MT 066

Spot-size dependence of ablation parameters in visible nanosecond ablation of metallic substrates

Jenn Fishburn, Michael Withford, Daniel Brown & Jim Piper.
Centre for Lasers & Applications
Macquarie University, Sydney Australia.

Phase Explosion is a critical phenomenon occurring during nanosecond micro-ablation of metal at high energy densities (>10^5 J/cm^2). Highly energetic material removal results leading to loss of spatial resolution. Experimental evidence is presented investigating an unexpected spot size dependence of the energy density threshold for phase explosion in metals. Several spot sizes were investigated by exposing samples of Aluminium, Copper, Molybdenum and Tungsten to single shot, visible (511nm & 578nm), copper laser pulses (50ns) focussed by lenses of various focal lengths. Incident pulse energies were tailored using a wave-plate polariser to maintain an equal energy density for each spot size.

MT 068

Multiphoton excitation through scattering media: Monte Carlo simulations

Tadayuki Funaba & Graham Town
School of Electrical and Information Engineering,
University of Sydney, NSW.

Monte Carlo simulations were used to determine the intensity distribution and spot size of light focused into scattering media from a high numerical aperture lens. In media with tissue-like scattering properties, sufficient focusing for localised multiphoton excitation was observed at depths up to approximately 2 mean free paths. When focusing to larger depths, scattering prevented spatial localisation of the excitation.

MT 060

Physical interpretation of fluorescence waveforms from coupled energy levels

W.E.K Gibbs, V.K. Bogdanov, D.J. Booth
Centre for Imaging and Applied Optics, Swinburne Optronics and Laser Laboratories, Swinburne University of Technology, VIC.

The rising portion of the fluorescence waveform of an energy level that obtains significant population from the decay of a higher level can yield valuable information on the decay processes of the higher level. However, the physical interpretation of such waveforms depends on the relative magnitudes of the lifetimes of the two levels and in some cases can be counter-intuitive. For example, if the lifetime of the upper level greatly exceeds that of the lower level, the rise time of lower level equates to its own lifetime and its decay time equates to the lifetime of the higher level. This is illustrated by fluorescence measurements on erbium-doped fluoride glasses where relative lifetimes can change significantly with concentration.

MT 062

Laser-induced lesions in heart muscle to treat atrial fibrillation

Thang Ha, Judith Dawes and Michael Withford,
Centre for Lasers and Applications, Dept. of Physics,
Macquarie University, NSW
Duncan Guy and David Ross,
Dept. of Cardiology, Westmead Hospital, Westmead,
NSW

A proposed treatment for atrial fibrillation is to use laser radiation to denature specific regions of the heart muscle so as to suppress abnormal electrical circuits. Our aim is to optimise the laser parameters for inducing such lesions, while avoiding damage to surrounding tissue. We have created lesions under various laser irradiation conditions and measured the tissue temperature using a grid of thermistors. We plan to model the optical transmission and heat diffusion in the tissue, to compare with our experimental results.

MT 064

Stabilising the laser source for the Atomic Kilogram

Esa Jaatinen
CSIRO-National Measurement Laboratory, NSW

A novel laser frequency stabiliser is presented that provides two visible reference wavelengths separated by 7 nm from a single tunable laser. The stabiliser uses only one modulating element and can reduce the uncertainty in wavelength to less than 10^9. This source was used to measure the radius of a silicon sphere to the nearest nanometre.

MT 066

A novel high-throughput polarisation insensitive spectrometer for separation of closely-spaced fluorescence spectra.

Kian Wei Kho, Martin Harris, Gavan Rosman, and Alex Mazzolini
Centre for Imaging and Optics, Swinburne Optronics and Laser Laboratories, BSEE, Swinburne University of Technology, VIC.

A novel polarisation insensitive beamsplitter is presented, for use in a low-cost, high-throughput, prism-based spectrometer. This allows polarisation measurements to be carried out with minimum optical losses. In addition, a novel method for double-labelling fluorescence experiments is also presented.

MT 068

Physical and Theoretical Modelling of Peripheral Light Focussing Using an Anterior Eye Model

Valerian Kuznetsov1, Arthur Ho1 and Minas Coroneo2
1Cooperative Research Centre for Eye Research and Technology and 2Department of Ophthalmology, The University of New South Wales, NSW

There is a correlation between the location of foci of peripherally focussed incident light and the locations of certain types of sun-related eye diseases such as pterygium and cortical cataract.1 An increase of light exposure at the distal limbus using an eye model has been demonstrated before, but no quantification was given.2 We built an anterior eye model and measured the photometric effect of UV light on the distal limbus.