Decoding of atmospheric pressure plasma emission signals for process control

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Abstract: low-temperature, non-thermal atmospheric pressure plasmas (APP) are being developed for surface treatment of biomedical devices, sterilisation, and therapeutic techniques, such as wound sterilisation and cancer treatment. In addition to these medical applications, APP are now routinely employed in the automotive (car head lamps) and aerospace (fuselage and wing components) industry for surface activation of polymer prior to bonding. The impact of this technology offers enhanced quality of care at reduced cost and will be of immense societal and commercial value.

The invited plenary talk shall focus on the emerging plasma optical and electro-acoustic metrology that is being developed for these atmospheric pressure plasmas. In particular the requirement for extraction of information that describes the tempo-spatial heterogeneous processes, presently this technology is in its infancy when compared to low pressure plasma metrology. The new metrology multivariate analysis tools for the deconvolution and compression of single observables such as time-vary electrical current and electro-acoustic signals are presented for three different and contrasting plasma processes. The APP metrology will pertain to: the hand held plasma jet (needle) \textsuperscript{1} reel-to reel APP \textsuperscript{2, and 3}, and CNC controlled plasma jets \textsuperscript{4, and 5}.

Keywords: plasma, electrical harmonics, acoustic overtones, acoustic impedance

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