



# ViZoo

Computational Animal Models  
for *In Silico* Research



## Animal Testing with High-Resolution Anatomical Models

The IT'IS Foundation maintains a library of detailed, full-body computational anatomical models across several animal species, of varied size and both genders. These high-resolution phantoms were segmented from various image modalities, including microtome slices and magnetic resonance imaging (MRI), and are reconstructed as 3D computer-aided-design (CAD) solids. They are regularly used in research on electro-magnetic (EM) exposure.

All animal models are available free-of-charge to the research community for non-commercial purposes. They are fully compatible with the simulation platform Sim4Life<sup>1</sup> and can be used with the student edition Sim4Life light. Licenses for commercial purposes are available for a fee. The tissue naming scheme used with all of the animal models is compatible with the IT'IS Tissue Properties Database<sup>2</sup>, an online repository of EM, thermal, acoustic, and MRI tissue material properties.

## Applications of the ViZoo

The first-generation rodent models were developed from microtome slices and are used primarily in dosimetry research, e.g., related to safety assessment of mobile phones and medical devices. Additional mouse models segmented from MRI data were generated with the aim to reproduce and analyze *in vivo* animal experiments on exposure to EM fields.

The computational pig model was created in particular to support MRI and implant manufacturers by providing a dosimetry tool for computational safety assessments.

In an effort to facilitate investigations of mechanisms in involuntary neurostimulation (e.g., for MRI safety), as well as organ stimulation by peripheral nerves, IT'IS is currently working on neuro-functionalized human, monkey, and rat phantoms, which will allow the user to simulate and optimize neuro-stimulation treatments and analyze and predict *in vivo* observations. These next-generation models will include – for the first time – detailed mapping of the peripheral nerves, allowing EM fields and neuron physiology to be coupled under realistic conditions, i.e., with valid tissue material properties (e.g., electrical conductivity) and EM, thermal, or acoustic field distributions and anatomically correct nerve trajectories.

Name	Gender	Species	Length without tail [mm]	Weight [g]	Image modality	Number of tissues
Male Pig	male	Domestic Pig	977	35'000	MRI	103
Big Male Rat	male	Sprague Dawley	260	567	Microtome	51
Small Male Rat	male	Sprague Dawley	185	198	Microtome	52
Female Rat with Tumors	female	Sprague Dawley	225	503	Microtome	50
Pregnant Rat	female	Sprague Dawley	170	275	Microtome	52
Rat Pup	unknown	Sprague Dawley	93	14.3	Microtome	49
Male PIM1 Mouse	male	PIM1	98	44.7	Microtome	49
Male OF1 Mouse	male	OF1	95	35.5	Microtome	50
Female OF1 Mouse	female	OF1	78	17.3	Microtome	48
Pregnant Mouse	female	B6C3F1	72	28.7	Microtome	46
Diggy	male	Nude Normal	86	28	Microtome	43
Pregnant Mouse II <sup>3</sup>	female	B6F3C1	90	38	MRI	71
3-Week-Old Female Mouse <sup>3</sup>	female	B6C3F1	70	11.8	MRI	70
3-Week-Old Male Mouse <sup>3</sup>	male	B6C3F1	70	12.3	MRI	70
12-Week-Old Female Mouse <sup>3</sup>	female	B6C3F1	90	27	MRI	70
12-Week-Old Male Mouse <sup>3</sup>	male	B6C3F1	90	28	MRI	70
Monkey <sup>4</sup>	female	Rhesus Macaque	tbd	tbd	Cryosection	tbd

<sup>1</sup>Sim4Life is a multi-physics simulation platform targeted for life sciences research (ZMT Zurich MedTech AG, Switzerland, <https://zmt.swiss/sim4life>, [info@zmt.swiss](mailto:info@zmt.swiss)). All ViZoo models are available in CAD formats compatible with Sim4Life. <sup>2</sup>The Tissue Properties Database is hosted at <https://itis.swiss/tissuedb>. <sup>3</sup>The MRI-based mice phantoms are nearly complete; the number of tissues may be slightly different when released. Students or interns interested in supporting this effort can apply to help finalize these models. <sup>4</sup>The monkey phantom will be available ca. end of 2019.

### Acknowledgements

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