

INFORMATION OF THE DOCTORAL THESIS

Title of Thesis:

**INVESTIGATE OF JOIN DETECTION AND P-LDPC DECODING ALGORITHM
FOR LARGE-SCALE MIMO INFORMATION SYSTEMS
WITH LOW-RESOLUTION ADCS**

Speciality: **Information System**

Code: **9.48.01.04**

PhD. Candidate: **Dang Ngoc Hung**

Scientific supervisors:

1. **Assoc. Prof. Nguyen Van Thuy, PhD**
2. **Assoc. Prof. Nguyen Trung Hieu, PhD**

Training institution: Posts and Telecommunications Institute of Technology

NEW FINDINGS OF THE THESIS

1. Propose a solution to calculate the truncation limit regardless of the number of transmitting antennas to optimize a low-resolution uniform quantizer.
2. Propose a solution and design a new P-LDPC code suitable for large-scale MIMO systems with 1-bit ADC to improve system performance.
3. Propose the join detection and P-LDPC decoding algorithm for large-scale MIMO communication systems with mixed low-resolution ADCs.
4. Develop software tools to assist the design of LDPC code and simulation processes for performance analysis of large-scale MIMO communication systems.

APPLICATIONS, PRACTICAL APPLICABILITY, AND MATTERS NEED FURTHER STUDIES

The main contribution of the thesis is a new join detection and P-LDPC decoding algorithm for large-scale MIMO communication systems with mixed low-resolution ADCs. This algorithm is a powerful tool to design P-LDPC code and analyze the performance of large-scale MIMO systems under various MIMO configurations and mixed resolution ADC combination scenarios. The new findings of this thesis can be applied to design and construct future wireless MIMO communication systems. Some opening research questions should be further studied as follows:

1. Investigate the theoretical basis for the optimal portion of the number of low-resolution

antennas and high-resolution antennas in large-scale MIMO systems with mixed low-resolution ADCs.

2. Develop an efficient method to design P-LDPC code for large-scale MIMO systems with various MIMO configurations and mixed resolution ADC combination scenarios to improve overall system performance.
3. Find a more accurate mathematical model for a one-bit ADC quantizer to better the overall system performance.
4. The results indicate that the performance of the large-scale MIMO systems depends on the MIMO configurations – degrading when M/N is less than one. A thorough investigation should be carried to provide a sound explanation for this phenomenon. The findings will probably be useful for many other research works in this field of study.

**Confirmation of representative
Scientific supervisor**

PhD. Candidate

Assoc. Prof. Nguyen Van Thuy, PhD

Dang Ngoc Hung