Tech Note 3

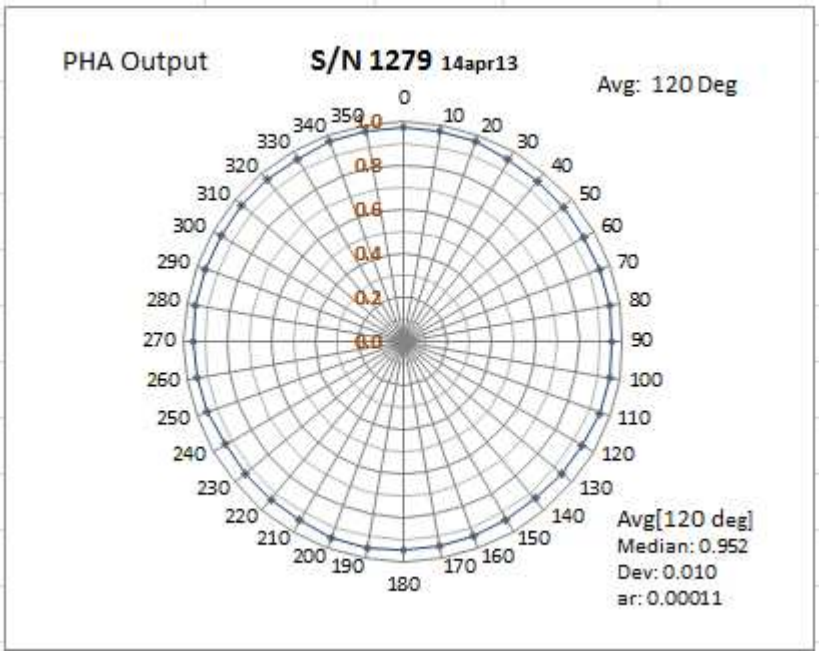
22 April 2013

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 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 a typical response normally obtained.

Some response patterns can be slightly irregular but recent improvements in assembly techniques have dramatically improved response patterns.

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.

Raw data has approximately 10 times the variance. There are several factors contributing to response irregularity. This is primarily due to micro-defects in the stainless steel surface.

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.

Causes for crystal response variations

- Physical density changes in the clay base.
- Electric field density changes in the clay base.
- Micro-defects in the stainless steel surface.
- 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. Low energy particles very close to circuit threshold cause the radial symmetry data to be noisy and very sensitive to imperfection in the surface. Low impact energies are used because the Pulse Height Analyzer output saturates at fairly low energy and this pulse height value is read off the digital oscilloscope screen.

Efforts to improve this symmetry response pattern have recently achieved excellent response patterns are ongoing and will continue. The vast majority of radial symmetry patterns are good enough to avoid the use of any radial correction to the Sensit KE data. Remember; PC does not require any radial cal.