More specifically, when the state of the interior of an object is known, calculating measurement data, which is the data measured as scattered waves relative to radio waves incident on the object, is easy as it is a forward problem. However, calculating the state of the interior of an object when the measurement data is known is difficult as it is an inverse problem.

[0007]

Radio waves incident on an object may contain a large number of frequency components. Different radio wave frequencies result in different dielectric constants in the object and different radio wave propagation speeds. Stated differently, radio waves are characterized by a plurality of propagation speeds corresponding to the plurality of frequency components. Because the measurement data is affected by this, it is difficult to calculate the state of the interior of an object from the measurement data.

[0008]

In view of this, embodiments of the present disclosure provide a scattering tomography device and the like that can generate a highly accurate image of the interior of an object using scattered waves of radio waves.

[Solution to Problem]

[0009]

According to a first aspect of the present disclosure, there is provided a scattering tomography device including: a transmitting antenna element that transmits radio waves into an interior of an object from outside the object; a receiving antenna element that receives, outside the object, scattered waves of the radio waves transmitted into the interior of the object; and an information processing circuit that generates an image of the interior of the object using measurement data indicating the scattered waves received by the receiving antenna element. The information processing circuit: derives, using the measurement data, a relational expression that satisfies an equation whose solution is a scattering field function that takes a transmission position of the radio waves and a reception position of the scattered waves as inputs and outputs an amount of the scattered waves at the reception position; derives, using the relational expression, an image function that is for generating the image and includes one or more parameters indicating a correspondence between a change in frequency of the radio waves and a change in a dielectric constant of the object in accordance with Debye relaxation; and generates the image using the image function.

[0009a]

According to a second aspect of the present disclosure, there is provided a scattering tomography method including: transmitting, by a transmitting antenna element, radio waves into an interior of an

object from outside the object; receiving, outside the object, by a receiving antenna element, scattered waves of the radio waves transmitted into the interior of the object; and generating an image of the interior of the object using measurement data indicating the scattered waves received by the receiving antenna element, wherein the generating includes: deriving, using the measurement data, a relational expression that satisfies an equation whose solution is a scattering field function that takes a transmission position of the radio waves and a reception position of the scattered waves as inputs and outputs an amount of the scattered waves at the reception position; deriving, using the relational expression, an image function that is for generating the image and includes one or more parameters indicating a correspondence between a change in frequency of the radio waves and a change in a dielectric constant of the object in accordance with Debye relaxation; and generating the image using the image function.

[0010]

These general or specific aspects may be implemented as a system, a device or apparatus, a method, an integrated circuit, a computer program, or a non-transitory computer-readable recording medium such a CD-ROM, or any combination thereof.

[Advantageous Effects of Invention]

[0011]

According to embodiments of the present disclosure, it is possible to generate a highly accurate image of the interior of an object using scattered waves of radio waves.

[Brief Description of Drawings]

[0012]

[FIG. 1]

FIG. 1 is a graph illustrating the frequency dependence of the dielectric constant and the Debye relaxation of water at 30 °C according to an embodiment of the present disclosure.

[FIG. 2A]

FIG. 2A is a graph illustrating the relative dielectric constant of breast adipose tissue for each frequency according to an embodiment of the present disclosure.

[FIG. 2B]

FIG. 2B is a graph illustrating the effective conductivity of breast adipose tissue for each frequency according to an embodiment of the present disclosure.

[FIG. 3]

FIG. 3 schematically illustrates a measurement apparatus used to measure the dielectric constant of an excised sample according to an embodiment of the present disclosure.

[FIG. 4]