



Wind Tunnel Cartesian Probe Traverse Systems

Description

Design of a large Cartesian probe traversing system for an automotive, acoustic wind tunnel. The system positions aerodynamic and acoustic probes (up to 25 kg) to an accuracy of +/- 1.5 mm in a working section of 5 x 12 x 13 m.

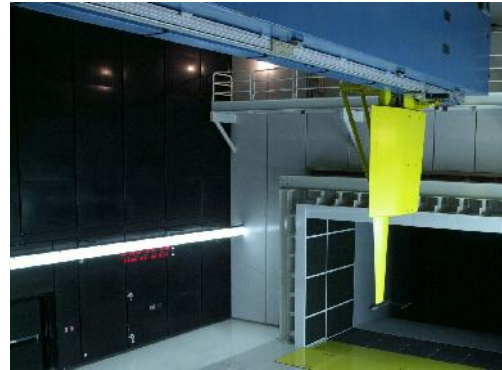
This required the design of a high stiffness steel structure, with a CFRP aerodynamically profiled 'Z' strut and fairing to carry the probe. Optimised design of the structure was achieved using finite element models to obtain a critical first mode frequency greater than 12 Hz.

The motion control system used a PC workstation and high stiffness, electro-mechanical actuators with incremental and absolute encoder feedback, to avoid 'skew' of the independent axial traverse.

Brakes were used to lock some of the axes in position during test, to ensure the 12 Hz requirement was met. Maximum traversing speed was 600 mm/s and the entire 20t assembly is hung from the tunnel roof.

Disciplines Used

- Conceptual, Mechanical & Electro-Mechanical Design
- Fluid Mechanics Analysis
- Composites Design & Analysis
- Stress & Vibration Analysis
- Project Management



Roof Mounted Probe Traverse



Inverted Traverse During Assembly

Specification Summary

- 150 mph wind speed
- High modulus carbon composite aerodynamic strut
- +/- 1.5 mm positional accuracy
- Integral pressure transducer
- Real-time laser wind deflection measurement system
- Multi-probe attachment system with integral cabling
- PC based motion control