ESRF	**Experiment title:Structural Phase Transitions and Magnetic Ordering in $ErFe_4Ge_2$**	**Experiment number: CH-512**
Beamline: BM16	**Date of experiment:** from: 26 Aug. 98 7h to: 29 Aug. 98, 15 h	**Date of report:** 24 Febr. 00
Shifts:9	**Local contact(s):**Eric Dooryhee, Andy Fitch	*Received at ESRF:*

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Report:

High-quality powder XRD data of the compound $ErFe_4Ge_2$ collected in the ESRF beam line BM16, are presented for the entire magnetically ordered regime (T_N=44K) [1,2]. The data analysis reveals the occurrence of a double symmetry breaking at the magnetic transition. This experiment has allowed us to distinguish between structural and magnetic satellites, both present in the neutron patterns, and to demonstrate the interdependence of structural and magnetic transitions. The high temperature (HT) phase disproportionates by a first-order transition into two distinct phases:

$P4_2/mnm$ (T_c, T_N =44K) $\rightarrow$ *Cmmm* (majority LT phase) + *Pnnm* (minority IT Phase)

which coexist in proportions varying with temperature down to 4K. The phase diagram comprises three temperature regions: *a)* the HT range with $T>T_N$ for the tetragonal $P4_2/mnm$ phase; *b)* the IT (intermediate temperature) range, $20K<T<T_N$, where the two phases coexist in strongly variable proportions and the *Pnnm* phase reaches its highest concentration (≈31%) around 30K; and *c)* the LT (low temperature) range, 1.5-20K,

where the *Cmmm* phase is dominating (up to 95%). We suggests that this phenomenon is the result of competing magneto-elastic mechanisms involving the Er crystal field anisotropy, the Er-Er, Er-Fe and the Fe-Fe exchange interactions and their coupling with the lattice strains.

[1] P. Schobinger-Papamantellos, J. Rodríguez-Carvajal, K.H.J. Buschow, E. Dooryhee and A.N. Fitch J. Magn. Magn. Mat **210** (2000) 121-137.

[2] ESRF Highlights 1999/2000.

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