

Title: Implanted biomedical sensor, cranial implant

Responsible person: Anja Skrivervik

General description

Implanted sensors are more and more used in medical application, for the monitoring and treatment of chronic diseases for instance. We consider an Implant having a diameter of 10 mm and a height of 3 mm, implanted in the cranium on the top of the head (thus covered by the fat and skin layers)

This project involves:

- Basic description of the system level architecture for the transceiver
- Identification of the frequency to use
- Identification and selection of potential candidates for the antenna
- Power budget estimations.
- Propositions of optimizations and trade-off analysis between the different options
- Highlighting of the major issues

Specifications

Size : has to fit in a cylinder of 10mm in diameter and 3 mm height

Dielectric characteristic of fat :

Dielectric properties of fat (not infiltrated) [1]

Frequency (GHz)	Complex permittivity $\hat{\epsilon}_r$
0.4	5.58 – 1.85i
0.6	5.52 – 1.34i
0.8	5.48 – 1.10i
1.0	5.45 – 0.96i
1.2	5.42 – 0.88i
1.4	5.40 – 0.83i
1.6	5.37 – 0.80i
1.8	5.35 – 0.78i
2.0	5.33 – 0.77i
2.2	5.31 – 0.77i

2.4	$5.29 - 0.77i$
2.6	$5.26 - 0.77i$
2.8	$5.24 - 0.77i$
3.0	$5.22 - 0.78i$
3.2	$5.20 - 0.79i$
3.4	$5.18 - 0.79i$
3.6	$5.16 - 0.80i$
3.8	$5.14 - 0.81i$
4.0	$5.12 - 0.82i$
4.2	$5.11 - 0.83i$
4.4	$5.09 - 0.84i$
4.6	$5.07 - 0.85i$
4.8	$5.05 - 0.86i$
5.0	$5.03 - 0.87i$
5.2	$5.01 - 0.88i$
5.4	$4.99 - 0.89i$
5.6	$4.97 - 0.90i$
5.8	$4.95 - 0.91i$
6.0	$4.94 - 0.92i$

- [1] S. Gabriel, R.W. Lau, and C. Gabriel, "The dielectric properties of biological tissues: III. Parametric models for the dielectric spectrum of tissues," *Phys. Med. Biol.*, vol. 41, 2271, 1996.

Title: Implanted biomedical sensor, muscle implant

Responsible person: Anja Skrivervik

General description

Implanted sensors are more and more used in medical application, for the monitoring and treatment of chronic diseases for instance. We consider an Implant having a diameter of 10 mm, implanted in the muscle 2 cm deep in muscle (for simplicity, we neglect the fat and skin layers) . The data transmission from the sensor to the external nodes occurs at 2.45 GHz.

This project involves:

- Basic description of the system level architecture for the transceiver
- Identification and selection of potential candidates for the antenna
- Power budget estimations.
- Propositions of optimizations and trade-off analysis between the different options
- Highlighting of the major issues

Specifications

Size : has to fit in a sphere of 10mm in diameter

Dielectric characteristic of muscle : $48.99-j13.23$