



Name of the Technology/knowhow/process: Tissue Equivalent Liquids as per IEEE-1528 for SAR compliance testing

Summary: The dielectric properties of human tissues for various body parts have extensively studied over the past decades. These dielectric parameters are frequency dependent, viz. permittivities that decrease and conductivities that increase with frequency. In their standard document, IEEE 1528-2013 (IEEE-1528-2019 published now), IEEE has specified the dielectric properties for different frequencies to be used while experimental SAR evaluation through mobile and wireless devices. Microwave metrology at CSIR-NPL has started the work of preparation of these tissues equivalent liquid. These TEL's will have equivalent properties (dielectric constant and conductivity both) as specified in IEEE-1528 document for range of 500 MHz to 6 GHz range each (proposed) at measurement temperature 23 ± 1 °C.

Table 1: IEEE recommended dielectric properties for human brain tissues at various communication frequencies*

Frequency(MHz)	Relative permittivity (ϵ_r)	Conductivity (σ) (S/m)
835	41.5	0.90
900	41.5	0.97
1800-1900	40.0	1.4
2100	39.8	1.49
2450	39.2	1.8

* Above data is tabulated from IEEE 1528-2013 Standards documents.

Applications: TEL's are used for phantom models while estimating SAR values of mobile handheld devices. This will be commercially useful for industries and testing agencies for SAR estimation and certification.

Advantages: It is an attempt to indigenous Mobile certification using Human Equivalent liquids at different microwave frequencies.

Choose the Readiness level of the Technology:

Idea	Concept Definition	Proof of Concept	Prototype	Lab Validation	Technology Development	Technology Demonstration	Technology Integrated	Market Launch

Related Patents: Patent No: Nil (Knowhow)

Country: NA,

Publication Date: NA

Grant Date: NA **Year of Introduction:** 2019-2020

Broad Area/Category: Processes

User Industries: Telecommunication Electronic Centre (TEC) regulated conformity assessment bodies, Mobile Manufacturer etc

For further details please contact:

Head, Industrial Liaison Group (ILG); Room No. 46-A, Main Building; CSIR-National Physical Laboratory; Dr. K.S. Krishnan Marg; New Delhi 110012; India; Email: headilg@nplindia.org; Tel: +91-11-4560-8350/8449; Fax: +91-11-4560-9310