Thesis title: High Dynamics GNSS Receiver **Topic number: AGD67**

Student Name: Cameron Cooke **Student ID: z3288185**

A. **Problem statement**

Development of High Dynamics GNSS receivers are vital for reducing the financial
burden of spaceflight. Accurate guidance can significantly reduce the fuel burn
Required, and helps ensure the safety of the crew. Unfortunately, high dynamics
significantly challenges the existing NAMURU GNSS receiver due to the stresses
placed up the tracking loops.

B. **Objective**

Improve the breaking point of the NAMURU receiver
Reduce the phase jitter of the NAMURU receiver
Develop a better understanding of the operation of the receiver
Simulate Launch and Re-Entry, ensuring reliable operation

C. **My solution**

Use a Monte Carlo simulation to identify significantly better settings to use
Analytically develop a value for the phase jitter due to vibration
Demonstrated operation during launch and re-entry using a GNSS simulator

D. **Contributions** (at most one per line, most important first)

Novel method for identifying optimum PLL bandwidth
Monte-Carlo simulation
Validating software simulation with hardware performance
Developing Laplace domain model
Identifying that PLL/FLL is actually PLL

E. **Suggestions for future work**

Further analysis of discrepancy between phase jitter and loop bandwidths
Measurement of Vibration errors using shaker-table
Implement changes in receiver

While I may have benefited from discussion with other people, I certify that this thesis is entirely my own work, except where appropriately documented acknowledgements are included.

Signature: Cameron Cooke Date: 29 October 2015

Thesis Pointers

List relevant page numbers in the column on the left. Be precise and selective: Don't list all pages of your thesis!

22	Problem Statement
22	Objective

Theory (up to 5 most relevant ideas)

34	PLL
101	Dynamics
38	Tracking loops
25	GNSS receivers

Method of solution (up to 5 most relevant points)

61	Novel method for identifying optimum PLL bandwidth
80	Monte-Carlo simulation
52	Developing Laplace domain model
52	Identifying that PLL/FLL is actually PLL

Contributions (most important first)

61	Novel method for identifying optimum PLL bandwidth
80	Monte-Carlo simulation
83	Validating software simulation with hardware performance
52	Developing Laplace domain model
52	Identifying that PLL/FLL is actually PLL

My work

45	System block diagrams/algorithms/equations solved
	Description of assessment criteria used
75	Description of procedure (e.g. for experiments)

Results

83	Succinct presentation of results
92	Analysis
92	Significance of results

Conclusion

95	Statement of whether the outcomes met the objectives
95	Suggestions for future research

Literature: (up to 5 most important references)

Ward	Phillip W Ward. Performance comparisons between fll, pll and a novel fll-assisted-pll carrier tracking loop under rf interference conditions. In Proceedings of the 11th International Technical Meeting of the Satellite Division of The Institute of Navigation, pages 783–795, 1998.

Kaplan	Elliott Kaplan and Christopher Hegarty. Understanding GPS: principles and applications. Artech house, 2005.
Kazemi	Pejman Lotfali Kazemi. Development of new filter and tracking schemes for weak gps signal tracking. Calgary, Alberta. Canada, University of Calgary. Department of Geomatics Engineering, 2010.
Gardner	Floyd M Gardner. Phaselock techniques. John Wiley & Sons, 2005