PHD THESIS DISCUSSION OF ALES POVALAC

GLOBAL EVALUATION

The thesis that is now being presented is devoted to the implementation of a location system based on RFID TAGs. The thesis is well organized and in line with what is expected for a Doctor in Philosophy.

The author clearly presents and proves that the proposals in this thesis are a step forward in the design of those location schemes, and present extremely interesting results when the designs are built and measured.

The author also presents a group of publications in International journals and international conferences that deserves to be mentioned.

Focusing now in the thesis in my opinion the thesis is clear and concise in its size; the themes are well presented and discussed through the thesis and explained in a level of analysis that clear shows the improvements made by this thesis.

The work now presented is quite broad and covers themes from signal processing, propagation models, location engines, RF system design and analysis and measurement.

Nevertheless I miss a comparison of the obtained results with the state of the art location engines in the area, and to have some benchmarking of the work now produced.

Despite this I have some questions that I think could clarify better the proposed thesis. I will now focus the questions specifically in each chapter.

CHAPTER 1

I would like to see the main achievements obtained in this thesis and its comparison with the state of the art, clearly explained in the introduction.

CHAPTER 2

Page 5 – It is said after equation (2.1) that the n in this equation should vary between 1.6 and 6 for indoor and outdoor environments, but it is very strange that the value is 6, which means that the attenuation will rise at a power of 12!! Can you explain this further?

Page 7 – Where it says "To unambiguously localize a tag in a n-dimensional space .. information from at leat n+1 ", the objective is really to have n-dimensional location? Where n can be higher than 3?

Page 9 – The simulator described in section 2.3 is a system simulator mainly? How many RFID TAG's can be simulated simultaneously? Can interferers be simulated also?

CHAPTER 3

Page 15 – In this chapter the different methods for location are described, one of those is the distance and direction as presented in Fig. 3.3 b), but nothing is referred on the minimum and maximum distance the RXTX and the RXRX antenna should be. Can you clarify that further?

Page 19 – After the hard discussion on different methods made on this chapter it would be nice to have a comparison between them, mainly in terms of location resolution. What is your opinion of the best method to use in a general system?

Page 19 – The multi-carrier is a system with improvements regarding the last ones? Do you have any reference on this system implementation?

Page 20 – In your opinion what is the parameter that impact and increase the error significantly?

Page 23 – How do you unwrap the phases in this case? That is how to you guarantee that you measure the correct phase in these schemes?

Page 25 – What are the limitations of these methods, a discussion about this should eb very interesting.

CHAPTER 4

Page 28 – In Fig. 4.2 you describe a technique to eliminate the LO leakage, can you present or discuss what is the importance of this elimination for the location resolution?

Page 29-30 – You say that the RFID reader use ASK in page 29, butin page 30 you refer FSK, can you explain this better?

Page 34 – In the beginning of the page you refer that "This boost is started manually …", what manually means?

Page 35 – What was the maximum distance achieved between the RFID reader and the TAG?

Page 38 – In Fig. 4.12, an attenuator is used at the entrance of the RFID reader receiver; can you explain the use of this attenuator? This attenuator will have an impact on the system sensitivity, can you explain?

Page 39 – Since in the digital domain the implementation of a filter is quite simple, can you explain why the LO elimination is made in hardware and not in the digital domain?

Page 41 – How do you classify the constellation diagram in Fig. 4.13? It is ASK modulated?

Page 42 – You describe the switch matrix operation, what is the time the switch should be closed in order to have a correct measurement?

CHAPTER 5

Page 44 – In Fig. 5.3 b) the aspect of the constellation diagram is different from the one in Fig. 4.13 b), can you comment on this?

Page 47 – From the Impinj Monza Tag and the NXP G2XM one, a significant difference on the constellation diagram can be seen; can you explain why and discuss it?

Page 47 – The constellation diagram in Fig. 5.5 e) is completely different from the other ones, can you explain why? And how do you identify the differences automatically?

Page 47 – Have you measured what will happen if the GSM power is increased even more?

Page 48 – In Fig. 5.6 b) can you explain the different slopes of each curve?

Page 48 – What you mean by “light multipath”

Page 49 – It is not clear to me how do you obtain the CIR using commercial TAG’s can you explain this further?

Page 50 – In Fig. 5.9 can you explain the dip in the green curve?

Page 50 – Again you refer the antennas are separated by 0.25m, can you identify the minimum and maximum distance they should be?

Page 52 – For the calibration purpose, there is a TAG in a fixed location for the implementing the calibration?

CHAPTER 6

A good list of publications is presented.

Nuno Borges Carvalho

Prof. Catedrático da Universidade de Aveiro