



ISSN: 1889-3066

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Web site: [jja.ujaen.es](http://jja.ujaen.es)

Jaen J. Approx. 9(1) (2017), 37–63

**Jaen Journal**

**on Approximation**

# The Marcinkiewicz-type discretization theorems for the hyperbolic cross polynomials

V. N. Temlyakov

## Abstract

The main goal of this paper is to study the discretization problem for the hyperbolic cross trigonometric polynomials. This important problem turns out to be very difficult. In this paper we begin a systematic study of this problem and demonstrate two different techniques – the probabilistic and the number theoretical techniques.

**Keywords:** discretization, hyperbolic cross polynomials, sparse approximation, entropy.

**MSC:** Primary 41A65; Secondary 42A10, 46B20.

## §1. Introduction

Discretization is a very important step in making a continuous problem computationally feasible. The problem of construction of good sets of points in a multidimensional domain is a fundamental problem of mathematics and computational mathematics. We note that the problem of arranging points in a multidimensional domain is also a fundamental problem in coding theory. It is a problem on optimal spherical codes. This problem is equivalent to the problem from compressed sensing on building large incoherent dictionaries in  $\mathbb{R}^d$ .

**Communicated by**  
Z. Ditzian

**Received**  
February 9, 2017  
**Accepted**  
June 8, 2017