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A special class of spherically symmetric space-times and their imbeddings

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During the year 1961 a series of papers dealing with the problem of imbedding of the Schwarzschild space-time was written by one of the authors and other two, and many valuable results were obtained [3]. The process by means of which the problem was completely studied was recently applied to a treatment of the imbedding of spherically symmetric space-time (abbreviated s. s. space) [4]. The present paper is written as an addition to the paper [4].

It is generally known that the fundamental form of s. s. space, with respect to the time coordinate t and spherical ones r, θ, φ, is given by

$$eds^2 = G(t, r)dt^2 - A(t, r)dr^2 - B(t, r)(d\theta^2 + \sin^2\theta d\varphi^2).$$

If the function $B(t, r)$ is constant, such a space is called S_{11} space. On the other hand, if B is not constant, it is shown that there exists a transformation of coordinates such that B is reduced to r^2 [7, I]. The space is denoted by S_1 space. It has long been known that any s.s. space is of class at most 2 in the sense of imbedding [2].

Among S_1 spaces those of which the function $A(t, r)=1$ have some special properties. For example, those spaces are not of class 1, as proved by H. Takeno [7, III]. In the previous paper [4] we excluded a discussion of those spaces, because the general method used in the paper was not applicable to them.

The exceptional case will be treated in the present paper, and