ELECTROMAGNETIC MODELLING OF SUBMILLIMETRE-WAVE SYSTEMS

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At present time there is considerable interest in modelling the electromagnetic properties of submillimetre systems. For example, in the area of astronomical instruments, there are ongoing intensive activities to analyse the behaviour of optical systems corresponding to the projects "HARP", "ALMA" and ESA miss ions "HERSCHEL" and "PLANK". The reasons for this increased effort may be summarised as follows:

- The continuous improvement in receiver technology and fabrication of optical components. This clearly needed comparable progress in the modelling and design tools.
- The availability of commercial software packages which can provide accurate, yet fast modelling of optical systems at submillimetre wavelengths.
- The increased numerical processing speed of computers which allowed rigours mathematical analysis in commercial software packages.

In a previous paper we have presented results from **Phase I of** a study which was commissioned by ESA to investigate submillimetre-wave and far-infrared optical design and verification techniques. Those results focused on comparing the performance of several commercial software packages in analysing the behaviour of optical components (offset mirrors, lenses,…etc), when illuminated by near or far field sources. In this paper we present results from **phase II** of this study where we compare the performance of the same software packages (**GRASP, GLAD, ASAP, CODE V)** in analysing the optical system of one of **HIFI** channels of the space telescope HERSCHEL. The analysis is carried at the frequency range 480-640 GHz and focuses on the ability of the software packages to predict the following properties:

- The near and far field radiation patterns
- The vector nature of the electromagnetic fields
- The effect of the aperture distribution and precise location of the feed
- Comparison with the Gaussian analysis

In addition to comparing the results of the software packages we also discuss in details the strengths and weaknesses of each package. In particular we investigate the relation between the computed results by each package and the underlying theory of the package simulation. Finally, we would like to emphasise that an experimental system, capable of near field measurements, is now being built at SRON in order to verify experimentally the integrity of the simulated results.