High-pressure Muon Spin Rotation studies of magnetic semiconductors: EuS

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From the early 1960s, europium monochalcogenides EuX (X = O, S, Se, Te) have been a model system to study different phenomena, starting from the basic problem of magnetic interactions in Heisenberg ferromagnets and antiferromagnets up to charge order and giant magnetoresistance. Further studies permit a better understanding of more complex systems like the Diluted Magnetic Semiconductors (DMS) which are considered to be a promising material spintronics applications[1].

We report first μSR experiments in EuS under high hydrostatic pressure. The shift of the internal magnetic field seen by the muon $d\ln(B_\mu)/dp$ ~1.2 %/kbar is bigger then the shift of the negative hyperfine field $d\ln(B_{Eu})/dp$ ~0.06 %/kbar studied in EuS using the ^{151}Eu Mössbauer effect [2]. This finding requires further theoretical study.

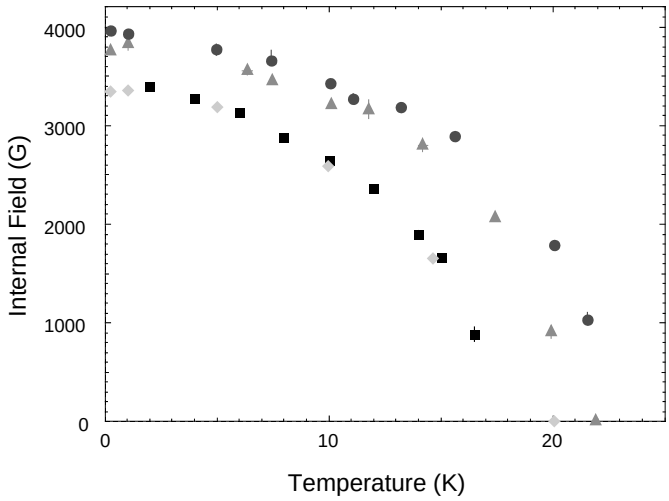

Fig. 1: Temperature dependence of the internal magnetic field seen by the muon in EuS measured at ambient pressure (diamonds and squares), 11.2 kbar (triangles) and 15 kbar (circles).

[1] H. Ohno, Science 281 (1998) 951.
[2] Ch. Sauer, A.M. Zaker and W. Zinn, J. Magn. Magn. Mat. 38 (1988) 225.