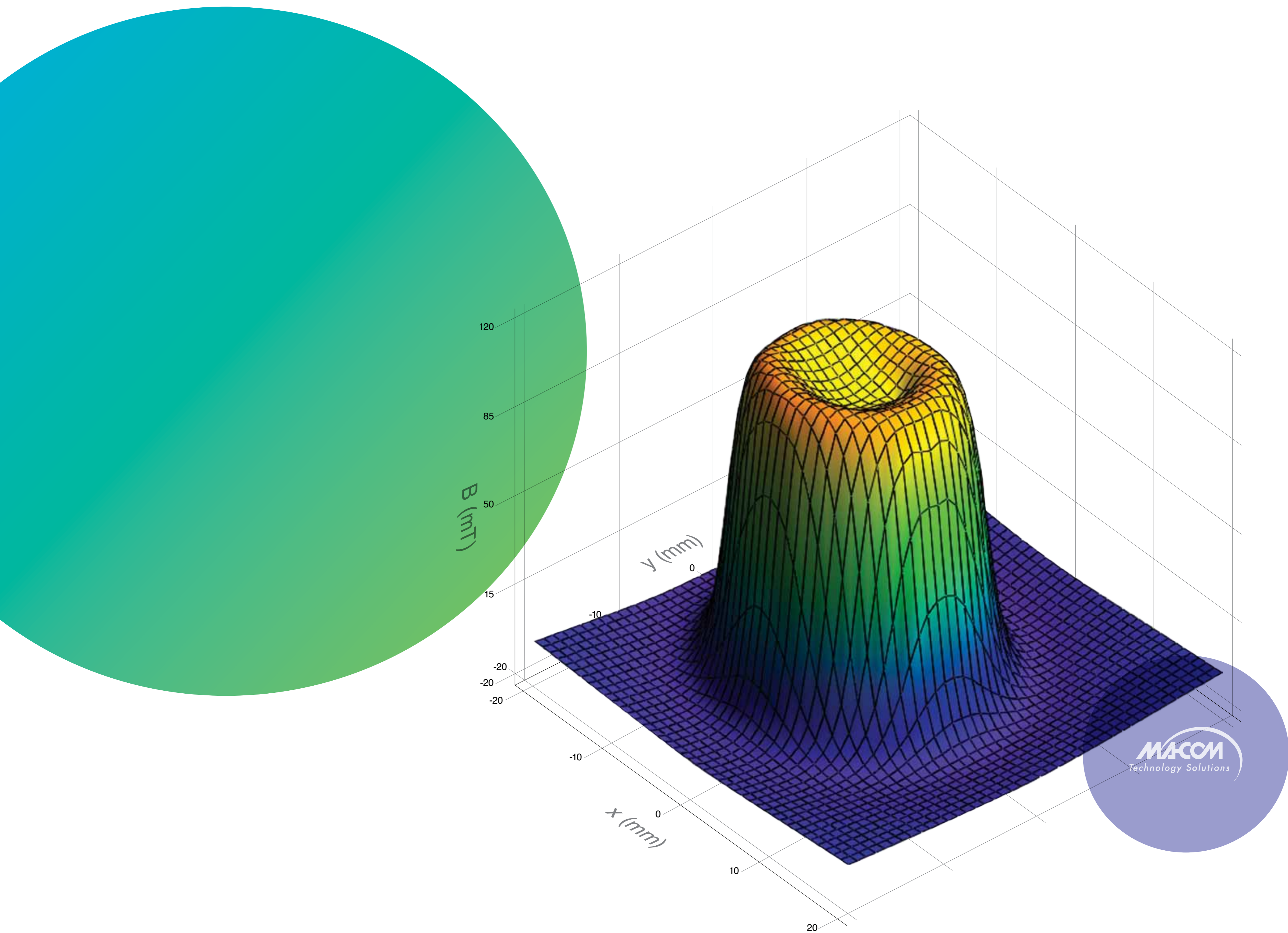


# DELIVERING FOR INDUSTRY M/A-COM



## INDUSTRY PROBLEM STATEMENT

M/A-COM Technology Solutions is a leading supplier of semiconductor components and subassemblies for use in radio frequency (RF), microwave and millimetre wave applications. RF circulators are an integral component in wireless infrastructure base stations. To facilitate M/A-Com in the development of next generation devices and insure commercial success, the continual optimisation and improvement of the circulator device in all parameters is critical.

## CRANN VALUE ADD

CRANN has world leading experts and infrastructure in a diverse range of research areas including magnetics. The research group of Prof. Michael Coey is active in many fundamental areas of research in magnetism and magnetic materials.

M/A-Com provided CRANN with device components and material samples. CRANN performed the characterisation of both soft and hard magnetic materials, utilised in the circulators' construction; conducted theoretical modelling and numerical simulations; and experiments to verify the field profiles produced by various magnetic circuits.

Magnetisation profiles of circulator components in external magnetic fields of up to 5 Tesla, have been obtained against temperatures permitting two dimensional interpolation for arbitrary fields and temperatures. Numerical finite elements models were developed for circulator structures with accuracy sufficient for commercial device design and optimisation, revealing two different dominating sources of field in homogeneity in the final assemblies – local variations of the orientation, and composition of the ceramic magnets and small angular deviations between the top and bottom cylindrical faces.

Work is ongoing with M/A-COM to further develop these techniques and new device designs and materials selection.

## CRITICAL CRANN ENABLERS

- Access to leading researchers in a specialised area.
- Access to materials expertise, literature and patent databases.
- Use of a wide range of advanced toolsets for magnetic materials characterisation.
- Computational analysis numerical models and finite element analysis.