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Spherical Hypersurfaces with Low Type Quadric Representation

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§0. Introduction.

Let S^{m-1} be the unit hypersphere of the Euclidean m-space E^m centered at the origin, embedded in the standard way. Then any submanifold of S^{m-1} we call *spherical*. If M^n is a compact spherical submanifold minimal in S^{m-1} then it is well known that the Euclidean coordinate functions restricted to M are eigenfunctions of the Laplacian Δ on M^n with the same eigenvalue n (see [25]). Spectral behavior of a spherical submanifold can be also nicely related to the second standard immersion ι of S^{m-1}. For example, A. Ros [20] studied compact minimal spherical submanifolds via the second standard immersion. He obtained characterization of those that are described by means of two different eigenvalues of Δ, i.e. those which are of 2-type via ι (for precise definition of k-type submanifolds see the next section). He showed that such submanifolds are Einstein and mass-symmetric via ι. Then M. Barros and B. Y. Chen [2] obtained generalization of Ros' characterization for spherical submanifolds which are mass-symmetric and of 2-type via ι. They also classified hypersurfaces of S^{m-1} which are mass-symmetric and of 2-type via the second standard immersion.

Let $x: M^n \to S^{m-1} \subset E^m$ be an isometric immersion and regard $x=(x_1, \cdots, x_m)^t$ as a column matrix. We define the map $\tilde{x}=\iota\circ x=xx^t$ from M into the set of $m\times m$ symmetric matrices and call it the *quadric representation* of M because the coordinates of $\tilde{x}$ depend on the coordinates of x in a quadratic manner. Studying submanifolds with finite type quadric representation amounts to studying spectral behavior of the product of coordinate functions $x_i \cdot x_j$.

In this paper we extend the above result of Barros and Chen giving the classification of spherical hypersurfaces with 2-type quadric representation without assuming mass-symmetry a priori (Th. 3.1). We also

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