



# High-Frequency Synergies

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# High-Frequency Science Goals

- Cradle of Life
  - High-redshift CO
    - Low-to-moderate energy transitions
  - Galactic star and planet formation
    - Ionized gas, combination with dust disks seen at higher frequencies
- Megamasers and dark energy
  - Determine Hubble Constant to 1%
  - Requires collecting area on long baselines

# Mm/cm Cradle of Life in 2010-2020

- ALMA operations begin in ~2012
  - $A_e/T_{\text{sys}} \sim 150 \text{ m}^2/\text{K}$  at 30 GHz after 2015?
  - Also, note CCAT, CARMA, SMA
- EVLA operations in ~2012
  - $A_e/T_{\text{sys}} \sim 270 \text{ m}^2/\text{K}$  at 30 GHz
- ATA in 2010
  - ATA-42  $\sim 15 \text{ m}^2/\text{K}$  at 5 GHz
  - ATA-350  $\sim 120 \text{ m}^2/\text{K}$  at 5 GHz
- SKA-high nominal specification at conclusion of SKA phase 3
  - $A_e/T_{\text{sys}} \sim 5000 \text{ m}^2/\text{K}$  at 25 GHz

# Other Telescopes in 2010-2020

- James Webb Space Telescope
  - Launch in 2014
  - 5-yr lifetime governed by consumables
- JDEM
  - Launch in 2015-2017, 3-yr prime mission
  - Wide-field galaxy/redshift survey telescope
- LSST, PS-4
- 20-30m optical telescopes
- GAIA/Kepler
- SOFIA?

# SKA-high (“phase 3”) era, post-2020

- Constellation-X? (X-ray spectroscopy)
- SIM/TPF? Will either exist?
- Inflation Probe
- Other recommendations of Astro2010
- Continuing operations of ALMA and EVLA, as well as LSST and large optical telescopes
- SKA-low and SKA-mid telescopes
  - High-f followup to RSST?

# International SKA Scenarios

- Complete low- and mid-frequency SKA by 2020
  - Will use the entire nominal cost of 270 G¥
  - Wide-field survey telescopes, unlike SKA-high
- High-frequency SKA being pushed into the indefinite future
  - Is the “Cradle of Life” science integral to SKA, or is SKA primarily an EOR and RSST/HI telescope?

# ~3-25 GHz, 2015-2030

- Is the science done by SKA-high or something else?
- Are SKA-high frequency range and collecting area appropriate for post-2020 science?
- What other telescopes will exist after 2020, and what will the key science questions be?
- Should we focus on SKA-high as part of a global SKA strategic program in Astro-2010, or develop some other high-frequency capability sooner?