-IEIIT and the industrial partner Sirio Antenne. This dual-polarized Log Periodic Dipole Antenna optimized to operate between 50 and 350 MHz is a candidate for the SKA1-LOW telescope. The main characteristics of the antenna are: aluminium material, 50 ohm single-ended feeding, screw fastening and grounding to the metallic plate. Besides the antenna, the Italian team worked also on developing a low noise amplifier (LNA) based on a 50-ohm single-ended solution to be installed on top of the antenna to amplify the signal before transmitting it to the front-end module. Two SKALA4-AL prototypes have been built, one of them used for tests in Italy, while the other antenna shipped to the Murchison Radio Observatory (MRO) site in Australia. Results from electromagnetic numerical analysis and experimental tests conducted in Turin with a hexacopter system and at MRO will be discussed. Finally, the current status and future perspectives of this activity will be presented.</p>
12:45	<p>The SKA1-LOW receiver: the Italian experience from SKADS to AADC - 15'</p> <p><i>Presenter: PERINI, Federico</i></p> <p>INAF/IRA has a long and well established tradition with low frequency arrays thanks to the Northern Cross radio telescope, located in Medicina (Italy). Since the beginning of the Italian adventure in the SKA project, with the participation to the SKADS EC-FP6 program, INAF/IRA has been involved, as part of its general effort, to contribute into the design of RF receivers for low frequency (<2GHz) systems. From the first prototype in 2004, called BEST, IRA/INAF has introduced the RFoF technology, which allow to remote antenna arrays transporting all signals into a central facility. After about 15 years of work in this field, this technology is a key component of the Verification System (AAVS1) of the Aperture Array Design Consortium recently deployed in Western Australia and has been selected for the reference design of SKA1-LOW.</p>

Lunch break (13:00-14:00)

SKA-related technology and HPC activities: [chair: R. Smareglia] (3 Dec 2018, 14:00-16:00)

time title

14:00	<p>ITPM ADU 1.5 for LFAA and general purpose application - 15'</p> <p><i>Presenter: SCHILLIRO', Francesco</i></p> <p>ITPM ADU is an international collaboration led by INAF team, whose goal is the realization of a digital equipment designed and produced for SKA-LFAA station signal processing. The project started in 2013 and led to the production of a digital platform consisting of 3 hardware upgrades (ITPM 1.0, 1.1 and 1.2), the processing and management firmware for LFAA and the station control software. Together with the design of a proper housing rack, made in Italy, the system ITPM mounting ADU 1.2 was adopted in AAVS1 experiment, held in Australia last year.</p> <p>This work describes the new ITPM ADU 1.5 development to contribute to the implementation of final version of SKA-LFAA telescope, improving power consumption, clock distribution circuitry and cooling system; as well as the design and engineering of a digital platform ITPM-based for other projects related to radio astronomy, or signal processing for general applications.</p>
14:15	<p>The SKA-Dish Local Monitor and Control - 25'</p> <p><i>Presenter: TRIGILIO, Corrado</i></p> <p>The Square Kilometre Array is currently completing the pre-construction phase in which two arrays of radio antennas (SKA1-Mid and SKA1-Low), observing at different frequencies, are being designed to be installed in the South Africa's Karoo region and Western Australia's Murchinson Shire. The SKA1-Mid array will consist of 133 15-m diameter dish antennas observing in the 350 MHz-14 GHz range and remotely orchestrated by the SKA Telescope Manager (TM) system using the Dish Local Monitoring and Control (LMC) system. LMC interfaces with antenna instrumentation to provide a rolled-up monitoring view of the dish and high-level control functionalities to TM components operating at higher layers in the SKA control system hierarchy.</p> <p>A Tango-based LMC software prototype is expected to be delivered to validate the designed software architecture and the SKA control system patterns and perform the Dish integration and qualification, expected in early 2019.</p> <p>In this talk we describe the SKA dish instrumentation and control system designed for the Critical Design Review stage, recently approved by SKA organization.</p>
14:40	<p>Central Signal Processing Consortium: the Italian contribution - 25'</p> <p><i>Presenter: COMORETTO, Gianni</i></p> <p>The SKA Central Signal Processor represents the largest radioastronomical correlator ever designed, including a massive real time pulsar search and pulsar timing machine.</p> <p>Italian contribution to this element is described. It includes a study of the element local monitor and control, with particular emphasis to the pulsar search machine, the final optimization stage of the pulsar search, and the modelling of the mid correlator signal chain, especially in the presence of radio frequency interferences.</p>

15:05 Telescope Manager Consortium: the Italian contribution - 25'*Presenter: DOLCI, Mauro*

Telescope Manager (TM) is the central element of the SKA. Its role (and responsibility) are the management of the preparation of astronomical observations, the execution of telescope operations and the control and monitoring of the overall telescope status.

To accomplish these functions, TM was originally structured as made of of specific sub-elements: Observation Management (OBSMGT, UK-led), Telescope Management (TELMGT, India-led), Local Monitoring and Control (LMC, Italy-led) and Local Infrastructure (LINFRA, Portugal-led). The TM Consortium, led by the NCRA team at Pune (India), also included South Africa for System Engineering as well as Australia and Canada for review and consultancy. The TM architectural design started on November 2013.

During the development of the final design an important change occurred after the adoption of the SEI architectural design standards by the SKAO. The TM PBS was redefined, in line with the change introduced at system-level, and three high-level products were foreseen: TM-Observatory, TM-Mid and TM-Low. Correspondingly, the design of TM was redefined as composed by two main software modules: *Observatory Science Operations (OSO) software* and *Telescope Monitoring and Control (TMC) software*. In addition to them, however, three cross-cutting modules were introduced: *TM Services (SER) software*; *Authentication, Authorization and Auditing (AAA) software* and *User Interface (UI)*.

The groups from INAF led these three important modules, while collaborating with the UK team in the development of the *Observation Data Archive (ODA)*, a crucial part of OSO software.

The TM consortium successfully passed the CDR in April, 2018 (the very first CDR of the whole SKA project). A large part of the activities carried on during the Pre-construction Phase, especially those concerning INAF, are to be prosecuted during the Bridging Period and could possibly play an important role during the SKA Construction Phase.

15:30 PHAROS2: A C-Band Cryogenic Phased Array Feed*Presenter: NAVARRINI, Alessandro*

High-sensitivity large-scale surveys are an essential tool for new discoveries in radio astronomy. A Phased Array Feed (PAF) placed at the focal plane of an antenna can increase the Field-of-View (FoV) and the mapping efficiency by fully sampling the sky. Multiple beams can be formed by adding signals from electrically small focal plane radiating elements of the array using different sets of complex weights.

Following an overview of PAF technologies, we will describe the design and architecture of PHAROS2, a cryogenically cooled 4-8 GHz PAF demonstrator with digital beamformer for radio astronomy application. The instrument is under development in the framework of the SKA (Square Kilometer Array) PAF Advanced Instrumentation Program as an international collaboration of the National Institute for Astrophysics (INAF, Italy), the Jodrell Bank Observatory (University of Manchester, UK), the Netherland Institute for Radio Astronomy (ASTRON, the Netherland), the Onsala Space Observatory (OSO, Sweden) and the University of Malta (Malta).

PHAROS2 will be capable of synthesising four independent single-polarization beams by combining 24 active elements of an array of Vivaldi antennas. The instrument features: a) commercial cryogenic Low Noise Amplifiers with state-of-the-art performance, b) a "Warm Section" for signal filtering, conditioning and single downconversion to select a ≈ 275 MHz Intermediate Frequency (IF) bandwidth within the 4-8 GHz Radio Frequency (RF) band, c) an IF signal transportation by analog WDM (Wavelength Division Multiplexing) fiber-optic link, and d) a FPGA-based Italian Tile Processing Module (ITPM) digital backend.

PHAROS2 will be mounted at the primary focus of the 76-m diameter Lovell radio telescope (Jodrell Bank Observatory, UK) for technical and scientific validation.

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coffee break (16:00-16:30)**SKA-related technology and HPC activities: [chair: G. Bernardi] (3 Dec 2018, 16:30-16:45)**

time title

16:30 Low-Frequency Array Verification with Unmanned Aerial Vehicles - 15'*Presenter: MATTEOLI, Stefania*

New-generation radio telescopes such as the SKA's aperture array require advanced techniques to confirm the desired performance and calibrate the instrument. At low frequencies, the strong mutual coupling between the array elements and the interaction of the antennas with the environment can drastically alter the expected response of the elements and compromise the calibration process.

In this context, an antenna measurement system consisting of a radio-frequency signal source mounted on an Unmanned Aerial Vehicle (UAV) has been developed in Italy in order to perform tests at both subassembly and end-to-end level. Measurement campaigns have been successfully carried out on two prototypes of the SKA low-frequency instrument placed in United Kingdom and on a station of the LOFAR radio telescope in The Netherlands. Recently, near-field verification strategies have also been proposed.

Science with SKA Precursors and Pathfinders: HI [chair: G. Bernardi] (3 Dec 2018, 16:45-17:40)

time title

16:45 Extragalactic HI Science: ongoing activities towards the SKA - 25'*Presenter: SERRA, Paolo*

I will discuss SKA-related work in the field of extragalactic HI astronomy. I will focus on recent, ongoing and upcoming science projects with a variety of telescopes -- including SKA pathfinders and precursors -- that will pave the way for SKA1 programs. I will discuss a few technical challenges such as RFI rejection/nulling, data volume and source finding; and I will present some exciting new recent HI results. Finally, I will describe how the extragalactic HI community has organised its activities towards the SKA.

17:10 First results from MeerKAT Commissioning Observations - 15'*Presenter: MACCAGNI, Filippo*

The MeerKAT Fornax Survey (MFS, PI Paolo Serra) is a dedicated large survey project planned by the MeerKAT telescope, the South-African precursor of the SKA. The MeerKAT telescope was inaugurated in July 2018. As of early 2019, MeerKAT will observe for 900 hours the Fornax cluster to study its assembly of new gas-rich galaxies and groups and the physics of gas accretion occurring in its environments. In this talk, I will outline the main scientific goals of the MeerKAT Fornax Survey and the main challenges that we will face in the analysis of high resolution (~25 kHz) and sensitivity (0.1 mJy) MeerKAT observations. I will show new results from high resolution (8") MeerKAT commissioning observations of the brightest cluster galaxy of Fornax (NGC 1399), of Fornax A, the extended radio source in the in-falling group of the cluster, and of the region connecting these two sources, where we detect neutral hydrogen gas (HI). I will focus on the challenges presented by the spatial extent of Fornax A (~1 degree in the sky) in correctly subtracting its continuum emission, and detecting the HI line with high signal to noise ratio. I will show how we solve these issues in the automated data reduction pipeline we developed for MeerKAT continuum and spectral line observations (MeerKATHI). The techniques for the reduction and analysis of MeerKAT observations will set an important starting point to plan and develop the SKA survey projects and data reduction strategies.

17:25 ASKAP HI Imaging of a nearby spiral galaxy - 15'*Presenter: KLEINER, Dane*

The Australia Square Kilometre Array Pathfinder (ASKAP) is a new radio interferometer that is pioneering revolutionary Phased Array Feed (PAF) receivers, which are under consideration for future SKA instrumentation. I will give an update on ASKAP status, rollout and commissioning, and present the first results from WALLABY, the main extragalactic ASKAP HI survey that has been using an ASKAP sub-array for early science. We have produced the highest resolution HI images of the nearby, gas-rich, spiral galaxy IC 5201 that has also revealed 3 gas-rich dwarf satellite galaxies. An additional 5 galaxies and 2 tidal features are detected in the same HI images due to the instantaneous wide-field imaging capabilities of ASKAP. I will discuss the physical properties of these systems, focusing on the ratios of available HI gas, star formation rate and stellar mass in order to describe the galaxies and their environments.

Synergies between SKA and other facilities: [chair: G. Bernardi] (3 Dec 2018, 17:40-18:05)

time title

17:40 Euclid & SKA: Competition or Synergy? - 25'*Presenter: SCARAMELLA, Roberto*

Tuesday 04 December 2018

SKA-related technology and HPC activities: [chair: G. Brunetti] (4 Dec 2018, 09:15-11:00)

time title

09:15	<p>Supercomputing and Big Data: the SKA requirements - 25'</p> <p><i>Presenter: MICCOLIS, Maurizio</i></p>
09:40	<p>Supercomputing and big data for the SKA: challenges and opportunities for Italy - 30'</p> <p><i>Presenter: A. POSSENTI / R. SMAREGLIA</i></p> <p>SKA Data Challenger is only one of the IT technologies challengers in which the SKA project is involved. These imply all activities from data management, network transfer, (super)computing infrastructure to, last but not least, software pipeline development and workflow management. INAF, as Italy main actor in the SKA project, can play an important role, both in the evolution of the exascale computing and data as a partner/host of the European SKA Regional Center, and as an Excellence center in the field of the software development. INAF is already part of this process as involved in the AENEAS H2020 project, and SKA Science Data Challenger host.</p>
10:10	<p>LOFAR-IT HPC Activities - 30'</p> <p><i>Presenter: U. BECCIANI / G. TAFFONI</i></p> <p>On March 2018, INAF approved the participation to the International LOFAR Telescope (ILT) and the organization of a LOFAR-IT Consortium led by INAF itself aiming at coordinating at Italian level the participation to ILT. The University of Turin (Department of Physics: DP-UniTO) has recently formalised the participation to LOFAR-IT Consortium.</p> <p>A Board of the LOFAR-IT project has been established to manage the whole participation of INAF to ILT. INAF will contribute to the development of LOFAR2.0 with an agreement with AstroTec to purchase a LOFAR2.0 station in 2021- 22.</p> <p>INAF and the LOFAR-IT Consortium have also planned to create an e-infrastructure for the reduction/analysis of LOFAR data for the Italian Astronomers. LOFAR-IT has established a working group that carried out a study for the LOFAR2.0 infrastructure participation.</p> <p>In this talk we will present the LOFAR-IT organization and the main characteristics of the Italian e-infrastructure. We will finally discuss the preliminary tests performed on the LOFAR pipelines to study the computational and storage needs of the Italian community that are driving the design of the e-Infrastructure.</p>
10:40	<p>Setting the stage for SKA: planning training and support for the community - 15'</p> <p><i>Presenter: MASSARDI, Marcella</i></p> <p>Training and support services will provide the pillars for the future SKA endeavour.</p> <p>The AENEAS WP5 analysis identified the crucial aspects in preparing for the new frontier that is SKA: several challenges await our astronomical communities to proficiently face the opportunities offered by it. A preparatory plan based on coordinated training events that exploit current facilities and tests will accompany and prepare the community for the path ahead.</p> <p>The ALMA Regional Centre experience has already proven that support facilities within large telescope projects are vital drivers not only for providing the preferential interface with the facility to any user (observers, data analysts, software scientists...), but also for improving the user SKA experience and getting the maximum benefit from its scientific exploitation. In my talk I will present some of the possibilities for user-facility interaction schemes and community training plans for the European SKA community.</p>

coffee break (11:00-11:30)

Outreach SKA-related activities: [chair: C. Trigilio] (4 Dec 2018, 11:30-12:05)

time title

11:30 The “wow” and the “how”: the challenge of effectively communicating SKA - 15'*Presenter: VARANO, Stefania*

Although the Square Kilometer Array is by now an “old acquaintance” for the big community of scientists and technologists involved, this huge project is not as well known to the public of non-experts. The work package for outreach in the Italian PRIN-INAF project FORECast (FORmation and Evolution of Cosmic STRuctures with Future Radio Surveys) aims at presenting it in all its strength, in a joint effort with other projects supported as PRIN-INAF.

Building upon our great professional expertise in communicating radio astronomy to students and public, we are designing pioneering outreach activities aiming at showing both the fascinating science and the groundbreaking technology involved in SKA. Indeed, we believe that the great challenge for SKA-related communication is telling about the scientific opportunities and expectations (the “wow”) while also communicating the peculiarities of studying the Universe through huge amounts of invisible radio data (the “how”). With this ambitious aim, within FORECaST we are designing activities for different targets, that we would like to present and discuss at the II National Workshop of SKA Science and Technology.

We have produced a set of educational activities for primary and middle schools, showing the specific observing techniques. High school students will on the other side experience observing with real radio telescopes and dealing with databases for data reduction and analysis. We have also designed an exhibit showing radio data converted into multisensorial stimuli, in order to i) show the need of conversion of invisible collected data into significant and understandable features and ii) create an effective mean of inclusion of a sensorial impaired public. Besides, we are working together with other national PRIN projects for designing a virtual reality experience based upon cutting edge technology, in order to bring SKA to people and let them effectively and emotionally get involved, though physically far away: the societal and human aspects of the story will play an important role into the narration.

All designed activities obviously include the presentation of the scientific goals of the FORECaST and other involved projects, in order to present their strategies for contributing to our understanding of the Universe.

11:45 GENESIS-SKA outreach: how to catch general public, how to engage business - 20'*Presenter: C. BOCCATO / S. PASTORE*

The GENESIS-SKA project is supported as PRIN-INAF and its main goal is to study dust evolution, planet formation, and pre-biotic chemical complexity, in the context of preparation of SKA Key Programmes. The funding PRIN-INAF also accounts for communication, public and industrial outreach of the projects' scientific goals and results. This is the reason why the project has a dedicate outreach work package with a specific activities' plan that we would like to present and discuss with the scientific community. The scientific aspects of this project are especially well suited for outreach, being related to the fundamental question of broad interest: How did life emerge? But we can also take advantage of previous professional engagement in many outreach activities related to other science projects.

In this context we are therefore developing different activities for different targets and throughout different approaches: a website for peers, educational activities for schools, highly engaging talks for general public. For as regards industrial outreach we think that such activity is intended to enable businesses in general, from industry to SMEs and entrepreneurs, to be engaged in SKA-GENESIS and thus in the SKA project at large and their scientific and technological challenges.

In the talk we'll start from the analysis of different approaches in the engagement process which targets companies (e.g., industry days, conferences, participation to fairs), highlights the necessity of proposing new typology of activities applying innovative methodologies derived from other areas (e.g., barcamp, hackaton, experiential laboratory) and customized for the business audience.

The aim is to promote SKA-GENESIS and SKA visibility. This activity and a specific event locally organized (e.g., a Barcamp) could contribute at creating science-businesses interdisciplinary links at a more territorial level, engaging the several productive sectors (e.g., mainly consisting of SMEs) and the local business organizations. New approaches to industrial outreach allow new networking and collaboration with companies, especially at local level, opening the way for benefit of EU regional funds for research and innovation.

Synergies between SKA and other facilities: [chair: C. Trigilio] (4 Dec 2018, 12:05-12:30)

time title

12:05 Synergies between SKA and other cosmological probes - 25'*Presenter: (ON BEHALF OF MATTEO VIEL), Stefano Camera***Science with SKA Precursors and Pathfinders: Our Galaxy [chair: C. Trigilio] (4 Dec 2018, 12:30-13:10)**

time title

12:30	<p>The SCORPIO project: the first ASKAP glimpse in the Galactic plane - 25'</p> <p><i>Presenter: G. UMANA / F. BUFANO</i></p> <p>SKA precursors are going to revolutionize our view of the Milky Way. ASKAP is entering its regime phase and one of its large program, EMU, is the largest radio survey ever designed at the planned depth of 10 μJy/beam. In the wide context of the preparation for EMU and ASKAP we present the SCORPIO project, an ATCA survey of a patch of the Galactic plane, originally covering a \sim5-square-degree. SCORPIO has recently been extended to \sim40-square-degree thanks to the first ASKAP early science data, being the first Galactic field ever imaged at this frequency by an SKA precursor. In this talk we show the major scientific results we are obtaining on point and extended sources in the general context of stellar evolution. We present also the first ASKAP early science observation of SCORPIO, carried out in January 2018 at a central frequency of 912 MHz. We highlight the surprising capability of ASKAP to image wide fields toward the Galactic plane also in view of EMU.</p>
12:55	<p>New methodologies for Galactic data reduction and analysis - 15'</p> <p><i>Presenter: CAVALLARO, Francesco</i></p> <p>SKA precursors have just started to collect data, whose amount is so huge that is somehow overwhelming scientists. And the data stream is going to blow up once the precursors will be fully operational, not to mention SKA itself. How are we preparing for this? Automation in data reduction and analysis is mandatory but it is still far to be complete with respect to all the cases the radio astronomy community is going to encounter in the very next future. Data reduction pipelines and newly developed analysis tools are representing an intriguing challenge for scientists and a formidable test bench for super-computing facility. In this talk we present the use case of data reduction and analysis of ASKAP Galactic observations of the SCORPIO field, as representative of a series of issues for radio mapping. We first discuss how we fitted the ASKAP data reduction pipeline to the "Galactic needs". Then we present some algorithms we developed or are developing to analyse Galactic maps, in particular for source extraction and characterization. We finally propose and summarise some practical solutions to help shaping the ASKAP Galactic data processing strategy.</p>

Lunch break (13:10-14:00)

Science with SKA Precursors and Pathfinders: the Cradle of Life [chair G. Umanal] (4 Dec 2018, 14:00-14:40)

time title

14:00	<p>From protostellar disks to planetary atmospheres with SKA: Back to cm-wavelengths with new perspectives - 25'</p> <p><i>Presenter: CODELLA, Claudio</i></p> <p>The ingredients for the recipe to make a "habitable" planet like our own Earth are: a relatively small rocky planet, at the right distance from the host star, with a not too thick atmosphere rich in volatiles and capable of developing interstellar complex organic molecules (iCOMs) chemistry. Searches for exoplanets have shown a large degree of diversity in the planetary systems, and as yet is unclear how common a System like our own is. Understanding the formation of planetary systems and the chemical processing of the volatiles that will form their atmospheres is key to understand the origins of the Solar System and how common the "habitable" planet outcome may be. More specifically key questions still to be addressed are: how chemically complex are the volatiles delivered on the pristine planetary atmospheres? What molecules are passed from the large-scale envelope to the disk in which planets, comets, and asteroids form?</p> <p>These are questions addressed by the INAF funded project GENESIS-SKA. The GENESIS-SKA approach is: to fully exploit the capabilities of the telescopes working in the mm- and sub-mm wavelengths to prepare pilot projects in the cm-domain and consequently plan science goals for SKA. We will present and discuss what obtained so far by GENESIS-SKA:</p> <ol style="list-style-type: none"> (1) the large program ALMA FAUST, the first and so far unique ALMA large program on astrochemistry (iCOMs and light C-chains at 220-260 GHz); (2) a pilot project for the preparation of a VLA large program (iCOMs, at 23-24 GHz); (3) a pilot project for the preparation of a Green Bank single-dish large program (iCOMs and heavy C-chains, at 13-15 GHz).
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14:25 Searching for exoplanets with SKA - 15'*Presenter: INGALLINERA, Adriano*

The improvement in sensitivity of radio telescopes is disclosing a brand new method for searching and characterizing extrasolar planets. Mutual magnetic interaction between an exoplanet and its parent star (or even one of its satellites) can give rise to a electron cyclotron maser emission (ECME), known as auroral radio emission. The radio emission has a peculiar signature in time and in polarization. There are two scenarios: in one case the planet orbiting the star can trigger this emission leading to a ECME in the stellar magnetosphere; in the other one the stellar wind can trigger the auroral radio emission directly above the planet. Information like the presence of a planetary magnetosphere or of different satellites can be inferred. Current observations are however heavily hampered by the limited sensitivity, and we expect that a major step forward will be possible only with SKA. Despite this limitation we present two cases we recently studied: the ultra-cool dwarf TVLM 513-46546 and α Centauri. For the first star we used VLA observations at 4.9 and 8.4 GHz to constrain an auroral radio emission model and reproduce the cyclic circularly-polarized pulses of the star. Our model explains the observed radio emission, and in particular its anomalies at 8.4 GHz, as a possible interaction of the star with an external body (Leto et al. 2017). For α Cen, we successfully detected both the stars at 17 GHz, being the first detection ever at these frequencies. We used 2-GHz data to search for time-variable coherent emission as a signature of the claimed Earth-sized planet in close orbit to α Cen B, finding no results (Trigilio et al. 2018). We finally discuss the implication of this early pioneering study in planning and proposing observations with SKA and its precursor, when the unprecedented sensitivity could be unveiling hundreds of these cases.

Synergies between SKA and other facilities: [chair: G. Umana] (4 Dec 2018, 14:40-15:45)

time title

14:40 Infrared-Radio synergies in Galactic Interstellar medium and star formation - 25'*Presenter: MOLINARI, Sergio*

I will illustrate recent developments in Galactic star formation and ISM studies from large panoramic surveys in the infrared and submillimeter. The amount and the quality of data now available over our entire Galaxy call for renewed efforts also in the radio. SKA allows a new leap in sensitivity and mapping capabilities at high spatial resolution both in continuum and spectroscopy to unveil new perspectives in the study of the atomic and ionised phases of the diffuse ISM and the initial stages in intermediate and massive star formation.

15:05 Synergies between SKA and LSST: the transient sky - 25'*Presenter: BOTTICELLA, Maria Teresa*

The LSST will be a wide-field 8m class telescope designed to obtain multi-band images over a substantial fraction of the sky every few nights. Multiple goals are expected in many relevant astrophysical areas, such as: (i) taking an inventory of the Solar System; (ii) mapping the Milky Way; (iii) exploring the transient universe; and (iv) probing dark energy and dark matter. The SKA and LSST offer significant synergies, in particular in time-domain astrophysics. Simultaneous observations of the transient sky carried out with SKA and LSST will allow us to study "known" and yet "unknown" classes of transient phenomena with unprecedented accuracy. The optical counterparts of a broad range of radio transients will be imaged by LSST in different bands and the spectroscopic follow-up of the most exciting candidates will be carried out with SOXS.

15:30 Definitive characterization of the ISM in the Local Universe: SKA and other facilities - 15'*Presenter: CASASOLA, Viviana*

Understanding the interplay between the various components of the interstellar medium (ISM: dust, atomic and molecular gas) in galaxies of the Local Universe is of fundamental importance for studies of galactic formation and evolution. In the last decade, thanks in particular to *Herschel*, we made a considerable effort in the study of one of these components, the dust. In this framework, the DustPedia project has been devised aimed at performing a complete characterization of dust in the Local Universe. However, we need information on all the phases of the ISM, including the gas, to draw definitive conclusions on it.

Exploring the cosmic evolution of the gas content of galaxies is a key science driver for **SKA**, and DustPedia is supporting this providing a first important step in understanding how the cold ISM related to the dust content, and to galaxy ability to form stars. We present the main scaling relations between uniformly homogenized data of molecular and atomic gas, and dust for a sample of ~ 450 nearby ($z < 0.01$), late-type galaxies extracted from the DustPedia sample. Only such a large and coherent dataset of all phases of the ISM can provide a definitive view of the ISM in the Local Universe and permit to link it with that at high redshift, tracing its evolution.

ALMA is revealing the molecular gas component through several tracers, as e.g. CO, detectable at millimeter wavelengths, while telescopes as JVLA and, in future, **SKA** detect the atomic gas component (21cm-HI). Our approach therefore represents a clear example of **synergy** between **SKA** pathfinder/precursors, ALMA, and *Herschel*, in addition to put us in a favored position for the forthcoming use of **SKA**.

coffee break (15:45-16:15)**Science with SKA Precursors and Pathfinders: Transients [chair: A. Possenti] (4 Dec 2018, 16:15-17:15)**

time title

16:15	<p>Pulsars and FRBs: ongoing activities towards the SKA - 25'</p> <p><i>Presenter: BURGAY, Marta</i></p> <p>I will present an overview of the ongoing and planned activities of the italian radioastronomical community related to pulsar and Fast Radio Burst science, in view of the SKA.</p>
16:40	<p>Probing the properties of globular clusters using pulsars with MeerKAT - 15'</p> <p><i>Presenter: ABBATE, Federico</i></p> <p>Globular clusters contain a large number of millisecond pulsars. Besides being extremely interesting by themselves, these pulsars are an invaluable tool to probe the cluster environment and dynamics. They can be used to search for the presence of an intermediate mass black hole in the center, ionized gas and its magnetic field. The SKA precursor MeerKAT is in a unique position as it is capable of observing all of the Milky Way globular clusters. Thanks to its large collecting area and wide bandwidth, MeerKAT will be able to time the pulsars in globular clusters with higher precision than now possible and to constrain better the structural parameters of the clusters. This will also lead to tighter limits on the mass of central black holes.</p>
16:55	<p>Deciphering the puzzle of GRB170817 and the SKA studies of Gamma Ray Bursts - 20'</p> <p><i>Presenter: GHIRLANDA, Giancarlo</i></p> <p>Radio observations of the first gravitational wave event with an electromagnetic counterpart (GRB170817) has shown unexpected features. The long lived, slowly rising, non-thermal radio emission (together with optical and X-ray observations), between 10 and 200 days after the BNS merger, is consistent with being produced by either a narrowly collimated or an isotropic outflow with geometrical and/or dynamical structure. Global-VLBI observations, owing to the exquisite angular resolution, hold the key to distinguish between these two models answering the question whether a relativistic jet emerged from the merger. Implications for the event rate and jet physics will be discussed.</p>

Synergies between SKA and other facilities: [chair: A. Possenti] (4 Dec 2018, 17:15-18:20)

time title

17:15	<p>GRAWITA: the role of SKA - 25'</p> <p><i>Presenter: PALAZZI, Eliana</i></p> <p>The first joint gravitational wave (GW) and electromagnetic (EM) signals detection in August 2017 marked the dawn of GW+EM multi-messenger astronomy. The GRAWITA collaboration has been at the forefront of this new era providing the most impressive spectro-photometric optical/near-infrared data set on the EM source. These observations secured the first compelling evidence for the existence of kilonovae.</p> <p>The GRAWITA team has been awarded time at several observing facilities and the project is representing an efficient operational framework capable of fast reaction on large error box GW triggers and direct identification and characterization of detected EM counterpart candidates. I will describe the GRAWITA collaboration and its activities and the contribution that the Square Kilometre Array (SKA) will provide to the discovery and understanding of transient EM sources associated to GW signals.</p>
17:40	<p>Synergies between SKA and CTA - 25'</p> <p><i>Presenter: VERCELLONE, Stefano</i></p> <p>The Cherenkov Telescope Array (CTA) will be the next generation gamma-ray observatory, open to the scientific community, to investigate the very high-energy emission from a large variety of celestial sources in the 20 GeV - 300 TeV energy range. The full array, distributed over two sites, one in the northern and one in the southern hemisphere, will provide whole-sky coverage and will improve the sensitivity with respect to the current major arrays such as H.E.S.S., MAGIC and VERITAS by a factor of five to twenty, depending on the energy. CTA will investigate a much higher number of already known classes of sources, going to much larger distances in the Universe, performing population studies, accurate variability and spatially-resolved studies. We review the current status of the CTA project and discuss the main CTA Key Science Projects, which will focus on major scientific cases, allowing us to provide legacy data-sets of high value to a wider community in a context of synergies with other major multi-wavelength facilities.</p>

18:05 The THESEUS space mission and its synergy with SKA - 15'

Presenter: AMATI, Lorenzo

The Transient High-Energy Sky and Early Universe Surveyor (THESEUS) is a space mission concept under study by ESA as candidate M5 mission aiming at exploiting Gamma-Ray Bursts for investigating the early Universe and at providing a substantial advancement of multi-messenger and time-domain astrophysics. THESEUS will address main open issues in cosmology such as, e.g., star formation rate and metallicity evolution up to redshift 10-12, Pop III stars, re-ionization. In addition, it will provide a fundamental contribution to time-domain and multi-messenger astrophysics by identifying the electromagnetic counterparts to sources of gravitational radiation, which will be routinely detected in the late '20s / early '30s by next generation facilities like aLIGO/aVirgo, LISA, KAGRA, and Einstein Telescope and studying most classes of transient sources, thus providing an ideal synergy also with the large observatories of the near future like LSST, ELT, TMT, SKA, CTA, ATHENA. In particular, the perspective synergy between THESEUS and SKA is apparent. First of all, the two observing facilities will address fundamental open issues in cosmology through complementary measurements and methods, whose combination will allow to increase substantially the accuracy and reliability in the determination of, e.g., star formation rate evolution up to the very early Universe, physics and evolution of cosmic re-ionization, detection and characterization of pop III stars and first galaxies. In addition, THESEUS will be a wonderful machine for the detection, characterization and redshift measurement of any kind of GRBs and many classes of X-ray transients. The combination of THESEUS data with those from simultaneous and follow-up observations of these phenomena with SKA will provide unique clues to their physics, progenitors and, more in general, will be a cornerstone contribution to the time domain and multi-messenger astrophysics of the future.

Wednesday 05 December 2018

Science with SKA Precursors and Pathfinders: Active Galactic Nuclei [chair: F. Govoni] (5 Dec 2018, 09:10-09:50)

time title

09:10	<p>AGN Science with the SKA - 25'</p> <p><i>Presenter: VENTURI, Tiziana</i></p> <p>In this talk I will overview the current open and hot questions in the area of radio emission from active galactic nuclei, and will address the impact the SKA and its precursors and pathfinders will play/are playing. I will further highlight the relevance of the SKA-VLBI in this field.</p>
09:35	<p>Search and modelling of remnant radio galaxies at 150 MHz with LOFAR - 15'</p> <p><i>Presenter: BRIENZA, Marisa</i></p> <p>Low frequency observations have finally opened the way to the search and study of remnant radio galaxies. These sources represent the last evolutionary stage of radio galaxies when the jets have switched off, and have remained elusive and poorly understood so far. For a long time there have been claims that new sensitive surveys would lead to the discovery of many more remnant radio galaxies, especially at low frequency, and LOFAR now gives us the opportunity to investigate whether this is the case.</p> <p>In this talk I present an extensive search for remnant radio galaxies at 150 MHz in the Lockman Hole, a well-studied extragalactic field, and JVLA follow-up observations of the candidate sources. In addition to this, I will show the results from Monte-Carlo simulations that we have performed to predict the fraction of remnants that should be found in radio flux limited samples, to be compared with observations.</p> <p>This study puts the basis for a statistical investigation of remnant radio galaxies over larger sky areas using new generation surveys performed with SKA precursors, such as the LOFAR Two-metre Sky Survey, The MeerKAT International GHz Tiered Extragalactic Exploration and GAMA Legacy ATCA Southern Survey.</p>

Synergies between SKA and other facilities: [chair: F. Govoni] (5 Dec 2018, 09:50-10:05)

time title

09:50	<p>The latest Fermi catalogs and SKA prospects for high energy studies - 15'</p> <p><i>Presenter: GIROLETTI, Marcello</i></p> <p>The Fermi-LAT Fourth Source Catalog (4FGL), based on 8 years of $E > 50$ MeV photon data, will comprise about 5500 sources. This number corresponds to a 60% increase relative to 3FGL. The talk will describe the analysis improvements over 3FGL and the new catalog features. About 66% of the sources will have high-confidence counterparts detected at other wavelengths, both extragalactic (mainly blazars) and galactic (mainly pulsars). The nature and properties of the newly detected sources will be discussed, in particular with a description of the accompanying Fourth LAT AGN catalog (4LAC), which will comprise about 3000 sources, essentially doubling the number of sources published in 3LAC, and of the first Fermi-LAT low energy catalog (1FLE) of sources detected in the 30 MeV - 100 MeV range. Multiwavelength observations are key for the characterisation of the physical properties of the identified objects, as well as for the classification of the so-far unassociated gamma-ray sources. The SKA and its precursor can have a prominent role in this area, as I will point out in this presentation with some case studies.</p>
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Science with SKA Precursors and Pathfinders: Magnetism and Galaxy Clusters [chair F. Govoni] (5 Dec 2018, 10:05-11:00)

time title

10:05	<p>Magnetism and Galaxy Clusters: ongoing activities towards the SKA - 25'</p> <p><i>Presenter: BONAFEDE, Annalisa</i></p> <p>Galaxy clusters are the host of complicated non-thermal phenomena, that are best visible at radio wavelengths. The current generation of radio instruments, such as the uGMRT, LOFAR, and the JVLA, are showing in these years new and interesting features regarding both the cluster magnetic fields and the non-thermal emission associated with the intra-cluster medium. In this talk, I will review the main milestones that the community has achieved in the last years, and show the main advances that we expect to obtain with the SKA.</p>
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10:30 Observation of a nearby filament of galaxy clusters - 15'*Presenter: VACCA, Valentina*

During this talk I intend to present radio observations with the Sardinia Radio Telescope (SRT) of a region of the sky of $8^\circ \times 8^\circ$, likely associated with an over-density traced by nine massive galaxy clusters at $z \approx 0.1$. The combination of the SRT data with observations from the NRAO VLA Sky Survey revealed the presence of 28 new diffuse synchrotron radio sources with radio emissivity and X-ray luminosity 10-100 fainter than known diffuse synchrotron cluster sources (radio halos and relics). The comparison with magneto-hydro-dynamical simulations suggests that this population is potentially the tip of the iceberg of a class of diffuse large-scale synchrotron sources associated with the filaments of the cosmic web and corresponding to magnetic field strengths of ~ 20 -50 nG.

10:45 Cosmic magnetism with the SKA: expectations on the study of intracluster magnetic fields - 15'*Presenter: LOI, Francesca*

In the next years, thanks to the advent of the SKA we expect a revolution of our knowledge about cosmic magnetism. Its precursors and pathfinders are already pushing the current limits of sensitivity and resolution and they will allow us to study large scale magnetic fields with unprecedented details. In this talk, I will present a computational tool which can produce realistic synthetic full-Stokes images that we expect to detect with the SKA1-MID. The simulated data are used as a framework to investigate how we can constrain large scale magnetic fields hosted by galaxy clusters with this next generation instrument.

coffee break (11:00-11:30)**Synergies between SKA and other facilities: [chair: R. Cassano] (5 Dec 2018, 11:30-12:00)**

time title

11:30 Synergies between SKA and Athena - 30'*Presenter: F. PANESSA / F. VAZZA*

In this talk we will highlight the existing synergies between SKA and Athena in the framework of two major research fields: AGN physics and cosmic web studies.

AGN physics:

A rich phenomenology of jets, winds, and accretion states has been observed in both active galactic nuclei (AGN) and X-ray binaries (XRBs), suggesting a connection between the accretion and ejection flows at different black hole masses, from supermassive down to stellar mass. In AGN, the radiation field from the disk and the outflows, both of winds and jets, are thought to play a fundamental role in the feedback invoked in galaxy formation and evolution. Notwithstanding their importance, our knowledge of the accretion and ejection phenomena and their interplay is still very limited. Single-object and population studies can explore the accretion/ejection mechanism in XRBs and AGN. The Athena X-ray observatory will be launched when the complete SKA array will be fully operative. The combination of these two facilities will provide fundamental improvements on several topics, revolutionizing our comprehension of the accretion/ejection phenomena at all scales (spatial, mass, radio power). The Athena+SKA synergy will allow us to disentangle the jet/disk flows based on their different contributions to the overall spectral energy distribution, expected to be different in ADAF, ADAF+jet and standard disk/corona models. The superb SKA and Athena sensitivities will lead to high temporal resolution, allowing to test the coronal emission models where reconnection events produce relativistic electrons, which may produce both the radio and the X-ray emission, leading to correlated variability. Given the large number of AGN that SKA will observe/detect, it will be possible to reconstruct all the AGN accretion phases in the local Universe, from pure ADAF, to ADAF+jet dominated, to accretion efficient regimes.

Cosmic Web:

The SKA promises to detect the synchrotron emission from shocked plasmas on scales beyond what is currently observed in galaxy clusters, finally imaging the location of the "missing baryons" of the cosmic web. This will have deep implications also for our understanding of how the magnetisation of cosmic structures has proceeded across cosmic epochs. By joining forces with the SKA, Athena should map the missing baryons in several regions: by observing with long exposures regions previously selected in the radio band, Athena will be able to collect enough X-ray photons to attempt first emission spectra from the missing baryons around galaxy clusters and in filaments. In particular, based on our ongoing campaign of simulations, we can predict that the interaction region of close pairs of galaxy clusters should emit enough radio waves to be detectable by the SKA, as well as enough X-ray photons to allow detections using the XIFU, which will allow us to capture these elusive baryons for the first time, and study their thermodynamical properties in detail.

Science with SKA Precursors and Pathfinders: The Epoch of Reionization [chair: R. Cassano] (5 Dec 2018,**12:00-12:55)**

time title

12:00	<p>Reionization and the Cosmic Dawn: ongoing activities towards the SKA □</p> <p><i>Presenter: MESINGER, Andrei</i></p> <p>The birth of the first stars, black holes and galaxies heralded the end of the cosmic Dark Ages and the beginning of the Cosmic Dawn. The light from these objects heated and ionized almost every atom in existence, culminating in the Epoch of Reionization: the final major phase change of the Universe. This final frontier of astrophysical cosmology is undergoing a transition from an observationally-starved epoch to a "Big Data" field. This process is set to culminate with upcoming Square Kilometre Array observations of the redshifted 21-cm line: providing a 3D map of the first billion years of our Universe. Currently, we are starting to get a handle on the timing of reionization. However with the SKA, we will be able to actually study the UV and X-ray properties of the first galaxies, which are encoded in the large-scale structure of the H I signal. I will discuss the innovative modeling techniques we are developing to tap into this bounty, allowing us to constrain astrophysical parameters in a fully Bayesian framework. With this framework, we can infer the star formation inside galaxies too faint to be seen even with JWST. Moreover, we can study high-energy processes in the early Universe, through their heating signature of the IGM before reionization. With SKA, the Italian astronomical community is in the position to become a world leader in the study of Reionization and the Cosmic Dawn.</p>
12:25	<p>Observing the cosmic dawn and epoch of reionization with the 21-cm line - 15'</p> <p><i>Presenter: BERNARDI, Gianni</i></p> <p>The quest for the 21-cm signal from the Cosmic Dawn and subsequent Epoch of Reionization has taken an unexpected turn with the reported detection of a sky-average absorption trough centred at 78 MHz ($z \sim 17$, Bowman et al., 2018) whose explanation challenges any current theoretical model. In this talk I will present competing observations aimed to confirm the reported detection. I will also review the current status of the Hydrogen Epoch of Reionization Array (HERA), the most sensitive SKA precursor for observations of the 21-cm line from the Cosmic Dawn and subsequent Epoch of Reionization.</p>
12:40	<p>Simulations of Galactic polarized synchrotron emission for Epoch of Reionization observations - 15'</p> <p><i>Presenter: SPINELLI, Marta</i></p> <p>Observations of the Epoch of Reionization (EoR) through the redshifted 21 cm line represent a new frontier in observational cosmology and have motivated the construction of several low frequency radio arrays. Detection of the redshifted 21 cm line emission is complicated by the contamination from foreground sources that are brighter by several orders of magnitude. The dominant foreground is Galactic synchrotron emission caused by cosmic ray electrons interacting with the galactic magnetic field. Synchrotron emission can also be polarized. Every EoR experiment with an instrumentally polarized response, may have to face a leakage of polarization into intensity. In this case, the polarized synchrotron becomes a potentially problematic foreground emission with its complex frequency dependent structure. Dedicated simulations are needed in order to estimate the level of contamination of this foreground emission. In this talk I will discuss how we tackle the issue of Galactic polarized emission, present our simulations and some applications to EoR studies down to Cosmic Dawn.</p>

Lunch break (13:00-14:00)

Synergies between SKA and other facilities: [chair: I. Prandoni] (5 Dec 2018, 14:00-14:15)

time title

14:00	<p>Complementarity and synergy with CMB projects - 15'</p> <p><i>Presenter: BURIGANA, Carlo</i></p> <p>The synergy between current and future cosmic microwave background (CMB) projects and the extreme sensitivity and resolution of the Square Kilometre Array (SKA) will be crucial for a wide set of themes relevant for cosmology and astrophysics at different cosmic epochs, including cosmological parameter estimation, integrated Sachs-Wolfe effect and constraints on dark energy, primordial non-Gaussianity and magnetic fields, CMB spectrum and cosmological reionization. I discuss the instrumental requirements and the observational/data analysis approaches relevant for performing these scientific investigations.</p>
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Science with SKA Precursors and Pathfinders: Galaxy Formation and Evolution [chair: I. Prandoni] (5 Dec 2018, 14:15-15:10)

time title

14:15 Galaxy/AGN Evolution: ongoing activities towards the SKA - 25'*Presenter: BONDI, Marco*

Nowadays deep radio surveys reach micro-Jy level flux densities detecting mainly star-forming galaxies and radio-quiet AGN. These are the classes of objects which have been studied for decades in the infrared, optical and X-ray bands. Moreover, radio observations are unaffected by absorption and therefore are sensitive to all kinds of AGN independently of orientation (e.g. Type 1s and Type 2s) and provide a dust-unobscured view on star formation achieving a better resolution than that obtained in current deep far-IR surveys. For these reasons radio observations provide a complementary and important tool to investigate the galaxy/AGN co-evolution throughout cosmic time. In this presentation I will summarize some recent results obtained from the VLA-COSMOS 3 GHz Large Project.

14:40 Theoretical Models of Galaxy Formation including HI - 15'*Presenter: ZOLDAN, Anna*

In my talk, I will present results obtained using the state-of-the-art galaxy formation model GAEA, and its most recent version including prescriptions to partition the cold gas into its atomic and molecular components (Xie et al. 2017 - X17).

I will first discuss how the most recent observational measurements available for HI selected galaxies in the local Universe compare with prescriptions from six independently developed semi-analytic models (all run on the same cosmological N-body simulation, with X17 being the only one including an explicit treatment for the partition of cold gas in HI and H₂). I will show that the specific treatment adopted for satellite galaxies strongly affects the final HI content at low masses but that, contrary to naive expectations, instantaneous stripping of hot gas from infalling galaxies does not translate necessarily in lower HI masses.

In fact, I will demonstrate that stellar feedback and star formation can influence significantly the gas content of satellites. Finally, I will discuss the origin of the correlation between HI content of model galaxies and the spin of the parent halos.

In the second part of my talk, I will focus on X17 and on its specific predictions for the sizes and specific angular momenta (j_*) of galaxies.

Our model includes an explicit treatment for specific angular momentum exchange between galactic components, and the scale radii of the gaseous and stellar disks depend directly on their specific angular momenta.

I will discuss how model predictions compare with recent observational estimates, and how they are affected by different prescriptions for cold gas accretion and stellar feedback.

The results I will present show that the X17 model is able to reproduce both the HI content and the dynamical properties of simulated galaxies, representing an ideal tool to create dedicated mock catalogues for the interpretation of existing surveys and the preparation of future ones.

We have developed a dedicated software to this aim.

A first preliminary all sky mock catalog has already been made available to the SKA cosmology group working on intensity mapping.

We plan to expand this work by extending this catalog up to higher redshift and including the 21 cm line emission of model galaxies.

We plan to make the catalogues available to the larger SKA community.

The results I will present have been published in Zoldan et al. (2017) and Zoldan et al. (2018).

14:55 Hosts and environments of radio-active AGN - 15'*Presenter: MAGLIOCCHETTI, Manuela*

Investigations of the population of radio-active AGN up to $z=3.5$ not only show that these sources are hosted by galaxies of very large, $M^* > 10^{10.5} M_{\text{sun}}$, stellar masses, but also that at all redshifts they reside in very massive dark matter halos, comparable to those associated with groups-to-clusters of galaxies. This result is found both via clustering studies and by directly pinpointing such sources to the cosmological structures they belong to. We also show how intense star-forming activity is encountered in the overwhelming majority of $z > 1$ (massive) galaxies hosts of radio-active AGN, and how this activity is only halted by nuclear feedbacks in the relatively local universe. What emerges from our work is a scenario whereby physical processes at sub-pc/pc (e.g. AGN emission) and kpc scales strongly influence the large-scale structure behavior of the AGN and its host. Within this context, wider and deeper radio surveys are strongly foreseen in order to beat the uncertainties associated to studies confined to small regions of the sky, so to provide the ultimate answer on how these sources evolve with cosmic epoch.

Synergies between SKA and other facilities: [chair: I. Prandoni (5 Dec 2018, 15:10-15:25)

time title

15:10 The IDIA Cloud and the HIPPO Project - 15'*Presenter: VACCARI, Mattia*

The IDIA cloud is a cloud computing system being developed at the Institute for Data Intensive Astronomy (IDIA). The IDIA cloud is a data intensive research facility whose main aim is to facilitate the reduction and the scientific exploitation of MeerKAT data. Building on the IDIA cloud, the HELP-IDIA Panchromatic Project (HIPPO) is developing an environment for the effective multi-wavelength characterization of radio sources detected by MeerKAT. In my talk I will introduce the IDIA cloud, detail the aims and the status of the HIPPO project and demonstrate some IDIA and HIPPO use cases in a Jupyter Notebook.

General Discussion: Introduction [chair I. Prandoni] (5 Dec 2018, 15:25-15:45)

time title

15:25 SKA in Italy - 20'*Presenter: PRANDONI, Isabella***coffee break (15:45-16:15)****General Discussion: The Italian Roadmap to the SKA [chaired by SKA Italy Board] (5 Dec 2018, 16:15-17:15)**