

## Ansys + Vivo

“Before using Zemax, we did not have a ready-to-use design process for diffractive waveguides, so we were forced to develop our own solutions, which took months of time,” said Kong. “When Zemax came up with its own RCWA algorithm and built it into Ansys Zemax OpticStudio, we adopted the Zemax solution and made it a key part of our simulation workflow. This greatly simplified our work and helped save us a lot of time by no longer having to develop the solution by ourselves.”

**Deqing Kong**

Optical Engineer / Vivo Mobile Communications Co. Ltd.

# Vivo uses RCWA in Ansys Zemax OpticStudio to streamline and enhance how it designs cell phone and AR/VR industry products

By enhancing its optical design workflow using OpticStudio's native RCWA algorithm, Vivo boosts productivity to stay innovative and competitive in a fast-moving market.

## / Challenges

The customers for Vivo's products are continuously seeking new features and improvements that give them the latest and greatest applications of optics technologies. Many of the most impactful recent developments in this market use diffractive optical elements (DOEs), which utilize the wave characteristics of light to achieve new levels of functionality, performance, and miniaturization for camera lenses, as well as for augmented reality and virtual reality (AR/VR) equipment.

Designs that include DOE require diffractive optics simulation capabilities that go beyond those for traditional geometric optics. To achieve these DOE capabilities, Vivo wrote macros and other code that implemented the new simulation types needed for testing and tolerancing the DOE-based designs. Along the way, the company remained mindful of the ongoing need to achieve the levels of miniaturization and performance their customers expected.

Developing these designs gave Vivo access to valuable new features they could now offer in their cell phone and AR/VR products. But the time and effort required to develop the code for DOE simulations was prohibitive. To achieve the time-to-market goals required for keeping up a competitive advantage, Vivo wanted a highly reliable way of doing this work more quickly.

## / Ansys Products Used

- Ansys Zemax OpticStudio

## / Engineering Solution

The January 2020 release of OpticStudio 20.1 introduced native support for rigorous coupled-wave analysis (RCWA), a diffractive optics simulation algorithm from computational electromagnetics that represents devices and fields as a sum of spatial harmonics. RCWA is a powerful method for simulating diffraction efficiency as well as optical paths and their impacts, particularly in semiconductor and cell phone manufacturing and design. OpticStudio uses RCWA to track DOE parameters in ways that optimize performance of the entire system.

Using the RCWA method within OpticStudio for DOE designs requiring paraxial and periodic microstructure simulations saved Vivo time with their DOE-based optical simulations and analyses, replacing the need to write and test macros for each new DOE optical design.

"RCWA support, along with other diffractive optics features in OpticStudio, gave us the advantage of speed without sacrificing the accuracy of our results," said Deqing Kong, optical engineer at Vivo. "Many of the latest technologies in our industry are related to DOE, so choosing Zemax was important to us for gaining these capabilities."



## / Benefits

- Built-in “black box” functionality and the direct output of Monte Carlo simulations to spreadsheets and graphs
- Native support for volume holographic simulations in designing various AR/VR applications using Kogelnik’s method to calculate diffraction efficiency
- Results are not just faster – they’re also more accurate
- Enhanced functionality, increased productivity, and ease of use
- Integrates sequential and non-sequential modes in a single software package, and can simulate both diffractive and geometric optics within a single platform.

## / Company Description

China-based Vivo designs and develops consumer telecommunication devices and related technologies, including smartphones, smartphone accessories, software, and online services. It sells its products in more than 100 countries across Asia, the Pacific islands, South Asia, Europe, and the Middle East. With more than 10 years of experience in the cell phone market, Vivo is a top leader in its industry by global shipments and market share.

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