ngvla
Next Generation Very Large Array

Panel Questions

ngVLA Project Team (NRAO)

NSF AUI NRAO

Q1 The project office's 1/3/2020 response to the RMS panel's question about construction phasing presents a scenario in which ~33% of the collecting area (and cost) would be deferred to construction years 11–15. In this scenario, additional observing time could be used to achieve full-ngVLA sensitivities starting in 2034. What is the basis for the estimate of "77% additional observing time to compensate" in this scenario, which is less than a naive factor of $(2/3)^{-2}$? What portion of the science case would not be recoverable as of 2034 even with extra observing time, considering both the KSGs and the broader range of ngVLA science (e.g., as envisioned by relevant Astro2020 whitepapers and/or the ngVLA Science Book)?

Summary: deferral of ngVLA capabilities via a longer construction period has predictable negative impacts on several KSGs, and the synergy of ngVLA with other facilities and opportunities.

Q2 What would be the key differences in capability between ngVLA and SKA1-mid, and in what respects would the two instruments be complementary?

Summary: we believe the current technical definitions of ngVLA and SKA1-mid are highly complementary from a scientific viewpoint, with ngVLA strongly focused on PI-driven targeted observations.

Q3 If ngVLA were not equipped with band 6 (70–116GHz) receivers, to what extent would the ngVLA KSGs not be recoverable either by ALMA, or by ngVLA at lower frequencies?

Summary: From the analysis, it should be clear that the loss of science from ngVLA descoping band 6 is very significant, removing or disproportionally handicapping several of the ngVLA Key Science Goals.

Q4 Does the planned collecting area of the SBA relative to that of the rest of ngVLA reflect the fact that not all ngVLA projects would require short-baseline observations? If not, does the undersubscription of the ALMA Compact Array (ACA) relative to the ALMA 12m array represent an informative precedent? What possible paths are envisioned for ngVLA projects that would need zero-spacing observations to obtain them?

Summary: the SBA component of ngVLA is scientifically well motivated and critical to addressing several KSGs. Comparisons to e.g. the ALMA ACA are unable to capture the complexities associated with the different scientific goals and technical implementations.

Q5 How robust are the models for the abundance of (millisecond) pulsars in the vicinity of the Galactic Center that suggest a likely outcome for KSG4?

Summary: ngVLA will successfully constrain the population of Galactic Center pulsars and advance the field in all scenarios.

Q6 How would the formal SETI agreement to support commensal science fit within the “Open Skies” framework for managing proprietary data?

Summary: A detailed SETI data policy will be developed in future.

Q7 For KSG5, why is 200Mpc the right horizon distance to use for next-generation gravitational wave facilities on the timescale of ngVLA? Would event rates at that distance be sufficient to answer the questions raised? How reliable are the predictions that all sources would be detectable at that distance, given uncertainties in geometry and ISM density?

Summary: 200 Mpc was selected as a conservative radius for detection; actual search volumes (and detection rates) may be factors of several larger.

Q8* What are the current prospects for obtaining ~25% international partnership support for ngVLA? If there were an ngVLA/SKA agreement for reciprocal access, could SKA partners still be incentivized to contribute financially to ngVLA?

Summary: initial discussions regarding a ngVLA-SKA observing alliance have been successfully completed; the projects plan a joint science meeting in 2020 or 2021. Given the complementarity of the two instruments, providing global access to both is the optimal goal for these negotiations.

Q9* What confidence level do the project office's Monte Carlo analyses associate with NRCC's Basis of Estimate for the cost of the antennas?

Summary: the Monte Carlo estimates presented provide a 70% confidence figure.

Q10 The ngVLA RFI response states that "all planned observing modes and data processing and product capabilities will be delivered as part of construction." Does this commitment allow for the staged deployment of correlator modes and associated software capabilities, or would all need to be available at a specific "first light" juncture? If staged deployment is possible, how would the rollout of new capabilities be tied to early science?

Summary: a staged deployment of capabilities is planned during construction.

Q11 How would the ngVLA design and cost be affected by the elimination of band 6 (70–116GHz)?

Summary: Band 6 is a 2.9% contribution to the construction cost.

Q12 If it were found necessary to reduce the bandwidth or bit-depth of data in the 2030s due to a shortfall in affordable IT capability, what overall impact would be expected on the science capabilities? When would a better understanding of the IT cost/capabilities be expected, and would an anticipated shortfall drive any modifications to the deployment plan?

Summary: Changes in fiber availability impact observing efficiency in predictable ways. It is not anticipated that a reduction of the available transmission bandwidth on the long baseline sites will affect the deployment plan.

Q13 Has the project office taken a critical look at the impacts of 5G RFI on the data products, assuming both conservative and worst-case scenarios, to determine if any design modifications are needed to meet the science goals?

Summary: ngVLA must be designed to successfully co-exist with the rapidly-evolving ground and space-based RFI environment.

Q14 What are the frequency range and spectral resolution of the water vapor radiometers (WVRs)? Is there a risk that their performance could be compromised by RFI from 5G networks? If it were found that the WVR phase corrections do not work 50% of the time, what would be the impact on observing efficiency?

Summary: impacts to observation durations and program allocations associated with WVR calibrations are generally modest.

Q15 If security concerns in Mexico made it difficult to site telescopes there, how would the loss in uv coverage impact the ability of ngVLA to achieve its KSGs? Are there any backup sites in the US that could help mitigate the loss of Mexican stations?

Summary: The total contribution of Mexico to ngVLA is not yet determined, and contributions beyond the three northern antennas could deliver scientifically unique and critical capabilities to the array. Impacts associated with the loss of the currently-defined three northern Mexico antennas are modest, and can generally be mitigated for equatorial or northern declinations.

Q16 Are there any technical risk implications of the commitment to use CASA to process ngVLA data? Could the CASA data model and measurement set concept represent a bottleneck for data processing? What is the basis of the assumption of 50% reuse of existing code?

Summary: we are confident that the planned evolution of CASA over the next several years will produce a system capable of supporting ngVLA.

Q17 What are the contingency plans for ensuring that longer delays in data delivery due to unrealized efficiencies in parallelized imaging algorithms do not result in loss of scientific viability?

Summary: ngVLA computing is challenging, however it represents a measured step beyond the current state of the art.

Q18 What project management tools and approaches would be used to integrate software development fully into the development, construction, and commissioning of ngVLA as a whole?

Summary: NRAO will use its existing Program Mangement expertise to create a standard set of tools and processes for use by the construction project.

Q19 Are there plans or ambitions for pipeline processing to take direction-dependent effects into account when generating science-ready data products (SRDPs; see p15 of the Preliminary System Requirements document)? Are there plans or ambitions to include polarization calibration as part of the standard calibration pipeline (see p52 of the Preliminary System Requirements document)?

Summary: Direction-dependent and polarization calibration will be supported.

Q20 Is the “Science Operations Center and Data Center” described on p4 and p49 of the RFI response (but not obviously present in WBS element 1.15 on p98) included in the ngVLA cost estimate?

Summary: Science Data Center costs have been included in the project estimate.

Q21 At what point in the construction and commissioning of ngVLA would the existing VLA be expected to cease operations, considering the planned reuse of buildings at the VLA site?

Summary: the transition between JVLA and ngVLA involves several stakeholders, opportunities and threats. NRAO will lead a community-based consultation process beginning in 2020 to explore the options and coordinate the opportunities with ngVLA development.

Q22 Noting that atmospheric phase stability and opacity can vary substantially across the 70–116GHz window, can the project team model what fractions of ngVLA observing time would be useable in different parts of that window for (a) baselines within the main array core, and (b) baselines extending to the main array spiral arms? (Reasonable simplifying assumptions can be made for (b), given the current lack of atmospheric measurements away from the VLA site.)

Summary: atmospheric opacity and stability issues are being considered as part of operations planning and site selection.

Q23 How feasible would it be to retain a sufficiently large pool of qualified workers to maintain such a large, geographically separated array of antennas?

Summary: human capital considerations in ngVLA operations are being continuously assessed.

Q24 Have other design options for the LBA sites been considered (different diameter antennas, smaller numbers of dishes, etc.)?

Summary: LBA design and development activities will continue in 2020/2021 to explore all appropriate options.

Q25 Would the currently proposed sites for the LBA clusters allow sufficient separation between elements to avoid shadowing problems?

Summary: LBA clusters will be designed and built to minimize shadowing problems, enabling other observing modes and science opportunities.


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Supplementary Topics Available

- JVLA-ngVLA Transition
- SKA Complementarity & Alliance
- ngVLA Human Resources
- Environmental Topics
- RFI
- Programmatics