



Max-Planck-Institut für Radioastronomie Radio-Observatorium Effelsberg

Information about the Telescope

Location: D-53902 Bad Münstereifel-Effelsberg. Effelsberg lies south of Bad Münstereifel itself south of Euskirchen. Take the road from Bad Münstereifel to Altenahr (Ahrtal). Turn off into Lethert. Follow the white road signs "RADIOTELESKOP".

Parking: It is not permitted to drive down to the telescope. Cars should be left in the designated public parking area, just outside of Lethert/Effelsberg. From there it is a 10 minute walk to the Visitors' Area which provides information stands, a plateau with panoramic view of the telescope site, and a pavilion, where public lectures are held regularly.

Reservation: Advance reservation for the lectures is strongly recommended (++49 (0)2257-301101 from 8:30 to 12:30) and compulsory for english language lectures.

Since its earliest beginnings in 1932, radio astronomy has developed into one of the most important means of investigating the Universe. An impressive confirmation of this statement is given by the fact that all observing astronomers who received a Nobel prize in physics were working in the field of radio astronomy. This happened in 1974, in 1978, and for the last time in 1993. Electromagnetic radiation in the radio wavelength range from 0.35 mm up to about 15 m, which continuously hits the Earth from outer space, can be received using special aerials like the 100m radio telescope.

In this regard the large aperture of the dish of about 7850m² is important for the detection of the extremely weak radio signals, while the large diameter of 100m is the reason for a comparatively high angular resolution, i.e. the smallest distance on the sky at which two different objects can be detected separately. At 1.3cm radio wavelength this resolution is 35 arc seconds, about 2 times better than that of the human eye at optical wavelengths.

The radio telescope rotates on a circular track of 64m diameter which rests on a solid concrete foundation. The total weight of the steel structure is 3200 tons. Within about 12 minutes the telescope can be turned through 360° horizontally, and the dish can be tipped by 90° in less than 6 minutes. Thus, practically the whole Sky above the horizon can be scanned.

The 100m telescope in Effelsberg went into operation already in 1972. Yet, even today it is one of the two largest fully steerable parabolic antennas in the world. It can be used to observe the radio emission from objects in the Sky in the wavelength range from 90cm down to 3.5mm. Observations at short wavelengths can be performed despite the flexing of the steel members of a few centimeters due to gravity. Because of a special support structure the deviation of the dish surface from the ideal parabolic form is at most 0.5mm. The shift in the focus position due to surface flexure accompanying the tilting of the dish is compensated by means of an electronic control mechanism.

The receiver systems for astronomical radio radiation have horn aerials connected to extremely sensitive cooled low-noise amplifiers. These are mounted at the focal point of the main reflector just beneath the prime focus cabin suspended on four support legs. Alternatively, an elliptically curved second reflector can focus the incoming radiation towards the central point of the surface. There, in the secondary focus cabin, it is possible to use many additional receiver systems, some even simultaneously. The equipment used to record, process and store the

signals, as well as the computers which control the telescope drives and the data collection are installed in the control room building up the hill.

The total project costs of about 34 million DM were essentially covered by a foundation (Volkswagen-Stiftung). Additional financing was provided by the state of Northrhine- Westfalia and the Max-Planck-Gesellschaft. The federal ministry for science and technology (Bundesministerium für Bildung, Wissenschaft, Forschung und Technologie) paid for some special parts of the equipment.

Technical Data of the Effelsberg Radio Telescope

Reflector Diameter	100 m
Aperture	7,850 m ²
Number of Surface Elements (Panels)	2,352
Shape Accuracy of Surface	< 0.5 mm
Focal Length in Prime Focus	30 m
Secondary Mirror Diameter (Gregory-Reflektor)	6.5 m
Aperture Stop	
- in Prime Focus	f/0.3
- in Secondary Focus	f/3.85
Angular Resolution (Beam Width)	
- at 21cm wavelength (1.4 GHz)	9.4' (arc minutes)
- at 3cm wavelength (10 GHz)	1.15' (arc minutes)
- at 3.5mm wavelength (86 GHz)	10" (arc seconds)
Azimuth Track Diameter	64 m
Setting Accuracy of Track	± 0.25 mm
Azimuth Range	480°
Maximum Rotation Speed	32°/min.
Power Output of the 16 Azimuth-Drives	10.2 kW each
Radius of Elevation Gear Track	28 m
Elevation Movement	from 7° to 94°
Maximum Tilt Speed	16°/min.
Power Output of the 4 Elevation-Drives	17.5 kW each
Total Weight	3,200 t
Construction Period	1968-1971
Commencement of Operation	August 1st, 1972
Constructed by	Arbeitsgemeinschaft KRUPP/MAN