

**DF 17: Invited Talk - Heidemarie Schmidt (Joint Session with MA, HL, DS, KR)**

Time: Wednesday 15:00–15:45

Location: GER 37

**Invited Talk** DF 17.1 Wed 15:00 GER 37  
**Smart multiferroic thin films for cognitive computing** —  
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Cognitive systems promise to penetrate complexity and assist people and organizations in better decision making [1]. We have successfully prepared metal-multiferroic-metal (MMM) structures with the multiferroic material BiFeO<sub>3</sub> and BiFeTiO<sub>3</sub>. All those MMM structures exhibit nonvolatile resistive (memristive) switching. Investigations of memristive switching is driven by promising applications of power-efficient memristive nanostructures including data storage, logic systems, cog-

nitive computing and artificial neural networks. Prominence of work on memristive systems might be visualized by the near-future breakthrough in computing technology, where classical Von Neumann architecture is replaced by cognitive systems. In this talk I present three new functionalities of smart MMM structures including nonvolatile multilevel resistive switching [2], nonvolatile reconfigurable logics and nonvolatile second and higher harmonics generation [3] which are very promising for the development of cognitive computing. [1] J. E. Kelly III, S. Hamm, *Smart Machines: IBM's Watson and the Era of Cognitive Computing*, Columbia University Press, 2013 [2] Y. Shuai et al., *J. Appl. Phys.* 109 (2011); *Appl. Phys. Lett.* 98 (2011); *Appl. Phys. Exp.* 4 (2011); 111 (2012); *IEEE Electron Device Letters* 34 (2013); *Scientific Reports* 3 (2013) [3] N. Du et al., *Rev. Sci. Instr.* 84 (2013)