

COMPARISON OF THREE DIFFERENT TYPES OF WAVEGUIDE HORN APPLICATORS

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Introduction

Three different types of horn applicators (WHA, WSHA and SSHA – see Fig.1) are compared. All the three applicators were designed with the same geometrical dimensions and optimized by aid of 3D electromagnetic field simulator. Impedance matching measurements were done by aid of vector analyzer and SAR characteristic was obtained with infrared camera.

Methods and results

As a basic type of the applicator we consider the WHA (waveguide horn applicator). The geometrical dimensions were chosen according to principle that applicator works in the middle of the dominant mode TE_{10} pass band at working frequency 434 MHz. To decrease cut off frequency of this applicator it is filled by distilled water with $\epsilon_r = 81$. The dielectric lateral faces (WSHA, SSHA) have been used with the idea to achieve more uniform distribution in the aperture of the discussed applicator.

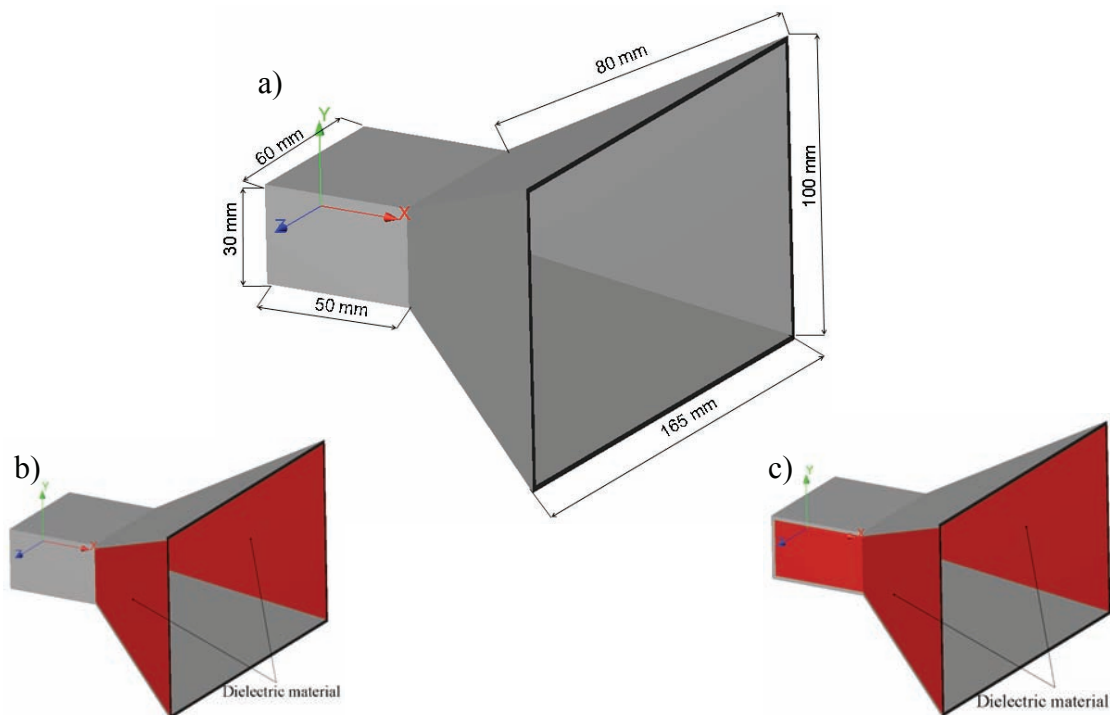


Fig. 1. Models of the three studied applicators:

- a) WHA – waveguide exciting horn aperture applicator
- b) WSHA – waveguide exciting strip-line type horn applicator
- c) SSHA – strip-line exciting strip-line type horn applicator

All mentioned applicators were designed and optimized by aid of 3D electromagnetic field simulator. Agar phantom with $\epsilon_r = 54$ and $\sigma = 0,8 \text{ S/m}$ was used. Two centimeters thick water bolus was used between aperture of the applicator and agar phantom. The impedance matching of the simulated applicators at working frequency 434 MHz are:

- WHA $S_{11} = -24,7 \text{ dB}$
- WSHA $S_{11} = -28,5 \text{ dB}$
- SSHA $S_{11} = -18,5 \text{ dB}$

Fig. 2 describes SAR characteristics of the applicators – input power is 100W.

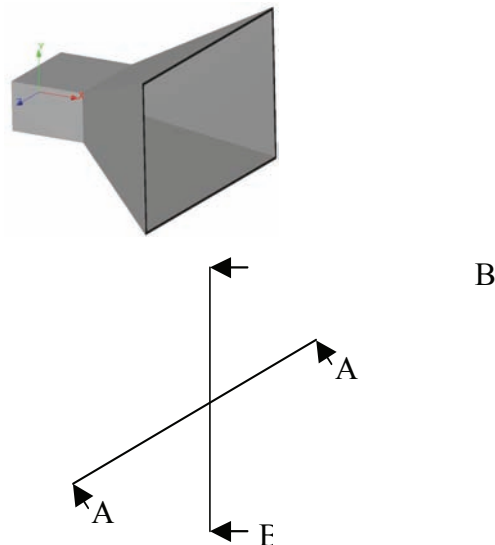
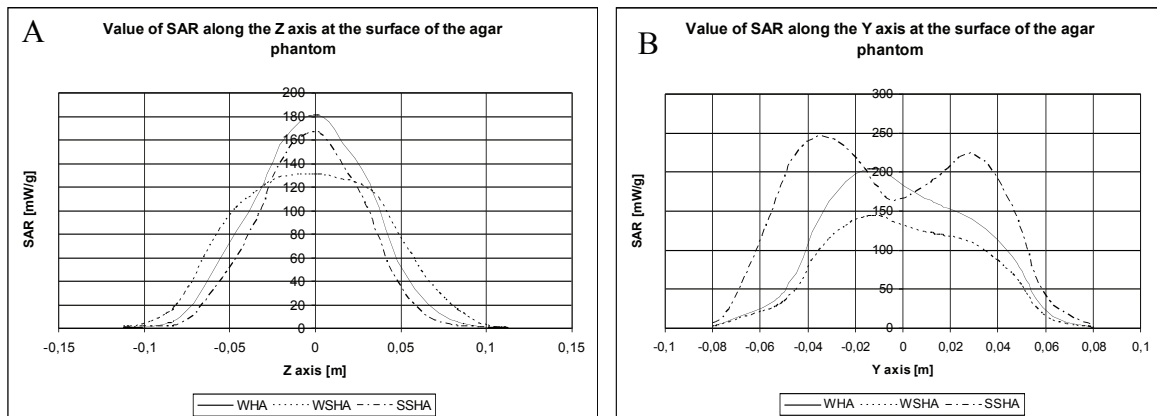


Fig. 2. SAR distribution along the Y and Z axis at the surface of the agar phantom

Conclusion

Three different types of applicators were compared in this paper according to criteria: achieved impedance matching and SAR distributions in two different cutting planes.

Acknowledgement

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