

SYSTEMS AND DEVICES FOR MW HYPERTHERMIA AND HDR BRACHYTHERAPY

IITM Technology Available for Licensing

Problem Statement

- It is noted that Microwave energy is clinically being used for the treatment of cancer by ablation and hyperthermia.
- Hyperthermia treatment (HT) of cancer involves selective elevation of cancerous tissue temperature to 40-45°C.
- Various external heating devices, endocavitary, interstitial and intracavitary applicators were explored for treatment of cancer based on patent & non-patent literature survey.
- However, intracavitary applicators have **limited scope** for antenna optimization due to **stringent space constraints within the natural body cavity**. And said devices are **not clinically proven to use**.
- Hence, there is a requirement to introduce an improved **device** to mitigate above challenges & provide new **efficient solution**.
- This invention provides solution for said issues.

Technology Category/ Market

Technology: Microwave antenna device;

Industry: Healthcare; **Applications:** Bio-medical Engineering, Medical & Surgical device;

Market: The global microwave antenna market size is projected to **\$3.06B** by **2030**, at a **CAGR** of **5.1%** during period of 2022-2030.

Intellectual Property

IITM IDF Ref.:2028; IN Patent No. 437127

TRL (Technology Readiness Level)

TRL- 3/4, Proof of Concept & validated

Research Lab

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Technology

- Present invention describes a **microwave antenna device** configured to **provide effective hyperthermia treatment to a**

Technology

tissue volume at least one operating frequency F1.

- Said device comprises of
 - a) an applicator** of first diameter having front portion;
 - a coaxial monopole antenna** of second diameter smaller than first, wherein the antenna having **a central conductor** surrounded by **a coaxial conductor** having a wall thickness & with **an insulating material therebetween**, the central conductor extending towards the closed end of the applicator, the antenna having **an exposed conductor** of length L_e (121), and a **free insulated portion** of length g extending from the antenna junction;
 - c) a choke** of length C_1 & having **3rd diameter** & a **hollow annular space** therewithin, located on the coaxial conductor at a distance C_p from the antenna junction & open at one end.

Image of Microwave Antenna Device

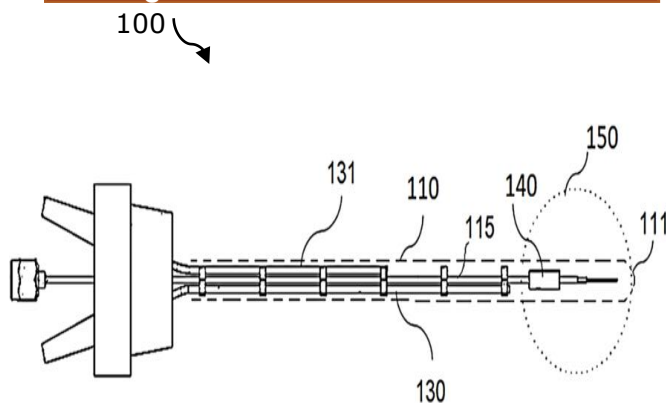


Fig.1: Illustrates a Microwave Antenna Device

Reference Details:

110:Applicator, **111:**a first diameter having a front portion of an applicator, **115:** a coaxial monopole antenna, **130,131:** inlet & outlet tube, **140:**a first choke, **150:** antenna active section,

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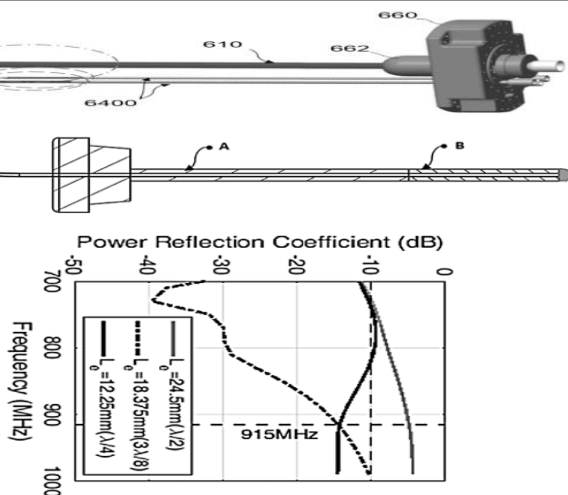
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Experimental Images

Fig.2a,2b&2c:depicts template with obturator for positioning intracavitary applicator and holes for placing interstitial catheters within tissue; Fig. 2b depicts tandem with brachytherapy template inserted, Fig.2c depicts graph of simulated & experimental power reflection coefficient of monopole antenna with choke.

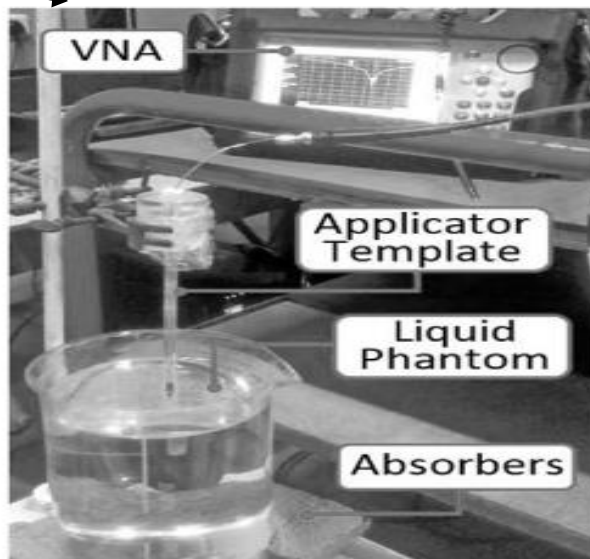
Fig.2a

Fig.2b



Experimental Setup

Experimental setup for power reflection, electric field and heating measurements



Key Features / Value Proposition

❖ Technical Perspective:

1. Claimed device includes one or more choke wherein **an annular space within the choke is filled with water as a coupling medium.**
2. **First choke & second chokes** are oriented so that the **first choke** is configured to allow the antenna to resonate **at a higher frequency F1 to produce hyperthermia at a higher intensity over a smaller volume**, and the second choke is configured to resonate at a **lower frequency F2** & cause a lower intensity hyperthermia over a larger volume.
3. The choke length is equal to **1/4 or 3/8** of the **wavelength of the microwave radiation** at the **operating frequency F1**. Further, said device provides **three frequencies F1, F2 & F3**.

❖ Industrial Perspective:

1. **Cost-effective** device for a low profile microwave antenna device, having a **catheter** with a pointed front portion configured to pierce tissue.
2. The advantage of **multifrequency approach** is that **various tumour sizes** can be conformally heated **without causing undesired healthy tissue heating**.

❖ User Perspective:

1. Ensures **more reliable & user-friendly device** by **Medical Trained Authorized technician**.
2. The Patented device is **compact in size**, having diameter of **2 mm or less**.
3. Facilitates **better local control, improved long term survival, & complete response**.

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