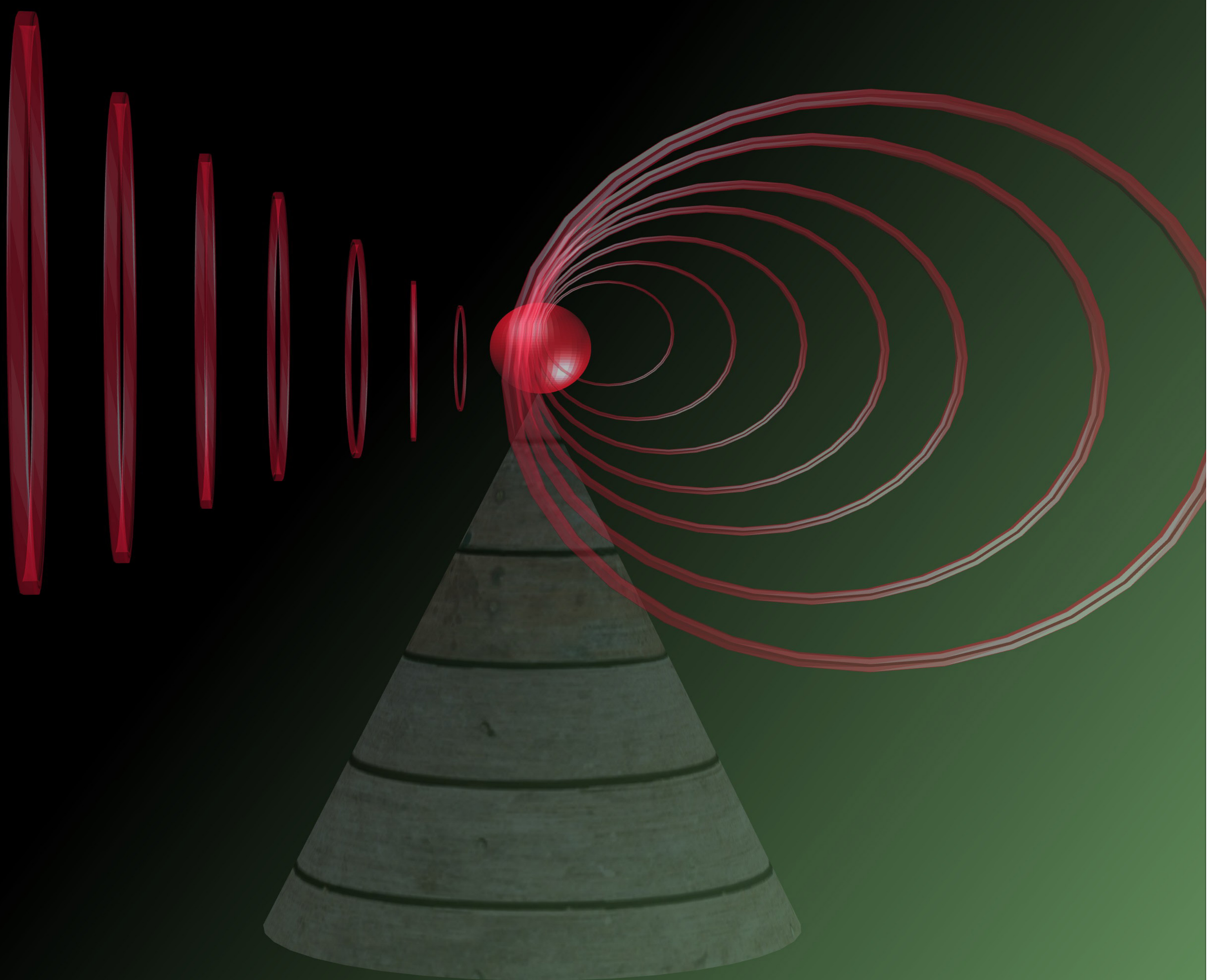
COLLINEAR ANTENNA ARRAY



Electro
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COLLINEAR ANTENNA ARRAY

A collinear antenna array is made up of dipole elements. These dipoles are parallel and collinear with each other. This type of antenna has an enhanced gain and directivity in E-plane. Doubling the number of dipole elements, shall double the gain. However, practically it is usually less than that due to losses. In this example, a collinear array operating at 3.2 GHz is simulated with HF-Works.

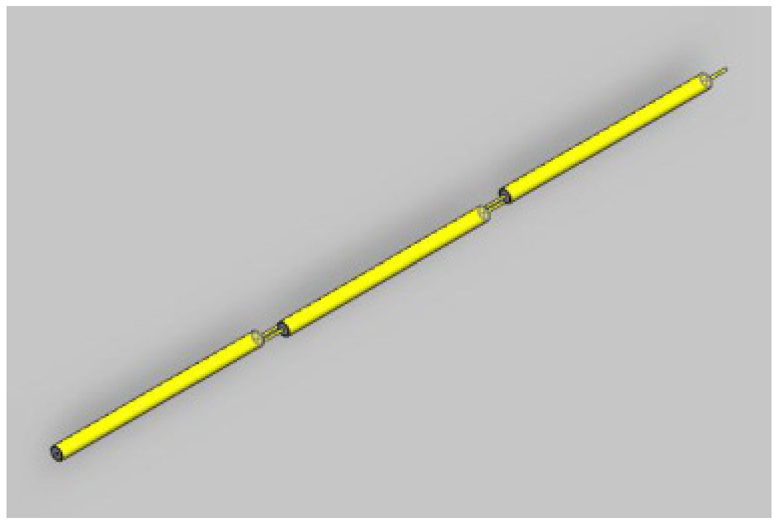
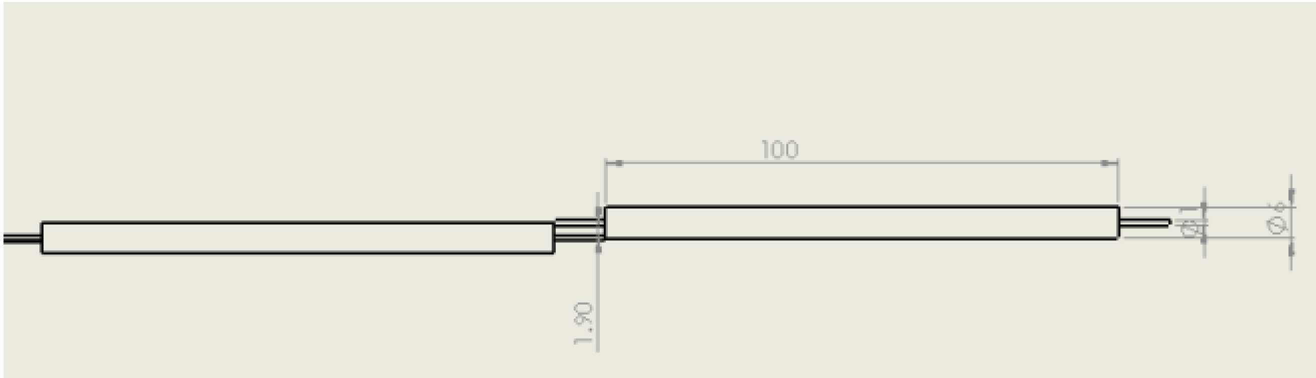


FIGURE 1: THE ANTENNA ARRAY

The antenna structure recalls the use of Franklin's principle in linking several radiating dipoles to sum up all radiations' intensities. Using 180° phase shifting between the dipoles to prevent destructive sums, the antenna can be implemented with other types of antenna dipole such as microstrip patch antenna.

DIMENSIONS



All dimensions are in mm. The schematic shows only the linking between two of the three dipoles: The second link being exactly built of the same manner.

SOLIDS AND MATERIALS

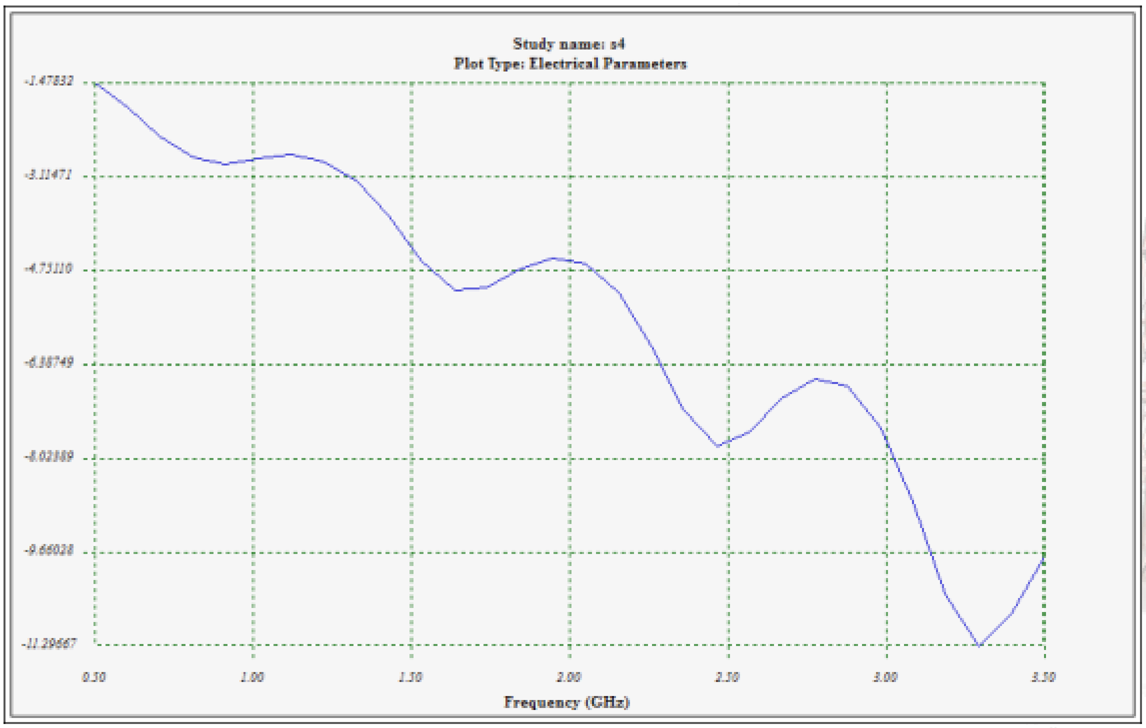
The feed of the antenna is located on the lateral face of one of its ends; the other end being an open circuit. Each dipole is treated like an insulating later of Duroid 5880 substrate with PEC inner and outer conductor layers. All dipoles are plunged in an air box whose lateral surfaces.

MESHING

The mesh of this example must be accurate enough on the circularly formed dipoles so that the simulator gets that the models are pretty circularly shaped and assigns fine mesh elements on the borders.

RESULTS

The meshing being realized, we run an antenna simulation in the frequency range from 0.5 GHz to 3.5 GHz to precisely visualize the behavior of the antenna around the intended frequency.



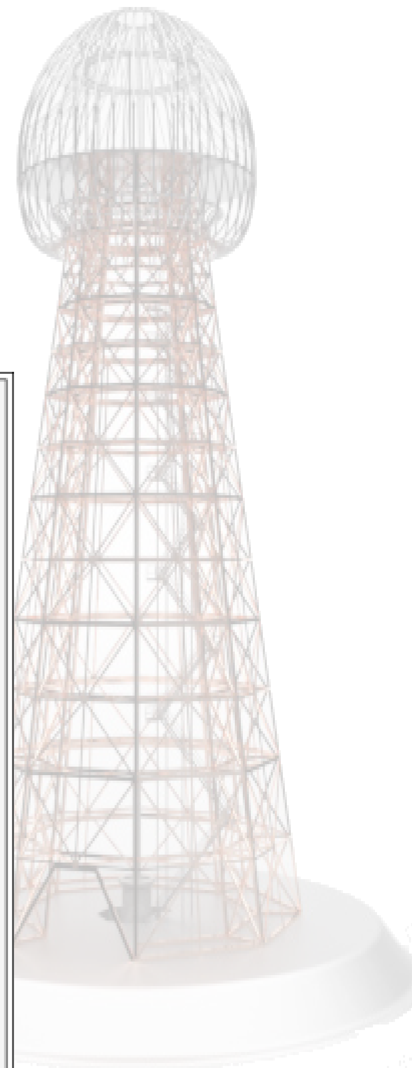


FIGURE 3: REFLECTION COEFFICIENT AT PORT 1

As we have seen in the dimension section, the full wavelength is about 100 millimeters which almost corresponds a frequency around 3 GHz. According to the curve above, we have reached a good level of return loss at 3.25 GHz: the curve keeps decreasing reaching an acceptable matching and proves the principle of the constructive sums of the three radiating dipoles. A further figure of the radiated total field will be shown later.

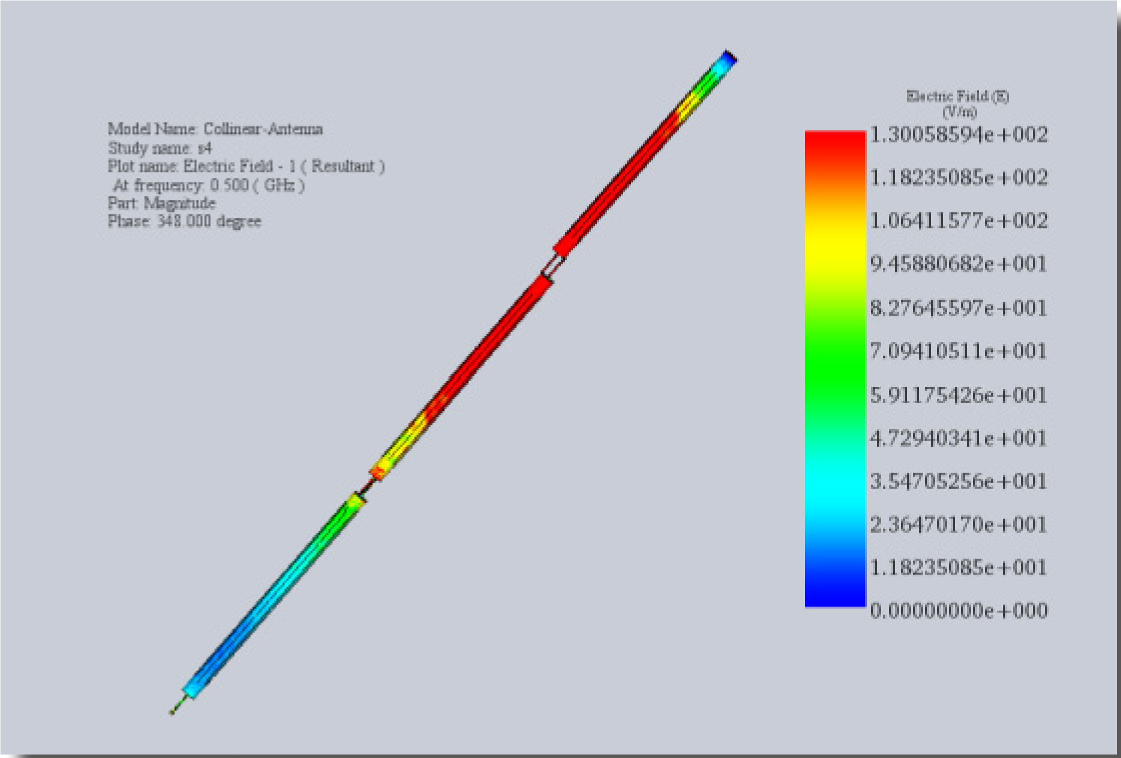


FIGURE 4: NEAR ELECTRIC FIELD DISTRIBUTION

We can refine the angles' steps during the creation of the study to get smooth plots whether in 2D or 3D. In this figure, we have plotted the 3D radiation of the electric field.

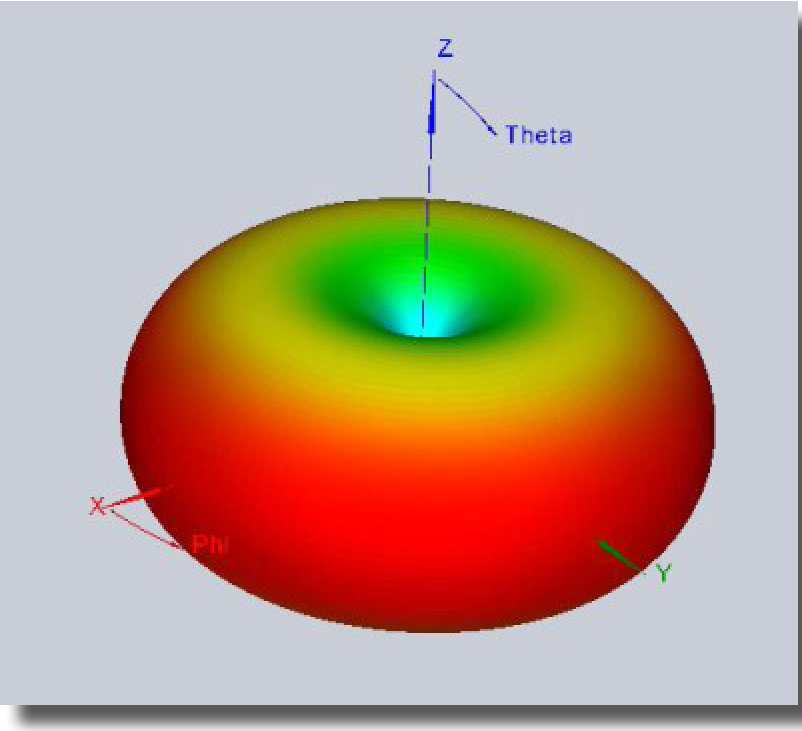
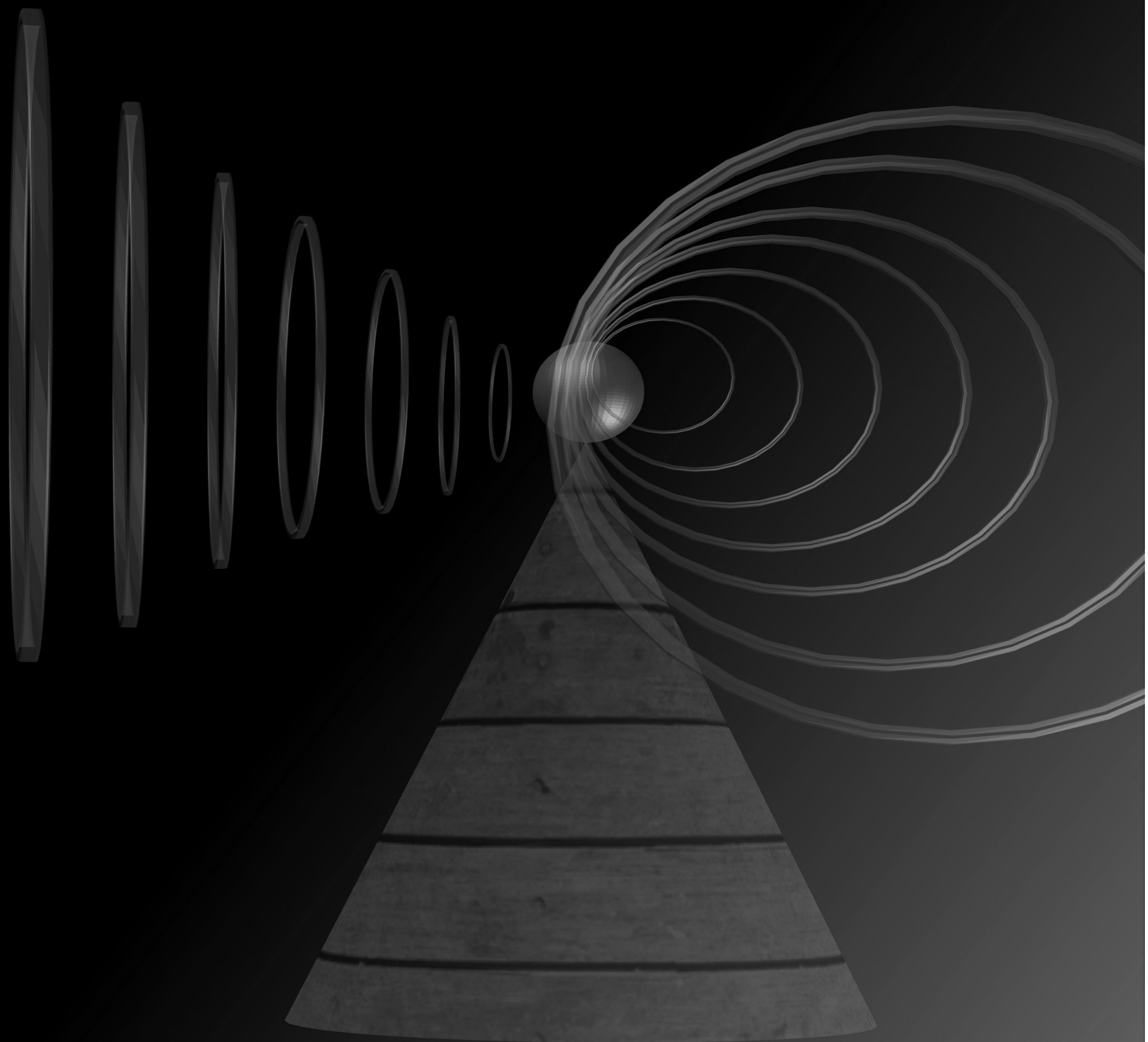


Figure 5: Far field distribution

CONCLUSION

This antenna has been optimized to respond to the specifications of the intended application, testing the precision and the principle of the Franklyn antenna; as we have seen, the antenna shows acceptable performances by operating within the right frequency range and with good levels on return loss around 3 GHz. Further tests for other Franklyn antenna types (mirostrip patch antennas) can be tested in HFWorks..



ElectroMagneticWorks Inc.
8300 St-Patrick, Suite 300, H8N 2H1, Lasalle, Qc, Canada +1 (514) 634 9797 |
www.emworks.com

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