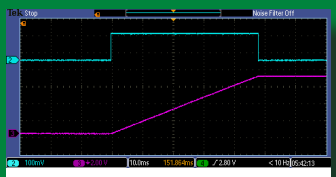
EAGLE HARBOR TECHNOLOGIES

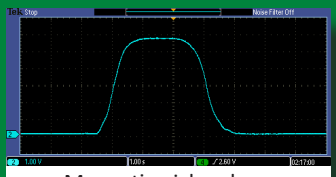
EHT Integrator Short Pulse (ISP16)

Eagle Harbor Technologies, Inc. has developed an ultra-stable, high-gain analog integrator for short-pulse applications (ISP16) for magnetic diagnostics used throughout the fusion science community. Due to their extremely high gain and high frequency of operation, these integrators have an unprecedented dynamic range. The ISP16 has been tested extensively for ground loop, high frequency, and common-mode noise rejection.

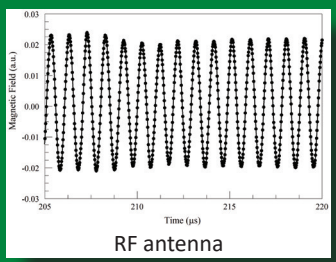


5 ms ramp

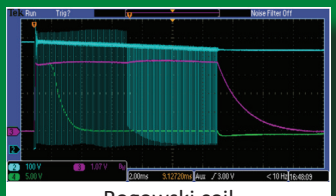
10 µs ramp



Magnetic pickup loop



RF antenna



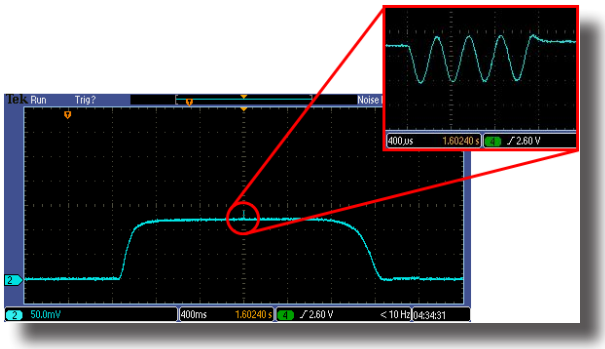
Rogowski coil

Key Features

- RC time constant: 1 µs to 100 ms (factory set)
- Integrator drift: 2 mV/s for 10 s for 0.1 ms RC
  0.3 mV/s for 10 s for 1 ms RC
  0.1 mV/s for 10 s for 10 ms RC
- Integrator droop: 0.1% / second (can be corrected in post processing)
- Bandwidth: 5 MHz bandwidth
- 16 differential independent channels in 1U rackmount box

Waveform Demonstration

The figure (right) demonstrates both low and higher frequency performance of the integrator. The 6 s long signal was generated with a magnetic pickup loop and the high frequency signal shown in the blow-up view injected through a transformer-coupled function generator. The integrator fully resolves both signals simultaneously.



Applications

The ISP16 has been tested with signals straight from a pulser to demonstrate signal fidelity (top and 2nd left). The ISP16 can be used in conjunction with a magnetic pickup coil in slow (3rd left) and radio frequency (4th left) magnetic fields. A Rogowski coil was used with the ISP16 for monitoring the load current from a 2.5 kA pulse width modulated source (bottom right). In the last case, the green trace shows a saturated current transformer. The pink trace is the integrator ouput. The shape changes as the pulse width changes. The ISP16 has also been used on a spheromak experiment (HIT) and will be tested on a tokamak (DIII-D) in late Fall 2014.

EHT Integrator Product Line

The Integrator Long Pulse (ILP8) re-zeros the integrator before it drifts, making it suitable for long-pulse applications like ITER (> 3600 s). Used in short-pulse applications, the ILP8 allows the digitizer to fill during each re-zero period thereby increasing the effective bit-depth of the digitizer.

Contact

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