

Parabolic Dish in Vicinity of a Crane

WIPL-D Pro is a frequency-domain Method of Moments (MoM) based code which enables very accurate EM simulation of arbitrary 3D structures. Owing to application of sophisticated techniques, very large structures are simulated on PC computers or inexpensive workstations.

MoM Efficiency – Wire and Plate Modeling

WIPL-D software applies very sophisticated higher order basis functions (HOBFs) on quad patches and wires, which results in about 10 times less unknowns than in low-order MoM. Also, having wires as building elements enables the code to very efficiently model wire-like structures, such as the crane presented here, with many times less unknowns than equivalent all-plate models. Owing to this, significantly larger structures are quickly simulated on cheap PCs.

Smart Reduction of Expansion Order

This feature is especially suitable for antenna placement problems. It is based on adaptive reduction of current expansion order over parts of the model which are distant from the antenna or in shadow. This way, the **number of unknowns is reduced 2-10 times** depending on the model, while very good accuracy of calculated radiation pattern or coupling between multiple antennas is preserved.

Model Description

A parabolic dish antenna is located in the vicinity of a tower crane (Fig 1). The task is to examine the influence of the crane to the radiation pattern of the antenna.

The parabolic reflector diameter is 3.57 m and it is fed by a dual-mode horn with a choke. The system is designed for the operating frequency of 2.8 GHz. The crane is 30 m tall and its arms are 28 m long in total. Both the antenna and the crane are positioned above a perfect ground plane. The main radiation direction of the dish is towards the vertical boom, close to the place where the boom and the arms meet.

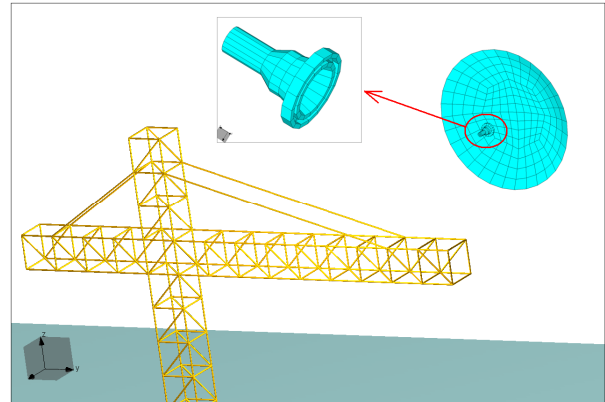


Figure 1. Dish in the vicinity of a crane

The radiation pattern with and without the crane is displayed in Fig 2. The results were obtained by MoM simulation with adaptive order reduction on an Intel Core 2 Quad CPU with 2.83 GHz clock rate using 5407 and 11506 unknowns (without and with the crane) which translates to 233 MB and 1060 MB of memory, respectively. The simulation took 28 sec and 173 sec, respectively.

Model	No. of unknowns	Disk space used	Simulation time
Dish only	5407	233 MB	28 sec
With crane	11506	1060 MB	173 sec

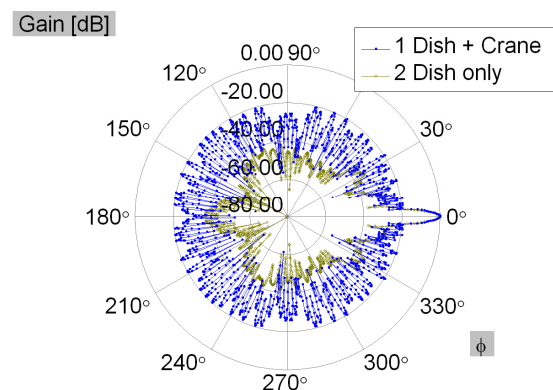


Figure 2. Influence of the crane to the radiation pattern