SKA Organisation Bulletin

19th Issue, August – September - October 2016

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There is never an uninteresting or slow period in the adventure that is the SKA. The last few months have been particularly intense with the preparations for the 2016 SKA Engineering Meeting, which really was the best yet. I left the meeting with the feeling that the teams are working well together, there has been major progress in the design of the SKA elements and in the overall system. This is exemplified by the work being done on prototype systems in all areas, from digital signal processing boards to feed systems, aperture array verification systems and advance planning on two prototype SKA1-Mid dishes. The atmosphere of the meeting was enhanced by the lovely surroundings of the Spier Wine Farm in Stellenbosch, South Africa. I thank all those who made the meeting a success, particularly the members of the Local and the Event Organising Committees.

Immediately prior to the Engineering Meeting was the fourth plenary meeting of the Inter-Governmental Organisation (IGO) negotiating body in Rome. Simon Berry describes this in more detail below; however, my view was that this was also a very successful meeting. The number of issues requiring resolution is now small and can be counted on the fingers of one hand. The so-called Convention Task Force, chaired by Daan du Toit of South Africa’s DST, is working hard right now to address the remaining issues. I, personally, am hopeful that we may not require a fifth IGO plenary but can move to a meeting in early 2017 at which the Convention is signed by appropriate government representatives. This would be a major milestone for the SKA.

Simon Berry and William Garnier also mention the ICRI (International Conference on Research Infrastructures) conference, which was held, for the first time, outside Europe in Cape Town. This was the same week as the Engineering meeting (not a coincidence) and several of the senior SKAO staff oscillated between the two. The profile that SKA had at the meeting was impressive, possibly even greater than at ESOF 2016, which I wrote about in the previous bulletin.

Immediately prior to the Rome IGO meeting I was privileged to attend the inauguration of FAST, the Chinese 500m Aperture Spherical Telescope. FAST was inaugurated by Chinese Vice Premier Liu Yandong who read out a congratulatory letter from President Xi Jinping. I congratulate all at NAOC who conceived, designed and built a magnificent machine.

The focus now within the SKA office is described in the various contributions below, on the technical side we are ramping up towards Critical Design Review (CDR). On the governance side, we are hoping for agreement on the Convention and protocols in early 2017; the planning for the transition from the current SKAO to the future SKA Observatory is underway. The design work for the new HQ building is well advanced and we are looking at a ground-breaking ceremony very early in 2017. More immediately we have the 22nd meeting of the SKA Board scheduled to take place on 24-25 November at SKA HQ; senior staff are busy writing Board papers as I type.

Philip Diamond
Director-General.
Project
By Alistair McPherson, Head of Project

Probably the biggest event for us over the last period was the Engineering Meeting that took place in Stellenbosch from 2-5 October. That said, for many the meeting started with a site visit to the Karoo on the Friday and several Consortium Meetings extended into the following weekend. I believe that this was, overall, an extremely productive meeting.

Over 250 people attended the 2016 SKA Engineering meeting in Stellenbosch, South Africa, early October

The activities certainly showed that there is an increased pace in the project as we head towards CDR season next year. Many got together to sort out the details of Interface Control Documents (ICDs), most of which are now well developed, and many had bi-lateral meetings to sort out issues. In some ways, the period was more of a symposium of meetings rather than a traditional conference. We are already well on the way towards planning next year’s meeting as we will need to ensure that it is timed to assist in the CDR preparations. June is the favoured month at present and we are discussing options with our Dutch colleagues.
In the midst of this, the Office has been preparing for the Systems PDR and there has been a great deal of activity within the consortia to assist with this. This is very much a joint effort and the input from the consortia is vital to demonstrate that we have a system that will deliver the anticipated science.

As a result of moving towards releasing Issue 10 of the L1 Requirements in early December, we have received a significant number of Engineering Change Proposals (ECPs). These are visible on confluence. We are investigating them at present to see which need to be in Issue 10, and which can be handled in coordinating with the relevant parties. You may have noted that we have managed to release the initial SKA-low configuration, but there is a further ECP asking for adjustments. This is under review.

As we move towards CDR, it is obvious that the work required is becoming clearer to all of the consortia. This is not surprising, but please keep in touch with the office if you see any major issues arising that we need to work through. Early warning is always better than missing an opportunity.

In parallel, with the IGO discussions, we are working through the procurement policy and ideas on how the work will be allocated or won. This has not yet concluded, so it is important that consortia continue to work towards CDR with a clear aim of having a coherent documentation package which could be taken up by another party for construction. To assist in this area, we have made an offer to a potential Head of Procurement, so hopefully we will have assistance here soon.

**Project Management**

*by Andrea Casson, Head of Project Management*

Northern hemisphere summer saw the latest round of construction and operations cost updates being submitted by the Consortia ready for the IGO negotiation meeting in Rome at the end of September. Cost modelling work to enable the estimation of construction costs of different scenarios at the telescope level also made progress. The revised Pre-Construction schedule is being compiled, with key milestones being the release by the Office of the L1 System Requirements revision 10 (planned for early December 2016) and the subsequent CDR data pack submission dates of the Consortia (which are being changed via ECPs).

Significant preparation work for the 2016 Engineering Meeting in South Africa also took place with project managers and system engineers organising over 100 sessions, most of which were detailed working meetings to address engineering design and planning issues. The meeting in October was considered the most successful to date and planning is already underway for next year’s in the Netherlands in June.

**Mission Assurance**

*by Tim Stevenson, Head of Mission Assurance*

Following on from the Mission Assurance topic of the last Bulletin, the recent months have seen a major change to the way we manage change. The new ECP process involves much more consultation with Consortia, particularly at the early stages. This first consultation takes the form of requesting impact analyses of proposed changes – in simple terms, this means identifying the design documentation that would be affected. This simple step is greatly aided by the establishment of eB as our configuration management tool. Early indications are that most Consortia can and do provide this impact analysis in a timely fashion. Consultation has been a serious problem in previous change management processes, and we have high hopes that Consortia are now well prepared to support us in considering changes.

Those of you who are interested in the scope for flexibility in the design of SKA-1 will be pleased to hear that a
Custom Experiments Policy is being developed under the auspices of the Operations Planning Group and the Science Group. The need for the Policy arose from the number of proposals to make alternative use of data flows within the baseline design of both telescopes. Rather than to take these proposals on a case by case basis, it was decided to study whether a small number of Custom Experiment Ports (CEPs or ‘Spigots’) could be provided which would cater for a wide range of such experiments at minimum cost and impact to the ongoing development. The draft Policy will give rise to a number of ECPs (one per CEP) which will then be considered each individually on their merits and feasibility.

**Project Engineering**  
*by Luca Stringhetti, SKA Project Engineer*

The last months have been quite busy and challenging. The system work is proceeding on multiple fronts which are keeping the engineers in the office quite busy. In the last months, the office released some important documents including the System requirement specification version 9, and the first ten system budget documents. The work on the requirements is not over, and the team is already working, with consortia support, on specific topic reviews in order to elicit the system requirement for the better. The office is indeed working hard to release revision 10 of this document before the end of the year.

The office is also fully devoted to pass the System PDR. This is a very important milestone that will be concluded in early December in front of an external panel. So far, after the milestone on ICDs as reported in the previous bulletin, we have completed the milestones dedicated to requirements and functional analysis (late September) and performance budgets (late October). Both milestones have been extremely interesting and fruitful; that dedicated to the system budget showed that there is still some work to do in this area. The detailed reports are being written. Now, the office is working hard to finalise the documentation to be delivered to the panel within the middle of November. This documentation includes: ICDs, analysis reports, block diagrams, system definitions and descriptions, requirements, and compliance matrices. One important piece to have a successful PDR is to show a precise plan for the next steps. The office has initiated already a process to change the focus to the system CDR.

In parallel, the office keeps working with the element consortia to define ICDs, lower level requirements and design definition and justification in order to prepare the element CDRs that will start from middle next year.

Internally the office has been reorganised. Marco Caiazzo is now acting as Senior System Engineer and his role is to be the focal point for the System Engineering processes within the office. His current task is following the system ICD work ensuring that ICDs are well configured and complete.

Mark Bowen has just joined the project engineering office with the role of domain engineer for RF systems. Currently, he is working on the MID system budgets.

**Architecture**  
*by Peter Dewdney, SKA Architect*

I would like to highlight a few aspects of the telescope design whose profile has risen recently:

**Signal-chain analysis**: RFI detection/levels, flagging policy, non-linear products. A general policy for the classification of RFI into ‘strong’ (flagged) and ‘weak’ (conforming to a limit on non-linear spectral products) is described in ‘RFI Characterisation and SKA1 Signal Chain Design Consideration SKA-TEL-SKO-0000492’. Each consortium with responsibility for design of signal-chain segments has been asked to analyse them to ensure that they meet this requirement. Because of the complexity of the issue the specific design approaches are unconstrained. In practice, the bandwidth of RFI signals tends to be...
narrow, and the most susceptible segments of the signal chains are likely to be the narrow digital channels, not the wider RF channels.

A workshop was held at the Cape Town engineering meeting to bring together people working on this for a discussion. The agenda was threefold: a) review of principles b) review of currently available information on the RFI environment and regulations c) review of design approaches for different segments of the signal chain.

It is clear that the analyses are still a ‘work in progress’. As we enter the detailed design phase, it will be important to carry this analysis out early, to ensure that PDR-level architectural assumptions are sufficient to meet RFI linearity and flagging requirements.

**SKA1-low Ionospheric Calibration:** The Resolution Team has been making steady progress in gathering information on this calibration issue. Their mandate is to come up with a well-substantiated position on the ionospheric calibratability of SKA1-low for EoR imaging. Note the ‘divide and conquer approach’: consider how to carry out the calibration under the assumption of the current baseline array configuration and telescope design, separately from the calibration of the multi-dimensional instrument response.

Based on experience with MWA data, it appears that the ionosphere is well enough behaved more than 50% of the time to be able to calibrate scales up to several km. These are the key scales needed for EoR observations, and this result indicates that the ionosphere is relatively smooth during these periods. Work is continuing to pin this down more quantitatively. This also indicates that the methods used for the MWA might be adaptable to the SKA, particularly statistical tests that can quickly determine whether an upcoming ‘night’ might be suitable. Extending this to longer scales (i.e., stations well outside the core) is the next step, for which the approaches used by LOFAR may be more applicable.

Clearly this emphasises the need to have an adaptive-scheduling approach for SKA1-low, although we have known this for some time.

**Telescope Teams:** The SKA1-mid Telescope Team (TT) has completed four reports from Resolution Teams, with good progress on six others. The SKA1-low TT is handling some complex issues, but has completed seven out of 20 issues presented to them. For more detail see [https://confluence.skatelescope.org/display/MTT/MID+Telescope+Team+Home](https://confluence.skatelescope.org/display/MTT/MID+Telescope+Team+Home) and [https://confluence.skatelescope.org/display/LTT/LOW+Telescope+Team+Home](https://confluence.skatelescope.org/display/LTT/LOW+Telescope+Team+Home).

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**Operations Planning**

*by Gary Davis, Director of Operations Planning*

I attended the IGO negotiation meeting at the end of September in Rome and had two specific tasks at that meeting: (a) to review and discuss the evolving Hosting Agreements with colleagues from Australia and South Africa, and (b) to present the current operational budget estimate to plenary negotiation meeting. The latter was informed in part by budget submissions from the Consortia in early September, for which my thanks. The key element of these negotiations was the potential financial commitment of each signatory, and the capital and operational budget estimates are essential inputs to this discussion.

I also attended the SKA Engineering Meeting, where I presented a summary of the current status of Operations Planning, and our plans for the remainder of pre-construction.
Science
by Robert Braun, SKA Science Director

An SKA-Athena Synergy Team (SAST) has been appointed to explore and develop scientific synergies between the SKA and ESA’s Advanced Telescope for High ENergy Astrophysics (Athena). Four experts representing both the radio and X-ray scientific communities, and chaired by Rossella Cassano (INAF/IRA), will have responsibility for preparing an SKA-Athena Synergy White Paper. They will invite broader community input through a Workshop hosted by SKAO in April 2017 and plan to publish the White Paper in autumn 2017.

The 2016 SKA Science Meeting and Key Science Project Workshop, entitled “Science for the SKA Generation”, will take place in the week of 7 to 11 November in Goa, India. An excellent program has been developed by the SOC and is available at this link.

We expect about 200 participants for the event that will highlight results obtained with SKA pathfinders and precursors from around the world and provide an opportunity to further advance planning of Key Science Projects during the final two days.

Programme cover of the SKA Science Meeting to be held on 7-11 November in Goa, India

Other activities of the Science Team include Jeff Wagg giving an SKA presentation at the “First Stars V” meeting in Heidelberg and at the URSI AP-RASC meeting in Seoul in August, as well as Tyler Bourke giving presentations at the “Star Formation 2016” meeting in Exeter in August and at the Macclesfield Astronomical Society meeting in September and also Evan Keane at the AG2016 Meeting in Bochum in September.

Policy Development
by Simon Berry, SKA Director of Policy Development

The Policy team’s focus over the northern summer has continued to be in supporting the IGO negotiation process, leading to the fourth Plenary meeting that took place at the end of September. In August, SKA HQ
hosted a three-day meeting where the expert lawyers from the various country representatives got together to work through the language and wording of the current Convention text and associated documents. This work, combined with the activities of the Convention Task Force, which has tackled a range of outstanding issues in the negotiation process, delivered an updated Convention and Protocols to the Plenary for discussion. That meeting took place in Rome between the 27th and 29th September, again kindly hosted and chaired by the Italian government. The meeting was very successful, with open and constructive discussion on all the main issues. The next steps will feature continued work on the remaining text and policy issues, and discussions on potential financial arrangements for the initial establishment of the IGO and then SKA1 construction. It remains the hope that the whole negotiation can be complete and the Convention signed in early 2017.

In parallel, in the Office, we are working hard to develop a detailed transition plan that will start to take us into the IGO. With our legal advisors, we are looking at how we will wind up the current SKA Organisation company and transfer its assets (physical items and indeed, more importantly, people) into the IGO. These, and the process of planning and organising the new structure are all intricate and tricky challenges to address by themselves and internal and external teams are being established to take on the work.

All members of the Policy team were in South Africa early October for the Engineering meeting, and a parallel event that took place in Cape Town; the International Conference on Research Infrastructures (ICRI). At the Engineering meeting, Phil Crosby organised an expert industry discussion session, which was well attended and received, and we held a dedicated session on the current challenges of managing IPR in the design phase (and how the situation may evolve in the IGO era). Meanwhile at ICRI, the profile of the project was impressive, held up as beacon of excellence in the global research project world. Let’s all work together over the coming months and years to ensure we deliver on the promise!

SKA Board Matters and Administration

by Colin Greenwood, SKA Head of Administration and Legal

SKA Governance

On 20 August 2016, Prof. John Womersley stepped down as the UK’s Voting Representative (Board) and Nominated Representative Member. Prof. Womersley was a member of the SKA Board’s Executive Committee and is a former Chair of the SKA Board of Directors (2011-15). He chaired the SKA Founding Board (2011), which was formed to co-ordinate the incorporation of SKA Organisation. Previously, he also chaired the SKA Funding Agencies Working Group (2007-11), which was set up to co-ordinate global support of funding agencies for the SKA project. Prof. Womersley is thanked for the pivotal role he has played in taking the governance of the SKA to the point of establishing an Inter-Governmental Organisation.

On 20 August 2016, Prof. Paul Alexander stepped down as the UK’s Science Representative (Board). Prof. Alexander has represented the UK on the SKA project’s governance bodies for more than a decade. In 2012, he contributed to the SKA site selection process by chairing the Site Options Working Group. This working group was tasked with assessing the viability of dual-site implementation options. Prof. Alexander continues to contribute to SKA project as Consortium Leader for the Science Data Processor (SDP) Consortium.

Dr Adam Baker (Department for Business, Energy and Industrial Strategy) has replaced Prof. Womersley as the UK’s Voting Representative (Board), Nominated Representative Member and member of the SKA Board’s Executive Committee. Prof. Philip Best (University of Edinburgh) has been appointed as the UK’s Science Representative (Board) and Second Representative (Members).

The 22nd meeting of the SKA Board of Directors will be held at SKA HQ, Jodrell Bank, UK on 24-25 November 2016. In addition to standing items on the agenda, the SKA Board will topics for discussion will include project
progress, construction schedule/plan, operations planning, SKA Observatory Development Programme, and a report on the latest negotiations to establish SKA as an intergovernmental organisation.

SKA HQ

The RIBA Stage 3 (Developed Design) Report for the permanent SKA HQ at Jodrell Bank was submitted to the SKA Office on 1 July 2016. It was reviewed and conditionally endorsed by the SKA Office and this Stage was formally signed off by The University of Manchester on 28 July 2016. The project is now progressing through RIBA Work Stage 4 (Technical Design), which is scheduled for sign off by 24 November 2016. This £16.5M project remains on target for completion by 2018Q1.

Staff

We are pleased to welcome Anna Bonaldi (Project Scientist) and Mark Bowen (Specialist Engineer: RF/Dish) to the staff of the SKA Office. Also, Miles Deegan has moved from his role as Engineering Project Manager: Science Data Processor & Telescope Manager to take up the new role of HPC Specialist.

Interviews for the post of Head of Contracts and Procurement have been concluded and there was an excellent field of candidates; an appointment is expected soon.

The posts of Engineering Project Manager: Science Data Processor & Telescope Manager, Telescope Manager (Low), Telescope Manager (Mid) and Administration Assistant have been advertised recently and interviews will be conducted in the coming weeks. The deadline for applications for the post of SKA Regional Centre Coordinator is 15 November 2016.

A new video produced by the SKAO Comms team has just been issued as well, featuring the diversity of SKAO staff and focusing on the working environment at the SKA HQ. This video aims at supporting the recruitment strategy.

The recent call for secondments by members was successful and the following placements have been agreed: Faiza Saban (SKA SA): HR Transition (Nov 2016 for up to 2 years)
Warren Bax (AU Fellowship): Transition/Procurement (Nov 2016 – Mar 2017)
Transition Co-ordinator: TBC
Tracy Cheetham (SKA SA): Head of Construction Planning (Nov 2016 for 12+ months)
Ant Schinckel (CSIRO): Head of Construction Planning (Nov 2016 for 12+ months)
Attila Popping (AU Fellowship): SKA sensitivity calculator (May-Aug 2017)
Martin Meyer (AU Fellowship): Survey ideas and processes (2017 Q1-Q2)

In addition, Toshihiro Handa (NAOJ) will be on secondment to the SKA Office in Nov-Dec 2016.

Communications and Outreach
by William Garnier, SKA Director of Communications, Outreach and Education

As follow is a summary of the most relevant activities undertaken by the SKAO Comms team over the last 3 months.

Conferences
- ICRI 2016 – the SKA had a strong presence at ICRI 2016 (International Conference on Research Infrastructures) in Cape Town early October with a large booth, the presence of SKAO’s policy and comms teams and a number of SKA Board members at the conference. There were a number of plenary talks given by the wide-SKA leadership and we also organised informal presentations at the SKA stand on a number of topics. The SKA was heavily mentioned in many sessions resulting in excellent visibility with influential policy-makers. We also received the visit of the South African Science Minister Ms Naledi Pandor and the EC DG for Research and Innovation Mr. Robert-Jan Smits as we were engaging with students at the SKA booth (see photo below).

South African Science Minister Ms Naledi Pandor and EC DG for Research and Innovation Mr. Robert-Jan Smits visiting the SKA booth at ICRI
• AAS 229 – We have secured a booth for the 229th meeting of the American Astronomical Society taking place in Grapevine, Texas, the 1st week of January and are working on the production of specific leaflets (TBC) as part of our engagement strategy with the US;

• SKA Engineering conference and Science conference – We have been heavily involved in a number of organisational and promotional aspects of both conferences as part of our role in the organising committee and are very pleased about all the positive and constructive feedback received from many participants after the Engineering meeting. The experience we’ve gained in playing a strong role in organising several conferences over the last few years certainly helps in delivering an increasingly better experience to our community and ensuring a smooth and productive meeting. Work is already underway to identify the venue for the 2017 Engineering meeting, whose details will be announced shortly. Stay tuned!

Multimedia production
• SKA trailer – As reported in the previous issue, we have finished the production of a new trailer for the SKA. This was released on 16/08 on Youtube and social media and was extremely well received and now has almost 10,000 views. Thanks to the help of the SKACON, the video now has subtitles in 5 different languages and is being translated in more. Feel free to use it and share it!

• New animations of SKA-low, SKA-mid and SKA science which were produced for the SKA trailer are now available for download here. We encourage you to use them in presentations, as they are particularly illustrative and impressive.

• Shared Sky in Manchester - We produced a small video to promote the exhibition when it was in Manchester during the northern hemisphere summer.

Web
• France now has its flag on the SKA website. A short text describing the SKA-related activities in France is displayed when clicking on it, pointing to the newly-launched SKA-France official website

• We’ve published a webpage with the latest updates on the new SKA HQ construction works.

• We refreshed the SKA’s Youtube page, adding a new banner and creating curated lists of content, including our latest animations, videos about the Shared Sky art exhibition, about the precursor and pathfinder facilities and SKA talks from around the web.

Shared Sky
• Shared Sky in Manchester – Shared Sky was exhibited at the Manchester Central Library from the end of July – start date was the 1st day of the ESOF conference until early September. Over 4,000 people visited the exhibition during that period.

• Shared Sky in Genoa, Italy – Shared Sky is featured at the magnificent Palazzo della Borsa in Genoa from October 27 to November 6 as part of the science festival. About 100 people attended the inauguration ceremony on October 27th, hosted by the Italian Director Steven Tingay. The Australian Ambassador to Italy, Dr Greg French, was amongst the high-level delegates to attend the ceremony (see tweet below).

• Shared sky in Adelaide, South Australia – we’ve started discussions about sending Shared Sky to Adelaide in 2017 for the International Astronautical Congress, a major event in the space industry calendar.
The Australian Ambassador to Italy Dr Greg French attended the Shared Sky inauguration in Genoa, Italy on October 27. Here on the photo with Dr Steven Tingay, SKA Italy Board Director.

Education & Outreach
- In collaboration with the comms team and with the kind support of UK SKA engineers including many at SKAO (many thanks for their time!), the Jodrell Bank Discovery Centre team has developed a hands-on kit to explain the engineering behind the SKA, funded by the Royal Academy of Engineering. The 1-year project has been completed and we now have one kit in the office available for outreach activities. We are also in the process of distributing the resources to our SKA colleagues around the world and with the international community.

News
- We’ve published a number of releases including the opening of Shared Sky in Manchester, the release of our new trailer, the funding boost for HERA, the planning approval for the new SKA HQ building, the start of the Engineering Meeting in Stellenbosch and the launch of the scientific synergies team between Athena and SKA.

Media
- We hosted Ricardo Garcia, a Chilean documentary filmmaker, at the SKA HQ during two weeks in August. Ricardo is working on the production of a documentary about the SKA project.
- We arranged for Media INAF to interview the Italian SKA staff at SKAO in August
- FAST – we arranged interviews with Prof Schilizzi and Prof. Diamond in support of the inauguration of FAST. See the final documentary here.

www.skatelescope.org
- PEN – two interviews were conducted with Phil Diamond and were published in the Pan-European Networks magazine
- Interviews were conducted with local media and BBC about the planning approval for the new SKA HQ building
- Euronews – we arranged for the top European news channel Euronews to visit ASTRON and Cambridge to cover the work going on there. This production, done in cooperation with European Commission DG Research and DG CONNECT, will be aired in the award-winning program Futuris. The documentary that covers three different research projects (including the SKA) will be 12-minute long, and it will be broadcasted to 158 countries in Euronews' thirteen broadcasting languages (English, German, French, Italian, Russian, Spanish, Portuguese, Arabic, Turkish, Persian, Ukrainian, Greek and Hungarian). Total reach is 430 million households.

**Tweet from Denis Loctier, Euronews journalist, during Euronews filming of the LFAA prototype facilities in Cambridge, UK**

*Selection of SKA in the News*

We’ve read the news for you and are happy to provide this selection of media articles relevant for the SKA. Note that the appearance of articles in this selection is not synonymous of endorsement by SKA Organisation. Enjoy!

- ICRAR astronomers reveal how the sky would look like in radio waves
- SKA prepares for the ultimate big data challenge
- SKA listed in China’s five-year plan for science and technology
- $283.5 million awarded to nine ARC Centres of Excellence
- Deepest ever millimeter observations of early Universe explored
- HERA telescope gets $9.5m funding injection
- GMRT on standby for signals from Mars lander
- Rob Adam gives radio interview about the land acquisition programme in South Africa
- Interview from Phil Diamond explaining the history of SKA
- The world's largest telescope will allow to observe the 'dawn' of the cosmos (Spanish)
Connect with us

For any enquiries, requests or feedback please write to ska-outreach@skatelescope.org

You can also find the SKA Organisation on Facebook, Twitter, Google+ and YouTube.