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SEMISIMPLE DEGREE OF SYMMETRY OF MANIFOLD WITH THE HOMOTOPY TYPE OF PRODUCT $(S^1)^r\times(S^2)^s\times(S^3)^t$

KAZUO SAITO AND TSUYOSHI WATABE

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Introduction

In this note, we shall consider the topological semisimple degree of symmetry of manifold with the homotopy type of a product $(S^1)^r\times(S^2)^s\times(S^3)^t$ of spheres. Here the *topological semisimple degere of symmetry* is, by definition, the maximum of dimension of compact connected semisimple Lie group which acts on the manifold topologically and almost effectively.

This note is motivated by works on the degree of symmetry of manifold with large low homotopy groups as $K(\pi, 1)$-manifolds or product of 2-spheres (see [1], [5], [6], [9], [14] or [15]). We shall prove the following

Theorem A. *Let M be a $3m$-dimensional closed topological manifold with the same integral cohomology ring as a product of 3-dimensional spheres. If a compact connected simple Lie group G acts on M topologically and almost effectively, then G is $SU(2)$ or $SO(3)$.*

By a slight modification of the method of the proof of Theorem A, we can prove the following

Theorem B. *Let M be a closed topological manifold with the homotopy type of $N=(S^1)^r\times(S^2)^s\times(S^3)^t$. If a compact connected simple Lie group G acts on M topologically and almost effectively, then G is $SU(2)$ or $SO(3)$.*

Moreover we shall prove the following

Theorem C. *Let M be as in Theorem B and G a compact connected Lie group which acts on M topologically and almost effectively. Then G is locally isomorphic to $T^u\times(SU(2))^v$ with $u+v\leqq r+2\,(s+t)$.*

In this note, we shall consider only topological almost effective action and "manifold" means "connected paracompact Hausdorff manifold".

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In this note, we shall use the following notations;