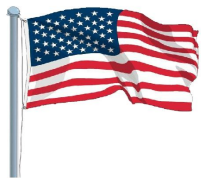




## Recent Advances in Geotechnical Earthquake Engineering and Soil Dynamics

May 2010



**Come and visit us at stand number 1.**

HCA and DCSS are available as dynamic systems.

**GDS Instruments**  
Unit 32 Murrell Green  
Business Park  
London Road  
Hook  
Hampshire  
RG27 9GR

☎: +44 (0)1256 382450  
☎: +44 (0)1256 382451

info@gdsinstruments.com  
[www.gdsinstruments.com](http://www.gdsinstruments.com)

**GDS Instruments**, a division of Global Digital Systems Ltd, is a world leader in the manufacture of laboratory and field testing equipment for use by geotechnical engineers and geologists. We are specialists in dynamic and static software based triaxial and stress path testing systems for soils and soft rocks, consolidation testing systems, and in-situ testing systems for the evaluation of shear modulus v. depth profiles.

Founded over 30 years ago, GDS has worked with some of the leading institutes around the world, supplying over 75 dynamic triaxial testing systems. GDS supply Dynamic Cyclic Triaxial Testing Systems using either electro-mechanical or hydraulic actuation to suit your application in terms of load and frequency. Our comprehensive service and support team consists of geotechnical, software and hardware engineers who often work closely with our customers to create bespoke testing solutions.

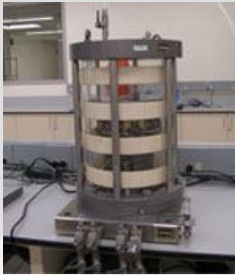
Below is a product comparison of our dynamic devices. If you would like some more information on any of our products either come along to stand number 1 and meet Jerry Sutton, our Commercial Director and one of our equipment designers, who will be available for the duration of the conference. Alternatively contact us directly by phone or e-mail.

	ELDyn	MiniDyn	MaxiDyn	Hydraulic Load Frame	Resonant Column
<b>Available Load Ranges</b>	5 or 10kN	10, 16, 20, 40 or 60kN	20kN	20, 40, 60, 100, 250kN, custom	10, 12, 15kN
<b>Frequency Range</b>	Static to 5Hz	Static, 2 or 5Hz	Static to 10Hz	Axial 10 or 20Hz Radial 10 or 20Hz	0.5, 1, 2, 5Hz
<b>Balanced Ram</b>	-	Included	Not Required	-	-
<b>Dynamic Cell Pressure</b>	-	Optional	Included	Optional	-
<b>Data Acquisition Channels</b>	4 / 8 Channel	8 Channel	8 or 16 Channel	8 or 16 Channel	8 or 16 Channel
<b>Data Acquisition Resolution</b>	16 bit	16 bit	16 bit	16 bit	16 bit
<b>Communications</b>	USB	USB	USB	USB	USB
<b>Form Factor</b>	Frame Style Desktop	Free Standing	Free Standing	Free Standing	Free Standing

All systems can be upgraded to include local strain measurement, bender elements and unsaturated testing. GDS's product range also includes static triaxial, unsaturated testing, hollow cylinder, resonant column, consolidation, simple shear, direct shear, transducers, software and field geophysics.



## GDS RCA



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**GDS Instruments**  
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## Case Study Colorado School of Mines: Resonant Column



**User: Dr. Judith Wang, Division of Engineering, Colorado School of Mines**

Dr. Wang's research team is interested in modelling the dynamic behaviour of soil-structure infrastructure systems where the contributions of both the manmade and natural earth construction materials must be considered. To do this, it is necessary to develop, calibrate, and validate numerical modelling procedures for incorporating the unique inertial, elastic, and dissipative properties of all of the component materials. Of these dynamic mechanical properties, the dissipative properties of soils are perhaps the most difficult to quantify and numerically represent; there is no generally accepted consensus for modelling multiple intrinsic damping properties in one infrastructure system, nor have proposed techniques been the focus of rigorous experimental validation.

The research team are using GDS Instruments Resonant Column device to obtain mesoscopic, element level measurements of the intrinsic damping characteristics of multiple standardized sands. This data is being generated in the form of viscous damping ratio,  $\xi$ , versus shear strain,  $\gamma$ , curves at varying effective stress levels. The aim is to

determine these damping ratio curves for three different types of standardised sands.

These three sands with a range of damping properties will then be used to construct simple stratified foundation models subjected to ground motions in a geotechnical centrifuge; the experimentally observed accelerations from these centrifuge experiments will be compared to a numerical model developed using the intrinsic damping curves from the GDS resonant column device. The numerical model will be calibrated and validated by using the resonant column data and the centrifuge data, thus providing an experimentally validated means for multiple intrinsic damping characteristics in soil-structure dynamics.

### Conclusion/Testimonial:

Dr. Wang's research team has been very pleased with the GDS Resonant Column thus far and the ongoing, enthusiastic level of support and service as provided by the GDS team. The column has performed very well for its original research purposes and is now in its new home in the newly constructed Geotechnical Research Engineering Laboratory in the Colorado School of Mines. The column helps enable a wealth of potential research opportunities, and it will be an integral part of the growth and development of Dr. Wang's research program.

### Tim Newson Ph.D. Research Director, Geotechnical Research Centre, The University of Western Ontario

GDS Systems: Stress Path Triaxial, Hollow Cylinder and Resonant Column

*"I have been dealing with GDS Instruments for more than 10 years. During my dealings with the company they have been highly professional, providing excellent service and products. We have compared the products and service from a number of other vendors as part of our purchasing procedures using a range of metrics and GDS consistently out perform their competitors. Their maintenance procedures and after sales service are also excellent. I have no hesitation in recommending GDS Instruments for soil testing instrumentation and apparatus"*