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ON ANTI-INVARIANT MAXIMAL SPACELIKE SUBMANIFOLDS OF AN INDEFINITE COMPLEX SPACE FORM

Augustus Nzomo Wali
Department of Applied Mathematics, Kigali Institute of Science and Technology
B P 3900, Kigali, Rwanda

ABSTRACT

The purpose of this paper is to study the geometry of an n-dimensional anti-invariant maximal spacelike submanifold M immersed in a 2(n+p)-dimensional indefinite complex space form $\bar{M}(c), c \neq 0$ of holomorphic sectional curvature c and index 2p and give a pinching result of the Ricci and scalar curvatures of M.

We have shown that if the Ricci curvature R is less than $\frac{c}{4}\left((n-1)+\frac{(n+1)(n+2p)}{(2n+4p-1)}\right)$ then M is totally geodesic. Moreover the scalar curvature $\rho \geq \frac{c}{4}\left(n(n-1)+\frac{(n+1)(n+2p)}{(2n+4p-1)}\right)$ and if ρ is less than $\frac{c}{4}\left(n(n-1)+\frac{(n+1)(n+2p)}{(2n+4p-1)}\right)$ them M is totally geodesic.

Keywords: Anti-invariant submanifold, Spacelike submanifold, Complex space form, totally geodesic.

INTRODUCTION

Among all submanifolds of a Kaehler manifold there are two classes; the class of anti-invariant submanifolds and the class of holomorphic submanifolds. A submanifold of a Kaehler manifold is called anti-invariant (resp. holomorphic) if each tangent space of the submanifold is mapped into the normal space (resp. itself) by the almost complex structure of the Kaehler manifold, Chen and Ogiue (1974). A Kaehler manifold of constant holomorphic sectional curvature is called a complex space form, Wali (2005).

Let $\bar{M}(c), c \neq 0$ be an indefinite complex space form of holomorphic sectional curvature c, complex dimension (n+p), $p \neq 0$ and index 2p and let M be an n-dimensional anti-invariant maximal spacelike submanifold isometrically immersed in $\bar{M}(c), c \neq 0$. We call M a spacelike submanifold if the induced metric on M from that of the ambient space is positive definite Ishihara (1988).

Let J be the almost complex structure of $\bar{M}(c), c \neq 0$. An n-dimensional Riemannian manifold M isometrically immersed in $\bar{M}(c), c \neq 0$ is called an anti-invariant submanifold of $\bar{M}(c), c \neq 0$ if each tangent space of M is mapped into the normal space by the almost complex structure J, Yano and Kon (1976).

Let h be the second fundamental form of M in $\bar{M}(c)$ and denote by S the square of the length of the second fundamental form h.

The purpose of this paper is to study an n-dimensional anti-invariant maximal spacelike submanifold M immersed in an indefinite complex space form $\bar{M}(c), c \neq 0$ and give a pinching result of the Ricci and scalar curvatures of M.

Our main result is:

Theorem: Let M be an n-dimensional compact anti-invariant maximal spacelike submanifold of $\bar{M}_p^{n+p}(c), c \neq 0$. Then if the Ricci curvature R is less than $\frac{c}{4}\left((n-1)+\frac{(n+1)(n+2p)}{(2n+4p-1)}\right)$ then M is totally geodesic. Moreover, the scalar curvature

Author email: tabnzo@yahoo.co.in