

INFORMATION ON DOCTORAL THESIS

1. Full name: Tran Thi Thuy Quynh
2. Sex: Female
3. Date of birth: 22/09/1979
4. Place of birth: Hanoi
5. Admission decision number: 2377/SDH Dated 14/12/2006
6. Changes in academic process:
 - Decision No. 661/QD-DTSDH, dated 24/10/2007 of the Rector of the University of Engineering and Technology on adding supervisor.
 - Decision No. 4050/QD-SDH, dated 07/04/2008 of the President of Vietnam National University, Hanoi on allowing Ph.D student to pause the study program in a 24-month period from 01/07/2008 for reason of maternity.
 - Decision No. 2905/QD-SDH, dated 12/10/2010 of the President of Vietnam National University, Hanoi on allowing Ph.D student to pause the study program in a 24-month period from 01/07/2010 for reason of maternity.
 - Official Letter No. 2637/DHQGHN-DT, dated 09/08/2011 of the President of the Vietnam National University, Hanoi on allowing Ph.D student to continue the study program from 7/2011.
7. Official thesis title: Improving performance of the radio direction finding system using antenna without phase center in the correlated environment.
8. Major: Telecommunication Engineering
9. Code: 62 52 02 08
10. Supervisors:
 - Prof. Dr.Sc. Phan Anh
 - Assoc. Prof. Dr. Tran Minh Tuan
11. Summary of the **new findings** of the thesis:

The thesis proposes the radio finding systems which work well in correlated environment. The proposed systems include:

a. An Asymmetric AWPC (Asym-AWPC), which is composed of two arrays of vertical dipoles and one of them is asymmetric at least, is designed. The DOA estimation system, includes the antenna and Multiple Signal Classification (MUSIC) algorithm (called Asym-AWPC-MUSIC), operates in full space (from 0° to 360°) with advantages of simple hardware, high resolution, less sensors than sources, and isotropic array. The detailed results are shown as:

- The performance of the Asym-AWPC-MUSIC is the best if the rotation angle of the antenna is averaged (360° divides by the antenna rotation number).
- The asymmetric factor of the antenna is equal to 0.6. This value satisfies the desired characteristics of the proposed system.
- The performance of the Asym-AWPC-MUSIC versus Signal to Noise Ratio (SNR), resolution, and snapshot number is better than that of UCA-MUSIC (the DOA estimation system is composed of Uniform Circular Array and MUSIC algorithm), respectively. The obtained resolution is 0.5 degree.

b. The Asymmetric AWPC is combined with Compressive Sensing algorithm (called Asym-AWPC-CS) to estimate DOA exactly in a correlated environment without the memory for the measurement matrix entries. The detailed results are shown as:

- The performance of the Asym-AWPC-MUSIC is perfect if the sources are uncorrelated, degrades if they are correlated, and fails if they are coherent.
- The measurement matrix, built from the Asym-AWPC, satisfies conditions to apply CS directly for DOA estimation without memory. The system works well in a multipath environment even the sources are coherent.
- In $(0;2]$ examined range, the asymmetric factor of the Asym-AWPC is larger, the resolution of the system is better.
- The computational load of the Asym-AWPC-CS is larger than that of the Asym-AWPC-MUSIC.

12. Practical applicability, if any: radio direction finding system.

13. Further research directions, if any: For Asym-AWPC-CS:

- a. Relationship between the rotation step number of Asym-AWPC and spatial spectrum.
- b. Improving angle resolution and computational load.
- c. Hardware implementation ability.

14. Thesis-related publications:

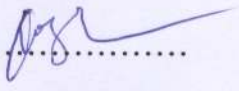
- [1] T. T. T. Quynh, P. P. Hung, P. Anh, P. T. Hong, T. M. Tuan (2010), "Direction-Of-Arrival Estimation Using Special Phase Pattern Antenna Elements in Uniform Circular Array", *Proceedings of the 2010 International Conference on Computational Intelligence and Vehicular System*, pp. 138-141.
- [2] T. T. T. Quynh, N. Linh Trung, P. Anh and K. Abed-Meraim (2012), "On optimization of antennas without phase center for DOA estimation", *Proceedings of the 2012 International Conference on Communications and Electronics*, pp. 421-425.
- [3] T. T. T. Quynh, N. Linh Trung, P. Anh and K. Abed-Meraim (2012), "Whole-Space Ambiguity Removal in DOA Estimation by AWPC Antenna", *Proceedings of the 2012 International Conference on Advanced Technologies for Communications*, pp. 337-340.
- [4] T. T. T. Quynh, N. Linh Trung, P. Anh and K. Abed-Meraim (2012), "A Compact AWPC Antenna for DOA Estimation", *Proceedings of the 2012 International Symposium on Communications and Information Technologies*, pp. 1133-1137.
- [5] Trần Thị Thúy Quỳnh, Trịnh Anh Vũ, Trần Minh Tuấn, Phan Anh (2013), "Hiệu năng của hệ thống tìm phương sử dụng anten không tâm pha bất đối xứng", *Tạp chí Khoa học và Công nghệ, ĐHQGHN*, tập 29 (3), tr. 40-50.
- [6] T. T. T. Quynh, T. Tran-Duc, N. Linh-Trung, P. Anh (2014), "Asymmetric Antennas Without Phase Center and Compressive Sensing for DOA estimation in Correlated Environments", *Proceedings of the 2014 International Conference on Green and Human Information Technology*, pp. 84-88.
- [7] T. T. T. Quynh, T. Tran-Duc, N. Linh-Trung, P. Anh (2014), "Antenna without Phase Center for DOA estimation in Compressive Array Processing", *International Journal of Control and Automation*, Vol. 7 (8), pp. 55-68.

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