

# Property and Performance Prediction of Meta Composites for Novel Applications.

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**Introduction:** Metacomposites are new class of materials engineered for unusual properties. The focus is on the modeling methods for predicting the effective properties of material and application performance.

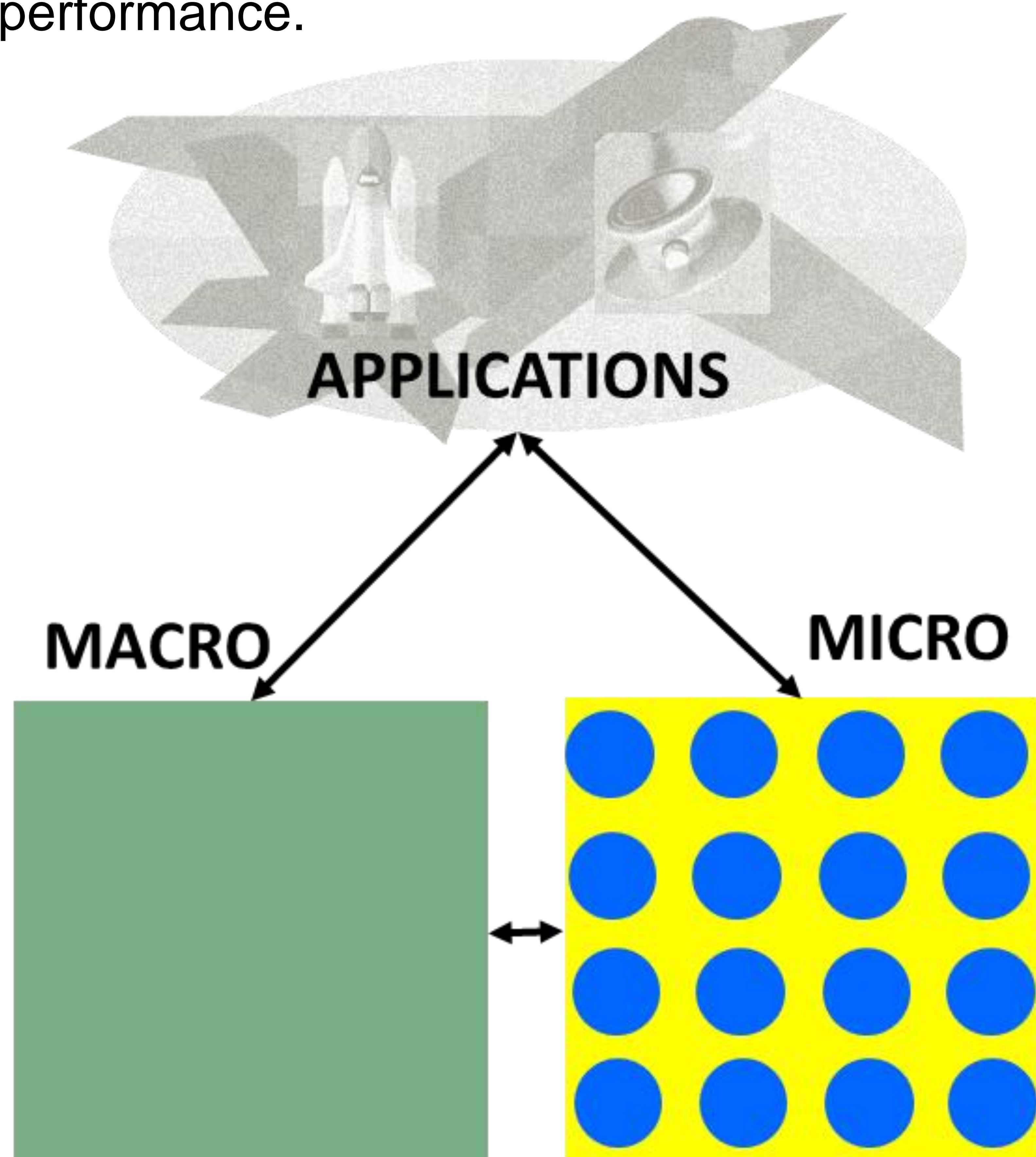


Figure 1. Multilevel macro and micro modeling

**Results:** The electromagnetic wave propagation in composite medium, negative refraction, electrostatic resonance and composite cloaking effects are described in this section.

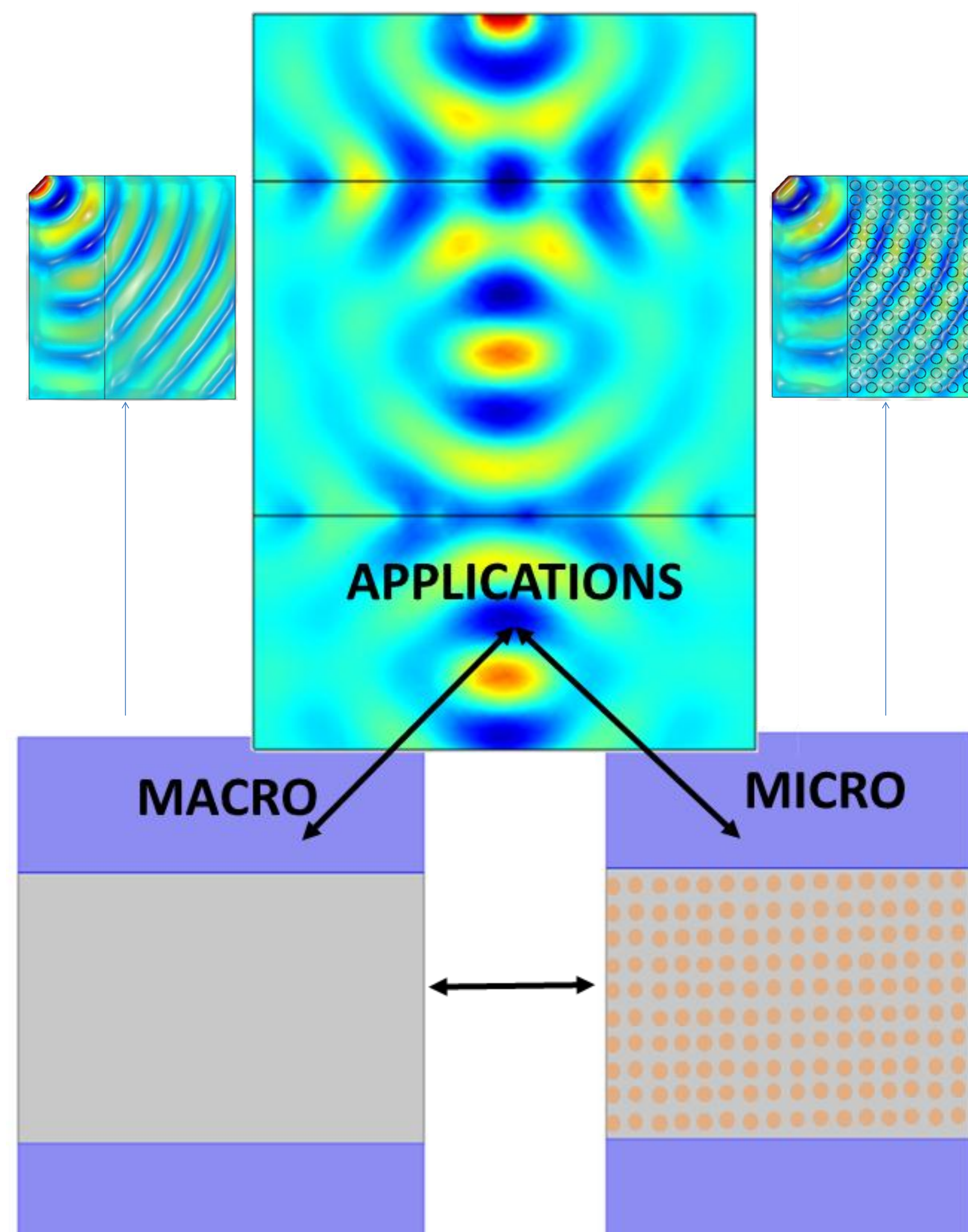


Figure 2. : Multi level model with simulation Results

**Governing Equations:** Electromagnetic and acoustical wave propagation equations

$$\nabla \times \bar{H} = \sigma \bar{E} + \varepsilon \frac{\partial \bar{E}}{\partial t}$$

$$\nabla \times \bar{E} = -\mu \frac{\partial \bar{H}}{\partial t}$$

Where,

$\bar{E}$ , electric field vector,

$\bar{H}$ , magnetic field vector,

$\sigma$ , conductivity,

$\varepsilon$ , permittivity,

$\mu$ , permeability.

$$\left( \nabla^2 - \frac{n^2}{c^2} \frac{\partial^2}{\partial t^2} \right) \psi = 0$$

$$\frac{1}{\rho_0 c_s^2} \frac{\partial^2 p}{\partial t^2} + \nabla \cdot \left( -\frac{1}{\rho_0} (\nabla p - q) \right) = Q$$

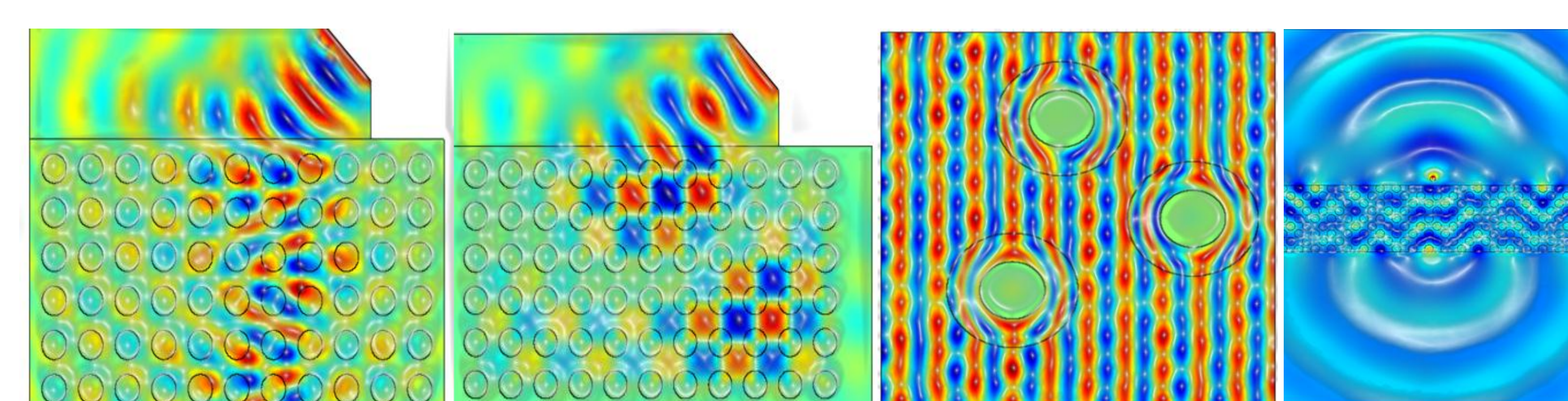


Figure 3. : Negative refraction, Electrostatic resonance, cloaking, acoustic super lens results

**Conclusions:** Acceleration of meta material and application development by multilevel computer aided micro mechanics models.