



# Tech Note 3

14 May 2009

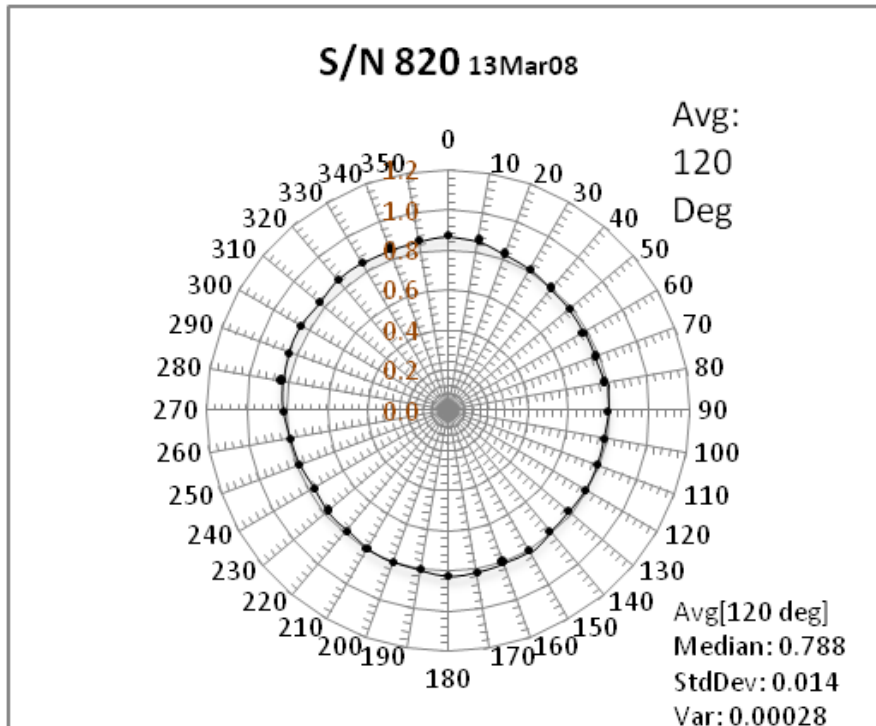
## Sensor radial response symmetry calibration apparatus

The symmetry test fixture rotates the sensor through 360 degrees driven by a stepper motor, currently in 10 degree increments. A plated cylindrical crystal rotated 90 degrees rests on the sensor's crystal as the source of mechanical impact energy with a small force. The impacting crystal is driven by a step up transformer. The transformer steps up 12V pulses to 2KV. This causes the impacting crystal to expand essentially hitting the sensor's crystal. Pulses to the transformer are about 10uS wide and supplied at a rate of 30Hz.

As the impacting crystal hits the sensor's crystal, the sensor's Pulse Height Analyzer (PHA) output is digitized by a digital oscilloscope. This pulse height (voltage) represents the impacting energy transferred to the sensor's crystal.



Symmetry test apparatus.



This calibration graph depicts an exceptionally good response.

Most crystals are more skewed. This crystal anomaly is not predictable so a corrections factor table is supplied with each sensor.

Notice that the data used to produce this graph has been averaged over 120 degrees. This is done to emulate natural averaging over the large

angular surface exposed to saltation at all times. This averaging serves to smooth the response profile substantially. Individual point data has approximately 10 times the variance.

## IMPORTANT

The radial symmetry response pattern supplied with your Sensit™ saltation sensor applies only to the kinetic energy output. The radial symmetry response does not apply to the particle impacts output.

## EXPLANATION

When the sensors crystal is made there are unavoidable variations in the bulk density of the clay that cause response values to change.

Causes for crystal response variations

- Physical density changes in the clay base.
- Electric field density changes in the clay base.
- Heat damage at connection points.

Once a particle impact exceeds the sensor's trigger threshold, the particle count (PC) "impact" output is generated. Circuit trigger threshold for the PC output is so close to zero that only extremely small impact energy data is subject to effects of crystal variations. This is especially true considering the energy range of saltating particles. The following real analysis demonstrates this effect.