University of Victoria | Graduate Studies

Notice of the Final Oral Examination for the Degree of Master of Applied Science

of

MAAIKE VAN KOOTEN

BSc (University of Victoria, 2014)

"Investigation of Alternative Pyramid Wavefront Sensors"

Department of Mechanical Engineering

Thursday, July 7, 2016
1:00 P.M.
Engineering Office Wing
Room 230

Supervisory Committee:
Dr. Colin Bradley, Department of Mechanical Engineering, University of Victoria (Supervisor)
Dr. Jean-Pierre Veran, Department of Physics and Astronomy, UVic (Outside Member)

External Examiner:
Dr. Christian Marois, Department of Physics and Astronomy, UVic

Chair of Oral Examination:
Dr. Mauricio Garcia-Barrera, Department of Psychology, UVic

Dr. David Capson, Dean, Faculty of Graduate Studies

Abstract

A pyramid wavefront sensor (PWFS) bench has been setup at the National Research Council-Herzberg (Victoria, Canada) to investigate: the feasibility of a lenslet based PWFS and a double roof prism based PWFS as alternatives to a classical PWFS, as well as to test the proposed methodology for pyramid wavefront sensing to be used in NFIRAOS for the Thirty Meter Telescope (TMT). Traditional PWFS require shallow angles and strict apex tolerances, making them difficult to manufacture. Lenslet arrays, on the other hand, are common optical components that can be made to the desired specifications, thus making them readily available. A double roof prism pyramid, also readily available, has been shown to optically equivalent by optical designers. Characterizing these alternative pyramids, and understanding how they differ from a traditional pyramid will allow for the PWFS to become more widely used, especially in the laboratory setting. In this work, the response of the SUSS microOptics 300-4.7 array and two ios Optics roof prisms are compared to a double PWFS as well as an idealized PWFS. The evolution of the modulation and dithering hardware, the system control configuration, and the relationship between this system and NFIRAOS are also explored.