Defense Announcement

ASSESSMENT OF TIME REVERSAL METHODS USED FOR RF HYPERTHERMIA IN CANCER TREATMENT

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Radio frequency (RF) hyperthermia, for which cell temperatures are increased to 41-45 °C, is a well-recognized method for treatment of malignant tumors. However, it suffers from the lack of selectivity towards cancer tissue. An optimized hyperthermia method, time reversal (TR) technique, is introduced to enhance specific heating on the target while reducing the non-specific heating elsewhere. TR is applied to electromagnetics (EM) recently because of its intrinsic temporal and spatial focusing properties from the linear reciprocity of the Maxwell's equations. It utilizes the time reversal mirror (TRM) to record the EM waves emitted from a source and reemit the time-reversed version back to the source. By collecting the scrambled information dispersed in the reflection and scattering, the original source signal is rebuilt and a high-intensity focus is observed at the source location. Owing to its focusing properties, EM TR has been applied in areas such as wireless communication and geophysics. The possible application of TR in hyperthermia is assessed and investigated.