**SKA Science Regional Centres - SCSRC community input**

# Survey Flow

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[**Section 0 - Some general questions (6 Questions)**](#bookmark=id.pl8x796kxn95)

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[**Section 1. Data products and scientific requirements\_Loop (66 Questions)**](#bookmark=id.vtmhbw15q3gb)

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**Start of Block: Questionnaire Preamble**

**SKA Regional Centre Network Questionnaire**

# Questionnaire Preamble

A key objective of the SKA Regional Centre Steering Committee (SRCSC) WG6, Task Package 1 group is to collect feedback from the future SKA user communities regarding their needs, requirements and expectations of services delivered by the future SRC Network. The outputs of this process will be fed directly into the requirement definition process for the SRC Network via the various SRCSC working groups. This will be done both at an early stage, and via periodic reviews, to ensure that the SRC Network is developed as optimally as possible to serve the communities needs and, maximise the science evolving impacts and outputs of the SKA. The SRCSC’s WG6 (TP1) are initiating a number of engagement and requirement capturing actions with the future SKA user community. These actions will take multiple forms. Initially we will be surveying different parts of the SKA user community via targeted questionnaires and engagement forums. The outputs of these actions will be then used to help to define the detailed (level 1 & 2) requirements of the SRC Network.   The development of the global SRC Network for the SKA is a major programme.  As such it is important to develop a comprehensive set of requirements as soon as possible to allow the significant planning and development work required to be undertaken.  We do however expect there to be changes during the multi-year SRC development, and later SRC operational phases. In particular we recognise that this evolution will be in part driven by the evolving needs of the science community. We expect periodic revisions and additions of these requirements.   At the heart of the SRC remit is to provide the resources and access environment for all SKA users to maximise the scientific productivity and impact of the instrument. As such it is critical that the input from future SKA science users is captured and incorporated in this process, so that from the outset, the design and implementation of the SRC Network can fulfil the science communities requirements.   The following questionnaire is targeted at Representatives of each of the SKA Science Working (SWGs) and Focus Groups.  We invite these representatives to complete the appended questionnaire on behalf of their respective SWG and focus groups to help capture the currently foreseen needs of these science areas. In particular, we would like to understand the scope and needs that are envisioned for future large programmes on the SKA (such as Key Science Programmes) which will account for the majority of SKA and SRC usages in the first years of operations. This will help to update and extend information that can be derived from previous exercises such as the SKA High Science Priorities and science use-cases to help establish SRC use-case requirements.    The questionnaire also aims to better understand the science needs for SRC services across a range of areas from the production of Advanced Data products, to Archive access and interfaces. From the expert SWG community we wish to more fully understand these needs such that an SRC network can be developed to best accommodate the wide and diverse SKA user-base.   We recognise that in some cases questions may not be relevant to all science areas, and that some specific science areas may have additional requirements that are not easily captured in this questionnaire. In each of these cases please supply all the relevant information that is possible, or discuss this directly with the WG6 team for incorporation in this process.      To aid with the completion of this we have also appended a series of relevant documentation from the SKAO and other sources which we recommend that you read beforehand. This includes:    [SKAO Science data products: A summary](http://astronomers.skatelescope.org/wp-content/uploads/2021/06/SKA-TEL-SKO-0001818-01_DataProdSummary-signed.pdf) [SKA1 Scientific Use Cases](https://astronomers.skatelescope.org/wp-content/uploads/2014/02/SKA-TEL-SKO-0000015_Rev_03_SKA1_Science_Use_Cases_Combined-part-1-signed.pdf)
 [SKA1 Operations plan](https://astronomers.skatelescope.org/wp-content/uploads/2020/04/SKA-TEL-SKO-0001012-03-SKA1-Operations-PlanSigned.pdf)
[SKA1 Science Priority Outcomes](https://astronomers.skatelescope.org/wp-content/uploads/2021/01/SKA-TEL-SKO-0000122-SCI-REQ-RE_Rev_01_SKA1_Science_Priority_Outcomes.pdf)
[SKA Observatory Establishment and Delivery Plan](https://www.skatelescope.org/wp-content/uploads/2021/02/22380_SKA_Est-Delivery-Plan_DIGITAL_v3.pdf)
  It is hugely important to the development of the SRC Network that information on all of these areas is gathered.  The Core WG6-TP1 team (SRCSC\_WG6-TP1Core@jb.man.ac.uk - Chiara Ferrari, Rob Beswick, Isabella Prandoni, Jose Carlos Guirado, and Jeff Wagg), as well as the chairs of the entire WG6 (Andrea Possenti and Hans-Rainer Klockner) will be available to assist with any questions you may have regarding this process and would welcome direct input and discussions with any groups.   **Notes:** - Please use "." and not "," when writing fractional values in the following questionnaire - A list of relevant acronyms used in this questionnaire are included in the SKAO Science Data Products: A summary (linked above), and where relevant defined within the questionnaire sections.

Recaptcha

**End of Block: Questionnaire Preamble**

**Start of Block: Section 0 - Some general questions**

  **Section 0 - Some general questions** The following section contains some general questions aimed at understanding who are the users. In addition it provides a general framework useful for the users to better understand what are the scopes and boundaries of the questionnaire.

0.1 Do you belong to a SKA Science Working / Focus Group (SWG) ?

* No
* Yes

YES

*Display This Question:*

*If 0.1 = Yes*

0.1.1 On behalf of which SWG/Focus group are you completing this questionnaire, please specify:

* Cosmology
* Cradle of Life
* Epoch of Reionization
* Extragalactic Continuum (galaxies/AGN, galaxy clusters)
* Extragalactic Spectral Line
* Gravitational Waves
* HI galaxy science
* Magnetism
* Our Galaxy
* Pulsars
* Solar, Heliospheric & Ionospheric Physics
* Transients
* High Energy Cosmic Particles
* VLBI

Solar, Heliospheric and Ionospheric Physics

0.2 Which research field do you want to address with the SKA? (multiple choice allowed - We refer to Sect. 2.2 of "[SKA Phase 1 Construction Proposal](https://www.skatelescope.org/wp-content/uploads/2021/02/22380_Construction-Proposal_DIGITAL_v3.pdf)" for a description of the research fields listed below)

* Cosmic Dawn and the Epoch of Reionization
* Cosmology
* The Transient Universe
* The Evolving Energetic Universe
* The Evolving Molecular Universe
* The Gaseous Evolution of Galaxies
* Galactic Baryon Ecology and Matter Cycle
* Magnetism
* Fundamental Physics with Pulsars
* Cradle of Life
* Solar, Heliospheric & Ionospheric Physics
* High-Energy Cosmic Particles
* Ultra-high Resolution Science (VLBI)
* Other (specify) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Solar, Heliospheric and Ionospheric Physics

0.3 Type of project (multiple choice allowed):

* Key Science Project (KSP) [needs large observing/computing resources; requires more than one time allocation cycle]
* PI [can be completed within one time allocation cycle]
* Archive

KSP, PI, Archive

0.4 What are the typical levels of expertise in radio interferometry data analysis of the team (multiple choice allowed)?

* Precursor/pathfinder team (i.e. involved in running data analysis pipelines for precursors/pathfinders)
* Expert (i.e. will likely interact with SRCs for enhanced data analysis, optimization of data reduction, etc.)
* Mixed level of expertise (ie. team composition is expected to include a range of expertise from expert to non-expert)
* Non expert (i.e. will likely use the data products as provided by SDP/SRCs and/or the long-term archive)

Mixed level of expertise

**End of Block: Section 0 - Some general questions**

**Start of Block: Section 1. Data products and scientific requirements**

# **Section 1.  Data products and scientific requirements**

This section aims to get a better understanding of the data products that will be needed for your project(s), both in terms of a) the kind of data needed for scientific analysis (OLDP, PLDP, ADP) and b) computing and storage needs (to be estimated by the SRCSC working groups based on your replies).

The [SKAO Science data products: A summary](http://astronomers.skatelescope.org/wp-content/uploads/2021/06/SKA-TEL-SKO-0001818-01_DataProdSummary-signed.pdf) provides an essential companion to this section of the questionnaire. This document also provides the definitions of many of the acronyms used in this section. A few of the key ones are listed below:
ODP = Observatory Data Product
OLDP = Observation Level Data Product
PLDP = Project Level Data Product
ADP = Advanced Data Product
SWG = Science Working Group

1.1 In 2016, the SWGs completed an exercise to outline SKA use cases relevant to their science areas. This document can be found [here](https://astronomers.skatelescope.org/wp-content/uploads/2014/02/SKA-TEL-SKO-0000015_Rev_03_SKA1_Science_Use_Cases_Combined-part-1-signed.pdf).  These use cases, along with additional information gathered as part of this process, will provide key information used to determine the requirements for the future SRC Network.
We ask you to review the relevant use cases for your SWG and/or science area. We note that since this 2016 exercise new SWGs have been formed and new science objectives have developed. Toward the end of this section we invite SWGs to inform us of these, and provide an opportunity to supply more details.

1.1.1 Which use case(s) do you identify as relevant to your SWG? Please provide list:

**3.54 Shocks waves, CMEs, Type II bursts**

**3.55 Study of spatially and spectrally resolved MHD waves with solar radio
bursts**

**3.56 Observations of flaring loops in the solar corona with SKA1-MID**

**3.57 Imaging the inner heliosphere and Space Weather**

**3.58 Turbulent Structures in the Ionosphere** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1.1.2
Are these use cases still valid, or do they require substantial amendments?

* Yes, use case(s) are still valid (indicate which use-cases) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Yes, use case(s) still valid but they require(s) some amendment (Indicate which Use-cases) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* No, use case(s) is no longer valid (indicate which use-cases) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Yes, all use cases are still valid

1.2 We recognise that there are a number of important use cases that were not included in the previous exercise. If a key use case in your SWG/research area is not present within this compilation, please submit a new case at your earliest convenience (template for use case is available [here](http://astronomers.skatelescope.org/wp-content/uploads/2015/07/UseCase_Template_postRBS.docx)). In doing so this will allow your use case to be accounted for in the SRC specification process.    If you intend to submit a new use case please contact Jeff.wagg@skao.int, Robert.beswick@manchester.ac.uk and Chiara.ferrari@oca.eu who will advise you further on the process.

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  In 2014 an indicative programme of "Science Goals" and “High Priority Science Objectives” (HPSOs) was defined by the SKA Science Working Groups (Science Goals and HPSOs are listed in Table 1 and Table 2, respectively, of the document "SKA1 Science Priority Outcomes", linked [here](https://astronomers.skatelescope.org/ska-tel-sko-0000122-sci-req-re_rev_01_ska1_science_priority_outcomes/)) and the envelope of requirements for their successful completion has formed the basis for the SKA1 Science Requirements.

1.2.1 Is your specific scientific objective included in this list?

* Physics of the early universe IGM - I. Imaging
* Physics of the early universe IGM - II. Power spectrum
* Reveal pulsar population and MSPs for gravity tests and Gravitational Wave detection
* High precision timing for testing gravity and GW detection
* Resolved HI kinematics and morphology of ~10^10 M\_sol mass galaxies out to z~0.8
* High spatial resolution studies of the ISM in the nearby Universe.
* Multi-resolution mapping studies of the ISM in our Galaxy
* Solve missing baryon problem at z~2 and determine the Dark Energy Equation of State
* Map dust grain growth in the terrestrial planet forming zones at a distance of 100 pc
* The resolved all-Sky characterisation of the interstellar and intergalactic magnetic fields
* Constraints on primordial non-Gaussianity and tests of gravity on super-horizon scales.
* Angular correlation functions to probe non-Gaussianity and the matter dipole
* Star formation history of the Universe (SFHU) – I+II. Non-thermal & Thermal processes
* Other: We recognise that science evolves rapidly and that important science objectives may not be included in this list. In this case please provide the title of the project: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

No, no science of Solar, Heliospheric & Ionospheric Physics is included in this list.

1.2.2 For the same reasons as stated previously, please indicate here if some of the current HPSO survey parameters (frequency resolution, observing cadence, etc.) require minor modifications:

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  **Data products**

The [SKAO Science data products: A summary](http://astronomers.skatelescope.org/wp-content/uploads/2021/06/SKA-TEL-SKO-0001818-01_DataProdSummary-signed.pdf) provides an essential companion to this section of the questionnaire. This document also provides the definitions of many of the acronyms used in this section. A few of the key ones are listed below:
ODP = Observatory Data Product
OLDP = Observation Level Data Product
PLDP = Project Level Data Product
ADP = Advanced Data Product
SWG = Science Working Group
(Note OLDPs and PLDPs are themselves a subset of the ODPs)

1.3 Using the information given in the accompanying document ([SKAO Science Data Products: A summary](http://astronomers.skatelescope.org/wp-content/uploads/2021/06/SKA-TEL-SKO-0001818-01_DataProdSummary-signed.pdf)), please indicate the type of data products needed for your science project (please check all that apply):

* OLDPs
* PLDPs
* ADPs
* Science archive data products (Specify kind of data): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Other (Specify): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

PLDP (e.g. for a deep integration or large mosaic)

*Display This Question:*

*If 1.3 = OLDPs*

  OLDPs (specify):

* Image Cubes/Imaging data for continuum
* Image Cubes/Residual image in continuum
* Image Cubes/Clean components
* Image Cubes/Spectral line cube after continuum subtraction
* Image Cubes/Spectral line cube before continuum subtraction
* Image Cubes/Representative PSF
* UV Grids/Gridded calibrated visibilities
* UV Grids/Accumulated weights
* Calibrated visibilities
* LSM catalogue
* Imaging Transient Source Catalogue
* Pulsar Timing Solutions
* Transient Buffer Data
* Sieved Pulsar and Transient Candidates
* Science Alerts Catalogue
* Science Product Catalogue
* Raw visibilities (Explain why): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Other (Please specify): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

*Display This Question:*

*If 1.3 = PLDPs*

  PLDPs (specify):

* A combination of all selected OLDPs
* A combination of only a sub-set of selected OLDPs (Specify which OLDPs you will need to combine): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

*Display This Question:*

*If 1.3 = ADPs*

  ADPs (specify):

* spectral index maps
* spectral curvature maps
* source catalogues
* postage stamps
* stacked postage stamps
* mosaiced image/cube
* stacked spectra
* position-velocity maps
* moment maps
* fractional polarization maps
* polarization angles,
* RM synthesis cubes
* circularly polarised maps
* time series for variable sources
* Other (please specify) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1.4 All ODPs will have an associated Quality Assessment (QA) log from the entire SKA processing chain, stored in the project log, ensuring that it is accessible to the Operations staff at the Observatory and to science users. These QA logs will chiefly contain information generated by the SDP, but will also contain other relevant information from the CSP (specifically in the PSS and PST) and the LFAA Monitoring, Control and Calibration System.
 Is there any particular information (metadata, QA diagnostics. etc.) which is critical to have in the log for your science case (multiple choice allowed)?   Acronyms: ODP = Observatory Data Product QA = Quality Assessment SDP = Science Data Processor CSP = Central Signal Processor PSS = Pulsar Search PST = Pulsar Timing LFAA = Low-Frequency Aperture Array

* Tsys
* Astrometry (source positions)
* Photometry (comparison of source fluxes with known standards)
* Radiometry (overall image statistics)
* Polarimetry (comparison of polarisation fluxes and angles with known standards)
* Spectrometry (measurement and characterisation of emission line fluxes and moments)
* Station-level calibration & monitoring (LFAA)
* Other (please specify) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* None

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#  Section 1.5. Scientific Requirements

In the following questions we explore currently envisioned observational requirements for your science. If your project area is likely to comprise of multiple, scientifically linked but observation independent, surveys you will be asked to complete the details for each. The number of times this 'loop' will be initiated will depend on your response to the following question (1.5).

1.5 How many independent surveys (including survey tiers) do you need to reach your science goal?
(please enter as a number, e.g. 1 or 2 or 3 etc)

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_We need input from the community on the different science surveys our working group will carry out, and the technical specifications they need.

\_\_\_\_\_\_\_\_\_If you have suggestions for an independent survey, please fill out the relevant form attached to the e-mail you received, and e-mail it back to Galina, Wenjuan and Hamish. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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1.6 Do you expect that some or all of your science goals will involve observations that are commensal with other programmes. If so please elaborate below.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_This depends up whether or not other programmes includes other SKA programmes or other space based / ground based instruments. We are seeking clarification from the SKA team.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**End of Block: Section 1. Data products and scientific requirements**

**Start of Block: Section 1. Data products and scientific requirements\_Loop**

**Independent survey (including survey tiers)**
You will be asked to complete the following looped questions for each of the independent surveys (or survey tiers) that you have spe  The following set of questions will be repeated several times (max 10) depending on your answer to the previous question 1.5.

*Display This Question:*

*Si Boucle 1 Boucle actuelle*

  **Survey 1**

Coherent Radio Bursts from the Active Sun

*Display This Question:*

*Si Boucle 2 Boucle actuelle*

  **Survey 2**

*Display This Question:*

*Si Boucle 3 Boucle actuelle*

  **Survey 3**

*Display This Question:*

*Si Boucle 4 Boucle actuelle*

  **Survey 4**

*Display This Question:*

*Si Boucle 5 Boucle actuelle*

  **Survey 5**

*Display This Question:*

*Si Boucle 6 Boucle actuelle*

  **Survey 6**

*Display This Question:*

*Si Boucle 7 Boucle actuelle*

  **Survey 7**

*Display This Question:*

*Si Boucle 8 Boucle actuelle*

  **Survey 8**

*Display This Question:*

*Si Boucle 9 Boucle actuelle*

  **Survey 9**

*Display This Question:*

*Si Boucle 10 Boucle actuelle*

  **Survey 10**

## Survey 1. Coherent radio bursts of the Active Sun

1.6 Which telescope?

* SKA-Mid
* SKA-Low

SKA-Low

1.7
Operational Mode (multiple choice allowed)

* Standard
* Fixed schedule
* Time-critical override
* Custom Experiment
* Commensal
* Collaborative & Coordinated (e.g. VLBI)
* Sub-arrays required
* Joint SKA-MID and SKA-LOW

Collaborative and Coordinated with e.g. SKA-MID and LOFAR, SKA-LOW and MUSER.

Time-critical Override based upon solar activity. Fixed Schedule, coordinating with space-based

instruments like Parker Solar Probe and Solar Orbiter.

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1.8 Product type (multiple choice allowed):

* Image-domain / Imaging time-domain
* Non-imaging time domain
* Other (Specify and quantify relevant parameters:): \_\_\_\_Image-Domain\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

*Display This Question:*

*If 1.8 = Image-domain / Imaging time-domain*

1.8.1 Image-domain / Imaging time-domain:

*Display This Question:*

*If 1.8 = Image-domain / Imaging time-domain*

1.8.1.1 Polarization products (multiple choice allowed):

* I
* U
* Q
* V

I and V, *Display This Question:*

*If 1.8 = Image-domain / Imaging time-domain*

1.8.1.2 Observing time and sensitivity requirements:

*Display This Question:*

*If 1.8 = Image-domain / Imaging time-domain*

a Total observing time of survey (order of magnitude) (h):

\_\_\_\_1000 hours\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

*Display This Question:*

*If 1.8 = Image-domain / Imaging time-domain*

b Total integration time per pointing direction (order of magnitude) (h):

\_\_\_\_\_\_\_\_\_\_\_1000 hours. The Sun is the main pointing direction. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

*Display This Question:*

*If 1.8 = Image-domain / Imaging time-domain*

c Goal rms sensitivity (uJy/b or uJy/arcsec or K, please specify units used):

\_\_\_\_\_\_\_1 Jy/b is likely good enough for most sensitivity. The quiet Sun background varies with frequency. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

*Display This Question:*

*If 1.8 = Image-domain / Imaging time-domain*

d Dynamic range:

\_\_\_\_\_\_\_\_Five orders of magnitude will resolve all but the brightest events. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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*Display This Question:*

*If 1.8 = Image-domain / Imaging time-domain*

1.8.1.3 Sky Coverage:

Two degrees diameter

*Display This Question:*

*If 1.8 = Image-domain / Imaging time-domain*

a Total area of the survey (sr or deg2):

\_\_\_\_\_\_\_\_4 square degrees\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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*Display This Question:*

*If 1.8 = Image-domain / Imaging time-domain*

b Number of pointing directions:

\_\_\_\_\_\_\_\_\_2, one for the Sun and one for the calibrator \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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*Display This Question:*

*If 1.8 = Image-domain / Imaging time-domain*

c
Observing strategy:

* Single pointing (single object)
* Single pointing (multiple objects)
* Mosaic
* On-the-fly scans
* Multi-beam observing mode
* Other (Specify): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Single Pointing, Single or Multiple Objects (activity dependent)

Mosaic of the Sun using a multi-beam observing mode (tied-array beams)

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*If 1.8 = Image-domain / Imaging time-domain*

1.8.1.4 Observing Frequency, bandwidth, required number of channels:

* Lower frequency limit of output map (MHz): \_\_\_\_\_\_\_50MHz using SKA-Low or 350 MHz using SKA-High\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Upper frequency limit of output map (MHz): \_\_\_\_\_\_\_\_350MHz using SKA-Low, or 2 GHz using SKA-High\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Number of output channels in final image (f.i. 1 or few for continuum; more for spectral line or RM analysis): \_\_\_\_\_\_\_\_\_\_Many for spectral coverage, dependent on SKA resolution \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Zoom-mode enabled? If yes, please specify requirements (e.g. number of zoom windows, bandwidth, resolution, etc.): \_\_\_\_No \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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*If 1.8 = Image-domain / Imaging time-domain*

1.8.1.5 Field of View, Image Angular Resolution, Largest Recoverable Size:

 Frequency dependent.

*Display This Question:*

*If 1.8 = Image-domain / Imaging time-domain*

a Fraction of Primary beam to be imaged (%):

\_\_\_\_\_Depends upon the size of primary beam. The solar disc of 0.5 degree diameter plus the outer solar corona needs to be imaged, no more than 2 degree square. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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*If 1.8 = Image-domain / Imaging time-domain*

b PSF FWHM (arcsec):

\_\_\_\_\_\_\_Frequency dependent based upon the largest baseline available. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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*If 1.8 = Image-domain / Imaging time-domain*

c Pixel size (arcsec):

\_\_\_\_\_10 arcsec for interferometric imaging.

\_\_\_\_\_\_No requirement for mosaic tied-array beam imaging \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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*If 1.8 = Image-domain / Imaging time-domain*

d Maximum baseline (km):

\_\_\_\_\_\_100 km\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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*If 1.8 = Image-domain / Imaging time-domain*

e Minimum baseline (m):

\_\_\_\_\_No specific requirement \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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*Display This Question:*

*If 1.8 = Image-domain / Imaging time-domain*

1.8.1.6 Data Resolution:

Frequency dependent.

*Display This Question:*

*If 1.8 = Image-domain / Imaging time-domain*

a Frequency resolution (kHz):

\_\_\_\_\_\_Frequnecy fine structure observations will require lowest possible frequency resolution.

\_\_\_\_\_\_Large Bandwidth observations will require coarser resolution of e.g. 0.1-10 MHz, depending on bandwidth range\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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*If 1.8 = Image-domain / Imaging time-domain*

b Time resolution (s):

\_\_\_\_\_\_Fine time resolution studies will require millisecond or better.

\_\_\_\_\_\_Longer duration observations will require coarser resolution \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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*If 1.8 = Image-domain / Imaging time-domain*

1.8.1.7 Multi-epoch experiment?

* Yes
* No

Yes

*Display This Question:*

*If Loop current: 1.8.1.7 = Yes*

1.8.1.7 Please specify:

* Cadence of observations - order of magnitude (seconds,minutes,hours,days,weeks, months, years): \_\_\_\_Burst of observing daily when solar activity is high, with bursts separated by weeks or months when activity is low.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Latency between data acquisition and data analysis: \_\_\_\_\_\_\_data analysis will be done after the solar activity has finished.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

*Display This Question:*

*If 1.8 = Image-domain / Imaging time-domain*

1.8.1.8 Other parameters (please specify and quantify):

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*Display This Question:*

*If 1.8 = Non-imaging time domain*

1.8.2 Non-Imaging Time domain

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*If 1.8 = Non-imaging time domain*

1.8.2.1 Type of observation:

* Pulsar Search
* Pulsar Timing
* Pulsar Single Pulses
* Blind Transient Search
* Transient Follow-up
* Flow through
* Dynamic spectrum
* Other (Please specify): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

*Display This Question:*

*If 1.8 = Non-imaging time domain*

1.8.2.2 Sky Coverage and Field of View

*Display This Question:*

*If 1.8 = Non-imaging time domain*

a Total area of the survey (sr or deg2):

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*Display This Question:*

*If 1.8 = Non-imaging time domain*

b Number of pointing directions:

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*If 1.8 = Non-imaging time domain*

c PSF FWHM per beam (arcsec):

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*If 1.8 = Non-imaging time domain*

d Beams for each pointing:

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*If 1.8 = Non-imaging time domain*

e Fraction of the primary beam to be observed (%):

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*If 1.8 = Non-imaging time domain*

f Sub-array/sub-station (if yes describe and report PSF):

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*If 1.8 = Non-imaging time domain*

g Number of beams to be simultaneously coherently dedispersed (pulsar timing only):

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*If 1.8 = Non-imaging time domain*

h Number of epochs per year:

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*If 1.8 = Non-imaging time domain*

i Taking data in not-pointed mode (scanning, on-the-fly mapping etc ..,):

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*If 1.8 = Non-imaging time domain*

1.8.2.3 Polarization products (multiple choice allowed)

* I (unique option for search)
* I, U, Q, V (unique option for pulsar timing, single pulse, and transient buffer)

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*Display This Question:*

*If 1.8 = Non-imaging time domain*

1.8.2.4 Observing Frequency, bandwidth, required number of channels:

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*If 1.8 = Non-imaging time domain*

a Bandwidth for each sub-array (MHz):

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*If 1.8 = Non-imaging time domain*

b Lower frequency limit of output map (MHz):

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*If 1.8 = Non-imaging time domain*

c Upper frequency limit of output map (MHz):

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d Central frequency (MHz):

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e Number of output channels and frequency resolution (kHz):

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*If 1.8 = Non-imaging time domain*

1.8.2.5 Total time, Time resolution and Depth:

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*If 1.8 = Non-imaging time domain*

a Total observing time of the program (h):

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b Total integration time per pointing direction (min):

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*If 1.8 = Non-imaging time domain*

c Number of samples and time resolution (ms):

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d Goal rms sensitivity (uJy/b or uJy/arcsec or K):

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*If 1.8 = Non-imaging time domain*

1.8.2.6 Other useful parameters:

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*If 1.8 = Non-imaging time domain*

a Number of candidates per beam entering the SDP:

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*If 1.8 = Non-imaging time domain*

b Number of “transients/single pulses” per beam per seconds produced by the CSP and surviving the sifting in SDP:

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*If 1.8 = Non-imaging time domain*

c Other parameters (please specify and quantify):

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**End of Block: Section 1. Data products and scientific requirements\_Loop**

**Start of Block: Section 2. Archive mining and VO Interface**

2.1

# **Section 2. Archive mining and VO Interface** **Data storage requirements**

In the following section we wish to explore the archive and VO interface requirements of future SKA projects and in particular their implications for the SKA SRC network.

2.1.1 The intention is to archive all project-level data products (PLDPs). However, it would be useful for you to write in the text box below the list of your PLDPs that you deem to be most important to archive (please indicate close to each PLDP a priority from 1 -lowest - to 3 - highest - You can assign the same priority to multiple products). For further information please refer to the [SKAO Data Products: a summary](https://astronomers.skatelescope.org/wp-content/uploads/2021/06/SKA-TEL-SKO-0001818-01_DataProdSummary-signed.pdf).

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2.1.2 From the list of your anticipated advanced data products (including source catalogues), please write in the text below which of these would you choose to archive (please indicate priority from 1 -lowest - to 3 - highest - You can assign the same priority to multiple products)

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2.1.3  If storage and transfer costs were not an issue, are there any observatory-level, or raw data products that you would wish to archive at the SRCs (please list)?

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2.2 **Data search and retrieval**

2.2.1 When searching for data products in the archive, please rank in order whether you prefer using (click on each item and move it upwards/downwards w.r.t. lower/higher priority items)

\_\_\_1\_\_\_ a web interface

\_\_\_3\_\_ a desktop application (e.g. topcat, aladin)

\_\_\_2\_\_\_ a library (e.g. astropy/PyVO)

\_\_\_4\_\_\_ other (please specify) Apps to be used in the smart phone or pad

2.2.2 Please, describe key search terms (metadata) for each data product that you would like to retrieve from the archive (e.g. coordinates, SIMBAD/NED resolved names, redshift, etc)

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coordinates, SIMBAD/NED resolved names, resolution, frequency, project name, abstract, or keywords, PI name, science keyword, related publication name, abstract, keywords, observation date

2.2.3 Which do you prefer to use when searching for data?

* A set of pre-defined fields
* Using a SQL-type language
* Other (please specify) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

A set of pre-defined fields

2.2.4 Under the assumption that you cannot download the data to your local machine, once a search has been completed, how would you like to be able to interrogate/work with your search results?

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I would like the SRC to send me a link to the data for me to download later.

2.2.4 Do you have any suggestions for working with results that are not covered by the categories listed here (inspection plots/data, subset selection, data product visualisation)?

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I hope there is a link or list of the publications that are related to the data.

2.2.5 Do you have any input/suggestions on how you would like to visualise/interact with searches that might return, for example, one million results?

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I hope there is a suggestion from the archive on how to narrow down the results, for example,”your searches might return a million results, do you like to narrow the frequency range?”

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2.3 **Data subset selection**

2.3.1 Would you benefit from having a means of directly accessing a specific subset of a dataset (cubes, time series, etc)?

* Yes
* No

We are going to reply YES

*Display This Question:*

*If 2.3.1 = Yes*

2.3.1.1 Once a dataset is identified, describe ways in which you would like to make the selection of the subset, or define the cutouts (e.g frequency range, area in the sky, area around an optical source identified in a VO catalog, etc).
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I would like to specify the frequency range, observation time, and area in the sky (it is better to have an image to select the area interactively).

2.3.2 Would you benefit from having a functionality enabling citation (e.g. DOI) of a region of e.g. a datacube or cubelets?

* Yes
* No

We are going to answer YES

2.3.3 Do you see any purpose in being able to access a subset (or cutout) of your data?

* Yes
* No

We are going to answer Yes

*Display This Question:*

*If 2.3.3 = Yes*

2.3.3.1 How do you envision such subset/cut-outs to be used? For example, systematic batch processing of sources by requesting a cutout based on some query result, interactive visualization of a source.

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It depends….I guess most of the time systematic batch processing would work.

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2.4 **Inspection plots for data**

2.4.1 Which kind of remote science platform/visualisation tools do you require for data inspection/visualisation prior to downloading data ?

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A tool to preview the image with zoom out function and labelled axes

**End of Block: Section 2. Archive mining and VO Interface**

**Start of Block: Section 3. Post-processing – Analysis – Visualisation**

# **Section 3. Post-processing – Analysis – Visualisation - Developers - Usage of HPC resources**

This section will explore requirements and expectations for post-processing analysis of data products to enable your science that require future SRC resources.

## 3.1 **Post-processing**

  Tools for Advanced Data Products (ADP)

3.1.1 Based also on previous answers in Section 1 of the questionnaire, do you expect to need post-processing for producing Advanced Data Products (ADPs)?

* Yes
* No

Yes

*Display This Question:*

*If 3.1.1 = Yes*

3.1.1.1 Which standard or established software tools/libraries do you plan to use for the post-processing need(s) that you have identified? (multiple choices possible)

* Casa
* ASKAPSoft
* DPPP/BBS
* KillMS/DDFacet
* WSClean
* Factor
* MeqTrees
* AIPS
* Miriad
* CARTA
* Others (please specify) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

CASA, Python, IDL

*Display This Question:*

*If 3.1.1 = Yes*

3.1.1.2 Have you developed additional specific tools?

* Yes (please provide an ID and a reference) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* No

*Display This Question:*

*If 3.1.1.2 = Yes (please provide an ID and a reference)*

3.1.1.3 Are they open-source codes/software?

* Yes
* No

*Display This Question:*

*If 3.1.1.3 = No*

3.1.1.3.1 For the SRC Network to respect OpenScience and FAIR principles it will be important to make tools associated with publications of SKA data available to the community. If your codes are not open source, please make suggestions about how the results of analysis using this software can be made reproducible (e.g. encouraging teams to make them open source by crediting teams for development).

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*Display This Question:*

*If 3.1.1.3 = Yes*

3.1.1.3.2 Are they actively maintained and documented?

* Yes
* No

*Display This Question:*

*If 3.1.1.3 = Yes*

3.1.1.3.3 Which kind of input data do you need to run your software/tools?

* standard data products expected as output of the Observatory (OLDP/PLDP, see Sect. 3.1.1 “SKAO SCIENCE DATA PRODUCTS: A SUMMARY”)
* any other data product (please specify what kind of data) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

  Tools for additional sanity checks

3.1.2 Observatory and Project Level Data Products (OLDP/PLDP) will have an associated Quality Assessment log from the SKAO processing chain. Based on your experience, do you have any suggestions for possible high-priority tests that could be used to validate and/or to demonstrate the expected quality of OLDP/PLDP & Advanced Level Data Products (ALDP)?

* Yes (please specify your suggestions) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* No

*Display This Question:*

*If 3.1.2 = Yes (please specify your suggestions)*

3.1.2.1 If you are currently conducting similar projects with existing telescopes, what are the tools that you are using for the quality assurance check that you have identified?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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*Display This Question:*

*If 3.1.2 = Yes (please specify your suggestions)*

3.1.8.2 Which kind of input data do you need to run those tools?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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3.2 **Analysis**

  Tools for data analysis

3.2.1 If you are currently conducting similar projects with existing telescopes, what are the analysis tools that you are using on your radio data (possibly jointly with other multi-messenger data)?  (multiple choices possible)

* CASA
* AIPS
* Miriad
* Python
* CDS tools
* Topcat
* Karma
* CARTA
* Sources finders (please specify which software tool(s)) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Others (please specify) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

CASA, Python, IDL

3.2.2 Based on your knowledge of these tools, do you expect to be able to run them directly on SKA data products?

* Yes
* No (briefly explain why, e.g. software will not scale to SKA data sizes) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* I don't know

Yes

*Display This Question:*

*If 3.2.2 = Yes*

3.2.2.1
 Are they open-source tools?

* Yes
* No

Yes for CASA and Python and IDL

3.2.2.2 Do these tools provide provenance information (such as system information, version control and so forth) and reproducible workflows together with advanced science products?

* Yes (please specify) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* No
* I do not know

Yes

*Display This Question:*

*If 3.2.2 = No (briefly explain why, e.g. software will not scale to SKA data sizes)*

*And 3.2.2 = I don't know*

3.2.2.3   Which is the kind of analysis that you will need to run?

\_\_\_\_\_\_\_We don’t need to answer this. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

*Display This Question:*

*If 3.2.2 = No (briefly explain why, e.g. software will not scale to SKA data sizes)*

*And 3.2.2 = I don't know*

3.2.2.4 Which kind of input data do you need?

\_\_\_\_\_\_We don’t need to answer this. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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3.2.3 For the SRC to respect OpenScience and FAIR principles it will be important to make tools associated with publications of SKA data available to the community. Please make suggestions about how to allow teams to be credited for development.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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to maintain a list of Open Source tools with related paper or webpage for the community to cite when they use these tools

  Simulation tools

3.2.4 Are you expecting to need to run any kind of simulation for your data analysis and interpretation?

* Yes
* No

Yes

*Display This Question:*

*If 3.2.4 = Yes*

3.2.4.1 Which kind of simulations?

* Data Challenges to test new methodological developments
* "End-to-end" simulations needing large data processing resources (e.g. to quantify systematic error propagation from realistic instrumental and processing effects, etc. )
* Simulated data to help interpreting observational results (e.g. applying a data processing workflow on simulated dataset to quantify uncertainty, biases; …)
* Simulated data to help setting up a proposal / experiment
* Modeling work
* Other (please specify) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Simulated data to help setting up a proposal/experiment, Simulating data to help interpreting observational results, Modeling work.

*Display This Question:*

*If 3.2.4 = Yes*

3.2.4.2 Are those simulations a specific stage of a more complex workflows ?

* Yes
* No

No

*Display This Question:*

*If 3.2.4 = Yes*

3.2.4.3 If known, what are the type and volumes of data that need to be stagged in for the simulations and to be stagged out from the centralised computing SRC node?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

*Display This Question:*

*If 3.2.4 = Yes*

3.2.4.4 Do these simulations require or can use accelerated technologies (GPU, FPGA, others)?

* Yes (please specify) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* No

| Page Break |  |
| --- | --- |

3.3 **Visualization**

3.3.1 Which are the visualization tools that you are currently using on your radio data, in particular of large data products (possibly jointly with other multi-messenger data)?

* DS9
* CASA viewer
* kvis
* AIPS
* IDL
* CARTA
* Others (please specify) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

DS9, CASA viewer, IDL

3.3.2  Are you using them on your local desktop/cluster?

* Yes
* No

Yes

3.3.3 Have you ever used them on remote machines?

* Yes (If yes, can you shortly report on any issues that you have met?) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* No

Yes.

3.3.4 Are they open-source tools?

* Yes (If yes, can you shortly report on any issues that you have met?) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* No

Yes

3.3.5  Would you benefit from having some kind of preview, low-resolution version of the data cube?

* Yes
* No

Yes

| Page Break |  |
| --- | --- |

## 3.4 **Developers**

3.4.1 Are you expecting to use SRC facilities to run any kind of algorithmic and/or methodological development for analysis or creation of ADPs?

* Yes
* No

*Display This Question:*

*If 3.4.1 = Yes*

3.4.1.1 Can you please specify in which category they will fall:

* Data processing tools (including, e.g., calibration & imaging)
* Data analysis tools (including, e.g., sources finders)
* Other (please specify) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

3.4.2 Do you have any specific requirements, such as

* Computing architectures needs (please specify) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Types of input data needed to test your tools (please specify) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Other (please specify) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

3.4.3 Describe the axes and granularity of data parallelism in your use case.

* Data can be divided by time (specify how fine-grained can this division be) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Data can be divided by frequency (specify how fine-grained can this division be) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Data can be divided along some other axis (specify how fine-grained can this division be) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

3.4.4 Do you use existing Machine Learning/Decentralised Machine Learning (ML/DML) libraries or frameworks, and can you list them (PyToch, TensorFlow, SciNet/, Keras…)?

* Yes \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* No

*Display This Question:*

*If 3.4.4 = No*

3.4.4.1 Might ML or DML be applicable in the future?

* Yes
* No

3.4.5 Are you part of a software development activity (including advisory roles)?

* Yes, please describe your role: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* No

*Display This Question:*

*If 3.4.5 = Yes, please describe your role:*

3.4.5.1 What is your role in the software development process? (multiple answers)

* Scientist (providing overview, requirements and data)
* Computational scientist (expert in numerical and algorithmic solutions)
* Computer scientist (expert in system software and architectures)
* HPC expert (expert in code optimization/parallelization)

*Display This Question:*

*If 3.4.5 = Yes, please describe your role:*

3.4.5.2 What kind of interaction do you have with the other members of your software development team?

* Unstructured daily interaction
* Daily interaction following specific procedures (agile…)
* Interaction only when/if necessary
* Interaction at planned checkpoints (meetings, workshops)
* Only through documents exchange

*Display This Question:*

*If 3.4.5 = Yes, please describe your role:*

3.4.5.3 Do you think it would be useful to introduce procedures to better organise the work of your software development team?

* Yes
* No
* We already adopt the following \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* I don't know

*Display This Question:*

*If 3.4.5 = Yes, please describe your role:*

3.4.5.4 What kind of collaborative tools do you use to interact with your software development team? Please specify its effectiveness for your work (from 1=none to 5=excellent)

|  | Non applicable |
| --- | --- |

|  | 1 | 2 | 3 | 4 | 5 |
| --- | --- | --- | --- | --- | --- |

| Slack |  |
| --- | --- |
| Mattermost |  |
| GitLab |  |
| GitHub |  |
| Mercurial |  |
| Vnc |  |
| Google Drive |  |
| Dropbox |  |
| Confluence |  |
| Social media |  |
| Jira |  |
| Others (please specify) |  |

*Display This Question:*

*If 3.4.5 = Yes, please describe your role:*

3.4.5.5 What kind of additional tools do you think might improve your software development work?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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3.5 **Usage of HPC Resources**

3.5.1 In what aspect do you think the HPC resources provided by the SRC could be most critical?

* To handle big data (that cannot be treated by a single CPU)
* To reduce time to solution (with parallelism or accelerators)
* To have large and fast storage devices
* To have access to reliable and state-of-the-art systems
* I don't know

The HPC resources are best used to reduce the time to make radio images - to create the

image cubes required from the raw visibilities.

3.5.2 Can the tools you use for data processing/analysis/visualization already exploit HPC systems?

* No
* Yes, distributed parallelism (e.g. MPI)
* Yes, multithreading parallelism (e.g. OpenMP, Pthreads)
* Yes, accelerators (e.g. FPGA)
* Yes, others (please specify, e.g. parallel I/O) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* I don't know

3.5.3 Do you consider it feasible to work on a multi-user shared system (as usually happens in HPC centres)?

* Yes
* No (please shortly specify why) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

3.5.4 Do the tools you use support checkpointing/restart (i.e. you can interrupt you process and restart later exactly from the point you stopped). This is critical to work on shared systems

* Yes, all of them (please specify) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Yes, part of them (please specify) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* No, but we can consider to implement it
* No
* I don't know

**End of Block: Section 3. Post-processing – Analysis – Visualisation**

**Start of Block: Section 4. User support**

# **Section 4. User support**

In this section we will explore expectations for the level of support that science teams will require from the SRC network.

4.1 According to the experience of your team, evaluate the expected level of support from the SRCs for the following items (from 1=very low to 5=very high):

|  | Not applicable |
| --- | --- |

|  | 1 | 2 | 3 | 4 | 5 |
| --- | --- | --- | --- | --- | --- |

| Interferometry skills | 3 |
| --- | --- |
| Proposal preparation | 2 |
| Observatory Data Product info | 3 |
| Data quality info | 3 |
| Data retrieval | 2 |
| Calibration | 3 |
| Visualization | 1 |
| Advanced Data Product production | 3 |
| Archive mining | 5 |
| Usage of HPC systems | 3 |
| HPC/Parallel applications | 3 |
| I/O optimization | 3 |
| Other (specify) |  |

4.2 What kind of additional interactions, services, and/or support do you expect when using the SRC Network?

* Information about supported libraries, codes, workflows
* Monitoring provenance information
* Enable possible interactions when workflows or codes are being executed
* Other (specify) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Information about supported libraries, codes, workflows, Enable possible interaction when workflows or codes are being executed, Other: training for proposal preparation and data analyzation

4.3 If you are running a custom experiment or joint project with another observatory, what level of support might you require from the SRC for each stage of the project (from 1=very low to 5=very high)?

|  | Not applicable |
| --- | --- |

|  | 1 | 2 | 3 | 4 | 5 |
| --- | --- | --- | --- | --- | --- |

| Specify custom experiment/Mid+Low joint project | 3 |
| --- | --- |
| Specify custom experiment/Coordinated project (with another observatory; includes VLBI) | 3 |
| Specify custom experiment/Other (specify) | 3 |
| Interferometry skills | 3 |
| Proposal preparation | 2 |
| Observatory Data Product info | 3 |
| Data quality info | 3 |
| Data retrieval | 3 |
| Calibration | 4 |
| Visualization | 1 |
| Advanced Data Product production | 3 |
| Archive mining | 5 |
| Other (specify)  |  |

4.4 For those involved in the SKA pathfinder/precursor surveys, what are the biggest issues that you encounter? Comment your selection(s).

* Data Processing \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Data Storage \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Data Transfer \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Lack of metadata / provenance \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Lack of quality assessment \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Lack of sufficient computing resources \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Lack of fast I/O \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Other (specify): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

4.5 What are the biggest issues that you encounter using astronomy software and tools? Comment your selection(s).

* Software poorly documented \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Inadequate software for new telescopes \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Lack HPC enabling \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Absence of training to exploit the software \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Poor flexibility for certain use cases \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Other (specify): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Inadequate software for new telescopes

4.6 What are the biggest issues that you encounter when processing your data? Comment your selection(s).

* Specify the SKA precursor(s) / pathfinder(s) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Effective usage of HPC solutions (performance, scalability, I/O) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Issues with HPC (speed, accessibility of data) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Long time in the queue \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Not enough storage \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Large processing times \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Memory limitations \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Other (specify): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Not enough storage, Large processing times, Memory limitations

4.7 As specified in the ["SKAO Science data products: A summary"](https://astronomers.skatelescope.org/wp-content/uploads/2021/06/SKA-TEL-SKO-0001818-01_DataProdSummary-signed.pdf) document, only in some exceptional cases, Science Data Processor (SDP) pipelines/parameters of large projects can be adjusted by the SRC or SKAO support staff, in consultation with user, after observation of a small fraction of the observing project. No further user interaction with the SDP workflow is expected for the remainder of the project.

4.7.1

 Would your project benefit from this feedback loop with the SDP?

* Yes
* No

Yes

4.7.2 Would your project require a more continuous interaction with the SDP workflow?

* Yes
* No

Yes

4.7.2.1 Justify why your project is so exceptional to require this very special treatment:

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**End of Block: Section 4. User support**