VIETNAM NATIONAL UNIVERSITY, HANOI

VNU UNIVERSITY OF ENGINEERING AND TECHNOLOGY

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SOCIALIST REPUBLIC OF VIETNAM

Independence – Freedom – Happiness

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INFORMATION ON DOCTORAL THESIS

1. Full name : Tran Cao Quyen..... 2. Sex: Male.....

3. Date of birth: 28/3/1976..... 4. Place of birth: Hanoi.....

5. Admission decision number: 268/SĐH ..... Dated 5/11/2003 .....

6. Changes in academic process:

From 1/2006 to 12/2007 studied at Laval University, Quebec, Canada by the Decision No 1012/QHQT on 29, November 2005 of Vietnam National University.

From 29/2/2009 released to University of Engineering and Technology (VNUH) by the official dispatch No 881/SĐH on 29, February 2009.

7. Official thesis title: *Smart antenna and its application in multi-carrier communications*

8. Major: Telecommunications ..... 9. Code: 62 52 70 05.....

10. Supervisors: Prof. Phan Anh and A. Prof. Trinh Anh Vu .....

11. Summary of the **new findings** of the thesis:

The thesis proposed a smart antenna model. When applied the proposed smart antenna to mobile communication based OFDM/SDMA (Orthogonal Frequency Division Multiplexing/ Space Division Multiple Access), some new results obtained as follows:

Introduce a new directional finding (DF) system based an antenna with two elements. The first element is a monopole. The second element is without phase centre and having non-linear phase pattern. When the DF system using MUSIC (Multiple Signal Classification) algorithm, the number of detected sources is not limited by the number of antenna elements (2 elements in this case). However, to detect the same source numbers as in an *L* elements uniform linear array, the phase of the second element has to sample *L*-2 more in times.

Proposed a smart antenna model based a phase array and the DF system to control its beam tracking to the highest user density location within a sector in order to increase the system capacity.

Considering 4 systems as follows:

System 1: SISO-SECTOR-OFDM; Second System 2: SISO-ADAPTIVE-OFDM; System 3: MIMO 2x2 –SECTOR-OFDM; System 4: MIMO 2x2-ADAPTIVE-OFDM.

The analysis and simulation have proved that:

- The capacity of the system 1 is higher almost 3 times to that of the system 2 reverse.
- The capacity of the system 3&4 even better since MIMO 2x2 is used.
- System 2 using adaptive beam steering is more simple than LMS.

12. Practical applicability, if any:

The proposed smart antenna can be applied for LTE (Long Term Evolution).

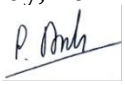
13. Further research directions, if any: Smart antennas for Radar and Sonar

14. Thesis-related publications:

1. **Trần Cao Quyền** (2002), " Frequency offset sensitivity reduction in OFDM mobile communication system", *The 8th Vietnam Biennial Conference on Radio and electronics (REV'02)*, pp. 189-192.

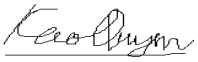
2. Phan Anh, **Trần Cao Quyền** (2005) " DOA determination by using an antenna system without phase center and MUSIC algorithm*", IEEE Antenna and propagation Society International Symposium*, Vol. 4A, pp.134-137.
3. **Trần Cao Quyền**, Paul Fortier, Phan Anh (2006), " An approach for BTS antenna system for 3G and 4G*"*, *The 10th Vietnam Biennial Conference on Radio and Electronics (REV'06)*, pp.198-201.
4. **Trần Cao Quyền**, Paul Fortier, Phan Anh (2007), " Space diversity beam steering microstrip BTS antenna system for 3G and 4G", *IEEE AP-S International Symposium*, pp.1693-1697.
5. **Trần Cao Quyền**, Bạch Gia Dương, Paul Fortier, Phan Anh (2008), "An approach for passive radar using a smart antenna system*", International conference on advanced technologies for communications (ATC08)*, pp 270-274.
6. **Trần Cao Quyền** (2010), "Capacity Improvement for An OFDM Mobile Communication System using A Smart Antenna System", *The Third International Conference on Communications and Electronics (ICCE2010)*, Nha Trang, Vietnam, pp. 75

Date: 18 May, 2012

Signature: 

Full name: Phan Anh

Date: 18May, 2012 ……..

Signature: 

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