Introduction and welcome

In 1980 I was destroying power semiconductor devices using very short duration electrical overloads and it was perfectly obvious that there were thermal non-linearities which would have to be modelled. In discussions with Peter Johns he suggested that I should try his new technique, TLM. I have to say that I had no sense of where this might lead. During his lifetime Peter frequently worried about whether his baby would ever grow to maturity amongst the titans of finite difference and finite elements. The reality has been an exponential growth. There was a time when Philip Naylor in Nottingham maintained a database of all published work on TLM. I wonder it that is still possible to keep up with developments, given the range of applications and disciplines as well as the diversity of journals?

For many years there have been two distinct camps. The electromagnetic modellers worked with lossless networks and ignored resistive losses wherever possible. This is largely because in electromagnetic theory (as it currently stands) the parameters:

$$Z_0 = \sqrt{\frac{R + j\omega L}{G + j\omega C}}$$

$$\gamma = \sqrt{(R + j\omega L)(G + j\omega C)}$$

are very unpleasant entities to handle.

At the other side the thermal and particle diffusion modellers have tried to ignore the wave component as they have widened their range of applications.

In addition to these extremes there are also the acoustic modellers who face a set of different problems due to the propagation velocity of sound. Today we will hear of several other exciting new fields.

There are changes afoot and the traditional boundaries are becoming less clear. Electromagnetics modellers are now beginning to develop clever algorithms to

include resistive loss. For many high-speed thermal applications, heat-flow modellers must face the fact that there is a wave propagation component. Indeed, as I shall show later, the wave component is very important in many TLM treatments of physical phenomena, and so also is the resistive component.

I also have some concerns bearing on the matter of priority. At the Victoria Workshop on TLM last August there was much talk about alternating TLM (ATLM) where pulses can be considered to swap between meshes at successive itertations. Peter Russer who presented the ideas pointed out that this approach inhibited some of the spurious eigen-modes; for instance, one did not see anomalous 'jumps to zero'. I did take the opportunity to point out that this was effectively first mentioned by Pulko, Wilkinson and Gallagher in their paper "Redundancy and its implications in TLM". Similarly, the pioneering work by Al-Zeben, Saleh and Al-Omar on charge carrier transport in semiconductors significantly predates and was not referenced in a recent paper on methods of incorporating charged particle motion within a 2-D TLM field code.

Today's meeting represents a spontaneous coming together by those who use TLM in the wider sphere of applications. There is much room for the sharing of experience the cross-fertilisation of ideas and the provision of a sense of community. I hope that it is the first of many such events which will be held at regular intervals at different locations.

The plan is to follow this introduction by a presentation of some of the work which we are doing at UEA. We will then go to the King's Head at Bawburgh for a pub lunch. When we return we will continue the presentations by other groups and close the day with a discussion about the future.

I would like to thank everyone for coming and hope that it is a useful day.

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UEA, June 1996