## **ACKNOWLEDGEMENTS**

I would like to acknowledge my advisor, Assoc. Prof. Dr. Tosawat Seetawan, who gave best advice and be guidance of this thesis since start until successful. He gave appreciate suggestion, checked and corrected the fault of this thesis, and support tuition fee 13,000 Bath.

I would like to thankful Mr. Athorn Vora-Ud, who good training MXDORTO and DV-X $\alpha$  calculation. He gave appreciate suggestion and support tuition fee 13,000 Bath.

I would like to thank the thesis committee such as Assoc. Prof. Dr. Weerasak Somkhunthot, Asst. Prof. Dr. Wilawan Kumharn, Dr. Surasak Santhaveesuk and Dr. Chokchai Kahattha for their kindly advices and helpful suggestions, including my family supported spiritual for me forever.

I would like to thank for all of staff at the Center of Excellence on Alternative Energy (CEAE), Sakon Nakhon Rajabhat University, for their helpful for my thesis.

Finally, I would like to special thanks to Program of Physics (Graduate), Faculty of Science and Technology, Sakon Nakhon Rajabhat University for support tuition fee 26,000 Bath.

Meena Rittiruam