

MICROWAVE ABSORBING KITCHEN APRON

IITM Technology Available for Licensing

Problem Statement

- Leaks from microwave oven used in the kitchen is potentially **dangerous to the health** of the chef or people working nearby.
- Electromagnetic absorber** is a material which absorbs all the radiations falling at the **operating frequency** while minimizing the transmission and reflection. However, **the weight of such absorbers is not suitable** for a person to wear it as an apron.
- There is a **need for an apron that is designed using the concept of metamaterial based absorber** and absorbs the microwave at 2.45GHz.

Intellectual Property

- IITM IDF Ref.1504
- IN 513284 Patent Granted

TRL (Technology Readiness Level)

TRL 2 Technology concept formulated

Technology Category/ Market

Category- Advance Material & Manufacturing Industry Classification:

- NIC (2008)- 32902** Manufacture of protective safety equipment.
- NAICS (2022)- 339113-** Radiation shielding aprons, gloves, and sheeting manufacturing
- Applications:** Safety aprons, protective gears, Microwave radiation shields

Market drivers:

The global market for aprons was valued at USD 100 Billion in 2023 and is estimated to reach USD 141.56 Billion by 2030, growing at a CAGR of 4.5%

Research Lab

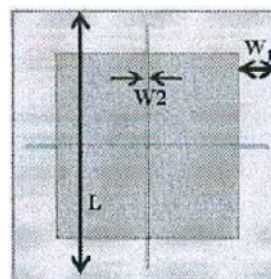
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Dept. of Physics

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(a)



(b)



(c)

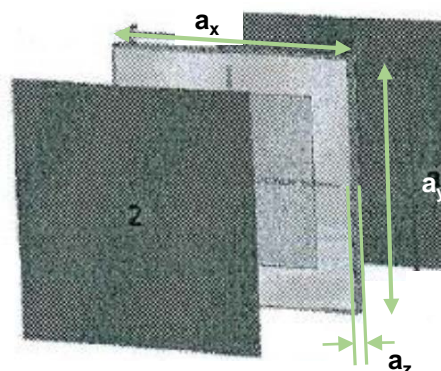


Figure: Schematic representation of unit cell of the proposed absorber. (a) Front view (b) Back view (c) Perspective view. The unit cell in this example (Fig.1) has dimensions, $a_x=27\text{mm}$, $a_y=27\text{mm}$, $a_z=1.58\text{mm}$ with the other optimized parameters are $W1=8.3\text{mm}$, $w2=0.25\text{mm}$, $L=26.5\text{mm}$.

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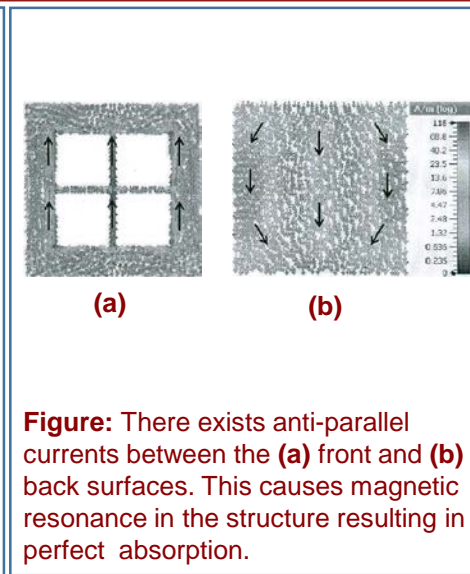
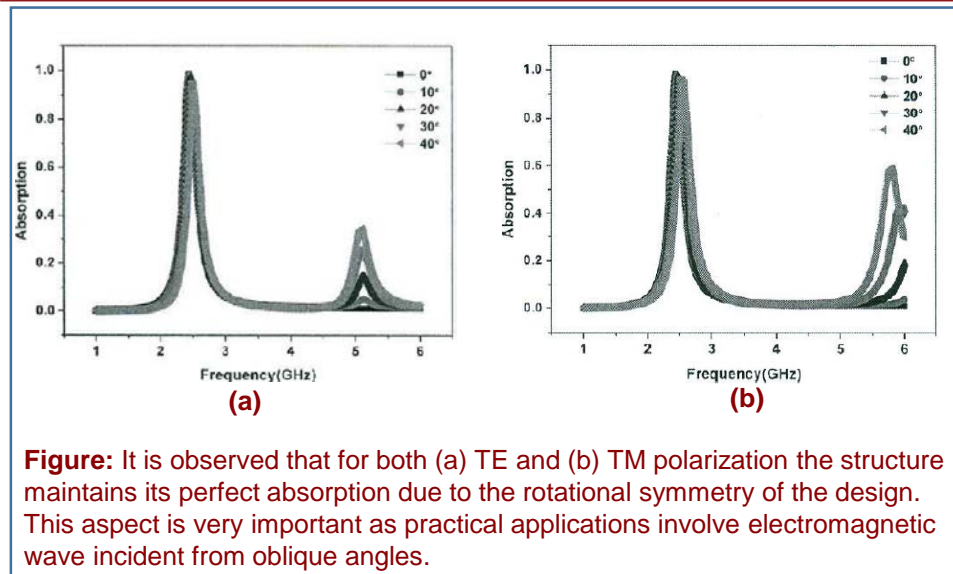
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Technology

-  The invention is a metamaterial based absorber operating at 2.45GHz which is the operating frequency of microwave oven.
-  The substrate used in this absorber is a flexible cloth type which makes the absorber wearable as safeguard apron
-  The metamaterial comprises of a metal-dielectric-metal configuration with metal on both sides of a flexible dielectric substrate (cotton with Dielectric constant of 1.91 and loss tangent of 0.07). The first layer is made of a metal such as copper in cross and square pattern. It is preferably of thickness 36µm and conductivity of 5.8x10⁷S/m.
-  The electromagnetic response by the structure is simulated with CST Microwave Studio. The design shows 99.2% absorption at 2.45GHz.

Key Features / Value Proposition

- The metamaterial based microwave absorbing structure is flexible, light weight and wearable and can be used to absorb the microwave leaking from the microwave ovens. Whereas, conventional meta-materials are complex and heavy making them unusable in aprons.
- Conventional metamaterials do not act on a number of frequencies and are prone to reflect the incident radiation causing harm to others around. Whereas the invented material effectively absorbs over 99% of the microwave radiation thereby safeguarding the personnel wearing it as well as people around such personnel.
- The disclosed absorber possesses preferable qualities such as thin width, polarization insensitivity and wide angle receptivity. angles. The design absorbs up to 90% of the radiation that falls on the apron within 40 degrees of incidence, irrespective of the nature of polarization.

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