



# Sensitivity Calculator

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# What is the Sensitivity Calculator?

- User friendly way of helping observers estimate time on source based on their desired sensitivity level
  - not the total time request!
- Generated results should be added to the technical justification of the proposal
- Accessing the Sensitivity Calculator:
  - [https://dss.gb.nrao.edu/calculator-ui/war/Calculator\\_ui.html](https://dss.gb.nrao.edu/calculator-ui/war/Calculator_ui.html)
- Documentation for the Sensitivity Calculator:
  - [https://dss.gb.nrao.edu/docs/Calculator\\_ug.pdf](https://dss.gb.nrao.edu/docs/Calculator_ug.pdf)



# Information needed for the Sensitivity Calculator

- General Information
  - Desired sensitivity (confirm desired units!)
    - Flux density vs. antenna temperature vs. radiation temperature... etc.
- Hardware information
  - Backend, receiver, bandwidth, switching mode, etc
- Source Information
  - Frequency, doppler corrections and velocity, background contributions, elevation limits, etc
- Data Reduction Information
  - Averaging, desired velocity/frequency resolution, etc



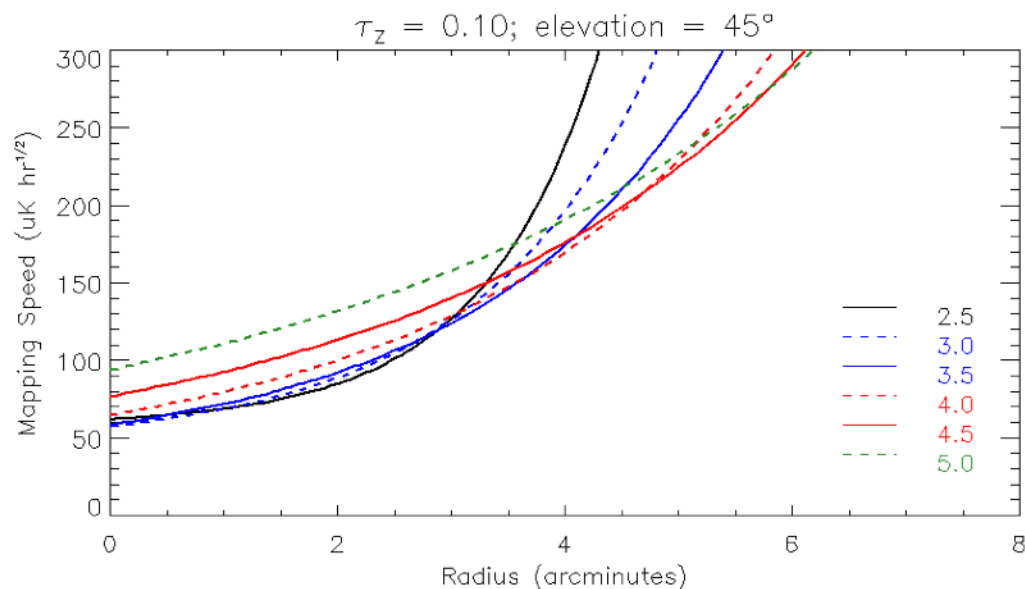
# Different Units for the Desired Sensitivity

- Flux density (mJy)
  - ( $10^{-29}$  Watts  $m^2$  Hz $^{-1}$ ), and as if measured from above the Earth's atmosphere (Default).
- Antenna temperature (mK)
  - as measured below the Earth's atmosphere
- Radiation temperature (mK)
  - as if measured from above the Earth's atmosphere and defined for sources of any size
- Main Beam temperature (mK)
  - similar to radiation temperature, but defined for sources whose diameter extends to the first nulls in the telescope's beam
- Forward Antenna temperature (mK)
  - Measured antenna power in the forward on-sky direction, corrected for atmosphere
  - Used for Argus observations



# Sensitivity Calculations with MUSTANG-2

- To compute sensitivities and integration time:
  - <https://greenbankobservatory.org/science/gbt-observers/mustang-2/>
- Further details about overheads and other useful info:
  - <https://greenbankobservatory.org/science/gbt-observers/mustang-2/mustang-2-overview-requirements/>



# Accessing the Sensitivity Calculator

[https://dss.gb.nrao.edu/calculator-ui/war/Calculator\\_ui.html](https://dss.gb.nrao.edu/calculator-ui/war/Calculator_ui.html)

Help Desk | Users Guide  
Sensitivity Calculator 2.4.2

### General Information

Derive:  Observing Time from Desired Sensitivity  
 Sensitivity from Observing Time

Sensitivity Units:  Flux Density (mJy)  
 Antenna Temp.,  $T_a$  (mK)  
 Main Beam Temp.,  $T_{mb}$  (mK)  
 Forward Antenna Temperature,  $T_a^*$  (mK)  
 Radiation Temp.,  $T_r$  (mK)

Desired Sensitivity (1-sigma):

### Hardware Information

Answer questions from top to bottom. If you change a question that was answered previously, check all answers that follow. Some answers will dictate the answer for other questions.

Backend:

Mode:

Receiver:

Beams:

Polarization:

BandWidth (MHz):

Number of Spectral Windows:

Switching Mode:

### Source Information

Frequency Specified in the:  Topocentric Frame  
 Rest Frame

Rest Frequency (MHz):

Doppler Correction:

Source Velocity (km/s):

Source Diameter (arc minutes):

### Controls

#### Results

Result Grids

#### Messages

Warning - Minimum elevation is below the suggested minimum of 20.00 degrees.  
Warning - Since source is extended, the calculated results are approximations.

#### Results

Please fill out the questions to the left to begin.



We will now continue  
with a live demo 😊





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