

平成 16 年 11 月 19 日

応用物理学会北海道支部
会員各位

応用物理学会北海道支部

講演会のお知らせ

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演題：Role of simulation technologies in Research and Development of Surface Acoustic Wave Devices

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日時：平成 16 年 11 月 30 日（火） 16:30～17:30

場所：北海道大学工学部物理工学系大会議室(A1-17)

主催：応用物理学会北海道支部

講演の要旨

Presently, surface acoustic wave (SAW) filters are mass-produced and widely used in various consumer products and communication equipment. For their research and development, use of fast and precise simulation and design tools is essential, and much effort has been paid for their enhancement for many years.

Fortunately, recent rapid progress of computer technologies has made it possible to deal with large-scale problems using small personal computers. So as for computers, anyone can set up the latest research environment with small investment. The remaining task is to establish simulation and design software tools.

This talk reviews simulation technologies used in the research and development of modern SAW devices. Firstly, current status of modern SAW devices is surveyed and then simple discussion is presented on the role of the numerical simulation to clarify its applicability and necessity. Although a number of simulation techniques have been

developed, none of them are perfect. So we must select appropriate ones for each purpose with the trade-off between computation speed and precision.

The simulation techniques are categorized into two types. The first type is based upon phenomenological models, and is used in the optimization process. In this case, the calculation speed is very crucial as well as precision because the simulation will be executed for a huge number of iterations to search for the optimal solution. Presently, the coupling-of-modes, p-matrix and equivalent circuit models are widely used. In the second part of the talk, their use in practical device design is detailed.

The second type is based on the full-wave analysis, and is used for parameter extraction, design verification, theoretical examination, etc. where precision is more important than the calculation speed. In this category, the finite element method (FEM), boundary element method (BEM), spectral domain analysis (SDA) and their combinations are representative. In the third part of the talk, these techniques are practically applied in the SAW device design. It is also demonstrated how precise and speedy the phenomenological simulation can be performed provided that all necessary parameters were determined correctly in advance.

Once simulation tools are ready, it is a starting point of a trial road. This is because minor effects in former days become obvious after evolution, and further improvement is always necessary. In the final part of the talk, various hot topics in this direction are presented and hidden problems in current simulation tools are revealed.

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