

§4. Preparation of ECH Transmission System for LHD

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Four sets of the transmission lines of the under ground part via the public trench from just below the heating equipment room to the LHD underground room just below the LHD main hall have been completed. This four lines include linear polarizer and circularizer sets, which are miter bends with sinusoidally corrugated reflecting plates of depth  $\lambda/4$  and  $\lambda/8$ . The miter bend type pneumatic control switch is also included to connect the transmission line to the water dummy load during the gyrotron conditioning. The supporting structure of the waveguide is designed to align the whole system within the accuracy of 0.1 mm. A cat walk for adjustment, maintenance and upgrading is built along the part of the transmission line below the LHD main hall, since the transmission system of this part runs about five meters above the floor level of ground floor. This cat walk is designed to be mechanically isolated from the waveguide system. The transmission lines including the future upgrading are shown in Fig. 1. The part of the waveguide system completed is indicated with thick lines.

Structural design and optimization of the antenna system for LHD has proceeded. The configuration and supporting structure of the antenna system which is to be installed on the LHD upper ports 5.5U and 9.5U for the initial plasma operation are shown in Fig. 2. Each identical system includes two sets of mirror arrays. The microwave power, transmitted by the corrugated waveguide system as a symmetric beam, is radiated to the first concave mirror and expanded as an elliptical beam on to the final focusing mirror. The second mirror is simple plane mirror to direct the beam to the final focusing mirror. After strongly focused in the toroidal direction with the final focusing mirror, the beam is directed to

desired angle by the final steering mirror. This final mirror is a plane mirror in order to avoid the astigmatism due to the injection angle variation. The designed injection beam is an elliptical Gaussian beam which has the waist size 15 mm in radial and 50 mm in toroidal direction on the mid plane of the LHD. The steering angle will be controlled by the super-sonic motor, which operates in high magnetic field in the vacuum system. The super-sonic motor has been checked and confirmed to work well under the vacuum and high magnetic field circumstances. The injection angle is designed to be steered 15 and 5 degrees in radial and toroidal direction, respectively.

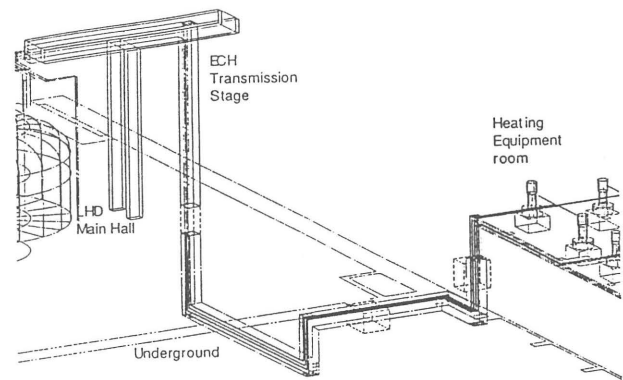


Fig. 1. The waveguide transmission system from heating equipment room to the LHD hall including future plan. The lines completed are shown as thick lines.

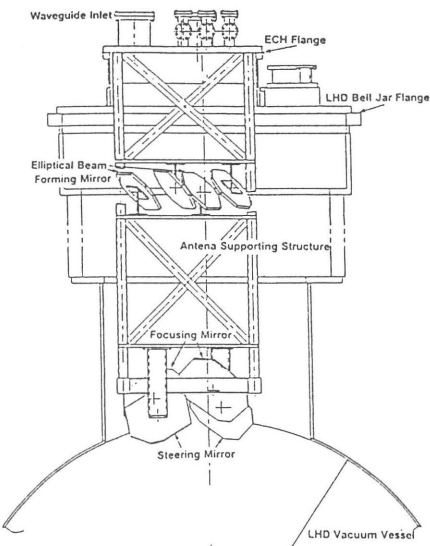


Fig. 2. The U-port ECH antenna mirror configuration and supporting structures. Two elliptical microwave beams are injected from this system.