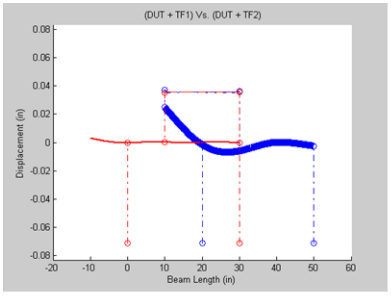
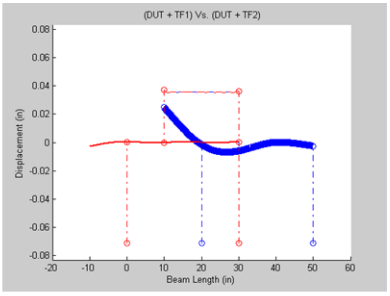
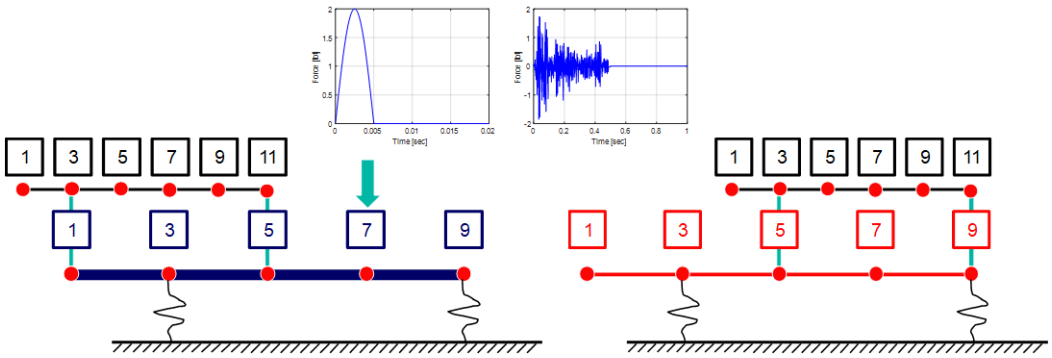
PHD DISSERTATION – JESUS REYES BLANCO

Adjustment of Input Excitation to Account for Fixture-Test Article Dynamic Coupling Effects





$$B_{ce}^{(2)} = \left(D_{cc} + L_{cc}^{(2)}\right)\left(D_{cc} + L_{cc}^{(1)}\right)^{-1} B_{ce}^{(1)}$$



Shaker system physical characteristics (e.g. shake tables, shock machines, shock fixtures) vary from one laboratory to another. Parameters such as size and payload capacity, make every system's dynamic characteristics unique. The commonly used control accelerometer cannot adequately adjust for the actual dynamic interaction/dynamic coupling effects between the test article and excitation fixture. Therefore, the payload/test article deformation will vary from test fixture to test fixture, making every test different. In order to properly address the dynamic coupling and dynamic interaction and to subject the test article to a vibration level that provides the proper excitation, customization of the input excitation is necessary.

This work identifies how the article under test is affected by the attachment to the excitation fixture. Models are presented to show how the test article response is distorted by the dynamic interaction with the test fixture. Using impedance modeling and frequency based substructuring, the input excitation can be modified to reflect the dynamic interaction and then used to provide an input excitation to cause the desired test article response considering the test fixture differences. The models developed show the compensation for the dynamic coupling effects between the test article and the shaker/fixture system.

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