

## Collaborative Research Programme Project Definition (1 of 2)



<b>Project Number:</b>	001
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<b>Project Title:</b>	Location Identification System Design and Algorithms
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<b>Relation to WRC Research Areas:</b>
Location Identification

<b>Background of Project Provider:</b>
Tait Electronics are seen as the main beneficiary of this project, due to them proposing the project and providing the funding to support the project. Other industrial organisations have been identified as potential benefactors and will be considered for inclusion in related/ on-going development work.

<b>Statement of Need:</b>
<p>When most people think of identifying location they think GPS; but what if you don't have a GPS unit?</p> <p>Cell phones signals can and are typically used to identify the location of a caller. This can be as simple as noting the cell tower to which a caller is registered which identifies the general geographical region of the user. Since there are many cell towers (<i>perhaps only 3km apart</i>) it is possible to identify a caller's location within a couple of km's. Using the signal arriving at other cell sites it may also be possible to identify location more accurately.</p> <p>Private Mobile Radio(PMR) systems can also apply the above techniques. However, the site separations can be as much as 50km. Thus knowing which site a caller is registered to is hardly an accurate location estimate. PMR systems therefore represent an unusual challenge to which various techniques can be applied to locate a caller.</p> <p>PMR channels are typically characterized by 12.5kHz channel spacing and are commonly limited to standard modulations and protocol structures. Further, these systems are deployed across rural, urban and city centre locations each creating different channel distortion characteristics.</p> <p>The problem therefore is to; within the constraints of the channels and modulation structure described, identify the location of a caller ideally within 200m but ranges as far as 2 or 3km also represent value. Accuracies of 200m could be applied to public safety markets. The longer range estimates can be applied to fleet management companies such as couriers; taxis etc that merely need to know roughly where the assets are located.</p> <p>It is anticipated that three key techniques require investigation to solve the above problem</p> <ul style="list-style-type: none"><li>• Improved synchronization techniques to accurately measure the relative time of arrival of the signals reaching sites. This includes the need to manage the effects of channel fading.</li><li>• System design. i.e site locations to allow best possible triangulation (<i>Clearly this is a geometric problem</i>).</li><li>• Applying statistical techniques such as Kalman Filtering to improve the location estimate over a period of time and to allow all sources of data to be considered in the estimate.</li></ul>

## Collaborative Research Programme Project Definition (2 of 2)



The output of the activity will be a description of

- How to design such a system.
- The algorithms should be applied.
- The physical and practical constraints.

### **Potential for Follow On Work:**

There is potential for follow on work to develop more sophisticated algorithms and systems leading to greater performance in location identification. This would be based on the research findings and success of the project defined above.

### **Anticipated Duration:**

The anticipated period for undertaking this project is 12 months, although the industry partner expects continuous engagement with the researchers, in order to make use of findings as early as possible and to transfer knowledge in the subject area to their staff and the WRC.

In addition, upon successful outcomes from this project it is hoped that the research will continue potentially supported by further funding.

### **Project Budget:**

\$75,000

(This is a nominal figure, the actually funding provided will be finalised once the project has been fully scoped.)

### **For further information Contact:**

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### **Appendices**

**Schedule A – Non-Disclosure Agreement**

**Schedule B – Intellectual Property Agreement**