Propagation Velocities of Dielectric Materials

Here are the approximate dielectric permittivities, electrical conductivities and radiowave velocities for various materials. Average velocity refers to a ballpark value for each material.

* Note that the electrical conductivity is in units milli-Siemens per meter
* Note that the velocity is in meters per nanosecond. To convert this to m/s, simply multiply by .

| **Material** | **Relative Permittivity** | **Conductivity (mS/m)** | **Average Velocity (m/ns)** |
| --- | --- | --- | --- |
| Air | 1 | 0 | 0.3 |
| Fresh Water | 80 | 0.5 | 0.033 |
| Sea Water | 80 | 3000 | 0.01 |
| Ice | 3-4 | 0.01 | 0.16 |
| Dry Sand | 3-5 | 0.01 | 0.15 |
| Saturated Sand | 20-30 | 0.1-1 | 0.06 |
| Limestone | 4-8 | 0.5-2 | 0.12 |
| Shales | 5-15 | 1-100 | 0.09 |
| Silts | 5-30 | 1-100 | 0.07 |
| Clays | 5-40 | 2-1000 | 0.06 |
| Granite | 4-6 | 0.01-1 | 0.13 |
| Anhydrites | 3-4 | 0.01-1 | 0.13 |