Effelsberg User Guide

Introduction

The 100-m radio telescope of the Max-Planck-Institut für Radioastronomie (MPIfR) is located in a protected valley near Bad Münstereifel-Effelsberg. It is one of the two largest fully steerable single-dish radio telescopes in the world and a unique high-frequency radio telescope in Europe. The telescope can be used to observe radio emission from celestial objects in a wavelength range from 90 cm (300 MHz) down to 3.5 mm (90 GHz).

The combination of the high surface accuracy of the reflector (holographic measurements showed a mean
deviation from the ideal parabolic form of ≤ 0.55 mm rms) and the construction principle of “homologous distortion” (i.e., the reflector in any tilted position has a parabolic shape with a well-defined, but shifted, focal point) enables very sensitive observations at unprecedented high frequencies for such a large telescope.

The wide variety of observations with the 100-m radio telescope is made possible by a large number of receivers which are located either in the primary or in the secondary focus. Together with a number of backends dedicated to different observing modes they provide excellent observing conditions for spectroscopic observations (atomic and molecular transitions over a wide frequency range), for high time-resolution measurements (pulsar observations), mapping of extended areas of the sky, for polarimetry and participation in a number of interferometry networks (such as mm-VLBI, EVN, and Global VLBI).

This *user guide* should help you in proposing, preparing, executing and analyzing observing runs at the 100-m telescope. It is continuously updated - contributions come from a number of colleagues, mainly U. Bach (general, observations, software), R. Beck (continuum mapping), H. Hafok (software, spectroscopy) A. Kraus (general), M. Krause (continuum mapping), and B. Winkel (spectroscopy).
In case of additional questions, please do not hesitate to contact us directly.

We are looking forward to meeting you personally in Effelsberg! Good luck with your observations,

Alex Kraus
(on behalf of the staff at the observatory)

Description of the Antenna and its Facilities

- Antenna
- Receiver and calibration parameters for the Effelsberg 100-m Telescope (new)
- Backends

- Receivers and Calibration (old)

How to get observing time

- From the Proposal to Observations

Acknowledge the 100-meter telescope

For a publication which made use of data observed with the 100-meter telescope, please use the following acknowledgment: **Based [Partly based] on observations with the 100-m telescope of the MPIfR (Max-Planck-Institut für Radioastronomie) at Effelsberg.**

Observing with Effelsberg

- The "OBSINP" observing software
  - Preparing your catalog
  - Flux density measurements
  - Continuum observations
  - Spectroscopy
  - Pulsar observations
- Continuum observations (On-the-fly mapping)
- Recommendations for VLBI experiments
- Spectroscopic observations
  - Available observing modes
  - Configuring the XFFTS (spectroscopy backend)
  - Velocity convention
  - About ghosts: Class and the ''FOLD'' command
  - ADC interleaving and the XFFTS
  - vLSR (Doppler) correction issues for large bandwidth observations
- Setting-up the correct signal path for spectroscopy and Pulsar observations
- Editing/Visualizing source catalogs: ''catalogME''
- New online plotter (beta)
- Observation logger
- Data storage and archive
- Remote Observing

Data reduction of Effelsberg observations

- Using the Toolbox to inspect cross-scans
- Reduction of pointed flux density measurements
- Reduction of on-the-fly maps (Continuum)
- Reduction of spectroscopic measurements
- For the reduction of Pulsar measurements, please contact the pulsar group in Bonn
- Further material (papers, tech memos, etc.)

Tips and Tricks

- Optimal reference position for On-Off measurements
- Using the Effelsberg Database
- Reading in FFTS Raw data (binary format) using Python
- Calibrators and their polarization

Logistics

- Hints for observers coming from abroad to Effelsberg

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