

# Onsala 20 m telescope proposals

**Proposals are invited for observations with the Onsala 20 m telescope in 2024.**

*(For information about proposals for Directors Discretionary Time (DDT): see Onsala's general [proposal web page](#). Calls for proposals for APEX observations are issued once per year, in January, but the possibility to submit proposals for Directors Discretionary Time (DDT) at any time remains.)*

We welcome proposals for **Large programmes**, i.e. spanning more than one semester and/or require a large number of hours (> about 500 h).

**Deadline: Friday 8 December 2023 (23:59:59 UTC)**

If you are considering submitting close to the deadline, please note that support will only be available during normal office hours. Proposals are to be submitted through the [NorthStar](#) system.

**Note:** Before submitting the proposal, the authors must contact the telescope scientist Henrik Olofsson ([henrik.olofsson@chalmers.se](mailto:henrik.olofsson@chalmers.se)) to arrange with a local collaborator to support the observations. To allow for more flexible scheduling, most projects will be observed in **service mode** by local staff who will consult with the PIs if needed.

**Onsala Space Observatory**, the Swedish National Infrastructure for Radio Astronomy, is located about 45km south of Göteborg, on the west coast of Sweden. **The Onsala 20 m diameter millimetre-wave telescope** is used for, e.g., observations of spectral line emission from molecules in comets, circumstellar envelopes, and the interstellar medium in the Galaxy and in extragalactic objects. (It is also used for astronomical and geodetic VLBI observations, through a separate proposal procedure.)

Our receivers provide **continuous frequency coverage in the ranges 18-50, 67-87 and 85-116 GHz with 4 GHz IF bandpass, dual polarisations and full mutual sideband rejection (<-13 dB)**. If the spectrometer bandwidth is reduced to 2.5 GHz then in the two high frequency bands both sidebands can be observed simultaneously ("2SB"), with these sidebands having centres 12 GHz apart. This spectrometer setup enables, e.g., such important lines as CS 2-1 near 98 GHz, and  $^{13}\text{CO}/\text{C}^{18}\text{O}$  near 110 GHz, to be observed at the same time. The lower portion of the 3/4 mm band, 67-87 GHz, enables observations of low-energy or ground state transitions of some important deuterated species such as DCO, DCN, DNC,  $\text{N}_2\text{D}^+$ , HDO,  $\text{DC}_3\text{N}$  etc.

The **control system**, Bifrost, allows **automatised observations** particularly suitable for **Large programmes**, e.g. the capability to observe large raster maps where the system strives to equalise the (theoretical) noise levels, while regularly retuning and conducting pointing/focus measurements. Spectral scans of multiple sources with variable noise targets for each tuning are also possible through advanced scripting. Bifrost also permits users to prepare tunings and test scripts in a (limited) off-line simulator mode.

## Observing period, operations, etc.:

This Call for proposals is for the observing period **January–December 2024** (observations will mainly be made in the period **January–May**). Calls for proposals for the 20 m telescope are issued only once per year, but proposals for Directors Discretionary Time (DDT) can be submitted at any time.

Before submitting the proposal, the authors must contact the telescope scientist Henrik Olofsson to arrange with a local collaborator to support the observations. While most projects will be conducted in service mode, on-site observations by a team member may be possible if requested. Note however that the possibility to find a suitable fixed time slot is limited. Also, note that after initial training by an Astronomer on Duty, there is no telescope operator support or technical support outside office hours. Remote observations using a VNC interface are normally allowed but only for team members having prior on-site observing experience. Projects will be preferentially scheduled in 24 h blocks; multi-source proposals should consider this in making their source selection.

## Telescope:

- Radome-enclosed, 20 m diameter telescope, operated 24 h/day.
- Location: Onsala, 45 km south of Göteborg, on the west coast of Sweden.  
Latitude: 57° 23' 45.0046" N, longitude 11° 55' 34.8719" E, elevation 22.758 meters.

## Receivers:

The telescope is equipped with receivers for the 18–50 GHz and 67–116 GHz ranges.

Receiver characteristics:

Frequency range	Receiver temperature (single sideband)	Receiver type	Polarisation
18–26 GHz	30 K	HEMT amplifier	Dual
26–36 GHz	50 K	HEMT amplifier	Single
36–50 GHz	50 K	HEMT amplifier	Dual
67–87 GHz ("4 mm")	50-60 K	HEMT amplifier	Dual
85–116 GHz ("3 mm")	45-60 K	SIS mixer	Dual

**Note:** Both the 3 mm and the 4 mm receivers are dual polarisation sideband separating with USB and LSB having centres presently 12 GHz apart. Each sideband has IF bandwidth 4 GHz, but there is only sufficient spectrometer capacity to observe single sideband 4 GHz bandwidth, or dual sideband 2.5 GHz if both linear polarisation products are to be recorded. The IF bandwidth for the receivers for < **50 GHz** is also 4 GHz but only one sideband can here be observed at a time (single-sideband).

Weak broad extragalactic lines can be detected down to a line strength of 2 mK or possibly better with the 3 mm receiver, and down to 4 mK or most likely better with the 4 mm receiver ( $T_A^*$ , after baseline subtraction).

Note that the **atmospheric transmission** decreases towards the low frequency end of the **4 mm band** due to several broad atmospheric molecular oxygen lines around 60 GHz.

## Spectrometers:

The back-ends for spectral line observations consist of three Fast Fourier Transform spectrometers (OSA, SPE, and HRF). The spectrometers have the following characteristics:

Spectrometer	Total bandwidth	Resolution
HRF*	2 x 0.2, ..., 2 x 50 MHz	24, ..., 6000 Hz
SPE **	2 x 100, 1 x 1000 MHz	12, 61 kHz
OSA***	2 x 4 GHz***, 2 x 2.5 GHz, 2 x 625 MHz, 2 x 156 MHz	76, 76, 19, 4.8 kHz

\* Please notify the telescope scientist as soon as possible after proposal submission if the HRF spectrometer is requested; there may be some lead time before it is available.

\*\*In dual polarisation and low-resolution mode, the bandwidth is 500 MHz per polarisation.

\*\*\*The four modules of the spectrometer can either be combined to cover 4 GHz in both polarisations in the same sideband, or to cover the upper and lower sidebands in one polarisation. An additional mode, 4 x 2.5 GHz simultaneously covering all sidebands and polarisations, is available. Below 50 GHz, the 2 x 4 GHz mode can be used to cover both polarisations of the same sideband for the two dual polarisation receivers (18–26 GHz and 36–50 GHz).

## Observing modes:

Position switching, frequency switching, and (above 67 GHz) beam switching (11 arcmin).

## Observing time estimates:

Please use the [online observing time calculator](#) for observing time estimates.

## Proposal preparation and submission:

Onsala Space Observatory uses the [NorthStar](#) system for preparation and submission of proposals. NorthStar is used by several radio and optical observatories.

In **NorthStar**, information about applicants, instruments, targets, etc., is to be provided "on-line", and the scientific justification is to be prepared "off-line" and uploaded as a pdf file (also target lists can be uploaded). NorthStar then produces one pdf file with all information. NorthStar includes information on how to use it.

The proposal must contain a proper and concise **scientific justification** including an explanation for how the requested observing time was calculated, in total no more than **two A4 pages** long, plus figures and tables if needed (for a total of maximum six pages). Proposers should mention relevant previous observations with Onsala telescopes, and clearly show preliminary results. Observing time estimates should be made using the **on-line observing time calculator**. If observations are for **Ph.D. work**, this should be stated.

## Further information and useful links:

- The [NorthStar](#) proposal submission tool.
- The [Onsala 20 m telescope website](#) (under construction).
- The [online observing time calculator](#).
- Questions about the telescope, receivers, etc.: [henrik.olofsson@chalmers.se](mailto:henrik.olofsson@chalmers.se).
- In case of problems with NorthStar: [michael.olberg@chalmers.se](mailto:michael.olberg@chalmers.se).
- General questions about proposals: [magnus.thomasson@chalmers.se](mailto:magnus.thomasson@chalmers.se).