§4. Design and Construction of the Vibration Isolation Stand for the FIR Laser Interferometer

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A multi-channel FIR laser interferometer system is under construction for the measurement of the spatial and temporal behaviors of the electron density on the LHD. A twin optically-pumped 118.8-μm CH₃OH laser[1] has been developed for the probing the plasma.

This fiscal year we have designed and constructed the vibration isolation stand for the installation of the interferometer system[2]. This stand was designed under the following considerations:

1) All components of the stand should be nonmagnetic in order to be free from the effect of the stray magnetic field.
2) To reduce the level of mechanical vibrations as low as possible the stand is floated on three pneumatic vibration isolation mounts having low resonance frequency.
3) The floating level of the stand is always kept to be constant to ensure the location of the laser input waveguide into the optical housing of the interferometer.
4) The main parts of the stand are to be connected to each other inserting insulating material to avoid closed conducting circuits.
5) To ensure the mechanical stability of the stand, the center of the gravity should be located near the supporting point.

Figure 1 shows the schematic drawing of the vibration isolation stand, which is 18.4 meters tall and weights about 30 tons. The diameter of the main supports is 712 mm. The upper shelf of the stand supports thirteen stainless steel corner cube reflectors which are located immediately above the vacuum windows, while the interferometer housing is supported by the lower shelf which is located below the floor of the Large Helical Device. The optical housing is air tight and filled with dry air, in order to reduce absorption of the CH₃OH laser radiation by atmospheric water vapor. The air tight duct having bellows sections is used to connect the optical housing with the vacuum windows.

References

Fig.1 Schematic of the vibration isolation stand for the FIR laser interferometer.