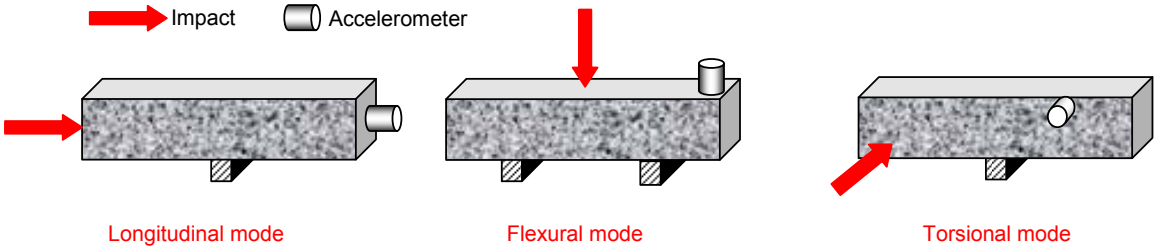
**Purpose**

The **DK-5000** determines the resonant frequency of prismatic or cylindrical specimens in accordance with the impact resonance method described in ASTM C215, "Test Method for Fundamental Transverse, Longitudinal, and Torsional Resonant Frequencies of Concrete Specimens." The impact resonance method is a simple test that determines the resonant frequency very quickly. Resonant frequency testing can be used for the following applications:

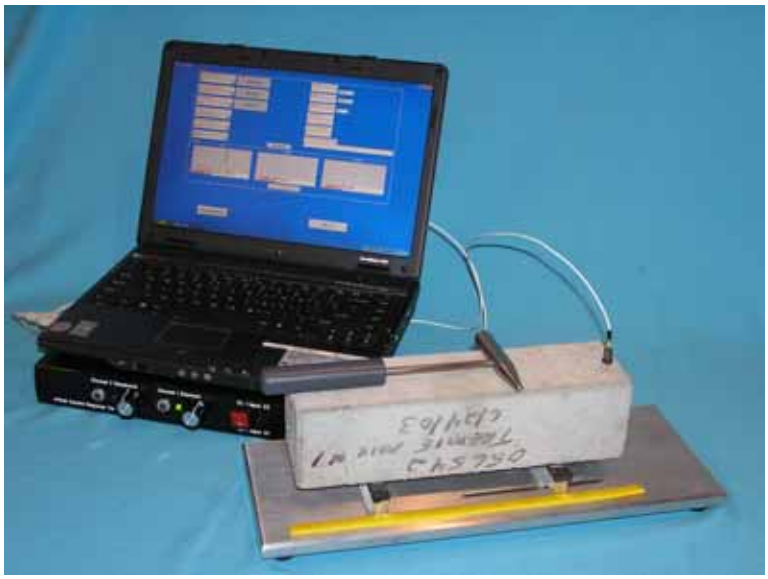
- Determining the dynamic elastic properties (modulus of elasticity, Poisson's ratio, and shear modulus of elasticity)
- Monitoring damage as a result of exposure to accelerated weathering, such as cycles of freezing and thawing in accordance with ASTM C666/C666M
- Quality control of manufactured products

**Principle**

If a test specimen is subjected to mechanical impact, such as being struck by a hammer, it will vibrate at it natural or resonant frequency. The **DK-5000** uses a small hammer to impact the test specimen and a small accelerometer to monitor the vibration of the specimen. By using the correct specimen support condition, the proper position of the impact point, and the correct location of the accelerometer, the resonant frequencies for different modes of vibration can be determined. The illustration below shows the locations of the specimen support(s), the impact point, and accelerometer position to measure the longitudinal, flexural, and torsional resonant frequencies. In the impact resonance method, the resonant frequency is determined by transforming the time history of the accelerometer signal into the frequency domain. The resultant amplitude spectrum will contain one or more peaks that correspond to the excited frequencies.

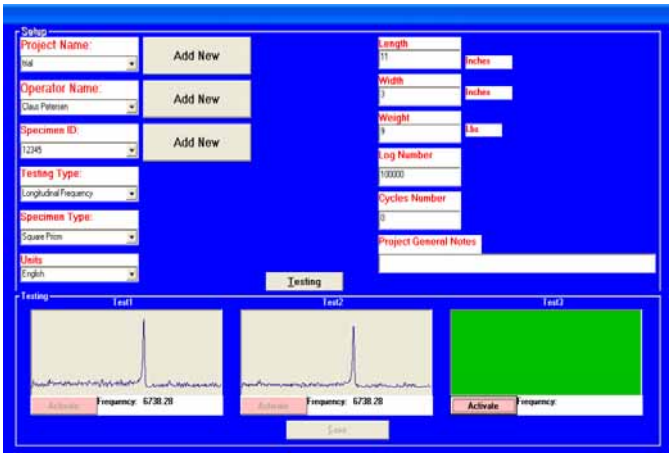



The **DK-5000** consists of a laptop computer, a data acquisition and signal conditioning system, the **DK Tester** software, a hammer, and an accelerometer. In addition, a test bench is provided for supporting the test specimen. The **DK Tester** software is used to set up the testing parameters, to input specimen size and mass, and display test results. In accordance with ASTM C215, the test is repeated three times on the same specimen. The software displays each test result, and calculates the average resonant frequency.



From the specimen mass, specimen geometry, and measured frequencies, equations given in ASTM C215 are used to compute the dynamic elastic properties.

## DK Tester Software



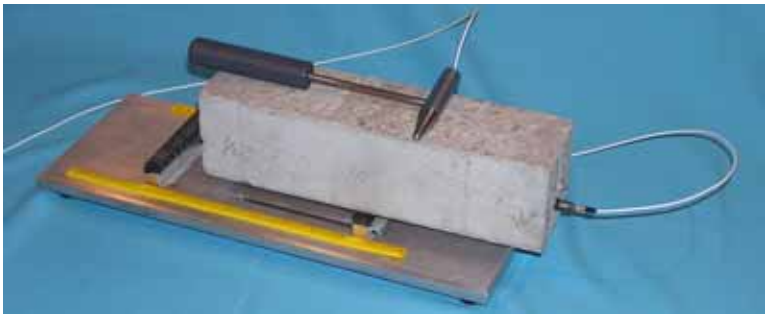

The **DK Tester** software displays each replicate test result. The graphs are the amplitude spectra obtained by transforming the recorded accelerometer signals into the frequency domain. The horizontal axis is frequency and the vertical axis is amplitude. The dominant peak represents the resonant frequency. In this example, the resonant frequencies from two replicate tests on the same specimen are both 6738 Hz, which indicates the highly repeatable nature of the impact resonance method. The green window indicates that the instrument is "active" and ready for the third replicate test. The software allows the user to compute the dynamic modulus of elasticity (from transverse or longitudinal modes), the dynamic shear modulus of elasticity (from the torsional mode), and the dynamic Poisson's ratio in accordance with ASTM C215.

### Resolution

The frequency resolution depends on the sampling frequency and the number of data points in the accelerometer signal. For example, for 1024 points at a sampling frequency of 20 kHz, the frequency resolution is 20 Hz.

## DK-5000 Ordering Numbers

| Item | Order # |
|---|---|
| Laptop PC with data acquisition card and **DK Tester** software | DK5000-1 |
| Accelerometer and cable | DK5000-2 |
| Impactor | DK5000-3 |
| Test bench | DK5000-4 |
| Manual | DK5000-5 |



*Specimen supported on test bench for measurement of longitudinal resonant frequency. Specimen is struck at end opposite to transducer position.*