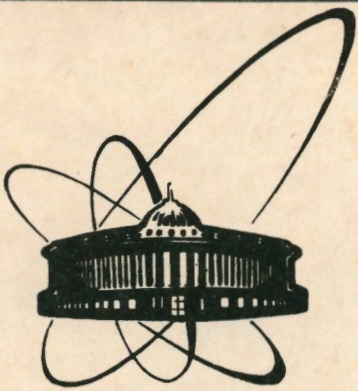

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E17-90-388

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PERMUTATIONAL MAGNETIC POINT GROUPS AND THEIR APPLICATION IN THE LANDAU THEORY OF PHASE TRANSITIONS

Complete List of Tables

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1990

1. Introduction

An adequate description of the symmetry of the investigated crystals is of prime importance[1-4] in the analysis of a number of physical properties of the crystals and especially in the description of their crystallographic magnetic structure, as well as in the study of phase transitions. The generalized groups known as colour groups proved to be quiet useful[3,5-7]. Recently their effectiveness in the analysis of phase transitions has been demonstrated[8-11]. The method of their application is rather close to the approach developed by Gufan and coauthors (see Ref.12) and the references therein).

In view of application of colour groups to the analysis of magnetic phase transitions[8-11] the study and the tabulation of a new type of generalized crystallographic groups - permutational magnetic groups, seems to be expedient. These groups are extension of Shubnikov's magnetic groups by groups of permutations[3]

The present article is a continuation of Ref.13, where the general theory and the classification of permutational magnetic groups were described. Now we discuss the algorithm for derivation of the groups and give some complete tables of their three-terms symbols, together with the label of the respective transitive permutational representation. The very permutational representations, decomposed to irreducible components, are published for the first time in part III of the article[14].

2. Permutational Magnetic Point Groups

The permutational magnetic point groups (PMPG) are colour groups of binary operations

$$G^{(P)} = \left\{ (p;g) \,\middle|\, p = \pi_G^H(g) \in P,\ g \in G,\ \pi_G^{H'}: G \longrightarrow P \leq S_n \right\} \subset P \times G \quad (1)$$

Using symbols of type $X(X_o)$ for the magnetic groups, where $X_o \subset X(X_o)$ is classical nonmagnetic subgroup, the three-terms symbol[3,6,13] of PMPG might be written as,

$$G(G_o)^{(p)} = G(G_o)/H'(H'_o)/H(H_o) \quad [A(A_o),A'(A'_o)]_n. \qquad (2)$$

A basic step in the algorithm for constructing colour groups is coupling of an element belonging to the magnetic group $g \in G(G_o)$ with an appropriate element of the transitive permutational group $P \leq S_n$. A rather convenient method is demonstrated in Refs.7,10, but in our case we used an IBM-PC compatible microcomputer and it turned to be more appropriate to employ the method proposed by Van-der-Waerden[5] . Following it one constructs for each $H' \subset G$, a transitive permutational representation $\pi_G^{H'}$ of the group G and every element $g \in G(G_o)$ is coupled to the permutation $\pi_G^{H'}(g)$. For this purpose,a special program, written in Turbo Pascal 5.0, gives the following results : a) the set of all the subgroups is found for every one of the 122 magnetic groups; b) classes of conjugated subgroups are determined; c) a particular group $G(G_o)$ is decomposed to left cosets with respect to a fixed subgroup $H'(H'_o)$ (for all groups $G(G_o)$ and all representatives of the classes of conjugated subgroups; d) the transitive permutational representation is built as permutations of the numbers (labels) of the left cosets obtained by an action from the left side of any element $g \in G(G_o)$,

$$D_G^{H'}(g) \cong \begin{pmatrix} H', \ \dots \ , g_iH', \ \dots \ , g_nH' \\ gH', \ \dots \ ,gg_iH', \ \dots \ ,gg_nH' \end{pmatrix} \in P \leq S_n. \qquad (3)$$

e) each element $g \in G(G_o)$ is combined with its image $p \in P_G^{H'}(g)$, $p \in P$. The character of each element is determined - it is equal to the numbers of cycles with unit length; f) the permutational representation is decomposed to irreducible components, with respect to $G(G_o)$; g) the intersection of all conjugated subgroups, belonging to a given class, known as Core $H'(H'_o)$, is found; h) the three-terms symbol (Eq.2) is composed using the result of c) and g).

3.Content of the Tables

The basic results of the present paper are collected in Tables

Tab. A.2

$(A,A')_n$	No	C_2	C_s	$C_2(C_1)$	$C_s(C_i)$	C_i^*	C_1	$C_i(C_1)$
$(C_2,C_1)_2$	1	C_1	C_1	C_1	C_1	C_1	C_1	C_1
$(C_1,C_1)_1$	2	C_2	C_s	$C_2(C_1)$	$C_s(C_i)$	C_i^*	C_1	$C_i(C_1)$

Tab. A.4

$(A,A')_n$	No	C_4	S_4	$C_4(C_2)$	$S_4(C_2)$
$(C_4,C_1)_4$	1	C_1	C_1	C_1	C_1
$(C_2,C_1)_2$	2	C_2	C_2	C_2	C_2
$(C_1,C_1)_1$	3	C_4	S_4	$C_4(C_2)$	$S_4(C_2)$

Tab. A.5

$(A,A')_n$	No	C_6	C_{3h}	$C_6(C_3)$	$C_{3h}(C_3)$	S_6	C_3^*	$S_6(C_3)$
$(C_6,C_1)_6$	1	C_1	C_1	C_1	C_1	C_1	C_1	C_1
$(C_3,C_1)_3$	2	C_2	C_s	$C_2(C_1)$	$C_s(C_1)$	C_i	C_1^*	$C_i(C_1)$
$(C_2,C_1)_2$	3	C_3	C_3	C_3	C_3	C_3	C_3	C_3
$(C_1,C_1)_1$	4	C_6	C_{3h}	$C_6(C_3)$	$C_{3h}(C_3)$	S_6	C_3^*	$S_6(C_3)$

Tab. A.1

$(A,A')_n$	No	C_1
$(C_1,C_1)_1$	1	C_1

Tab. A.6

$(A,A')_n$	No	C_{4h}	C_4^*	$C_{4h}(C_4)$	$C_{4h}(C_{2h})$	S_4^*	$C_{4h}(S_4)$
$(C_{4h},C_1)_8$	1	C_1	C_1	C_1	C_1	C_1	C_1
$(D_2,C_1)_4$	2	C_2	C_2	C_2	C_2	C_2	C_2
$(C_4,C_1)_4$	3	C_s	$C_2(C_1)$	$C_s(C_1)$	C_s	$C_2(C_1)$	$C_s(C_1)$
	4	C_i	C_1^*	$C_i(C_1)$	C_i	C_1^*	$C_i(C_1)$
$(C_2,C_1)_1$	7	C_{2h}	C_2^*	$C_{2h}(C_2)$	C_{2h}	C_2^*	$C_{2h}(C_2)$
	6	C_4	C_4	C_4	$C_4(C_2)$	S_4	S_4
	5	S_4	$C_4(C_2)$	$S_4(C_2)$	$S_4(C_2)$	$S_4(C_2)$	$C_4(C_2)$
$(C_1,C_1)_1$	8	C_{4h}	C_4	$C_{4h}(C_4)$	$C_{4h}(C_{2h})$	S_4	$C_{4h}(S_4)$

Tab. A.3

$(A,A')_n$	No	C_3
$(C_3,C_1)_3$	1	C_1
$(C_1,C_1)_1$	2	C_3

Tab. A.7

$(A,A')_n$	No	C_{6h}	C_6^*	$C_{6h}(C_6)$	$C_{6h}(S_6)$	C_{3h}^*	$C_{6h}(C_{3h})$	S_6^*
$(C_{6h},C_1)_{12}$	1	C_1	C_1	C_1	C_1	C_1	C_1	C_1
$(C_6,C_1)_6$	3	C_2	C_2	C_2	$C_2(C_1)$	C_s	$C_2(C_1)$	C_i
	2	C_s	$C_2(C_1)$	$C_s(C_1)$	$C_s(C_1)$	$C_s(C_1)$	C_s	$C_i(C_1)$
	4	C_i	C_1^*	$C_i(C_1)$	C_i	C_1^*	$C_i(C_1)$	C_1^*
$(D_2,C_1)_4$	5	C_3	C_3	C_3	C_3	C_3	C_3	C_3
$(C_3,C_1)_3$	6	C_{2h}	C_2^*	$C_{2h}(C_2)$	$C_{2h}(C_i)$	C_s^*	$C_{2h}(C_s)$	C_i^*
$(C_2,C_1)_2$	8	C_6	C_6	C_6	$C_6(C_3)$	C_{3h}	$C_6(C_3)$	S_6
	9	S_6	C_3^*	$S_6(C_3)$	S_6	$C_{3h}(C_3)$	$S_6(C_3)$	C_3^*
	7	C_{3h}	$C_6(C_3)$	$C_{3h}(C_3)$	$C_{3h}(C_3)$	C_3^*	C_{3h}	$S_6(C_3)$
$(C_1,C_1)_1$	10	C_{6h}	C_6^*	$C_{6h}(C_6)$	$C_{6h}(S_6)$	C_{3h}^*	$C_{6h}(C_{3h})$	S_6^*

Tab. A.8

$(A,A')_n$	No	D_2	C_{2v}	$D_2(C_2)$	$C_{2v}(C_2)$	C_{2h}	C_2^*	$C_{2h}(C_2)$	$C_{2h}(C_i)$	C_s^*	$C_{2h}(C_s)$	$C_{2h}(C_s)$	$C_{2v}(C_s)$	C_i^*
$(D_2,C_1)_4$	1	C_1	C_1	C_1	C_1	C_1	C_1	C_1	C_1	C_1	C_1	C_1	C_1	C_1
$(C_2,C_1)_2$	3	C_2	C_2	C_2	C_2	C_2	C_2	C_2	$C_2(C_1)$	C_s	$C_2(C_1)$	$C_2(C_1)$	$C_2(C_1)$	C_i
	2	C_2'	C_s'	$C_2'(C_1)$	$C_s'(C_1)$	C_s	$C_2(C_1)$	$C_s(C_1)$	$C_s(C_1)$	$C_s(C_1)$	C_s	C_s	C_s	$C_i(C_1)$
	4	C_2''	C_s''	$C_2''(C_1)$	$C_s''(C_1)$	C_i	C_1^*	$C_i(C_1)$	C_i	C_1^*	$C_i(C_1)$	$C_i(C_1)$	$C_s(C_1)$	C_1^*
$(C_1,C_1)_1$	5	D_2	C_{2v}	$D_2(C_2)$	$C_{2v}(C_2)$	C_{2h}	C_2^*	$C_{2h}(C_2)$	$C_{2h}(C_i)$	C_s^*	$C_{2h}(C_s)$	$C_{2h}(C_s)$	$C_{2v}(C_s)$	C_i^*

Tab. A.9

$(A,A')_n$	No	D_{2h}	D_2^*	$D_{2h}(D_2)$	$D_{2h}(C_{2h})$	C_{2v}^*	$D_{2h}(C_{2v})$	C_{2h}^*
$(D_{2h},C_1)_8$	1	C_1	C_1	C_1	C_1	C_1	C_1	C_1
$(D_2,C_1)_4$	4	C_2	C_2	C_2	C_2	C_2	C_2	C_2
	5	C_2'	C_2'	C_2	C_s	C_s'	C_s'	C_s
	3	C_2''	C_2''	C_2	$C_2'(C_1)$	C_s''	C_s''	$C_2(C_1)$
	7	C_s	$C_2(C_1)$	$C_s(C_1)$	$C_2''(C_1)$	$C_2(C_1)$	$C_2'(C_1)$	$C_s(C_1)$
	8	C_s'	$C_2'(C_1)$	$C_s'(C_1)$	$C_s'(C_1)$	$C_s'(C_1)$	$C_2''(C_1)$	C_i
	6	C_s''	$C_2''(C_1)$	$C_s(C_1)$	$C_s''(C_1)$	$C_s''(C_1)$	$C_s(C_1)$	C_1^*
	2	C_i	C_1^*	$C_i(C_1)$	C_i	C_1^*	$C_i(C_1)$	$C_i(C_1)$
$(C_2,C_1)_2$	12	D_2	D_2	D_2	$D_2(C_2)$	C_{2v}	C_{2v}	C_{2h}
	10	C_{2v}	$D_2(C_2')$	$C_{2v}(C_2')$	$C_{2v}(C_2')$	$C_{2v}(C_2')$	$D_2(C_2')$	C_2^*
	9	C_{2v}'	$D_2(C_2'')$	$C_{2v}(C_2'')$	C_{2h}	C_2^*	$C_{2h}(C_2')$	$C_{2h}(C_2')$
	11	C_{2v}''	$D_2(C_2^*)$	$C_{2v}(C_2^*)$	$C_{2h}'(C_i)$	$C_s'^*$	$C_{2h}(C_s')$	$C_{2h}(C_i)$
	14	C_{2h}	C_2^*	$C_{2h}(C_2')$	$C_{2h}''(C_i)$	$C_s''^*$	$C_{2h}(C_s'')$	C_s^*
	13	C_{2h}'	$C_2'^*$	$C_{2h}(C_2'')$	$C_{2v}(C_s')$	$C_{2v}(C_s')$	$C_{2v}(C_s')$	$C_{2h}(C_s)$
	15	C_{2h}''	$C_2''^*$	$C_{2h}(C_2^*)$	$C_{2v}(C_s'')$	$C_{2v}(C_s'')$	$C_{2v}(C_s'')$	C_i^*
$(C_1,C_1)_1$	16	D_{2h}	D_2	$D_{2h}(D_2)$	$D_{2h}(C_{2h})$	C_{2v}	$D_{2h}(C_{2v})$	C_{2h}

Tab. A.15

$(A,A')_n$	No	T
$(T,C_1)_{12}$	1	C_1
$(T,C_2)_6$	2	C_2/C_1
$(T,C_3)_4$	3	C_3/C_1
$(C_3,C_1)_3$	4	D_2
$(C_1,C_1)_1$	5	T

Tab. A.13

$(A,A')_n$	No	D_6	$D_6(D_3)$	$D_6(C_6)$	D_{3d}	$D_{3d}(D_3)$	$D_{3d}(C_{3v})$	$D_{3d}(S_6)$
$(D_6,C_1)_{12}$	1	C_1	C_1	C_1	C_1	C_1	C_1	C_1
$(D_3,C_1)_6$	4	C_2	$C_2(C_1)$	C_2	C_i	$C_i(C_1)$	$C_i(C_1)$	C_i
$(D_6,C_2')_6$	2	C_2'/C_1	C_2'/C_1	$C_2'(C_1)/C_1$	C_2/C_1	C_2/C_1	$C_2(C_1)/C_1$	$C_2(C_1)/C_1$
	3	C_2''/C_1	$C_2'(C_1)/C_1$	$C_2''(C_1)/C_1$	C_s/C_1	$C_s(C_1)/C_1$	C_s/C_1	$C_s(C_1)/C_1$
$(D_2,C_1)_4$	6	C_3	C_3	C_3	C_3	C_3	C_3	C_3
$(D_3,C_2')_3$	5	D_2/C_2	$D_2(C_2')/C_2(C_1)$	$D_2(C_2)/C_2$	C_{2h}/C_i	$C_{2h}(C_2)/C_i(C_1)$	$C_{2h}(C_s)/C_i(C_1)$	$C_{2h}(C_i)/C_i$
$(C_2,C_1)_2$	9	C_6	$C_6(C_3)$	C_6	S_6	$S_6(C_3)$	$S_6(C_3)$	S_6
	8	D_3	D_3	$D_3(C_3)$	D_3	D_3	$D_3(C_3)$	$D_3(C_3)$
	7	D_3'	$D_3'(C_3)$	$D_3'(C_3)$	C_{3v}	$C_{3v}(C_3)$	C_{3v}	$C_{3v}(C_3)$
$(C_1,C_1)_1$	10	D_6	$D_6(D_3)$	$D_6(C_6)$	D_{3d}	$D_{3d}(D_3)$	$D_{3d}(C_{3v})$	$D_{3d}(S_6)$

CONTINUE

Tab. A.13 (continued)

No	D_{3h}	$D_{3h}(D_3)$	$D_{3h}(C_{3h})$	$D_{3h}(C_{3v})$	C_{6v}	$C_{6v}(C_{3v})$	$C_{6v}(C_6)$	D_3^*	C_{3v}^*
1	C_1	C_1	C_1	C_1	C_1	C_1	C_1	C_1	C_1
4	C_s	$C_s(C_1)$	C_s	$C_s(C_1)$	C_2	$C_2(C_1)$	C_2	C_1^*	C_1^*
2	C_2/C_1	C_2/C_1	$C_2(C_1)/C_1$	$C_2(C_1)/C_1$	C_s/C_1	C_s/C_1	$C_s(C_1)/C_1$	C_2/C_1	C_s/C_1
3	C_s/C_1	$C_s(C_1)/C_1$	$C_s(C_1)/C_1$	$C_s(C_1)/C_1$	C_s'/C_1	$C_s'(C_1)/C_1$	$C_s'(C_1)/C_1$	$C_2(C_1)/C_1$	$C_s(C_1)/C_1$
6	C_3	C_3	C_3	C_3	C_3	C_3	C_3	C_3	C_3
5	C_{2v}/C_2	$C_{2v}(C_2')/C_s(C_1)$	$C_{2v}(C_s)/C_s$	$C_{2v}(C_s')/C_s(C_1)$	C_{2v}/C_2	$C_{2v}(C_s)/C_2(C_1)$	$C_{2v}(C_2)/C_2$	C_2^*/C_1^*	C_s^*/C_1^*
9	C_{3h}	$C_{3h}(C_3)$	C_{3h}	$C_{3h}(C_3)$	C_6	$C_6(C_3)$	C_6	C_3^*	C_3^*
8	D_3	D_3	$D_3(C_3)$	$D_3(C_3)$	C_{3v}	C_{3v}	$C_{3v}(C_3)$	D_3	C_{3v}
7	C_{3v}	$C_{3v}(C_3)$	$C_{3v}(C_3)$	C_{3v}	C_{3v}'	$C_{3v}(C_3)$	$C_{3v}'(C_3)$	$D_3(C_3)$	$C_{3v}(C_3)$
10	D_{3h}	$D_{3h}(D_3)$	$D_{3h}(C_{3h})$	$D_{3h}(C_{3v})$	C_{6v}	$C_{6v}(C_{3v})$	$C_{6v}(C_6)$	D_3^*	C_{3v}^*

Tab. A.12

$(A,A')_n$	No	D_{4h}	$D_{4h}(D_4)$	$D_{4h}(D_{2h})$	$D_{4h}(D_{2d})$	$D_{4h}(C_{4h})$
$(D_{4h},C_1)16$	1	C_1	C_1	C_1	C_1	C_1
$(D_{2h},C_1)8$	12	C_2	C_2	C_2	C_2	C_2
$(D_4,C_1)8$	6	C_s	$C_s(C_1)$	C_s	$C_s(C_1)$	C_s
	9	C_i	$C_i(C_1)$	C_i	$C_i(C_1)$	C_i
$(D_{4h},C_2')8$	2	C_2'/C_1	C_2'/C_1	C_2'/C_1	C_2'/C_1	$C_2'(C_1)/C_1$
	3	C_2''/C_1	C_2''/C_1	$C_2''(C_1)/C_1$	$C_2''(C_1)/C_1$	$C_2''(C_1)/C_1$
	4	C_s'/C_1	$C_s'(C_1)/C_1$	$C_s'(C_1)/C_1$	C_s'/C_1	$C_s'(C_1)/C_1$
	5	C_s''/C_1	$C_s''(C_1)/C_1$	C_s''/C_1	$C_s''(C_1)/C_1$	$C_s''(C_1)/C_1$
$(D_2,C_1)4$	15	D_2	D_2	D_2	D_2	$D_2(C_2')$
	17	D_2'	D_2'	$D_2(C_2'')$	$D_2(C_2'')$	$D_2(C_2'')$
	16	C_{2v}	$C_{2v}(C_2)$	C_{2v}	$C_{2v}(C_2)$	$C_{2v}(C_2')$
	18	C_{2v}'	$C_{2v}'(C_2)$	$C_{2v}'(C_2)$	C_{2v}	$C_{2v}(C_2'')$
	19	C_{2h}	$C_{2h}(C_2)$	C_{2h}	$C_{2h}(C_2)$	C_{2h}
	13	C_4	C_4	$C_4(C_2)$	$C_4(C_2)$	C_4
	14	S_4	$S_4(C_2)$	$S_4(C_2)$	S_4	S_4
$(D_4,C_2')4$	7	C_{2v}''/C_s	$C_{2v}''(C_2')/C_s(C_1)$	C_{2v}''/C_s	$C_{2v}''(C_2')/C_s(C_1)$	$C_{2v}(C_s')/C_s$
	8	$C_{2v}\hat{}/C_s$	$C_{2v}\hat{}(C_2'')/C_s(C_1)$	$C_{2v}\hat{}(C_s'')/C_s$	$C_{2v}\hat{}(C_s'')/C_s(C_1)$	$C_{2v}\hat{}(C_s')/C_s$
	10	C_{2h}'/C_i	$C_{2h}'(C_2'')/C_i(C_1)$	C_{2h}'/C_i	$C_{2h}'(C_2')/C_i(C_1)$	$C_{2h}'(C_i)/C_i$
	11	C_{2h}''/C_i	$C_{2h}''(C_2')/C_i(C_1)$	$C_{2h}''(C_i)/C_i$	$C_{2h}''(C_s'')/C_i(C_1)$	$C_{2h}''(C_i)/C_i$
$(C_2,C_1)2$	23	D_4	D_4	$D_4(D_2)$	$D_4(D_2)$	$D_4(C_4)$
	21	D_{2d}	$D_{2d}(D_2)$	$D_{2d}(D_2)$	D_{2d}	$D_{2d}(S_4)$
	20	D_{2d}'	$D_{2d}'(D_2')$	$D_{2d}'(C_{2v}')$	$D_{2d}'(S_4)$	$D_{2d}'(S_4)$
	22	C_{4v}	$C_{4v}(C_4)$	$C_{4v}(C_{2v})$	$C_{4v}(C_{2v}')$	$C_{4v}(C_4)$
	25	D_{2h}	$D_{2h}(D_2)$	D_{2h}	$D_{2h}(D_2)$	$D_{2h}(C_{2h})$
	24	D_{2h}'	$D_{2h}'(D_2')$	$D_{2h}'(C_{2h})$	$D_{2h}'(C_{2v}')$	$D_{2h}'(C_{2h}')$
	26	C_{4h}	$C_{4h}(C_4)$	$C_{4h}(C_{2h})$	$C_{4h}(S_4)$	C_{4h}
$(C_1,C_1)1$	27	D_{4h}	$D_{4h}(D_4)$	$D_{4h}(D_{2h})$	$D_{4h}(D_{2d})$	$D_{4h}(C_{4h})$

CONTINUE

Tab. A.10

$(A,A')_n$	No	D_3	$D_3(C_3)$	C_{3v}	$C_{3v}(C_3)$
$(D_3,C_1)6$	1	C_1	C_1	C_1	C_1
$(D_3,C_2')3$	2	C_2/C_1	$C_2(C_1)/C_1$	C_s/C_1	$C_s(C_1)/C_1$
$(C_2,C_1)2$	3	C_3	C_3	C_3	C_3
$(C_1,C_1)1$	4	D_3	$D_3(C_3)$	C_{3v}	$C_{3v}(C_3)$

Tab. A.12 (continue)

	$(A,A')_n$	No	$D_{4h}(C_{4v})$	D_4^*	D_{2d}^*	C_{4v}^*
	$(D_{4h},C_1)16$	1	C_1	C_1	C_1	C_1
	$(D_{2h},C_1)8$	12	C_2	C_2	C_2	C_2
C	$(D_4,C_1)8$	6	$C_s(C_1)$	$C_1\ (C_1)$	$C_1\ (C_1)$	$C_1\ (C_1)$
O		9	$C_i(C_1)$	C_1^*	C_1^*	C_1^*
N	$(D_{4h},C_2')4$	2	$C_2'(C_1)/C_1$	C_2'/C_1	C_2'/C_1	C_s'/C_1
		3	$C_2''(C_1)/C_1$	C_2''/C_1	C_s''/C_1	C_s''/C_1
T		4	C_s'/C_1	$C_2'(C_1)/C_1$	$C_2'(C_1)/C_1$	$C_s'(C_1)/C_1$
I		5	C_s''/C_1	$C_2''(C_1)/C_1$	$C_s''(C_1)/C_1$	$C_s''(C_1)/C_1$
N	$(D_2,C_1)4$	15	$D_2(C_2')$	D_2	D_2	C_{2v}
		17	$D_2(C_2'')$	D_2'	C_{2v}'	C_{2v}'
U		16	C_{2v}	$D_2(C_2)$	$D_2(C_2)$	$C_{2v}(C_2)$
E		18	C_{2v}'	$D_2'(C_2)$	$C_{2v}'(C_2)$	$C_{2v}'(C_2)$
D		19	$C_{2h}(C_2)$	C_2^*	C_2^*	C_2^*
		13	C_4	C_4	$S_4(C_2)$	C_4
		14	$S_4(C_2)$	S_4	S_4	$C_4(C_2)$
	$(D_4,C_2')4$	7	$C_{2v}''(C_s')/C_s(C_1)$	$D_2(C_2')/C_2(C_1)$	$D_2(C_2')/C_2(C_1)$	$C_{2v}''(C_s')/C_2(C_1)$
		8	$C_{2v}\hat{}(C_s'')/C_s(C_1)$	$D_2'(C_2'')/C_2(C_1)$	$C_{2v}\hat{}(C_s'')/C_2(C_1)$	$C_{2v}\hat{}(C_s'')/C_2(C_1)$
		10	$C_{2h}'(C_s')/C_s(C_1)$	$C_2'^*/C_1^*$	C_2^*/C_1^*	$C_s'^*/C_1^*$
		11	$C_{2h}''(C_s'')/C_s(C_1)$	$C_2''^*/C_1^*$	C_s^*/C_1^*	$C_s''^*/C_1^*$
	$(C_2,C_1)2$	23	$D_4(C_4)$	D_4	D_{2d}	C_{4v}
		21	$D_{2d}(C_{2v}')$	$D_4(D_2)$	$D_{2d}(D_2')$	$C_{4v}(C_{2v}')$
		20	$D_{2d}'(C_{2v})$	$D_4(D_2')$	$D_{2d}(C_{2v}')$	$C_{4v}(C_{2v}')$
		22	C_{4v}	$D_4(C_4)$	$D_{2d}(S_4)$	$C_{4v}(C_4)$
		25	$D_{2h}(C_{2v})$	D_2^*	D_2^*	C_{2v}^*
		24	$D_{2h}'(C_{2v}')$	$D_2'^*$	$C_{2v}'^*$	$C_{2v}'^*$
		26	$C_{4h}(C_4)$	C_4^*	S_4^*	C_4^*
	$(C_1,C_1)1$	27	$D_{4h}(C_{4v})$	D_4^*	D_{2d}^*	C_{4v}^*

Tab. A.14

$(A,A')_n$	No	D_{6h}	$D_{6h}(D_6)$	$D_{6h}(D_{3d})$	$D_{6h}(D_{3h})$	$D_{6h}(C_{6h})$
$(D_{6h},C_1)_{24}$	1	C_1	C_1	C_1	C_1	C_1
$(D_6,C_1)_{12}$	6	C_2	C_2	$C_2(C_1)$	$C_2(C_1)$	C_2
	9	C_s	$C_s(C_1)$	$C_s(C_1)$	C_s	C_s
	12	C_i	$C_i(C_1)$	C_i	$C_i(C_1)$	$C_i(C_1)$
$(D_{6h},C_2')_{12}$	2	C_2'/C_1	C_2'/C_1	C_2'/C_1	C_2'/C_1	$C_2'(C_1)/C_1$
	4	C_2''/C_1	C_2''/C_1	$C_2''(C_1)/C_1$	$C_2''(C_1)/C_1$	$C_2''(C_1)/C_1$
	3	C_s'/C_1	$C_s'(C_1)/C_1$	$C_s'(C_1)/C_1$	C_s'/C_1	$C_s'(C_1)/C_1$
	5	C_s''/C_1	$C_s''(C_1)/C_1$	C_s''/C_1	$C_s''(C_1)/C_1$	$C_s''(C_1)/C_1$
$(C_{2h},C_1)_8$	17	C_3	C_3	C_3	C_3	C_3
$(D_3,C_1)_6$	15	C_{2h}	$C_{2h}(C_2)$	$C_{2h}(C_i)$	$C_{2h}(C_s)$	C_{2h}
$(D_6,C_2')_6$	7	D_2/C_2	D_2/C_2	$D_2(C_2')/C_2(C_1)$	$D_2(C_2')/C_2(C_1)$	$D_2(C_2)/C_2$
	8	C_{2v}/C_2	$C_{2v}(C_2)/C_2$	$C_{2v}(C_s'')/C_2(C_1)$	$C_{2v}(C_s'')/C_2(C_1)$	$C_{2v}(C_2)/C_2$
	10	C_{2v}'/C_s	$C_{2v}'(C_2')/C_s(C_1)$	$C_{2v}'(C_2')/C_s(C_1)$	C_{2v}'/C_s	$C_{2v}'(C_s')/C_s$
	11	C_{2v}''/C_s	$C_{2v}''(C_2'')/C_s(C_1)$	$C_{2v}''(C_s'')/C_s(C_1)$	$C_{2v}''(C_s'')/C_s$	$C_{2v}''(C_s'')/C_s$
	13	C_{2h}'/C_i	$C_{2h}'(C_2')/C_i(C_1)$	C_{2h}/C_i	$C_{2h}'(C_2')/C_i(C_1)$	$C_{2h}'(C_i')/C_i$
	14	C_{2h}''/C_i	$C_{2h}''(C_2'')/C_i(C_1)$	$C_{2h}''(C_i'')/C_i$	$C_{2h}''(C_s'')/C_i(C_1)$	$C_{2h}''(C_i'')/C_i$
$(D_2,C_1)_4$	18	C_6	C_6	$C_6(C_3)$	$C_6(C_3)$	C_6
	19	C_{3h}	$C_{3h}(C_3)$	$C_{3h}(C_3)$	C_{3h}	C_{3h}
	24	S_6	$S_6(C_3)$	S_6	$S_6(C_3)$	S_6
	20	D_3	D_3	D_3	D_3	$D_3(C_3)$
	22	D_3'	D_3'	$D_3'(C_3)$	$D_3'(C_3)$	$D_3'(C_3)$
	21	C_{3v}	$C_{3v}(C_3)$	$C_{3v}(C_3)$	$C_{3v}(C_3)$	$C_{3v}(C_3)$
	23	C_{3v}'	$C_{3v}'(C_3)$	C_{3v}'	C_{3v}'	$C_{3v}'(C_3)$
$(D_3,C_2)_3$	16	D_{2h}/C_{2h}	$D_{2h}(D_2)/C_{2h}(C_2)$	$D_{2h}(C_{2h}')/C_{2h}(C_i)$	$D_{2h}(C_{2v}')/C_{2h}(C_s)$	$D_{2h}(C_{2h})/C_{2h}$
$(C_2,C_1)_2$	31	C_{6h}	$C_{6h}(C_6)$	$C_{6h}(S_6)$	$C_{6h}(C_{3h})$	C_{6h}
	28	D_6	D_6	$D_6(D_3)$	$D_6(D_3)$	$D_6(C_6)$
	26	D_{3d}	$D_{3d}(D_3)$	D_{3d}	$D_{3d}(D_3)$	$D_{3d}(S_6)$
	25	D_{3d}'	$D_{3d}'(D_3')$	$D_{3d}'(S_6)$	$D_{3d}'(C_{3v})$	$D_{3d}'(S_6)$
	30	D_{3h}	$D_{3h}(D_3)$	$D_{3h}(D_3)$	D_{3h}	$D_{3h}(C_{3h})$
	29	D_{3h}'	$D_{3h}'(D_3')$	$D_{3h}'(C_{3v})$	$D_{3h}'(C_{3h})$	$D_{3h}'(C_{3h})$
	27	C_{6v}	$C_{6v}(C_6)$	$C_{6v}(C_{3v})$	$C_{6v}(C_{3v})$	$C_{6v}(C_6)$
$(C_1,C_1)_1$	32	D_{6h}	$D_{6h}(D_6)$	$D_{6h}(D_{3d})$	$D_{6h}(D_{3h})$	$D_{6h}(C_{6h})$

CONTINUED

Tab. A.14 (continue)

$(A,A')_n$	No	$D_{6h}(C_{6v})$	D_6^*	D_{3h}^*	C_{6v}^*	D_{3d}^*
$(D_{6h},C_1)_{24}$	1	C_1	C_1	C_1	C_1	C_1
$(D_6,C_1)_{12}$	6	C_2	C_2	C_s	C_2	C_i
	9	$C_s(C_1)$	$C_2(C_1)$	$C_s(C_1)$	$C_2(C_1)$	$C_i(C_1)$
	12	$C_i(C_1)$	C_1^*	C_1^*	C_1^*	C_1^*
$(D_{6h},C_2')_{12}$	2	$C_2'(C_1)/C_1$	C_2'/C_1	C_2'/C_1	C_s'/C_1	C_2'/C_1
	4	$C_2''(C_1)/C_1$	C_2''/C_1	C_s'/C_1	C_s''/C_1	C_s'/C_1
	3	C_s'/C_1	$C_2''(C_1)/C_1$	$C_2'(C_1)/C_1$	$C_s'(C_1)/C_1$	$C_2'(C_1)/C_1$
	5	C_s''/C_1	$C_2'(C_1)/C_1$	$C_s''(C_1)/C_1$	$C_s''(C_1)/C_1$	$C_s'(C_1)/C_1$
$(C_{2h},C_1)_8$	17	C_3	C_3	C_3	C_3	C_3
$(D_3,C_1)_6$	15	$C_{2h}(C_2)$	C_2^*	C_s^*	C_2^*	C_i^*
$(D_6,C_2')_6$	7	$D_2(C_2)/C_2$	D_2/C_2	C_{2v}/C_s	C_{2v}/C_2	C_{2h}/C_i
	8	C_{2v}/C_2	$D_2(C_2')/C_2$	$C_{2v}'(C_s'')/C_s$	$C_{2v}(C_2')/C_2$	$C_{2h}(C_i')/C_i$
	10	$C_{2v}'(C_s'')/C_s(C_1)$	$D_2(C_2'')/C_2(C_1)$	$C_{2v}'(C_2')/C_s(C_1)$	$C_{2v}(C_s')/C_2(C_1)$	$C_{2h}(C_2')/C_i(C_1)$
	11	$C_{2v}''(C_s')/C_s(C_1)$	$D_2(C_2')/C_2(C_1)$	$C_{2v}''(C_s'')/C_s(C_1)$	$C_{2v}(C_s'')/C_2(C_1)$	$C_{2h}(C_s'')/C_i(C_1)$
	13	$C_{2h}'(C_s')/C_i(C_1)$	C_2^*/C_1^*	C_2^*/C_1^*	C_s^*/C_1^*	C_2^*/C_1^*
	14	$C_{2h}''(C_s'')/C_i(C_1)$	C_2^*/C_1^*	C_s^*/C_1^*	C_s^*/C_1^*	C_s^*/C_1^*
$(D_2,C_1)_4$	18	C_6	C_6	C_{3h}	C_6	S_6
	19	$C_{3h}(C_3)$	$C_6(C_3)$	$C_{3h}(C_3)$	$C_6(C_3)$	$S_6(C_3)$
	24	$S_6(C_3)$	C_3^*	C_3^*	C_3^*	C_3^*
	20	$D_3(C_3)$	D_3	D_3	C_{3v}	D_3
	22	$D_3'(C_3)$	D_3'	C_{3v}	C_{3v}'	C_{3v}
	21	C_{3v}	$D_3(C_3)$	$D_3(C_3)$	$C_{3v}(C_3)$	$D_3(C_3)$
	23	C_{3v}'	$D_3'(C_3)$	$C_{3v}(C_3)$	$C_{3v}'(C_3)$	$C_{3v}(C_3)$
$(D_3,C_2)_3$	16	$D_{2h}(C_{2v})/C_{2h}(C_2)$	D_2^*/C_2	C_{2v}^*/C_s^*	C_{2v}^*/C_2^*	C_{2h}^*/C_i^*
$(C_2,C_1)_2$	31	$C_{6h}(C_6)$	C_6^*	C_{3h}^*	C_6^*	S_6^*
	28	$D_6(C_6)$	D_6	D_{3h}	C_{6v}	D_{3d}
	26	$D_{3d}(C_{3v}')$	D_3^*	D_3^*	C_{3v}^*	D_3^*
	25	$D_{3d}'(C_{3v})$	D_3^*	C_{3v}^*	C_{3v}'	C_{3v}^*
	30	$D_{3h}(C_{3v})$	$D_6(D_3)$	$D_{3h}(D_3)$	$C_{6v}(C_{3v})$	$D_{3d}(C_{3v})$
	29	$D_{3h}'(C_{3v}')$	$D_6(D_3')$	$D_{3h}(C_{3v})$	$C_{6v}(C_{3v}')$	$D_{3d}(D_3)$
	27	C_{6v}	$D_6(C_6)$	$D_{3h}(C_{3h})$	$C_{6v}(C_6)$	$D_{3d}(S_6)$
$(C_1,C_1)_1$	32	$D_{6h}(C_{6v})$	D_6^*	D_{3h}^*	C_{6v}^*	D_{3d}^*

A.1–A.18. There can be found the necessary information for constructing the complete three-terms symbol for all permutational magnetic point groups and the respective representations $D_G^{H'}$. Most of the groups (115) are distributed in 18 classes of isomorphic groups. The remaining 7 centrosymmetrical grey groups are in 7 separate classes and are given in Ref.14.

In each isomorphic class the PMPG are split also to chromomorphic classes The symbol of the chromomorphic class $(A,A')_n$ is in the first column,while the symbols of the magnetic groups $G(G_o)$ are in the title row of the table. Below each symbol $G(G_o)$ there are situated the symbols of the corresponding subgroups $H'(H'_o)$ and $H(H_o)$ = Core $H'(H'_o)$ separated with a slash $H'(H'_o)/H(H_o)$. In the case of invariant subgroup $H'(H'_o) = H(H_o)$ there stands only one symbol. These data are enough for building the complete three-terms or 2-terms symbol :

$$G(G_o)/H'(H'_o)/H(H_o) \quad (A,A')_n \text{ , or } G(G_o)/H(H_o) \quad (A,A')_n . \tag{4}$$

As an illustration, we fetch from the last column of Tab.A.14, and write down a part of the symbols of the PMPG isostructural to $D^*_{3d} = D_{3d} \times \theta$:

$$\begin{aligned} &D^*_{3d}/D_{3d} \quad (C_2,C_1)_2 \quad , \quad D^*_{3d}/D_{3d}(D_3) \quad (C_2,C_1)_2 \\ &D^*_{3d}/C_{2h}/C_i \quad (D_3,C_2)_3 \quad , \quad D^*_{3d}/C_{2h}(C_i)/C_i \quad (D_6,C'_2)_6 . \end{aligned} \tag{5}$$

The numbers in the second column (below 'No') are particularly important. These are the numbers of the respective permutational representations $D_G^{H'}$, which are collected in tables[21] (noted by C. – in our example it will be Tab. C.14). In these tables $D_G^{H'}$ stands under the same No as that,which stands near the symbol of the group H' in A.–tables.

In conclusion we must clearly say that, for the 32 colourless magnetic groups, coinciding with the common point groups, the whole information given here is published in Ref.6,9. For the black-and-white and grey groups the classification of the subgroups in classes of 'exomorphism' (coinciding with the classification of the colour groups on chromomorphic classes) is published for the first time in Ref.15, (different criteria of equivalence had been chosen). The most essential difference between the present work and

Tab. A.11

$(A,A')_n$	No	D_4	D_{2d}	$D_4(D_2)$	$D_{2d}(D_2)$	C_{4v}	$D_4(C_4)$	$C_{4v}(C_4)$	$D_{2d}(S_4)$	$C_{4v}(C_{2v})$	$D_{2d}(C_{2v})$
$(D_4,C_1)_8$	1	C_1	C_1	C_1	C_1	C_1	C_1	C_1	C_1	C_1	C_1
$(D_2,C_1)_4$	4	C_2	C_2	C_2	C_2	C_2	C_2	C_2	C_2	C_2	C_2
$(D_4,C_2')_4$	2	C_2'/C_1	C_2'/C_1	C_2'/C_1	C_2/C_1	C_s/C_1	$C_2'(C_1)/C_1$	$C_s(C_1)/C_1$	$C_2'(C_1)/C_1$	C_s/C_1	C_2'/C_1
	3	C_2''/C_1	C_2''/C_1	$C_2''(C_1)/C_1$	$C_s(C_1)/C_1$	C_s'/C_1	$C_2''(C_1)/C_1$	$C_s'(C_1)/C_1$	$C_s(C_1)/C_1$	$C_s'(C_1)/C_1$	C_s'/C_1
$(C_2,C_1)_1$	6	D_2	D_2	D_2	D_2	C_{2v}	$D_2(C_2)$	$C_{2v}(C_2)$	$D_2(C_2)$	C_{2v}	C_{2v}
	5	D_2'	C_{2v}	$D_2(C_2)$	$C_{2v}(C_2)$	C_{2v}'	$D_2(C_2)$	$C_{2v}(C_2)$	$C_{2v}(C_2)$	$C_{2v}(C_2)$	$D_2(C_2)$
	7	C_4	S_4	$C_4(C_2)$	$S_4(C_2)$	C_4	C_4	C_4	S_4	$C_4(C_2)$	$S_4(C_2)$
$(C_1,C_1)_1$	8	D_4	D_{2d}	$D_4(D_2)$	$D_{2d}(D_2)$	C_{4v}	$D_4(C_4)$	$C_{4v}(C_4)$	$D_{2d}(S_4)$	$C_{4v}(C_{2v})$	$D_{2d}(C_{2v})$

Tab. A.16

$(A,A')_n$	No	T_h	T^*	$T_h(T)$
$(T_h,C_1)_{24}$	1	C_1	C_1	C_1
$(T,C_1)_{12}$	6	C_i	C_1^*	$C_i(C_1)$
$(T_h,C_2')_{12}$	2	C_2/C_1	C_2/C_1	C_2/C_1
$(T_h,C_s')_{12}$	3	C_s/C_1	$C_2(C_1)/C_1$	$C_s(C_1)/C_1$
$(T_h,C_3')_8$	4	C_3/C_1	C_3/C_1	C_3/C_1
$(C_6,C_1')_6$	9	D_2	D_2	D_2
$(T,C_2')_6$	7	C_{2h}/C_i	C_2^*/C_1	$C_{2h}(C_2)/C_i(C_1)$
$(T_h,C_{2v}')_6$	5	C_{2v}/C_1	$D_2(C_2)/C_1$	$C_{2v}(C_2)/C_1$
$(T,C_3')_4$	8	S_6/C_i	C_3^*/C_1	$S_6(C_3)/C_1$
$(C_3,C_1')_3$	11	D_{2h}	D_2^*	$D_{2h}(D_2)$
$(C_2,C_1')_2$	10	T	T	T
$(C_1,C_1')_1$	12	T_h	T^*	$T_h(T)$

Tab. A.17

$(A,A')_n$	No	O	O(T)	T_d	$T_d(T)$
$(O,C_1)_{24}$	1	C_1	C_1	C_1	C_1
$(O,C_2')_{12}$	2	C_2/C_1	C_2/C_1	C_2/C_1	C_2/C_1
$(O,C_2'')_{12}$	3	C_2''/C_1	$C_2''(C_1)/C_1$	C_s/C_1	$C_s(C_1)/C_1$
$(O,C_3')_8$	4	C_3/C_1	C_3/C_1	C_3/C_1	C_3/C_1
$(D_3,C_1')_6$	8	D_2	D_2	D_2	D_2
$(O,C_4')_6$	6	C_4/C_1	$C_4(C_2)/C_1$	S_4/C_1	$S_4(C_2)/C_1$
$(O,D_2')_6$	5	D_2'/C_1	$D_2'(C_2)/C_1$	C_{2v}/C_1	$C_{2v}(C_2)/C_1$
$(O,D_3')_4$	7	D_3/C_1	$D_3(C_3)/C_1$	C_{3v}/C_1	$C_{3v}(C_3)/C_1$
$(D_3,C_2')_3$	9	D_4/D_2	$D_4(D_2)/D_2$	D_{2d}/D_2	$D_{2d}(D_2)/D_2$
$(C_2,C_1')_2$	10	T	T	T	T
$(C_1,C_1')_1$	11	O	O(T)	T_d	$T_d(T)$

Tab. A.18

$(A,A')_n$	No	O_h	$O_h(O)$	$O_h(T_h)$	$O_h(T_d)$	O^*	T_d^*
$(O_h,C_1)_{48}$	1	C_1	C_1	C_1	C_1	C_1	C_1
$(O,C_1)_{24}$	17	C_i	$C_i(C_1)$	C_i	$C_i(C_1)$	C_1^*	C_1^*
$(O_h,C_2)_{24}$	2	C_2/C_1	C_2/C_1	C_2/C_1	C_2/C_1	C_2/C_1	C_2/C_1
$(O_h,C_s)_{24}$	3	C_s/C_1	$C_s(C_1)/C_1$	C_s/C_1	$C_s(C_1)/C_1$	$C_2(C_1)/C_1$	$C_2(C_1)/C_1$
$(O_h,C_2')_{24}$	4	C_2'/C_1	C_2'/C_1	$C_2'(C_1)/C_1$	$C_2'(C_1)/C_1$	C_2'/C_1	C_s/C_1
	5	C_s'/C_1	$C_s'(C_1)/C_1$	$C_s'(C_1)/C_1$	C_s'/C_1	$C_2'(C_1)/C_1$	$C_s(C_1)/C_1$
$(O_h,C_3)_{16}$	6	C_3/C_1	C_3/C_1	C_3/C_1	C_3/C_1	C_3/C_1	C_3/C_1
$(D_6,C_1)_{12}$	24	D_2	D_2	D_2	D_2	D_2	D_2
$(O,C_2)_{12}$	18	C_{2h}/C_i	$C_{2h}(C_2)/C_i(C_1)$	C_{2h}/C_i	$C_{2h}(C_2)/C_i(C_1)$	C_2^*/C_1^*	C_2^*/C_1^*
$(O,C_2')_{12}$	19	C_{2h}'/C_i	$C_{2h}'(C_2')/C_i(C_1)$	$C_{2h}'(C_i)/C_i$	$C_{2h}'(C_s')/C_i(C_1)$	$C_2'^*/C_1^*$	C_s^*/C_1^*
$(O_h,C_4)_{12}$	8	C_4/C_1	C_4/C_1	$C_4(C_2)/C_1$	$C_4(C_2)/C_1$	C_4/C_1	S_4/C_1
	9	S_4/C_1	$S_4(C_2)/C_1$	$S_4(C_2)/C_1$	S_4/C_1	$C_4(C_2)/C_1$	$S_4(C_2)/C_1$
$(O_h,C_{2v})_{12}$	7	C_{2v}/C_1	$C_{2v}(C_2)/C_1$	C_{2v}/C_1	$C_{2v}(C_2)/C_1$	$D_2(C_2)/C_1$	$D_2(C_2)/C_1$
$(O_h,D_2')_{12}$	10	D_2'/C_1	D_2'/C_1	$D_2'(C_2)/C_1$	$D_2'(C_2)/C_1$	D_2'/C_1	C_{2v}/C_1
	11	C_{2v}'/C_1	$C_{2v}'(C_2)/C_1$	$C_{2v}'(C_2)/C_1$	C_{2v}'/C_1	$D_2'(C_2)/C_1$	$C_{2v}(C_2)/C_1$
$(O_h,C_{2v}'')_{12}$	12	C_{2v}''/C_1	$C_{2v}''(C_2')/C_1$	$C_{2v}''(C_s)/C_1$	$C_{2v}''(C_s')/C_1$	$D_2'(C_2')/C_1$	$C_{2v}(C_s)/C_1$
$(O,C_3)_8$	20	S_6/C_i	$S_6(C_3)/C_i(C_1)$	S_6/C_i	$S_6(C_3)/C_i(C_1)$	C_3^*/C_1^*	C_3^*/C_1^*
$(O_h,D_3)_8$	13	D_3/C_1	D_3/C_1	$D_3(C_3)/C_1$	$D_3(C_3)/C_1$	D_3/C_1	C_{3v}/C_1
	14	C_{3v}/C_1	$C_{3v}(C_3)/C_1$	$C_{3v}(C_3)/C_1$	C_{3v}/C_1	$D_3(C_3)/C_1$	$C_{3v}(C_3)/C_1$
$(D_3,C_1')_6$	27	D_{2h}	$D_{2h}(D_2)$	D_{2h}	$D_{2h}(D_2)$	D_2^*	D_2^*
$(D_6,C_2')_6$	25	D_4/D_2	D_4/D_2	$D_4(D_2)/D_2$	$D_4(D_2)/D_2$	D_4/D_2	D_{2d}/D_2
	26	D_{2d}/D_2	$D_{2d}(D_2)/D_2$	$D_{2d}(D_2)/D_2$	D_{2d}/D_2	$D_4(D_2)/D_2$	$D_{2d}(D_2)/D_2$
$(O,C_4)_6$	21	C_{4h}/C_i	$C_{4h}(C_4)/C_i(C_1)$	$C_{4h}(C_{2h})/C_i$	$C_{4h}(S_4)/C_i(C_1)$	C_4^*/C_1^*	S_4^*/C_1^*
$(O,D_2')_6$	22	D_{2h}'/C_i	$D_{2h}'(D_2')/C_i(C_1)$	$D_{2h}'(C_{2h})/C_i$	$D_{2h}'(C_{2v}')/C_i(C_1)$	$D_2'^*/C_1^*$	C_{2v}^*/C_1^*
$(O_h,C_{4v})_6$	15	C_{4v}/C_1	$C_{4v}(C_4)/C_1$	$C_{4v}(C_{2v})/C_1$	$C_{4v}(C_{2v}')/C_1$	$D_4(C_4)/C_1$	$D_{2d}(S_4)/C_1$
	16	D_{2d}'/C_1	$D_{2d}'(D_2')/C_1$	$D_{2d}'(C_{2v})/C_1$	$D_{2d}'(S_4)/C_1$	$D_4(D_2')/C_1$	$D_{2d}(C_{2v})/C_1$
$(D_2,C_1')_4$	29	T	T	T	T	T	T
$(O,D_3')_4$	23	D_{3d}/C_i	$D_{3d}(D_3)/C_i(C_1)$	$D_{3d}(S_6)/C_i$	$D_{3d}(C_{3v})/C_i(C_1)$	D_3^*/C_1^*	C_{3v}^*/C_1^*
$(D_3,C_2')_3$	28	D_{4h}/D_{2h}	$D_{4h}(D_4)/D_{2h}(D_2)$	$D_{4h}(D_{2h})/D_{2h}$	$D_{4h}(D_{2d})/D_{2h}(D_2)$	D_4^*/D_2^*	D_{2d}^*/D_2^*
$(C_2,C_1)_2$	32	T_h	$T_h(T)$	T_h	$T_h(T)$	T^*	T^*
	31	O	O	O(T)	O(T)	O	T_d
	30	T_d	$T_d(T)$	$T_d(T)$	T_d	O(T)	$T_d(T)$
$(C_1,C_1')_1$	33	O_h	$O_h(O)$	$O_h(T_h)$	$O_h(T_d)$	O^*	T_d^*

Ref.15 is that the list of subgroups here is only an intermediate step in the construction of the colour groups, i.e. in addition for each subgroup $H \subset G$ is given also the transitive permutational representation $D_G^{H'}$, and the core of the subgroups Core H'. (The separation of the $D_G^{H'}$ is due to a technical reasons.) And finally we would point out that the computer derivation of all subgroups rises the reliability of the results as well as their efficiency and applicability.

The examples of applications of the permutational magnetic groups and their representations are considered in Ref.14.

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Received by Publishing Department
on June 6, 1990.

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Перестановочные магнитные точечные группы
и их применение в теории фазовых
переходов Ландау
Таблицы групп

На основе разработанного алгоритма с помощью микрокомпьютера выведены и табулированы все перестановочные магнитные точечные группы. Таблицы могут быть применены в симметрийном анализе магнитных фазовых переходов в рамках теории Ландау.

Работа выполнена в Лаборатории теоретической физики ОИЯИ.

Сообщение Объединенного института ядерных исследований. Дубна 1990

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Permutational Magnetic Point Groups
and Their Application in the Landau Theory
of Phase Transitions
Complete List of Groups

An algorithm has been proposed and applied for deriving and tabulating all permutational magnetic point groups. The tables might be implemented in the analysis of magnetic phase transitions in crystalls.

The investigation has been performed at the Laboratory of Theoretical Physics, JINR.

Communication of the Joint Institute for Nuclear Research. Dubna 1990