conference abstracts

s1.m1.p1 **Invariants of Automorphisms of the d-Dimensional Tori as a Criterion of Commensurability and Incommensurability of Crystal Structures.** J. Warczewski, P. Gusin, *University of Silesia, Institute of Physics, Uniwersytecka 4, 40007 Katowice, Poland.*
Keywords: modulated structure, compaction of the (3+d)-dimensional space, automorphisms of the d-dimensional torus.

De Wolff[1] has described a crystal modulated structure in an appropriate (3+d)-dimensional superspace, where d – dimension of modulation. Such a structure is called a supercrystal. A real 3-dimensional modulated crystal can be dealt with as a result of compaction of d dimensions of (3+d)-dimensional superspace in which a supercrystal is embedded. As every particular atom is represented in superspace by a d-dimensional atomic surface, then after the compaction such an atomic surface becomes a d-dimensional torus. It turns out that invariants (e.g. number of rotations) of the automorphisms of such a torus are connected with the type of crystal modulation, namely for an incommensurately modulated structure the values of corresponding invariants are irrational, whereas for a commensurately modulated structure they are rational[2].

s1.m1.p2 **Magnetic Modulated Structures in Terms of the Language of the Fibre Bundles.** P. Gusin, J. Warczewski, *University of Silesia, Institute of Physics, Uniwersytecka 4, 40007 Katowice, Poland.*
Keywords: magnetic modulated structure, order parameter, fibre bundle.

A magnetic modulated structure can be described with the aid of the order parameter which reveals to be a section of a fibre bundle over $\mathbf{R}^3$. A magnetic structure is created as a result of a phase transition[1]. Such a phase transition can be investigated with the aid of a thermodynamic potential, whose arguments are: the order parameter and its covariant derivative, the latter being a generalization of an ordinary derivative. Because an order parameter makes a section of a bundle one has to introduce an additional structure called a connection[2]. Taking into account the above mentioned ideas we have obtained for the thermodynamic potential in the simplest form a sine-Gordon equation for the order parameter.

[1] Wolff P.M. de. "The Pseudo-Symmetry of Modulated Crystal Structures", Acta Cryst. (1974), A30: 777 – 785.
[2] Gusin P., Warczewski J. "On the Relation of Modulated Structures with the Automorphisms of the d-Dimensional Tori Created by the Compaction of the (3+d)-Dimensional Space", Acta Cryst. (1998), A54: 486 – 490.

[1] Izyumov J.A., Syromyatnikov V.N. "Fazovyye perekhody i simmetria kristallov", Moskva, Nauka 1984
[2] Griffiths P., Harris J. "Principles of Algebraic Geometry", New York 1978