

RF・マイクロ波領域における生体組織の電磁特性とその応用 Electromagnetic Properties of Biological Tissue in RF and Microwave Frequencies and Their Applications

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概要

RF やマイクロ波は情報伝達のみならず，選択性，効率，安全性の点からも優れたエネルギーとして近年の，工業・科学・医療分野において更なる応用技術が進んでいる．本稿では医療分野を含めた生体への応用開発を進めるために，生体組織の特性についての基本的な特性についてまとめ，これらの応用の一端についての展開およびそれらの関連技術について検討する．

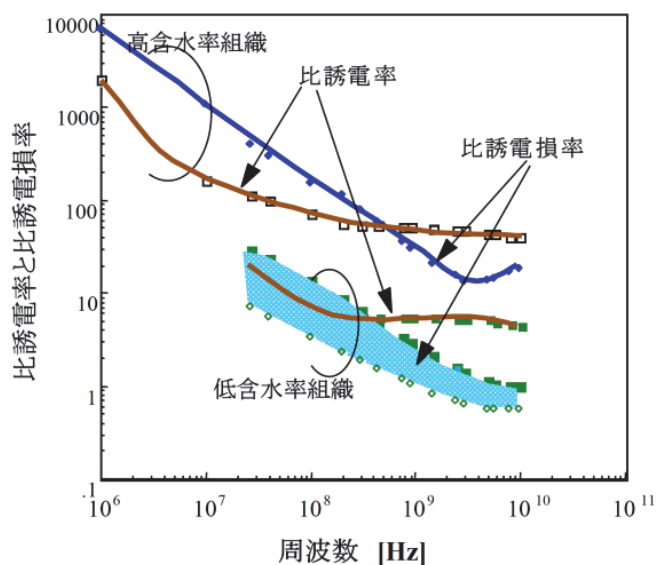


図1 生体組織の比誘電率と比誘電損率

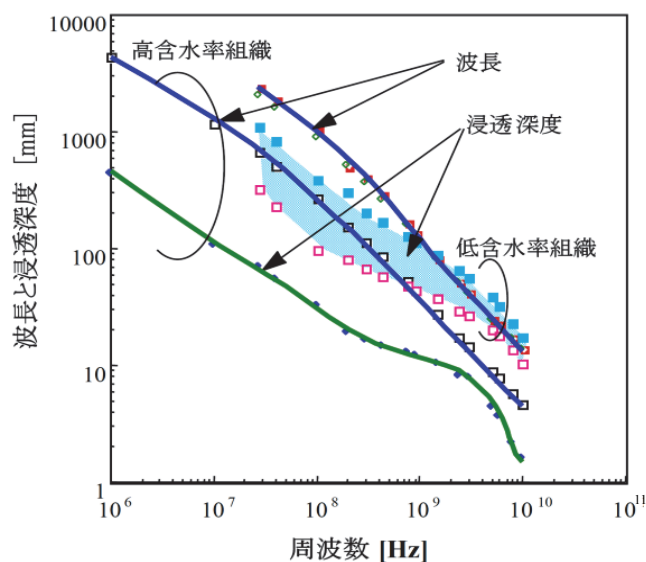


図2 生体組織中における平面波の波長と浸透深度

Abstract

It is very important to know electromagnetic (EM) properties of biological tissues to obtain biological information especially noninvasively. For this objective, it is effective to use electromagnetic (EM) waves over infrared. To obtain the biological information with high resolution, it is necessary to use shorter wavelength which is higher frequency of EM waves. Nevertheless, if the wavelength becomes shorter, the penetration depth of the EM wave becomes shallower, then it is more difficult to obtain the information of deeper area inside human body in higher frequencies. In this report, using wide range EM waves throughout infrared, acquisition technique of biological information from deep to shallow area is summarized. Using infrared, heart rate can be easily detected by reflection type photosensor devices. Using microwaves and millimeter-waves, complex permittivity inside human body can be easily detected. To know the temperature of the tissues is also very important to obtain information with higher accuracy. For this objective, MRI is very effective. The results show the usefulness of EM waves in application to receive information from human body.