*Dynamics of Continuous, Discrete and Impulsive Systems*
*Series* **B:** *Applications & Algorithms* **22 (2015)** 141-153


# TAUBERIAN THEOREM AND APPLICATIONS OF BICOMPLEX LAPLACE-STIELTJES TRANSFORM

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**Abstract.** Bicomplex Analysis is most recent powerful mathematical tool to develop the theory of functions belonging to large classes of frequency domain. In this paper we derive the bicomplex version of Laplace-Stieltjes transform. Also we derive some useful properties and Tauberian theorem for Laplace-Stieltjes transform in the bicomplex variable. Applications of bicomplex Laplace-Stieltjes transform in exponential decay of tail probability and bicomplex Dirichlet series are given.

**Keywords.** Bicomplex Number, bicomplex Laplace transform, Stieltjes transform, Laplace-Stieltjes transform.

**AMS (MOS) subject classification:** Primary 30G35; Secondary 42B10.

## 1 Introduction

Motivated by work of L. Galue et al. [13], in this paper we investigate bicomplex Laplace-Stieltjes transform which is generalization of complex Laplace-Stieltjes transform and it's Tauberian theorem, which are applied in the theory of moments, probability distribution theory, orthogonal polynomial, signal processing, tail probability, Dirichlet series and mathematical physics. In 1892, Segre Corrado [4] defined bicomplex numbers as

$$C_2 = \{\xi : \xi = x_0 + i_1 x_1 + i_2 x_2 + j x_3 |\ x_0, x_1, x_2, x_3 \in C_0\},$$

or

$$C_2 = \{\xi : \xi = z_1 + i_2 z_2 |\ z_1, z_2 \in C_1\}.$$

where $i_1$ and $i_2$ are imaginary units such that $i_1^2 = i_2^2 = -1,\ i_1 i_2 = i_2 i_1 = j$ and $j^2 = 1$. The set of bicomplex numbers is a commutative ring with unit and zero divisors. Hence, contrary to quaternions, bicomplex numbers are commutative with some non-invertible elements situated on the null cone.

In 1928 and 1932, Futagawa Michiji originated the concept of holomorphic functions of a bicomplex variable in a series of papers [14], [15]. In 1934,