Project II: Experimental Modal Analysis
Hands-on Lab Exercise II (Due on Final)

Learning Objectives

1) Conduct a sweep sine test to measure accelerations and input forces using a Web-based e-Learning system
2) Determine mode shapes and natural frequencies using the Peak-picking method
3) Build a finite element (FE) model and compare its modal properties from the FE model with experimental results

Test Structure (Fixed-Fixed End Beam)

The test structure is a fixed-fixed end beam made of carbon steel. The test set up is photographed in Figure 2. The beam has geometrical shape and dimensions as shown in Figure 2.

Figure 1 Test Setup for Laboratory Experimental Modal Testing

Test Equipment and Tools
1) Eight triaxial accelerometers (3093B1 Dytran)
2) Force Sensor (208C02 PCB)
3) Electrodynamic Shaker (LDS V408)
4) Data Acquisition System (NI PXI-4472B)
5) Power Supply
6) Amplifier
7) Function Generator
8) Web-based e-Learning System

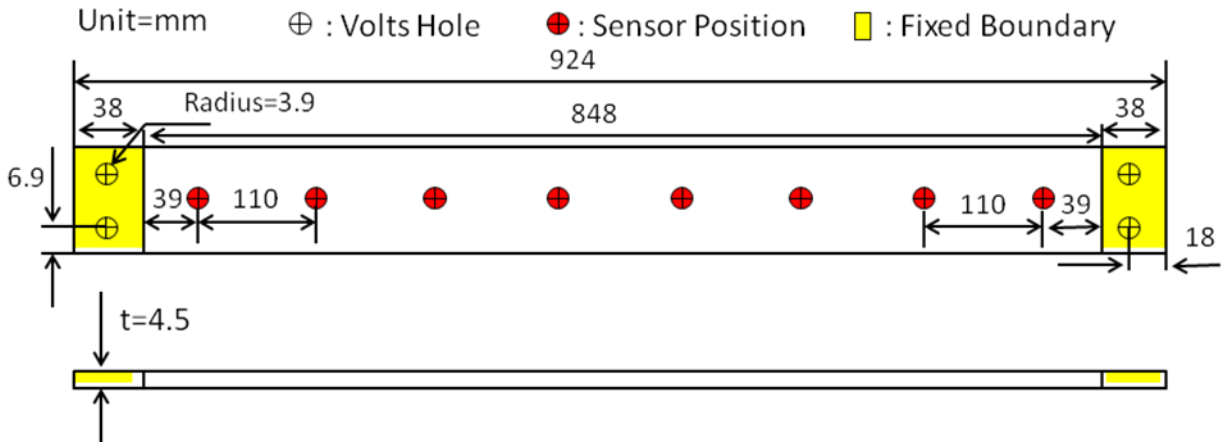

Figure 2 Dimensions of the tested beam and locations of sensors

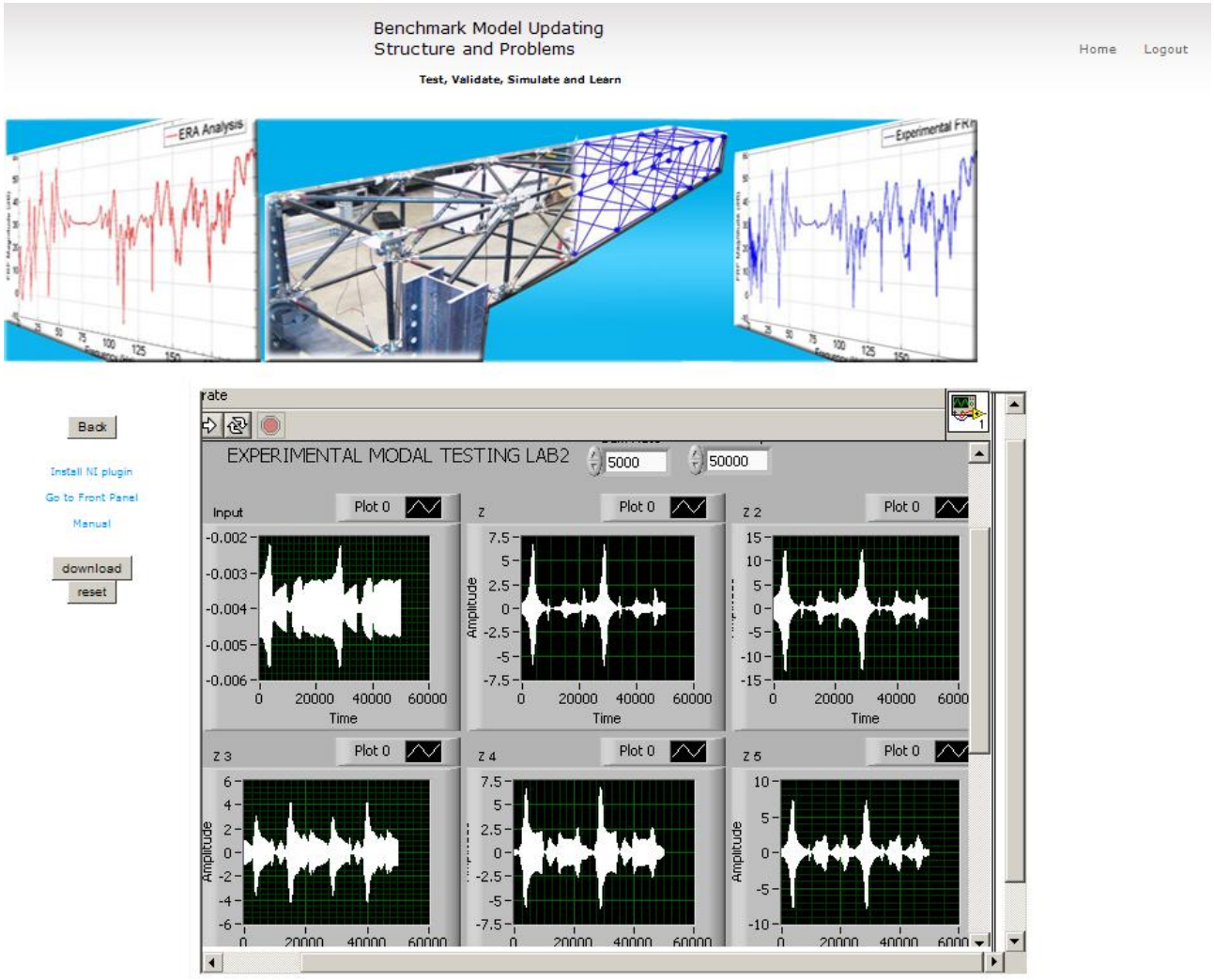

Figure 3 Web-based e-Learning System
(http://isehm1.mech.uakron.edu:8084/Benchmark)

Problem Statements

1) Go to the http://isehm1.mech.uakron.edu:8084/Benchmark and create your account
2) Go to 'UAkron collaboratory' menu in the web site and connect to the lab.
3) Measure the acceleration and input force signals and download data.
4) Using the provided MATLAB code (xfunc), compute complex frequency response functions and phase angles.
5) Determine the natural frequencies, and mode shapes using the Peak-picking method.
6) Build a finite element model (beam element) using MATLAB codes provided in the class (used in HW5).
7) Determine modal properties (natural frequencies and mode shapes) from the FE model and compare with experimental modal analysis results.
8) Write a report which contains all the measured data and frequency responses, phase angles, natural frequencies and mode shapes, comparisons with results from the finite element model.
9) Submit your matlab codes used in computation of complex FRF