

# Virtual Goat

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## SCOPE OF THE METHOD

<b>The Method relates to</b>	Animal health
<b>The Method is situated in</b>	Translational - Applied Research
<b>Type of method</b>	In silico
<b>This method makes use of</b>	Animal derived cells / tissues / organs
<b>Species from which cells/tissues/organs are derived</b>	Capra aegagrus hircus
<b>Type of cells/tissues/organs</b>	Muscle, fat, intestines' content and tissue, bone

## DESCRIPTION

### Method keywords

computational models

in silico analysis

### **Scientific area keywords**

electromagnetic simulations

Antenna Design

computational modelling

### **Method description**

Full-wave electromagnetic (EM) simulations solve the laws of Maxwell for a given problem. When designing a wireless solution for an Internet of Animal Health (IoAH) application, multiple iterations are needed to achieve well-defined metrics such as energy efficiency, electrical and mechanical robustness against environmental changes and reproducibility. When considering in-body devices, the surrounding tissue will electromagnetically couple with the radiating in-body antenna. Therefore, to optimize the antenna, the body of the animal and its electromagnetic properties must be well characterized and digitalized. The characterization is done by measuring the electrical permittivity and permeability of bulk tissue (Gabriel, 1996). To construct the heterogeneous model of the animal, a slaughtered animal was measured and expertly drawn in computer aided design (CAD) software. This model of the animal, together with the measured tissue properties, can be imported in the full-wave electromagnetic solver. In this *in silico* environment, multiple iterations and placements can be tried out at a low cost and without any extra test animals. Once the above defined metrics are achieved, only validation tests are left to be performed on test animals.

### **Lab equipment**

Electromagnetic solvers (CST, Sim4Life, COMSOL, HFSS,...)

Computation cluster

## **Method status**

Internally validated

## **PROS, CONS & FUTURE POTENTIAL**

### **Advantages**

- Cost reduction
- Reduction *in-vivo* and *in-vitro* experiments
- Improved understanding of underlying mechanisms
- Generalization of the results by digitally varying the model

### **Challenges**

- Validation of model assumptions / predictions / results still required a small set of test animals;
- Simplified body model can have unforeseen consequences.

### **Modifications**

The current method is described for goats. It can easily be extended to other animals.

### **Future & Other applications**

With the increased interest in automatic farming and IoAH, the demand for wireless in-body development will increase. This method will decrease significantly the need of test animals in the coming decade during the maturing of this technology.

## **REFERENCES, ASSOCIATED DOCUMENTS AND OTHER INFORMATION**

## Associated documents

### PARTNERS AND COLLABORATIONS

#### Organisation

**Name of the organisation** Ghent University (UGent)

**Department** Faculty of Veterinary Medicine

**Country** Belgium

**Geographical Area** Flemish Region

**Name of the organisation** Ghent University (UGent)

**Department** Faculty of Information Technology

**Country** Belgium

**Geographical Area** Flemish Region

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