

BIOLOGICAL TISSUE-EQUIVALENT AGAR-BASED SOLID PHANTOMS FOR 3 TO 6 GHz AND SAR ESTIMATION USING THE THERMOGRAPHIC METHOD

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Recently, wireless systems used at high frequency, such as wireless LAN devices have become popular and the Ultra Wide Band (UWB) system was developed. In addition, the standardization of measurement method for Specific Absorption Rate (SAR) 30 MHz - 6 GHz is now in progress. In this paper, the biological tissue-equivalent agar-based solid phantoms from 3.0 to 6.0 GHz are described. The solid phantom composes of agar, deionized water, polyethylene powder, sodium chloride, TX-151 and sodium dehydroacetate. The phantoms can maintain its shape by itself. Another feature of the phantom is that arbitrary shapes can be fabricated easily using a mold. The developed phantoms can reproduce the electrical constants of biological tissues, e.g. the human head and body, within 5%, and it is not necessary to change the phantom for each frequency band in the range of 3.0 to 6.0 GHz during the measurements. The constants of this phantom can be adjusted mainly by using polyethylene powder and sodium chloride. The phantoms can be used to evaluate the Specific Absorption Rate (SAR) as well as antenna characteristics in the range of 3.0 to 6.0 GHz.

The investigation of SAR measurements is performed on the phantom at 5.2 GHz using the thermographic method. Calculations using the FD-TD method and the heat transfer equation are carried out in order to evaluate the thermal diffusion in the measurements using the thermographic method. The measured and calculated temperature distributions are in good agreement. There is evidence that the thermal diffusion influences the SAR estimation at 5.2 GHz more than a lower frequency range even though this method basically does not depend on the frequency.

Abstract Submission Form  
2004 National Radio Science  
Meeting

Abstract: onishi14966

Date Received: September 16, 2004

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2. K - Electromagnetics in  
Biology and Medicine
3. (a)
4. C - Contributed Paper,  
Program chair: Prof. K. Ito
5. Special Session: Human body  
phantoms for wideband EM  
interactions