

Title	Modal test of structure 1618-15 'International Bridge'
Stakeholder	Rutgers University Centre for Advanced Infrastructure and Transportation
Location	Wayne, New Jersey, USA
Background	In April 2008 the FHWA's Office of Infrastructure Research and Development launched the Long Term Bridge Performance (LTBP) Program, a 20 year project with the objective of collecting scientific quality data from the Nation's bridges. The information collected will provide a detailed and timely picture of bridge health, improve knowledge of performance and promote safety, reliability and longevity of bridges in the USA. Pilot bridges have been selected for study in several states, and in addition a reference structure in New Jersey was chosen as an 'International Bridge' for comparative study of evaluation techniques by engineers from groups outside USA, including University of Tokyo (Prof. Fujino) and VCE consultants (Dr Wenzel, representing the EU FP7 IRIS project). Sheffield researchers were invited to carry out a forced vibration modal test of the bridge, with the support of Drexel University.
Response	Three FSDL engineers travelled to New Jersey and shipped equipment for a modal test during 21-23 July 2010. The objective was to use a 450N electro-dynamic shaker and 19 high quality accelerometers to generate and capture force/response time histories during uninterrupted operation of the bridge. A suite of modal analysis procedures were to be applied to extract modal parameters including modal mass, frequency, damping and shape.
Outcomes	A dense test grid of sensor locations and sophisticated modal analysis techniques such as OMAX, ERA and GRFP allowed the team to recover a full set of vibration modes on site and before return to the UK. Data from periods of both heavy and sparse traffic allowed us to identify mode shapes and frequencies reliably, while using OMAX procedure and data from periods of sparse traffic allowed for reliable estimation of modal mass.
References	Brownjohn JMW, Middleton CJ, Koo K-Y, Modal testing of 'Internal Bridge' at Wayne, New Jersey for Federal Highway Administration Investigation Long Term Bridge Performance Program. VES/2010/01, 25 July 2010.



Figure 1: Shaker and accelerometers on bridge during forced vibration test.



Figure 2: Bridge support, main girders and means of access.



Figure 3: Dr Chris Middleton running data acquisition system.