

## References Alternative Dielectric Properties

v4.2 (04.06.2024)

**References for the alternative dielectric properties of tissues** listed in our material properties database. Tissues, which do not have available literature values in the database, are substituted with values from other similar tissues. In these cases, the tissue used is listed instead of a reference. All other tissue parameters are the same as in the main tissue properties database.

**Table 1:** References for the density of tissues

Tissue	Reference
Bile	Sasaki, Wake, and Watanabe <a href="#">2014</a>
Blood	Sasaki, Wake, and Watanabe <a href="#">2014</a>
Bone (Cancellous)	Sasaki, Wake, and Watanabe <a href="#">2014</a>
Bone (Cortical)	Sasaki, Wake, and Watanabe <a href="#">2014</a>
Bone Marrow (Yellow)	Sasaki, Wake, and Watanabe <a href="#">2014</a>
Brain	Cerebellum
Brain (Grey Matter)	Sasaki, Wake, and Watanabe <a href="#">2014</a>
Brain (White Matter)	Sasaki, Wake, and Watanabe <a href="#">2014</a>
Breast Fat	Fat
Bronchi	Blood Vessel Wall
Cartilage	Sasaki, Wake, and Watanabe <a href="#">2014</a>
Cerebellum	sasaki2014
Cerebrospinal Fluid	Sasaki, Wake, and Watanabe <a href="#">2014</a>
Cervix	Uterus
Commissura Anterior	Brain(White Matter)
Commissura Posterior	Brain(White Matter)
Diaphragm	Muscle
Ductus Deferens	Blood Vessel Wall
Dura	Sasaki, Wake, and Watanabe <a href="#">2014</a>
Epididymis	Testis
Esophagus	Stomach
Esophagus Lumen	Air
Extracellular Fluids	Cerebrospinal Fluid
Eye (Aqueous Humor)	Cerebrospinal Fluid
Eye (Choroid)	Blood
Eye (Ciliary Body)	Muscle
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**Table 1:** continued from previous page

<b>Tissue</b>	<b>Reference</b>
Eye (Cornea)	Sasaki, Wake, and Watanabe <a href="#">2014</a>
Eye (Iris)	Muscle
Eye (Lens)	Eye Lens (Nucleus)
Eye (Retina)	Brain (Grey Matter)
Eye (Sclera)	Sasaki, Wake, and Watanabe <a href="#">2014</a>
Eye (Vitreous Humor)	Sasaki, Wake, and Watanabe <a href="#">2014</a>
Eye (Vitreous Humor)	Sasaki, Wake, and Watanabe <a href="#">2014</a>
Eye Lens (Cortex)	Sasaki, Wake, and Watanabe <a href="#">2014</a>
Eye Lens (Nucleus)	Sasaki, Wake, and Watanabe <a href="#">2014</a>
Fat	Sasaki, Wake, and Watanabe <a href="#">2014</a>
Fat (Average Infiltrated)	Fat
Gallbladder	Sasaki, Wake, and Watanabe <a href="#">2014</a>
Heart Lumen	Blood
Heart Muscle	Sasaki, Wake, and Watanabe <a href="#">2014</a>
Hippocampus	Brain (Grey Matter)
Hypophysis	Thyroid Gland
Hypothalamus	Brain (Grey Matter)
Intervertebral Disc	Cartilage
Kidney	Sasaki, Wake, and Watanabe <a href="#">2014</a>
Kidney (Cortex)	Kidney
Kidney (Medulla)	Kidney
Large Intestine	Kidney
Large Intestine Lumen	Muscle
Larynx	Cartilage
Liver	Sasaki, Wake, and Watanabe <a href="#">2014</a>
Lung	Sasaki, Wake, and Watanabe <a href="#">2014</a>
Lung (Deflated)	Sasaki, Wake, and Watanabe <a href="#">2014</a>
Lung (Inflated)	Sasaki, Wake, and Watanabe <a href="#">2014</a>
Mandible	Bone (Cortical)
Medulla Oblongata	Cerebellum
Meniscus	Cartilage
Midbrain	Cerebellum
Mucous Membrane	Muscle
Muscle	Sasaki, Wake, and Watanabe <a href="#">2014</a>
Nerve	Sasaki, Wake, and Watanabe <a href="#">2014</a>
Ovary	Sasaki, Wake, and Watanabe <a href="#">2014</a>
Pancreas	Thyroid Gland
Penis	Blood Vessel Wall
Pineal Body	Thyroid Gland
Placenta	Sasaki, Wake, and Watanabe <a href="#">2014</a>
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Tissue	Reference
Pons	Cerebellum
Prostate	Testis
Salivary Gland	Prostate
SAT (Subcutaneous Fat)	Fat
Scalp	Skin
Seminal vesicle	Prostate
Skin	Sasaki, Wake, and Watanabe <a href="#">2014</a>
Skull	Bone (Cortical)
Skull Cancellous	Bone (Cancellous)
Skull Cortical	Bone (Cortical)
Small Intestine	Sasaki, Wake, and Watanabe <a href="#">2014</a>
Small Intestine Lumen	Muscle
Spinal Cord	Nerve
Spleen	Sasaki, Wake, and Watanabe <a href="#">2014</a>
Stomach	Sasaki, Wake, and Watanabe <a href="#">2014</a>
Stomach Lumen	Muscle and Water
Tendon and Ligament	Sasaki, Wake, and Watanabe <a href="#">2014</a>
Testis	Sasaki, Wake, and Watanabe <a href="#">2014</a>
Thalamus	Brain (Grey Matter)
Thyroid Gland	Sasaki, Wake, and Watanabe <a href="#">2014</a>
Tongue	Sasaki, Wake, and Watanabe <a href="#">2014</a>
Tooth	Bone (Cortical)
Tooth (Dentine)	Bone (Cortical)
Tooth (Enamel)	Bone (Cortical)
Trachea	Sasaki, Wake, and Watanabe <a href="#">2014</a>
Ureter Urethra	Blood Vessel Wall
Urinary Bladder Wall	Sasaki, Wake, and Watanabe <a href="#">2014</a>
Uterus	Sasaki, Wake, and Watanabe <a href="#">2014</a>
Vagina	Large Intestine
Vertebrae	Bone (Cortical)

**N/A:** A value exists in the database but its reference is no longer traceable, **None:** The property is not existent for the tissue in question, **Not in Database:** Values for that property are not yet included in the material properties database.

## References

Sasaki, Kensuke, Kanako Wake, and Soichi Watanabe (2014). "Development of best fit Cole-Cole parameters for measurement data from biological tissues and organs between 1 MHz and 20 GHz". en. In: *Radio Science* 49.7, pp. 459–472. ISSN: 1944-799X. DOI: [10.1002/2013RS005345](https://doi.org/10.1002/2013RS005345). URL: <https://doi.org/10.1002/2013RS005345>.