

Multimode digital integrators with rigid triggering

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Rigid synchronization: what for?





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Wide range of magnetic measurements requires integration providing quite hard synchronization with measuring process



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Low pass filter with unity transfer function at zero frequency do not change voltage integral value

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• Rigid triggering is determined by the fast switch and a few nanosecond synchronization errors could be achieved.



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- Wide bandwidth is required only for input PGA.



BINP, Russia



- Rigid triggering is determined by the fast switch and a few nanosecond synchronization errors could be achieved.
- Wide bandwidth is required only for input PGA.
- The rest part of the device works with narrowband signal and can be made low noise and high precision.

Interleaving Time Operation Mode



to reach continuous integration with rigid triggering



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VsDC2 and VsDC3 Digital Integrators





VsDC – Volt-second to Digital Converter

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VsDCs main parameters



Offset error $\pm 1 \,\mu V$ Gain error ±5 ppm **Nonlinearity** ±20 ppm **Integration interval uncertainty** ±2 ns Noise of integral vs Time: VsDC3 Noise of Integral 10⁻⁴ Relative Noise of Integral 10⁻⁵) 10⁻⁶) 10⁻⁷ 10⁻⁸ 1 10us 100us 10ms 0.1s 1ms 1s 1us Integration Time

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VsDCs parameters





VsDC2 and VsDC3 Features		
	VsDC3	VsDC2
	(VME version)	(CAN version)
# channels	2	2
Input ranges	±0.2V; ±2V program	$\pm 0.2V; \pm 0.5V; \pm 1V;$
	selectable	$\pm 2V; \pm 5V; \pm 10V$
Built in ADC	312.5kSPS	
Sample Rate		
Built in ADC	24bit	
Resolution		
From factor	6U 4HP Eurocard	3U 4HP Eurocard



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Rotating coils system structure

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Main features:

Compensation is used

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Main features:

- Compensation is used
- Non-stop rotation and data processing on the fly: 20ms/point
- All lens parameters at 6 second

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Details at:

Proceedings of RUPAC2012, Saintl-IPetersburg, Russia

WEPPC022

STAND FOR PRECISE MEASUREMENTS OF MAGNETIC LENSES FIELD QUALITY*

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Noise performance of integrators is the key specification!

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NSLS-II 3GeV Booster Injection/Extraction Pulsed Magnets Measurement System





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NSLS-II 3GeV Booster Injection/Extraction Pulsed Magnets Measurement System





Measuring electronics at NSLS-II Booster service area

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NSLS-II 3GeV Booster Injection/Extraction Pulsed Magnets Measurement System





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Resume:

The report describes two models of digital integrators, intended for magnetic measurements with the relative accuracy close to 10⁻⁵. One of the main features of these devices is rigid synchronization with external timing pulses, allowing determining the moment of integral measurements with nanosecond accuracy. As a result these integrators provide high accuracy both for the pulsed measurements and for the constant magnetic field measurements using movable coils also.