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# On standard involutions of homotopy spheres

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INTRODUCTION

This paper studies fixed point free smooth involutions on homotopy $(2n-1)$-spheres. It has been proved in [10], [24] that every element of $bP_{2n}$ $(n\geqq 3)$ admits free involutions, where $bP_{2n}$ is the group of homotopy $(2n-1)$-spheres which bound parallelizable manifolds. When such actions exist, it is natural to ask how they behave.

We will make an approach to this problem in the study of the following involutions. *Let $T$ be a free involution on a homotopy sphere $\Sigma^{2n-1}\in bP_{2n}$ $(n\geqq 3)$. If there exists a parallelizable manifold $M$ with boundary $\Sigma$ such that $T$ extends to an involution with isolated fixed points on $M$, then we call $(T, \Sigma)$ a standard involution.*

We shall establish an explicit description of standard involutions on homotopy $(4k-1)$-spheres and then prove that they give a classification of standard involutions.

## Contents



Certain examples of satndard involutions are constructed by an equivariant plumbing technique in chapter III. F. Hirzebruch and K. H. Mayer [13], [21] gave examples of free involutions of homotopy 7-spheres using the equivariant plumbing. However, the plumbing we need here is different from it and is based upon the plumbing which is originally motivated by S. Weintraub [34]. In general, if we are given a free involution $T$ on a homotopy sphere $\Sigma$ and even though $T$ extends to an involution on $M$ which $\Sigma$ bounds, it may be considered that $T$ does not extend "uniquely". So to construction we need to construct $Z_2$-actions on $M$ in a "uniform