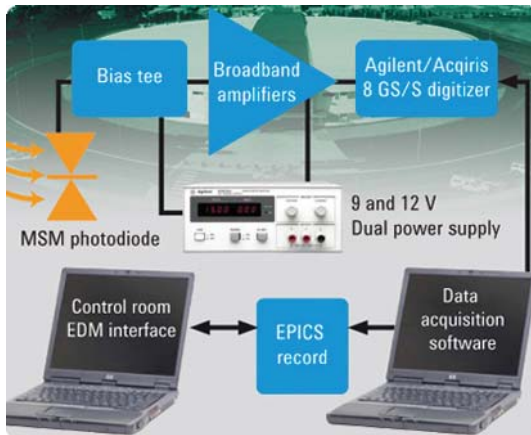




Application Overview

Synchrotron machines are high intensity light sources where the operators have excellent control over the beam properties. By using a Fill-Pattern Monitoring (FPM) system the operators are able to watch important beam characteristics such as the “RF bucket” position and “bunch” current and make adjustments. The Australian Synchrotron has developed an FPM that measures, in real-time, the intensity distribution of the electron bunches in the storage ring. The system uses an ultra-fast photo diode and with a high-speed digitizer achieves real-time measurement of the fill pattern with bunch-by-bunch resolution.

Applications includes: Similar principles apply in most circular accelerators used in High-Energy Physics research. Beam control engineers and scientists are looking for measurement techniques that can improve beam quality and stability.



Beam Control in Synchrotron Light Sources

Using a Digitizer for Real Time Fill Pattern Monitoring in Synchrotron Science

Solution Description

- U1065A, 10-bit, 4 channel, 2 GHz, 2-8 GS/s, cPCI digitizer.

Key Features and Added Value

- 8 GS/s single shot acquisition rate for fast pulse capture from an MSM type photodiode.
- Ultrafast data transfer to a PC for pulse analysis (using DMA transfers over the systems 66 MHz, 64 bit cPCI bus).
- Memory segmentation and unique SAR (simultaneous multi-buffer acquisition and readout) mode for faster data throughput.
- Support for Windows and Linux operating systems.
- Ability to interface directly with accelerator labs running, under an EPIC’s controlled environment.
- 10-bit resolution for better dynamic range and sensitivity.

Key Requirements

- The U1065A combines the unique characteristics of 8 GS/s sampling rate, 10-bit resolution and ultrafast data readout.
- This is a critical combination in the process of performing the real-time capture and analysis of the fast pulses that are being received from the photodiode.
- Control under Linux and the ability to interface with EPIC’s are also vital in most accelerator physics experiments.

Resources

- U1065A, 10-bit, cPCI digitizer brochure: <http://cp.literature.agilent.com/litweb/pdf/5989-7443EN.pdf>
- Article “Physics Measurement of the Real Time Fill-Pattern at the Australian Synchrotron”: <http://cp.literature.agilent.com/litweb/pdf/5989-7558EN.pdf>
- Summary of synchrotron science: http://www.synchrotron.vic.gov.au/content.asp?Document_ID=10
- Data Converter product selection guide: <http://cp.literature.agilent.com/litweb/pdf/5989-8038EN.pdf>
- Digitizers website: www.agilent.com/find/embedded-digitizers

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