

## ON THE RELATION BETWEEN $G_2^*$ STRUCTURES AND ALMOST PARACONTACT STRUCTURES

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**Abstract.** In this manuscript, we investigate the possible classes of seven-dimensional almost paracontact metric structures induced by the three-forms of  $G_2^*$  structures. We write the projections that determine to which class the almost paracontact structure belongs, by using the properties of the  $G_2^*$  structures. Then we study the properties that the characteristic vector field of the almost paracontact metric structure should have such that the structure belongs to a specific subclass of almost paracontact metric structures.

MSC: 53C25, 53D10

**Keywords:** Almost paracontact metric structure,  $G_2^*$  structure, normal structure, paracontact structure

### 1. Introduction

Manifolds with almost paracontact structures were first defined by Kaneyuki and Williams in [3]. Zamkovoy provided all the technical apparatus needed in [8]. After these remarkable works, almost paracontact metric manifolds were written as a direct sum of 12 subspaces with respect to the symmetry properties of the Levi-Civita covariant derivative of the fundamental two-form in [5, 9].

Almost paracontact metric structures induced by manifolds with  $G_2^*$  structures were constructed in [6] and existence of some classes were investigated. Our aim in this study is to get further results by calculating projections given in [9] on each of twelve subspaces of almost paracontact metric structures. Also, we provide some examples.

### 2. Preliminaries

Consider  $\mathbb{R}^7$  with the metric  $g_{4,3}$  having the signature  $(-, -, -, -, +, +, +)$ . The group  $G_2^*$  is defined as

$$G_2^* = \{g \in \text{GL}(7, \mathbb{R}); g^* \varphi = \varphi\}$$