



ELECTRICAL & COMPUTER ENGINEERING SEMINAR

“Towards Numerical Growth Model for Laser Damage on Optical Coating with Application to Multilayer Measurement”

by

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Abstract: General precursors and growth model of Laser Induced Damage (LID) have been the focus of research in fused silica material, such as polishing residues, fractures, and contaminations. For multi-layers optical coating, the precursors and respective growth model due to nodule effect and micro-cracks (cone and plane cracks) are of special concern. Assuming the absorption due to trapped material and mechanical strength is the same across the surfaces, various studies have shown that the LID could be minimized by reducing the light field intensification of the layers upon the laser strikes. The light field intensification can be minimised by enhancing the geometrical factors towards the upper layers (for reflective coating) or exit surface (for anti-reflection coating).

Thus, a numerical model to predict the growth of a particular LID in multilayer optical coating is needed. The model will first estimate the light propagation and subsequently the field intensification within the nodule dimension. The field intensification can be altered by changing the Angle of Incidence (AOI), this will allow us to evaluate the geometrical factor of the nodule effect over the intensification. In order to further enhance the accuracy, the research will look into category (morphology) of LID as well as the surface measurement (with wavefront reconstruction) techniques that can be used to retrieve multilayer parameters. The analysis will enhance the accuracy of overall growth prediction within the topological distribution of LIDs. Some measures are proposed to reduce the LID by optimising the physical parameters based on this first stage evaluation.

This is joint work with C. S. Menoni, M. Ritschard, E. Chong, and X. Wang.

Biography: Dr Ching Seong Tan serves as the Associate Professor in Multimedia University, Malaysia. Concurrently, he is appointed as the Director of Graduate Institute of Engineering, that spearheads the development of postgraduate program in the Faculty of Engineering. He is also the recipient of J. William Fulbright Award 2012/2013. He is elected as the division head of my-CIE (International Commission of Illumination, Malaysia) in image technology.

Dr Tan received his first degree in 1998 at the University of Malaya, the oldest university in Malaysia. He then worked in Schlumberger (Drilling and Measurement) as the Drilling Services Engineer before joining NTU Singapore for his PhD in Engineering in 2002. Academically, he has served in various institutions as department head, research centre chair, and research team leader since 2005. He is a senior member of IEEE (the Institute of Electrical and Electronics Engineers), member of SPIE (International Society of Optical Engineering) and Chartered Engineer (Institute of Mechanical Engineer, UK).

Please contact Prof. Carmen Menoni (Carmen.Menoni@colostate.edu) or Ali Pezeshki (pezeshki@enr.colostate.edu), with any questions.