

## Pioneering Real Wireless Power Delivery™ at Ossia Inc.: FEKO in the Simulation Process



Ossia's Cota Tile, is the transmitter that can be embedded in the false roofing



### Key Highlights

#### Industry

Wireless Power, Communications

#### Challenge

Demonstrate the safe (to humans) transmission of power wirelessly from 2-3 meters away

#### Altair Solution

Using FEKO for simulations to demonstrate that the SAR limit for COTA technology use for wireless power charging is within the FCC mandated limit of 1.6 watts per kilogram.

#### Benefits

Safely charging devices wirelessly from a distance

### Ossia: Real Wireless Power™

Ossia is revolutionizing the mobility and connectivity of people and industries, by empowering industry leaders and service providers to create ecosystems for delivering smart wireless power to small devices. This advance is a total game-changer for the entire energy industry.

Ossia's patented wireless power Cota® technology is delivered much like WiFi, is inherently safe, and provides real wireless power through the air and over a distance, even while the device is in motion. Privately-held and headquartered in Bellevue, Washington, Ossia is dedicated to improving the way we live and do business.

Another key differentiator is that Ossia's technology does **not** require line-of-sight.

The Cota technology is the invention of physicist and technologist Hatem Zeine, who formed Ossia in 2008 and invented a series of patents on advancements in wireless power. The technology was first launched publicly in 2013, and since then Ossia's team of engineers has continued to evolve and improve on its wireless power technology.

Ossia envisions a world in which devices are smart to better serve mankind. By utilizing the Cota wireless power technology, these devices can be remotely powered for better content, optimal performance, and improved data capturing ability. Ossia's Cota wireless power makes plugs, cables and charging mats obsolete, while safely delivering wireless power at a distance.

Delivery of the power is automatic, without user intervention, it happens

# Pioneering Real Wireless Power Delivery™



**"The hybridization of MLFMM and FEM solvers implemented in FEKO is an outstanding tool for simulations of complex dielectric human phantoms in proximity to a large antenna array composed of hundreds of elements. FEKO has been a powerful and enabling tool for technology development at Ossia."**

**MEHDI VEYSI AND CANER GUCLU,**  
ENGINEERS, ANTENNA GROUP, OSSIA POWER

while in motion and to multiple devices and sensors at the same time, without the need for line of sight between the transmitter and receiver devices.

## How does Cota technology work?

The Cota technology uses radio frequency to deliver energy to devices. There are three main components of the Cota platform: The Cota Receiver, the Cota Transmitter, and the Cota Cloud.

The Cota Receiver is a tiny silicon chip, built right into the product. The receiver sends a beacon signal that uses walls, but not people or pets, to find a safe path to the transmitter. The Cota receiver chip is small, only 3mm x 3mm, and easily fits in smartphones, wearables, sensors, and other IoT devices. It can receive up to four watts of incoming radio frequency (RF) power from as many as four antennas simultaneously.

The Cota transmitter, which can be any shape, identifies the receiver's beacon signal and sends power back through all the same paths the receiver used. This multi-path functionality allows it to continuously and safely send power when needed. A single transmitter can power an entire room or vehicle. Multiple transmitters will power a whole building.

The Cota cloud is cloud-based software that helps manage connected devices, which provides total mobility, visibility, and flexibility when using the technology. All Cota-enabled devices can be activated, managed, and monitored via the Cota cloud platform, which brings a plethora of opportunities for businesses and consumers alike.

## The Safety Factor

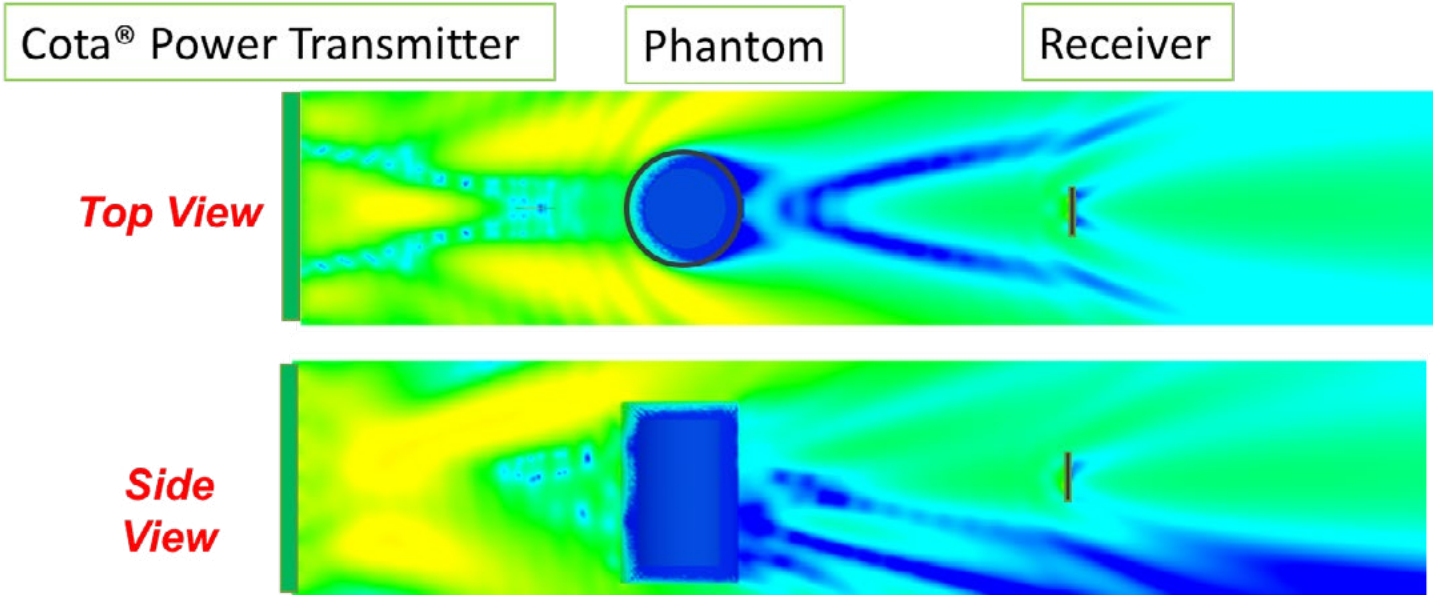
Wireless power transfer requires important considerations to account for the potential effects on objects that cross into the path. Living beings can unknowingly walk into the path.

Safety therefore becomes of paramount importance. In response, the Cota technology has been designed to safely transmit power around rather than through any obstructed paths.

The Federal Communications Commission (FCC) has regulatory authority for radio, television, wire, satellite and cable over all 50 states and sets the standards for communications law, regulation and technological innovation. The FCC mandated Specific Absorption Rate (SAR) limit for public exposure to power emitting from devices (e.g. microwave ovens, cellphones, etc) is at 1.6 watts per kilogram. These devices, including Cota technology, must undergo testing and demonstrate that these safety levels are met prior to formal approval for commercial use.

## Simulation for SAR

Simulation has been the ideal solution for Ossia's antenna group members, Mehdi Veysi and Caner Guclu, to



*Feko simulation results demonstrating the power density map generated by a Cota Power Transmitter at the presence of a cylinder phantom emulating a human body. Unlike the conventional beamforming techniques, the Cota technology utilizes the diffraction path to send the power around the phantom toward the client.*

measure whether Cota technology’s performance is compliant against the existing standards. Ossia engineers were able to perform simulations that modeled human tissue with actual characteristics, to demonstrate the performance of the technology against the required limits.

As described earlier, the Cota technology maintains its safety by identifying the non-obstructed paths through the beacon signal that reflects off walls and objects, while avoiding both people and pets.

Altair’s comprehensive electromagnetic software FEKO® offers both frequency and time domain solvers. Hybridized numerical methods enable efficient analysis of a broad spectrum of electromagnetic problems. Ossia engineers must solve 200+ antenna array elements in the presence of a human phantom. Their team successfully addressed this challenging task using FEKO’s hybrid solution by solving the human phantom with the

Finite Element Method (FEM) and the array with Method of Moments (MoM) or Multi-level Fast Multipole Method (MLFMM). FEKO’s scripting capabilities are also successfully utilized by the Ossia team to automate simulations with different array configurations and phantom locations. Thus, the setup time for each configuration was dramatically reduced and less prone to errors that occur during a manual process. Ossia engineers are now exploring the possibility expanding their scenarios to include multiple rooms and detailed phantoms that more accurately model reality.

“The hybridization of MLFMM and FEM solvers implemented in FEKO is an outstanding tool for simulations of complex dielectric human phantoms in proximity to a large antenna array composed of hundreds of elements. FEKO has been a powerful and enabling tool for technology development at Ossia.”

Simulations have successfully supported the testing of the technology at Ossia, which is helping to advance Cota wireless power into a mainstream technology.

Visit the HyperWorks library of  
**Success Stories**  
at [www.altairhyperworks.com](http://www.altairhyperworks.com)

## About Altair

Altair (Nasdaq:ALTR) is focused on the development and broad application of simulation technology to synthesize and optimize designs, processes and decisions for improved business performance. With more than 2,000 employees, Altair is headquartered in Troy, Michigan, USA and operates 69 offices throughout 24 countries. Altair serves more than 5,000 customers across broad industry segments.

[www.altair.com](http://www.altair.com)

---

## About HyperWorks

HyperWorks is the most comprehensive open-architecture simulation platform, offering technologies to design and optimize high performance, efficient and innovative products. HyperWorks includes modeling, analysis and optimization for structures, fluids, multi-body dynamics, electromagnetics and antenna placement, model-based development, and multiphysics. Users have full access to a wide suite of design, engineering, visualization, and data management solutions from Altair and its technology partners.

[www.altairhyperworks.com](http://www.altairhyperworks.com)



**Altair Engineering, Inc., World Headquarters:** 1820 E. Big Beaver Rd., Troy, MI 48083-2031 USA  
Phone: +1.248.614.2400 • Fax: +1.248.614.2411 • [www.altair.com](http://www.altair.com) • [info@altair.com](mailto:info@altair.com)

Altair®, HyperWorks®, RADIOSS®, HyperMesh®, BatchMesher™, HyperView®, HyperCrash®, HyperGraph®, HyperGraph®3D, HyperView Player®, OptiStruct®, HyperStudy®, HyperStudy®DSS, MotionView®, MotionSolve®, Altair Data Manager™, HyperWorks Process Manager™, HyperForm®, HyperXtrude®, GridWorks™, PBS Professional®, and e-Compute™ are trademarks of Altair Engineering, Inc. All other trademarks or servicemarks are the property of their respective owners.