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PROFESSOR JOHN EDWARD ALLEN

SUMMARY OF RESEARCH CAREER

J.E. Allen was educated at Liverpool University where he studied Electrical Engineering in the immediate post-war years. He stayed on to work for a Ph.D. doing experimental work with high current spark discharges. These involved currents up to 265 kA which were the highest currents produced in any laboratory at that time.

In 1952 he went to join P.C. Thonemann who had just moved the Controlled Thermonuclear Reaction (Fusion) project to Harwell, after preliminary work at the Clarendon Laboratory, Oxford. At Harwell J.E.A. carried out both experimental and theoretical work on various aspects of Plasma Physics. The work included Langmuir probes, the A.B.R. (Allen-Boyd-Reynolds) theory being much used thereafter. Another important contribution was the discovery of solitary waves in Plasma Physics, the Adlam-Allen wave (1958). The non-linear interaction of such waves was studied later by Zabusky and Kruskal (1965) who coined the term "soliton".

In 1958 J.E.A. was invited by Amaldi to start a Plasma Group in Rome. This group started in the University of Rome (La Sapienza) and later moved to Frascati. He stayed for six years to build-up, with B. Brunelli, the Laboratorio Gas Ionizzati. During this time a post-graduate course was run in Rome, students worked on their final year theses and some undergraduate projects were carried out. J.E.A. had the courtesy title of Professor; only Italian nationals could hold an established Chair at that time.

In 1964 J.E.A. went to Cambridge, on the invitation of W.R. Hawthorne (later Master of Churchill College). In 1965, however, he moved to Oxford because there was a greater interest there in Plasma Physics at that time. This was partly due to the presence of nearby Government Establishments, Culham in particular.

At Oxford J.E.A. has carried out a broad programme of research in plasmas (mostly of a non-fusion kind). This has been largely basic in nature, but also directed towards plasma processing. The latter is of great importance in the microelectronics industry. Experiment and theory have been closely combined in all of this work. Since 1965 the programme has included, inter alia, current limitation in low pressure plasmas, further work on Langmuir probes and boundary phenomena, thermally produced alkali plasma, plasma dynamics including ion rarefaction waves, optically pumped plasmas, magnetohydrodynamics of liquid metals and radio-frequency plasmas for plasma etching.

His recent researches have been mostly on dusty plasmas. These include the formation of dust vortices, the fracture of self-organized assemblies of dust particles (known as a "plasma crystals") using a low-power laser beam, and the measurement of the dust charge by two different methods. Theoretical work has also been carried out, mainly dealing with the limited validity of the much-employed Orbital Motion Limited (OML) theory of particle charging.

His present work is a theoretical study of dust particles in tokamaks. This is being carried out in collaboration with Dr Michael Coppins and his group at Imperial College, London, where J.E.A. has been a Visiting Professor in Physics since 2004.