***ngVLA Science Use Case Template***

Version 1.01: 02/02/2017

**Change Record**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Version** | **Date** | **Author** | **Affected Section(s)** | **Reason** |
| 0.1 | 12/07/2016 | Murphy | All | First draft. |
| 0.2 | 12/08/2016 | Murphy | All | Implementing comments |
| 0.3 | 01/12/2017 | Selina | 3 | Increasing narrative section. Adding additional functional and performance requirements. |
| 0.4 | 01/18/2017 | All | 3 | Clarifying science requirements |
| 1 | 01/24/2017 | All | 3 | Implementing requested changes to science requirements |
| 1.01 | 02/02/2017 | Murphy | 3 | Adding VLBI and polarization angle requirements. |

*ngVLA Science Use Case # XX*

**Title**

Authors

**I. Science Goal(s)**

*Briefly (in a sentence or two) summarize the key science goal(s) for this science case.*

**II. Scientific Rationale**

**(A) Scientific Importance**

*Provide a brief discussion on the scientific importance for this science case.*

**(B) Measurements Required**

*Provide a description of the necessary measurements to be carried out by the ngVLA to adequately address this science case. Please coordinate these measurements with the Science Requirements table in Section III.*

**(C) Uniqueness to ngVLA Capabilities (e.g., frequency coverage, resolution, etc.)**

*Is this science case uniquely addressed by the ngVLA? Can other facilities address this science and reach the same conclusion?*

**(D) Longevity/Durability: with respect to existing and planned (>2025) facilities**

*Describe potential synergies/complementarities between this ngVLA science case and those from future facilities at all wavelengths (e.g., JWST, ALMA, WFIRST, SKA, TMT/E-ELT, LUVOIR, OST, HABEX, etc.).*

**III. Science Requirements Tables**

|  |  |  |
| --- | --- | --- |
| **(A) ‘TARGETS’ OF OBSERVATIONS** | | |
| Type of observation  (what defines a ‘target’) |  | Individual pointings per object |
|  | Individual fields-of-view with multiple objects |
|  | Mosaics of multiple fields of view |
|  | Non-imaging pointings |
| Number of targets |  | |
| Position range of targets (RA/Dec.) |  | |
| Field of view (arcmin2) |  | |
| Rapidly changing sky position?  (e.g., comet, planet) |  | YES [details: ] |
|  | NO |
| Time Critical? |  | YES [details: ] |
|  | NO |
| Required rms (μJy/bm) [per km/s for lines] |  | |
| Peak brightness (μJy/bm) |  | |
| Expected polarized flux density  (expressed as % of total) |  | |

**(A) ‘Targets’ of Observations Discussion**

*Provide a brief discussion describing any trade-offs, interrelationships between specifications, or other nuance that is not captured in the above table.*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **(B) OBSERVATIONAL SETUP** | | | | | |
|  | Tuning 1 | | Tuning 2 | Tuning 3 | … |
| Central Sky Frequency(ies) (GHz) |  | |  |  |  |
| Instantaneous Bandwidth for each Sky Frequency (GHz/pol; max 40GHz) |  | |  |  |  |
| Spectral resolution(s) [km/s or kHz] |  | |  |  |  |
| Temporal resolution (in seconds) |  | YES [details: ] | | | |
|  | NO [*set by time/bandwidth smearing considerations*] | | | |
| Subarrays | (y/n; number): | | | | |
| VLBI |  | YES [details, including phased field of view: ] | | | |
|  | NO | | | |

**(B) Observational Setup Discussion**

*Provide a brief discussion describing any trade-offs, interrelationships between specifications, or other nuances that are not captured in the above table.*

|  |  |
| --- | --- |
| **(C) POLARIZATION DATA PRODUCTS REQUIRED** | |
| (y/n) | Stokes I |
| (y/n) | Stokes Q |
| (y/n) | Stokes U |
| (y/n) | Stokes V |

**(C) Polarization Product Discussion**

*Provide a brief discussion describing any trade-offs, interrelationships between specifications, or other nuances that are not captured in the above table.*

|  |  |  |
| --- | --- | --- |
| **(D) IMAGING CONSIDERATIONS (Continuum & Line, Including VLBI Observations)** | | |
| Required angular resolution (mas)  (single value or range) |  | |
| Largest angular scale required (arcsec) |  | |
| Mapped image size (arcmin2) |  | |
| Required pixel resolution (mas) |  | |
| Number of output/image channels |  | |
| Output bandwidth (minimum and maximum frequency - GHz) [Continuum] |  | |
| Channel width (km/s or kHz) [Spectral line] |  | |
| Required rms (μJy/bm) [per channel for spectral line] (if polarization products required define for each) |  | |
| Dynamic range within image  (if polarization products required define for each) |  | |
| Polarization accuracy (%) |  | |
| Required polarization angle accuracy (deg) |  | |
| Zero spacing/total power required? | (y/n) | |
| Required flux density scale calibration accuracy |  | 1-3% |
|  | 5% |
|  | 10% |
|  | 20-50% |
|  | n/a |

**(D) Imaging Considerations Discussion**

*Provide a brief discussion describing any trade-offs, interrelationships between specifications, or other nuances that are not captured in the above table.*

**(E) Other Functional Requirements**

*If the observation has additional functional needs, such as a phased array mode, VLBI recording capability, etc., please describe those needs here.*

**(F) Other Performance Requirements**

*If the observation has additional performance requirements not captured above, please describe those needs here.*

**IV. Appendix: Additional material, relevant sensitivity calculations, etc.**

*Please provide any other relevant material necessary to understand and substantiate this Science Use Case.*