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Alpha Control - A new Concept in SPM Control

P. SPIZIG, D. SANCHEN, G. VOLSWINKLER, W. IBACH, J. KOENEN, WITec GmbH, www.WITec.de — Controlling modern Scanning Probe Microscopes demands highly sophisticated electronics. While flexibility and powerful computing power is of great importance in facilitating the variety of measurement modes, extremely low noise is also a necessity. Accordingly, modern SPM Controller designs are based on digital electronics to overcome the drawbacks of analog designs. While todays SPM controllers are based on DSPs or Microprocessors and often still incorporate analog parts, we are now introducing a completely new approach: Using a Field Programmable Gate Array (FPGA) to implement the digital control tasks allows unrivalled data processing speed by computing all tasks in parallel within a single chip. Time consuming task switching between data acquisition, digital filtering, scanning and the computing of feedback signals can be completely avoided. Together with a star topology to avoid any bus limitations in accessing the variety of ADCs and DACs, this design guarantees for the first time an entirely deterministic timing capability in the nanosecond regime for all tasks. This becomes especially useful for any external experiments which must be synchronized with the scan or for high speed scans that require not only closed loop control of the scanner, but also dynamic correction of the scan movement. Delicate samples additionally benefit from extremely high sample rates, allowing highly resolved signals and low noise levels.

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