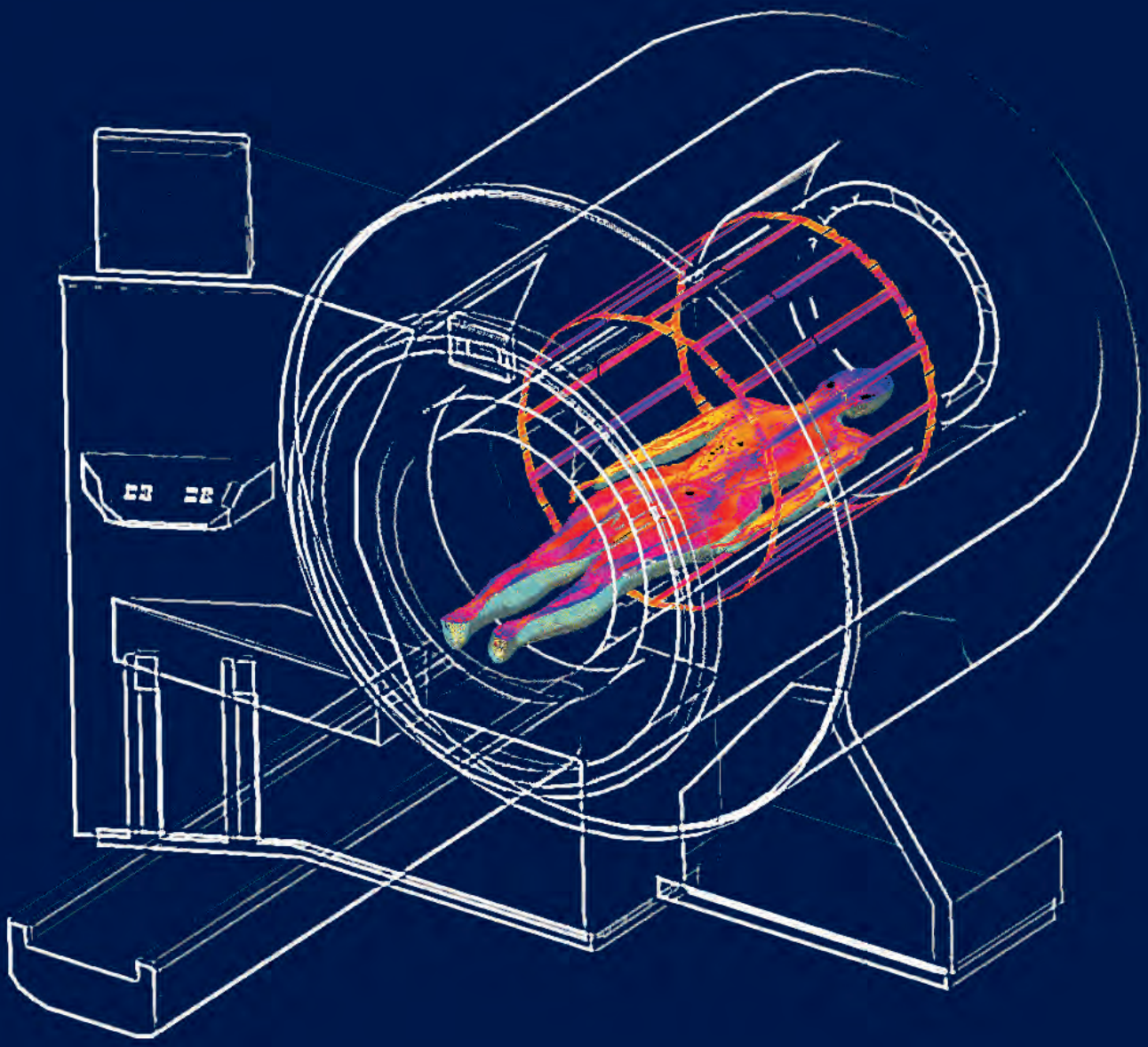
IT'IS FOUNDATION 2006



IT'IS FOUNDATION

In 2006 the IT'IS Foundation achieved its highest-ever level of academic marks with respect to numbers of publications, citations and funding (pages 7–8).

The significance of the research of our PhD students was demonstrated by the three who won best paper awards at international conferences. We established strong ties with many prominent research laboratories in pursuit of medical technology advances, with partners at universities, start-up companies and global corporations. We are proud that our successes in medical technology research led to the formation of ZMT – Zurich MedTech, an IT'IS Foundation spin-off.

Perhaps the best evidence of long-term respect and appreciation of our research accomplishments over the past six years came when the prestigious US National Institutes of Health (NIH) selected the IT'IS Foundation to develop the world's largest facility for RF animal exposures (pages 14–15). The six million dollar grant for its installation at the Illinois Institute of Technology was awarded to IT'IS through an unusual single-source funding process. Furthermore, our highly successful applications to National Research Program 57 of the Swiss National Science Foundation will result in the utilization of our know-how and experience in six projects. Research being conducted with our partners Prof. Primo Schär, Prof. Meike Mevissen and Dr. Peter Achermann has the potential to establish significant milestones toward understanding the biological interaction mechanisms of specific RF effects on cells and the brain.

Computational electromagnetics (EM) has always been a particular focus of ours. Therefore, we are especially proud of the recent breakthroughs made together with our commercial partners SPEAG (Zurich) and Acceleware (Calgary, Canada). The realized upgrade of SEMCAD X by joining new algorithms developed by IT'IS to customized acceleration hardware resulted in computational throughput more than fifty times greater than is achievable with the conventional FDTD/FIT implementations found in other systems. These advances made possible the first effective optimizer for the solution of complex EM problems using novel genetic algorithms. This breakthrough promises explosive demand for uses in virtual prototyping by industry from North America to Asia (page 12).

Progress in measurement and simulation technologies also stimulated our growing activities in promoting increased safety for magnetic resonance imaging, MR-safe implants and MR-guided intervention. Our innovative temperature solvers are a central element in these developments (page 16).

Dedicated people are the key ingredient for all these accomplishments. None of the successes of 2006 would have happened without the incredible hard work and creative skills of all of our current and past employees, students, colleagues and collaborators (page 5), the support and advice of our board members (page 4) and the generosity of our sponsors (page 9).

We extend our sincere thanks to the public institutions and private companies listed on page 9 for their endorsement and initiative in supporting our continuing and completed projects during 2006. We especially thank the Swiss CTI for funding several projects, and the Swiss Federal Office of Public Health for funding a number of specialized and highly useful research areas. We are also especially grateful to SPEAG and the Mobile Manufacturers Forum (MMF) for their commitment to the long-term funding essential for maintaining the IT'IS Foundation as the leading center of competence in numerous areas of information technology.

The support of our many colleagues both at ETH Zurich and abroad is of equal importance. We note with special appreciation the entire IIS Laboratory of Prof. Wolfgang Fichtner, in particular Dr. Doelf Aemmer, Dr. Norbert Felber, Christine Haller, as well as collaborating scientists Prof. Gábor Székely, Prof. Klaas Prüssmann, Prof. Manfred Morari and Prof. Heinz Jäckel. The signing of a strategic cooperation contract with Hokkaido University (Japan), similar to those already in place with ETH Zurich and the FDA (USA), has further enhanced our network of esteemed scientists and engineers.

With each passing day, the activities of the IT'IS Foundation help realize our long-standing vision (back cover) of ensuring that the public benefits from the safe use of EM fields through new and improved applications of health and information technologies.

Zurich, March 2007 *Prof. Niels Kuster*

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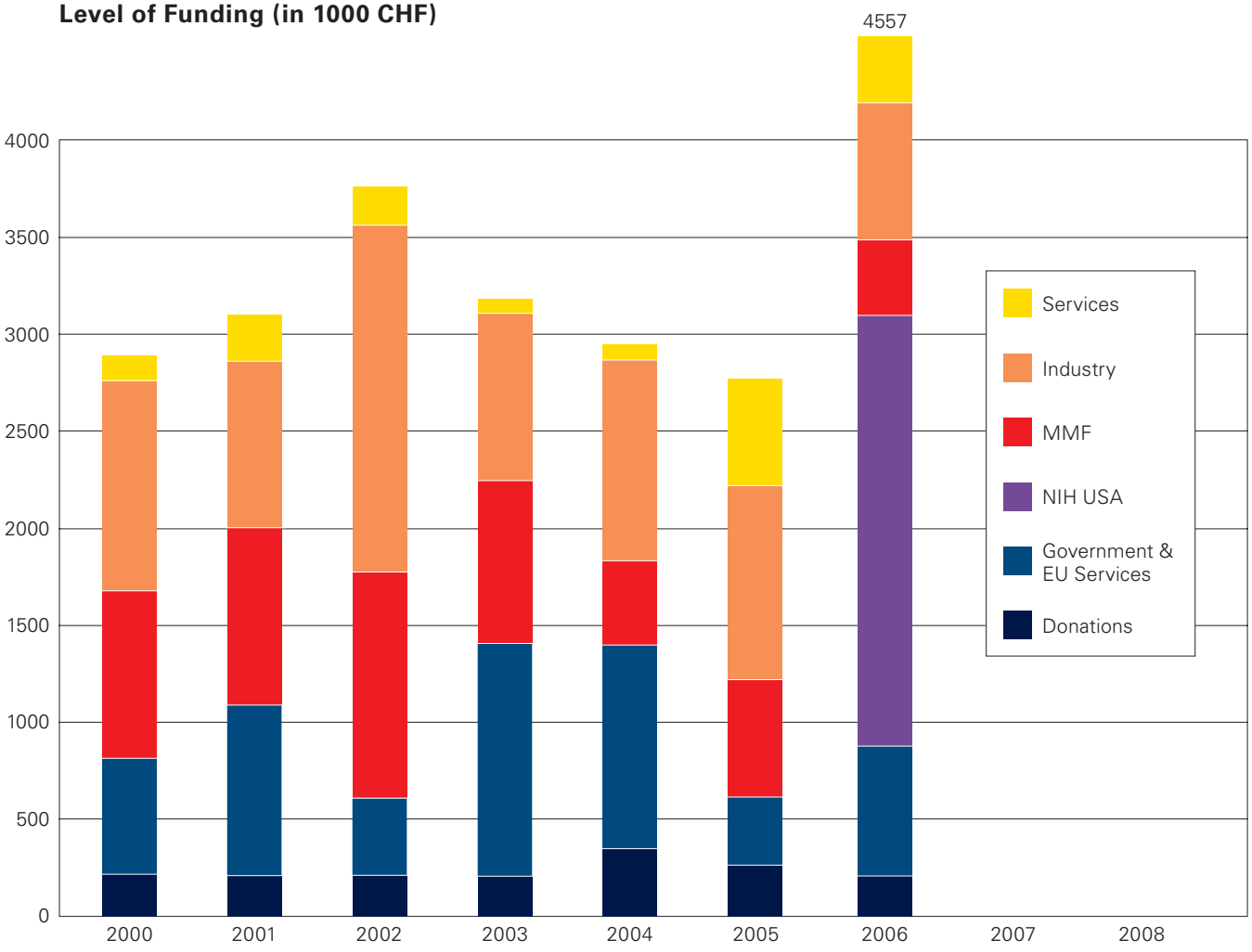
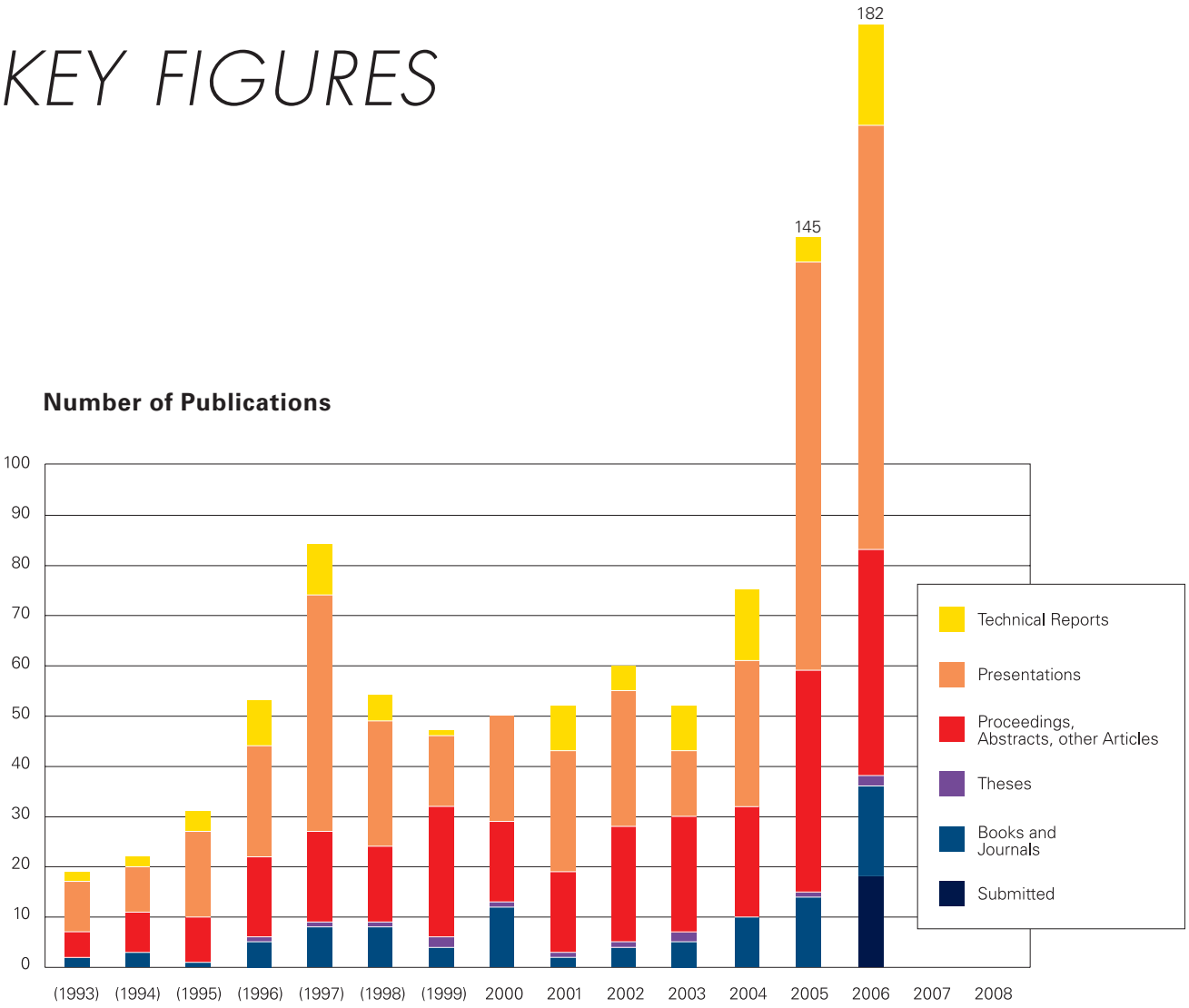


KEY FIGURES

Number of Publications



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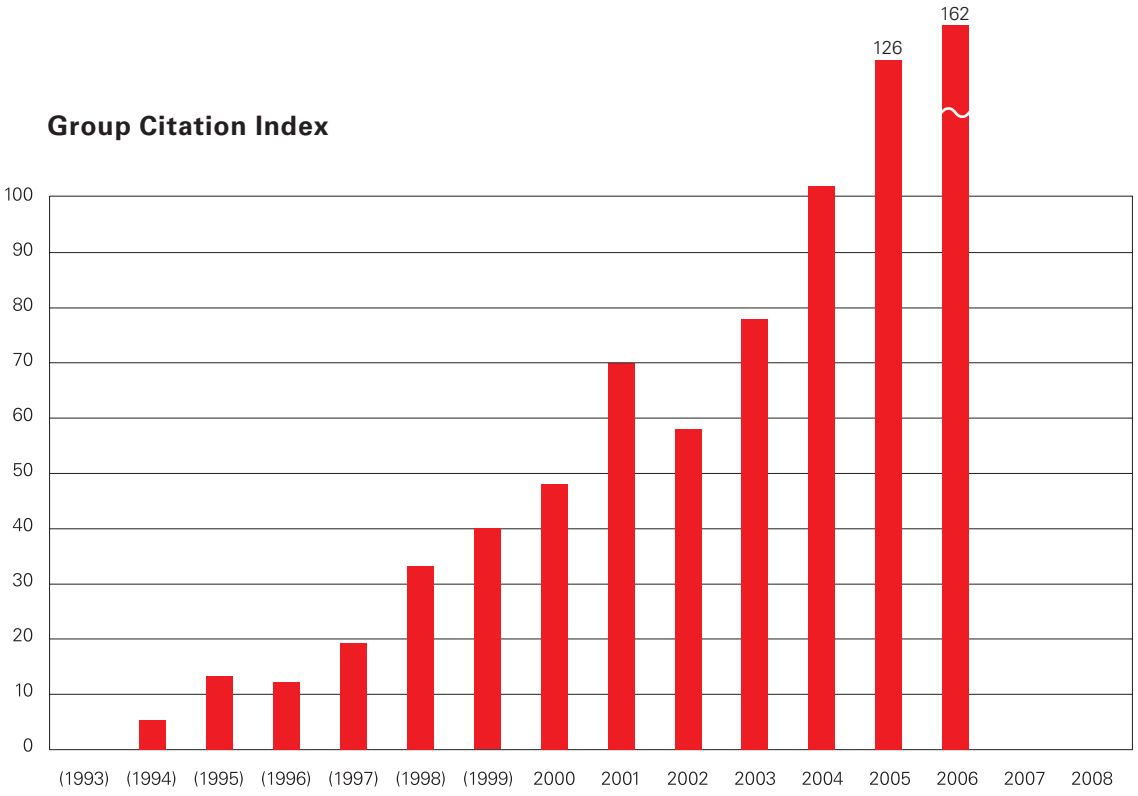

(year) represents development at ETH before establishment as an independent foundation

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PROJECTS

Measurement and Computational Techniques

TD SENSOR	development of a sensor platform for field measurements in time and frequency domains
MT SENSOR	development of a novel micro-thermal sensor for temperature measurements with high spatial resolution
TRINITY	simulation tool for the robust design and integration of next generation information technology devices
CSCIENCE HANDHELD	research on the scientific bases to test the compliance of handheld and body-mounted transmitters
EXPA INDOOR – BAG	development of procedures for the assessment of human exposure to electromagnetic radiation from wireless devices in home and office environments
BASEXPO	development of procedures and methodology for demonstrating compliance with known uncertainty in complex scattering environments.
EX-T	research on torso exposure to wireless devices with respect to existing compliance testing standards
STANDARDIZATION	participation in regulatory activities (standards committees & governments)

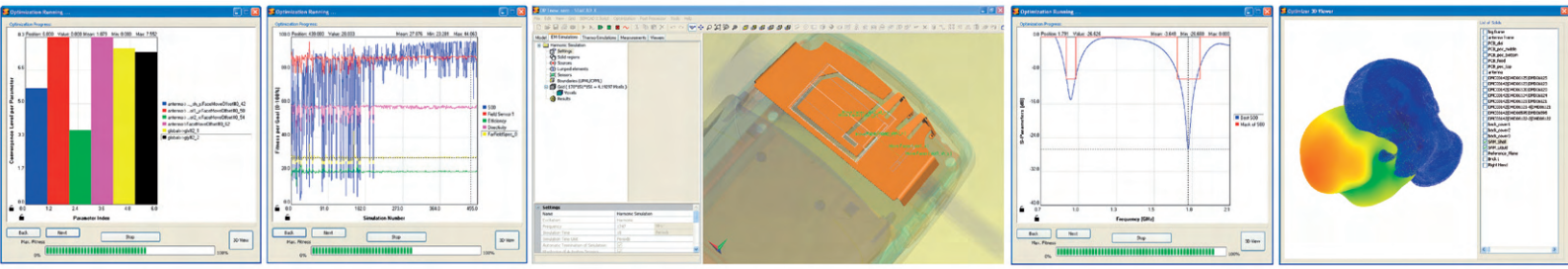
Health Risk Assessment

PERFORM A / ZHEJIANG	*in vivo* research on possible health risks from mobile phones and base stations through carcinogenic studies in rodents
PERFORM C	human studies related to mobile phones and base stations
EMF & BRAIN – SLEEP	effects of EMF on sleep, sleep EEG and brain function
REPLICATIONS	replication studies of bio-experiments
REPLICATIONS TNO	study to reproduce the findings of ultra weak UMTS exposures reported by TNO
sXc – 900 / 1800 / 1900	development of optimized exposure systems for *in vitro* studies from static to GHz
sXv – NTP / NIEHS	NTP study on possible health risks from high dose GSM and CDMA mobile phone exposures utilizing special reverberation chambers funded by NIEHS
sXh – RF / ELF	development of an optimized exposure system for human provocation studies from static to GHz
sX3P	dosimetric evaluation of third party exposure systems
CAHM Virtual Family	generation of anatomical CAD models of an adult male, an adult female and two children for dosimetric and medical applications
EXPA EPI – CTIA	exposure assessment for epidemiological studies of mobile phone users
EX-Age	characterization of mobile system exposures considering age dependent anatomical and physiological changes
EX-BASE	characterization of exposures close to base station antennas

Health Support Systems

ULTRACOM	channel model of the human body for medical monitoring systems
HYCUNEHT	research and optimization of hyperthermia treatment quality

GENETIC ALGORITHM BASED OPTIMIZER FOR PARAMETRIZED CAD DATA



Within recent years, full-wave numerical simulation has become an effective means to support RF engineers in the analysis and design of highly efficient mobile device terminals. The Finite-Difference Time-Domain (FDTD) method in particular has become the preferred technique due to its general applicability. In addition, numerical optimization has gained increasing interest to support design processes.

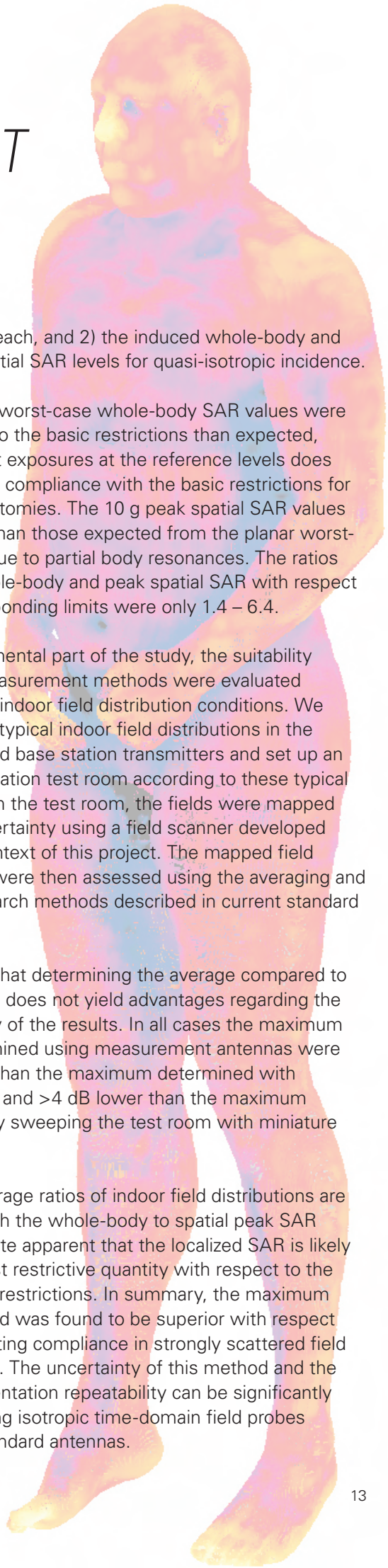
An optimization engine has been developed for SEMCAD X able to deal with the most complex design tasks like antenna miniaturization, device tuning, SAR minimization and far-field radiation pattern optimization. The new module consists of three main parts: the CAD data importer, model parametrization and the optimization algorithms.

- The CAD importer tool allows different CAD data set formats to be loaded into SEMCAD X. The implemented 3D model algorithms are based on the ACIS toolkit, a modeling interface, an in-house 3-D OpenGL rendering engine (real-time handling 10'000 CAD) and automated non-homogeneous grid generation.
- CAD data parametrization allows parts of the model to be transformed into parametrized entities, where the geometry and dimensions can be set in terms of user defined parameters. A novel 3-D parametrization engine has been developed for this purpose. It allows the full parametrization of arbitrarily complex CAD data, e.g., an antenna embedded within the 3-D electro-mechanical CAD dataset of an industrial mobile phone.
- For the optimization engine four methods have been developed: a standard genetic algorithm (GA) with dual population improvements (DUAL), statistical GA based on dependency trees (TREE), swarm particle optimization (SWARM) and a multi-variable bracketing optimization method (POWELL). The DUAL algorithm is a standard GA in which two populations are used to represent the parameter vector. Each parameter is codified into a string of bits, with different codification schemes used depending upon which population will be included. The TREE method estimates the probability density function (PDF) of the best vector of parameters, population after population and generation after generation. This method also allows measurement of the convergence speed of each parameter, which is also a measure of how relevant each parameter is in order to achieve the optimum. Swarm particle optimization addresses those problems where a real codification of the parameter vector is needed, while the POWELL method implements the traditional Powell multi-variable partitioning algorithm.

Three of the four methods implemented in SEMCAD X are Genetic Algorithms, due to their capability to resolve a global optimum search for large and complex optimization problems (with more than 20 variables and interdependences among them).

The new optimization engine subsequently allows the handling of multi-goal optimization (e.g., return loss, far-field, SAR) with each goal weighted individually. The latest study included the optimization of a commercial mobile phone. Its CAD dataset (IGES) consisted of more than 800 distinguished parts. The integrated antenna was subsequently converted into a parameterized form leading to a total of 6 parameters, allowing simulation and optimization of the targeted multi-band performance in different operational situations at the SAM head, including hands, SAR and far field (back radiation) of the antenna – within less than 2 days.

INDOOR EXPOSURE ASSESSMENT



Mobile communication networks have developed rapidly in the last decade. Public concern regarding exposure to base station transmissions has grown correspondingly. Unfortunately, standards for the compliance testing of base station transmitters with RF exposure safety limits are lagging behind the pace of development concerning general public exposure.

At present test procedures are based on simplified human models (spheroidal ellipsoid), enabling the estimation of whole-body but not localized exposure. Numerical investigations so far have only been based on plane-wave exposure, and the measurement equipment and methods used have also been developed and calibrated for plane-wave-like conditions.

However, the general public is mainly exposed in environments that exhibit strongly inhomogeneous field characteristics.

The objective of this project was to evaluate and develop practical measurement methods and procedures that provide high repeatability with minimal uncertainty for in-situ compliance testing of mobile base station transmitters with respect to current radio frequency safety guidelines in indoor environments.

This project was divided into two tasks:

- derivation of a correlation between incident fields and induced fields (SAR) for anatomical human models,
- determination of measurement techniques that reproduce the established correlation in realistic scenarios.

The worst-case plane wave absorption configuration in the mobile communication frequency bands related to incidence and polarization with the Visible Human model were investigated first.

We then evaluated the plane-wave and isotropic incidence for two different human models: the Visible Human and the Japanese Female. We determined 1) the induced whole-body as well as 10 g spatial peak specific absorption rates (SAR) for all major plane-wave incidence, i.e., incidence from all 6 sides with 2 polarizations each, and 2) the induced whole-body and 10 g peak spatial SAR levels for quasi-isotropic incidence.

The resulting worst-case whole-body SAR values were much closer to the basic restrictions than expected, indicating that exposures at the reference levels does not guarantee compliance with the basic restrictions for all human anatomies. The 10 g peak spatial SAR values were higher than those expected from the planar worst-case model due to partial body resonances. The ratios between whole-body and peak spatial SAR with respect to the corresponding limits were only 1.4 – 6.4.

In the experimental part of the study, the suitability of various measurement methods were evaluated under known indoor field distribution conditions. We reviewed the typical indoor field distributions in the vicinity of fixed base station transmitters and set up an indoor propagation test room according to these typical parameters. In the test room, the fields were mapped with low uncertainty using a field scanner developed within the context of this project. The mapped field distributions were then assessed using the averaging and maximum search methods described in current standard drafts.

It was found that determining the average compared to the maximum does not yield advantages regarding the reproducibility of the results. In all cases the maximum values determined using measurement antennas were >6 dB lower than the maximum determined with field mapping and >4 dB lower than the maximum determined by sweeping the test room with miniature field probes.

If peak to average ratios of indoor field distributions are compared with the whole-body to spatial peak SAR ratios, it is quite apparent that the localized SAR is likely to be the most restrictive quantity with respect to the ICNIRP basic restrictions. In summary, the maximum search method was found to be superior with respect to demonstrating compliance in strongly scattered field environments. The uncertainty of this method and the inter-instrumentation repeatability can be significantly improved using isotropic time-domain field probes instead of standard antennas.

RISK ASSESSMENTS – IN VIVO EXPERIMENTS

Modern society clearly values the role science plays in improving our daily lives through the development of new technologies and the new products derived from these technologies. However society also demands that science provides knowledge about the risks to its citizens posed by those industrial processes, new technologies, improved food, improved drugs, changed life-styles, etc. Science also must play a critical role in developing and implementing strategies to control any risks that are deemed unacceptable. The tool science has developed to satisfy these requirements is called *Risk Assessment*.

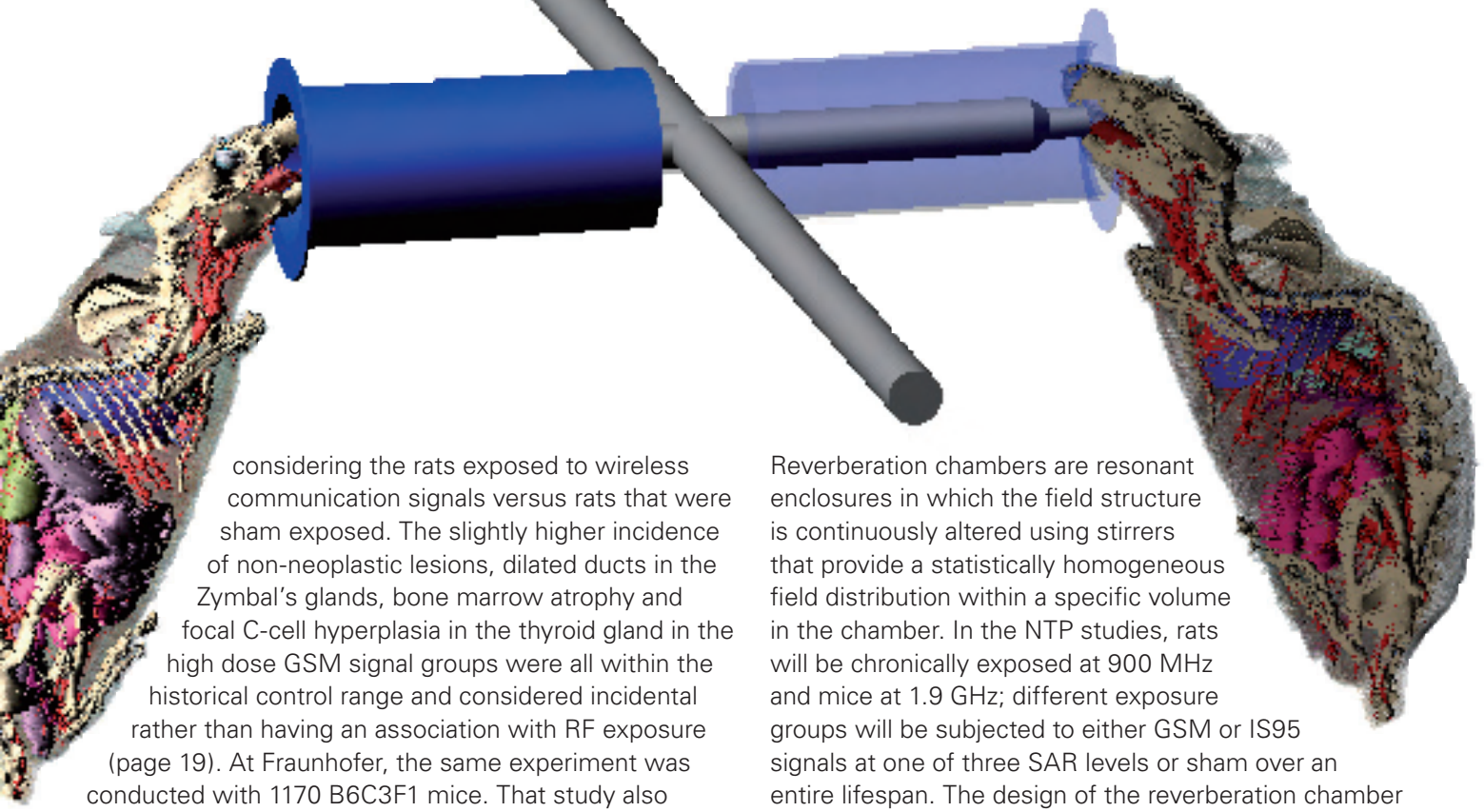
Risk assessment involves the use of scientific evidence to define health effects from the exposure of individuals or populations to hazardous chemicals, physical agents and/or hazardous situations. The scientific evidence must always be underpinned by data and established facts that identify the toxicity and the magnitude of the risk for a given exposure as a function of susceptibilities in the population. The evaluation of human exposure to the physical agent EMF is the subject of many of our research projects (page 11). The measurement of such exposure is complex, involving not only the average exposure but variation around the average that we encounter on a day-to-day, hour-to-hour, even minute-to-minute basis. The overall risk is then established by integrating (summing) the magnitude of the risk for each given exposure condition over all exposures for each member or representative members of the population.

Epidemiological studies combined with animal studies form the classic basis for cancer risk assessments. The primary means of using animal studies to estimate cancer risks for humans is based on using data from experiments in which rodents (rats and mice) are exposed for two-years (a virtual lifetime for rodents) to toxic and sub-toxic exposures of the test agent (such as EMF). The manner in which this is done has been specifically defined for chemical agent exposures. However, the study design to determine the risk of low-dose RF fields yields three major challenges:

- It is only within the last decade that the exposure of the majority of the population has increased to levels close to the existing safety limits.
- The use of wireless technologies is now widespread, reaching nearly two billion users worldwide, i.e., even small risks might be considered unacceptable by the society due to the extensive exposure.
- With the exception of the experiments designed to investigate the Repacholi et al. (1997) findings, animal study designs are generally not derived based on a strong hypothesis but are instead used as a means to generate hypotheses, i.e., for addressing the general question "Can EMF effect mammalian systems?".
- The value of negative results for risk assessment is directly related to the sensitivity of the experiments; the tightest restriction comes from the fact that the exposure of animals or human volunteers cannot be substantially increased above our daily exposure conditions (e.g., of the brain) due to thermal limitations.

Many past experiments were conducted at exposure levels that were significantly below today's daily exposures, with often little control of possible artifacts. The value of such experiments with relatively small numbers of animals is therefore questioned by health agencies. Classical measures to improve the sensitivities of *in vivo* experiments are to increase the exposure level to the maximum possible level (i.e., close to the thermal level in RF experiments), to maximize the duration of exposure, to operate with larger animal groups, to utilize transgenic animals (if available for the given hypothesis) and/or to minimize artifacts.

The four PERFORM A two-year bio-assay studies performed during the last six years at RCC, Basel and Fraunhofer, Hannover were designed to meet these requirements. Due to cost and space limitations, the optimal exposure setups were compact waveguide resonators that required restraint of the animals in order to obtain well-defined doses. At RCC a total of 1170 Han Wistar rats were exposed for 2 h/day, 5 days/week for up to 104 weeks to either GSM or DCS signals at one of three nominal SAR levels of 0.44, 1.33 and 4.0 W/kg (65 males and 65 females per group, 4 groups per signal type, plus one group as cage control). The study could not detect any significant difference in the incidence of primary neoplasms, in the number of rats with more than one primary neoplasm, in the multiplicity and latency of neoplasms, in the number of rats with metastases, nor in the number of benign or malignant neoplasms,



considering the rats exposed to wireless communication signals versus rats that were sham exposed. The slightly higher incidence of non-neoplastic lesions, dilated ducts in the Zymbal's glands, bone marrow atrophy and focal C-cell hyperplasia in the thyroid gland in the high dose GSM signal groups were all within the historical control range and considered incidental rather than having an association with RF exposure (page 19). At Fraunhofer, the same experiment was conducted with 1170 B6C3F1 mice. That study also found no evidence that the exposure resulted in adverse health effects or had any cumulative influence on the incidence or severity of neoplastic and non-neoplastic background lesions (page 19).

The major drawback of PERFORM A was seen in the two-hour exposure limit per day. The upcoming study requested by the National Toxicology Program (NTP) promises much greater sensitivity in detecting possible effects of communication signals in mammalian systems by requiring higher exposure levels, much longer exposures periods, larger animal groups and more endpoints to be investigated.

To meet these requirements a new exposure paradigm is necessary. It is based on using reverberation chambers to expose large groups of individually housed unconstrained rodents over extended periods. The original idea of using reverberation chambers for animal exposure was first suggested by NIST in 2001. A preliminary study involving an experimental investigation performed by NIST and a preliminary numerical dosimetry study performed by IT'IS were funded by NTP. The results of these preliminary studies were encouraging, and in January 2006 NTP issued the main study to evaluate the potential toxicity and carcinogenicity of cell phone RF radiation in laboratory animals. By September 2006, the prototype had been designed, developed, manufactured, installed and characterized at the IT'IS laboratories. Based on the successful fulfillment of all performance parameters, the exposure facility for the larger scale complete animal study will be continued and completed at IITRI in Chicago in summer 2007.

Reverberation chambers are resonant enclosures in which the field structure is continuously altered using stirrers that provide a statistically homogeneous field distribution within a specific volume in the chamber. In the NTP studies, rats will be chronically exposed at 900 MHz and mice at 1.9 GHz; different exposure groups will be subjected to either GSM or IS95 signals at one of three SAR levels or sham over an entire lifespan. The design of the reverberation chamber encompasses both electrical design and animal housing issues, resulting in a fully welded stainless steel design with two mode stirrers.

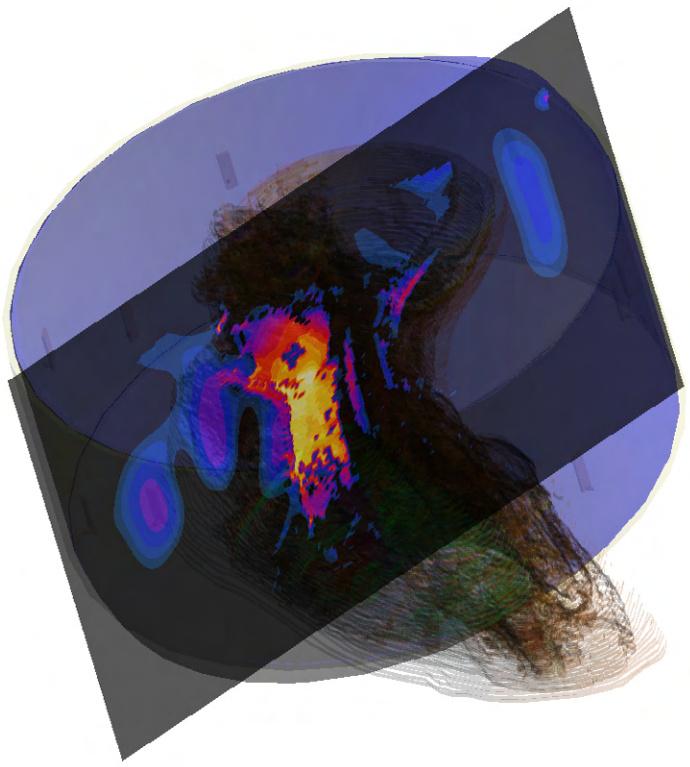
Additionally, the rodents (up to 216 mice or 108 rats) have to be supplied with drinking water in this reverberation chamber environment with high RF fields (up to 400 V/m average and >1 kV/m peak). The water system developed by IT'IS avoides or minimizes:

1) high local SAR peaks in the animal while drinking, 2) significant variations in whole-body average SAR with respect to the animal not drinking, 3) significant distortions in the fields around the water system, 4) power absorption in water.

The exposure in the chambers is controlled using a closed loop system. This system is based on the measurement of three orthogonal components of both the electric and magnetic fields at two locations in each chamber. The dual control verifies the required field strength for the exposure level required for a particular rodent species and cohort.

The numerical dosimetry was performed using high-resolution animal models (>100 tissues differentiated) covering the whole life span. The performance across all animal exposure criteria of the reverberation chamber is excellent; all target performance metrics are met or exceeded, resulting in the best possible exposure setups using constrained animals. In addition, the exposure periods can be extended from 2 hours to up to 20 hours per day. Animal exposures will begin fall 2007, and the final results of the study will become available in 2011.

HYPERTHERMIA TREATMENT PLANNING



Hyperthermia is a promising, relatively new treatment modality for various types of cancer. It aims at heating the tumor using EM fields; antenna arrays are generally used to focus the energy. IT'IS intends to apply its expertise in near-field exposure analysis and in simulating the interactions between EM fields and humans to develop new, improved hyperthermia applicators and treatment planning software. IT'IS is closely collaborating with the hyperthermia unit of the Erasmus MC in Rotterdam, one of the largest hyperthermia groups in Europe, as well as a local partner, the hospital in La-Chaux-de-Fonds.

The effective treatment of tumors with high levels of confidence requires excellent signal control, well characterized applicators and good positioning precision. This can be achieved using sources with fine amplitude and phase control combined with calibrated measurement of the signal applied to the applicator antenna. To focus the energy effectively into the target area while minimizing the energy deposited in other tissues and in particular sensitive areas requires carefully designed applicator antennas with sufficient numbers of elements. One particular approach, developed at Erasmus MC in Rotterdam, utilizes 12 elements in two circular arrays of 6 elements with a 30° offset in angular alignment. An accurate EM model for the applicator has been developed which can be used to optimize the applied signals within the software environment. Hardware is being developed for generation and control of the required RF signals with levels of up to a total applied power of 800 W.

A particularly challenging aspect of the software involved the development of a comprehensive and easy-to-apply treatment planning tool. It contains a segmentation toolbox, an EM and thermal simulation platform, a fast field optimizer for antenna arrays and routines to assess the resulting effects and the administrated dose.

The segmentation tool allows flexible combination of various methods ranging from automatic to highly interactive. The tool can handle CT and MRI data and uses preprocessing steps and robust competitive methods to cope even with noisy data.

SEMCAD X is ideally suited to simulate EM fields. The graded meshes, conformal subcell methods, pulsed excitations, hardware acceleration card and other features can all be usefully applied to the problem of hyperthermia treatment planning.

A new thermal solver has been integrated into SEMCAD X to account for the effects of blood flow (by using tensorial heat conductivities and connecting the simulation to a separate simulation of the discreet vessel tree) and temperature dependent tissue parameters. Special conformal techniques have been developed to improve the handling of boundary conditions. Various improvements have allowed dramatic reduction of the simulation time.

The ideal antenna exaltation parameters are subsequently obtained using a fast, dedicated optimizer that allows focusing to multiple targets and special treatment of sensitive healthy organs. The optimizer can quickly take into account patient feedback to modify the parameters reducing hot-spots.

Detailed simulations have been performed to assess the ability of the software to handle the task of hyperthermia treatment planning. Initial results are very promising. Extensive experimental validation will now follow.

It is anticipated that the new, superior hyperthermia equipment supported by a reliable and powerful treatment planning software will improve treatment outcomes and increase the acceptance of hyperthermia as a valuable treatment modality for cancer.

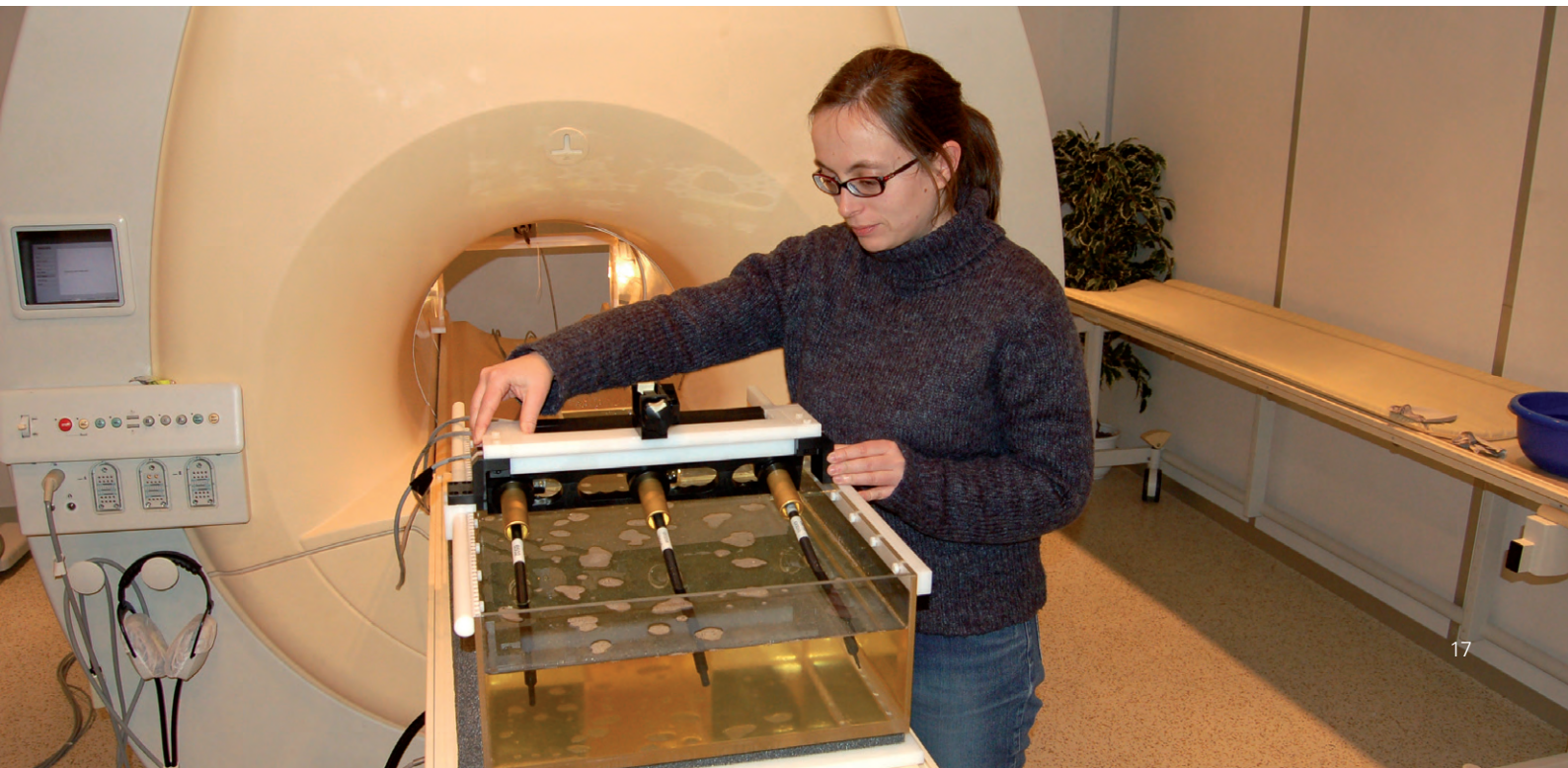
SERVICES

Antenna Design
The IT'IS Foundation is an internationally renowned competence center in several areas, ranging from investigations and validations of antennas for active medical implants and on-body wireless communication devices to consulting and design support with detailed evaluations of RF safety compliance and immunity to EMI. Consultations regarding standards and homologation rules include the revision of technical requirements, the assessment of regulation procedures and the evaluation of impending standards. A meticulously maintained on-site laboratory for RF and LF near-field measurements in liquids and free-space ensures accurate and efficient evaluations using the latest tools for analysis and simulation, such as DASY5 and SEMCAD X.

RF Safety and Compliance of RF Transmitters and Medical Implants
The IT'IS Foundation conducts compliance testing for RF applications to satisfy all national and international EMF safety guidelines. Globally regarded as the preeminent, truly independent institute for dosimetric evaluations, the Foundation has become a pacesetter for developing advanced near-field analysis tools and is at the forefront in developing the most accurate and suitable testing procedures. The advent of the wireless revolution has encouraged the IT'IS Foundation to extend its simulation and testing capabilities to MR imaging and similar technologies. The Foundation is currently applying for Class C accreditation for testing compliance with safety limits, which will enable IT'IS to develop and apply new methodologies beyond the current test protocols specified in standards for the evaluation of devices using RF energy.

Safety White Papers
As a leading player in the global effort on health risk assessment research and an active participant in commissions developing EMF safety guidelines, the IT'IS Foundation provides a full range of safety white papers. Numerous international organizations, industries and governments have entrusted the Foundation to draft safety white papers for existing and future technologies, as well as for the devices needed for their implementation. For example, risk evaluations may include an EMF risk analysis and predictions for worst-case exposures and worst-case temperature increases.

EMF Workshops
The IT'IS Foundation organizes customized workshops on EMF-related issues of current interest in collaboration with our national and international partners. On-site and specialized workshops and seminars can also be arranged upon request.



INFRASTRUCTURE

Dosimetric, Near-Field and EMC/EMI Facilities

Semi-Anechoic Chamber
This shielded, rectangular chamber has the dimensions 7 x 5 x 2.9 m (L x W x H). It is equipped with a reflecting ground plane floor, and half of its walls are covered with electromagnetic absorbers. The chamber contains an integrated DASY5 NEO system and can be utilized for all research activities involving dosimetric, near-field and far-field evaluations, the optimization and synthesis of handheld devices, body-mounted transmitters, implants, desktop applications, micro-base and pico-base station antennas, exposure setups, calibration procedures, EMI tests, MRI safety tests, compliance testing of implants, etc.

Two Reverberation Chambers
The Blue and NIEHS Reverberation Chambers have the dimensions 4 x 3 x 2.9 m and 3.7 x 2.2 x 2.7 m (L x W x H), respectively. Both chambers are equipped with two mechanical stirrers and provide controlled and consistent environments for EM emissions and immunity testing, as well as shielding effectiveness and susceptibility testing of electromagnetic equipment.

Facility for Dosimetric Compliance Testing
IT'IS shares a facility with Schmid & Partner Engineering AG which meets the requirements for dosimetric evaluations. Class C accreditation is expected in 2007 through METAS for all types of dosimetric evaluations.

Technical Equipment and Instrumentation

Spectrum and Network Analyzers
1 Rhode & Schwarz FSP, Spectrum Analyzer 9 kHz – 30 GHz
1 HP 8753E, Network Analyzer 30 kHz – 6 GHz
1 HP APC 85033B, Calibration Kit

Signal Generators and Testers
1 Agilent E8251A, Signal Generator, 250 KHz – 20 GHz
1 Rhode & Schwarz SMU200A, Signal Generator
1 Rhode & Schwarz SMT06, Signal Generator
1 Rhode & Schwarz SMIQ02B, Signal Generator
1 Rhode & Schwarz SML03, Signal Generator
2 Rhode & Schwarz SML02, Signal Generator
1 Rhode & Schwarz SMY02, Signal Generator
1 HP 8647A, Signal Generator 250 KHz – 1000 MHz
1 Agilent 33250A, Waveform Generator
3 Agilent 33120A, Waveform Generator
1 Rhode & Schwarz CTS55, Digital Radio Tester

DASY, iSAR and EASY4
1 SPEAG DASY5 NEO
1 SPEAG iSAR
2 SPEAG Twin SAM Phantom
1 SPEAG SAM V6.0 Phantom
2 SPEAG ELI4 Phantom
1 SPEAG ASTM Phantom
1 SPEAG HAC Extension
2 SPEAG EASY4
2 SPEAG DAEasy4MRI, Data Acquisition Electronics
2 SPEAG DAE4, Data Acquisition Electronics
1 SPEAG DAE3mini, Data Acquisition Electronics
2 SPEAG TGLA, Temperature Probe
1 SPEAG TSIL, Temperature Probe
5 SPEAG T1V3LA, Temperature Probe
2 SPEAG H3DV6, H-Field Probe
2 SPEAG H3DV7, H-Field Probe
1 SPEAG EX3DV3, Dosimetric Probe
2 SPEAG EE3DV1, E-Field Probe
2 SPEAG ER3DV6, E-Field Probe
1 SPEAG EF3DV6, E-Field Probe
3 SPEAG ET3DV6, Dosimetric Probe
1 SPEAG ET1DV1, Dosimetric Probe
2 SPEAG ET1DV2, Dosimetric Probe
Tissue Simulating Liquids 27 MHz – 6 GHz

Meters
2 Agilent E4419B, 4 HP 8482A, Power Meter
3 HP 436A, 3 HP 8481A, Power Meter
3 Agilent 34970A, Data Acquisition Unit
1 Magnet Physik FH49 – 7030, Gauss/Teslameter

Amplifiers
1 LS Elektronik 2450, Amplifier, 400 W / 900 MHz
3 LS Elektronik 2449, Amplifier, 200 W / 900 MHz
2 LS Elektronik 2448, Amplifier, 60 W / 900 MHz
3 LS Elektronik 2452, Amplifier, 200 W / 1800 MHz
1 LS Elektronik 2451, Amplifier, 60 W / 1800 MHz
1 LS Elektronik 2447, Amplifier, 5 W / 1800 MHz
2 LS Elektronik 2780, Amplifier, 40 W / 2140 MHz
1 Amplifier Research 10S1G4A, Amplifier 800 MHz – 4.2 GHz
1 Kalmus 717FC, RF Power Controller 200 – 1000 MHz
1 Nucletudes ALP336, Amplifier 1.5 – 2.5 GHz
8 Mini-Circuits, Amplifier, ZHL42, 700 – 4200 MHz

Other Equipment
1 Narda H2304/101 Exposure Level Tester 1 Hz – 400 KHz
8 Maury 1878B, 3-Step Tuner
1 Siemens, Universale Messleitung (0.5) 1 – 13 GHz
6 Validation Dipole D835, D900, D1640, D1800, D2450, D5GHz
2 SPEAG Dipole SCC34 Benchmark
8 Various Antennas
1 Tektronik 2235, Oscilloscope
1 Heraeus BB6620, Incubator
1 Opus 10 Thermo-Hygrometer
1 PTM 3000 Thermometer

Computers
19 MacOS X: 2 PowerMac G5, 3 PowerMac G4, 1 iMac G4, 1 eMac G4 4 MacBook Pro, 2 MacBook, 5 PowerBook G4, 1 iBook G4
44 9 Dalco AMD Dual Opteron 2.61 GHz, 1 Dalco Dual-Core AMD Opteron 2.21 GHz, 1 Dell Precision 870 Xeon 3 GHz, 3 Dell Dimension 8400 P4 3.4 GHz, 4 Dell Dimension 8300 P4 2.6 – 3 GHz, 3 Dell Dimension 8250 P4 1 – 3.4 GHz, 5 Dell Dimension 8200 P4 1–3 GHz, 1 Dell Dimension 5000 P4 3.2 GHz, 1 Dell Dimension 4700 P4 2.0 GHz, 1 Dell Dimension 4300 P4 1.5 GHz, 2 Dell OptiPlex GX110, 2 Dell OptiPlex GX100, 1 Compaq EVO, 2 HP Vectra vl420MT P4 1.5 GHz
1 Dell Precision M90 2 GHz, 1 IBM T43p 1.86 GHz, 2 IBM T42p PM 1.7 GHz, 1 Dell Latitude D800 1.6 GHz, 1 Dell Inspiron 6400 1.66 GHz, 1 Dell Inspiron P4 2.5 GHz, 1 IBM PM 240 MHz
6 LINUX: 5 AMD Dual Opteron aXware ClusterInABox (3 Dual-boot Windows XP 64 Professional), 1 Silverstone MiniCIB AMD Athlon 64 X2 Dual 2.41 GHz (Dual-boot Windows XP 64 Professional)

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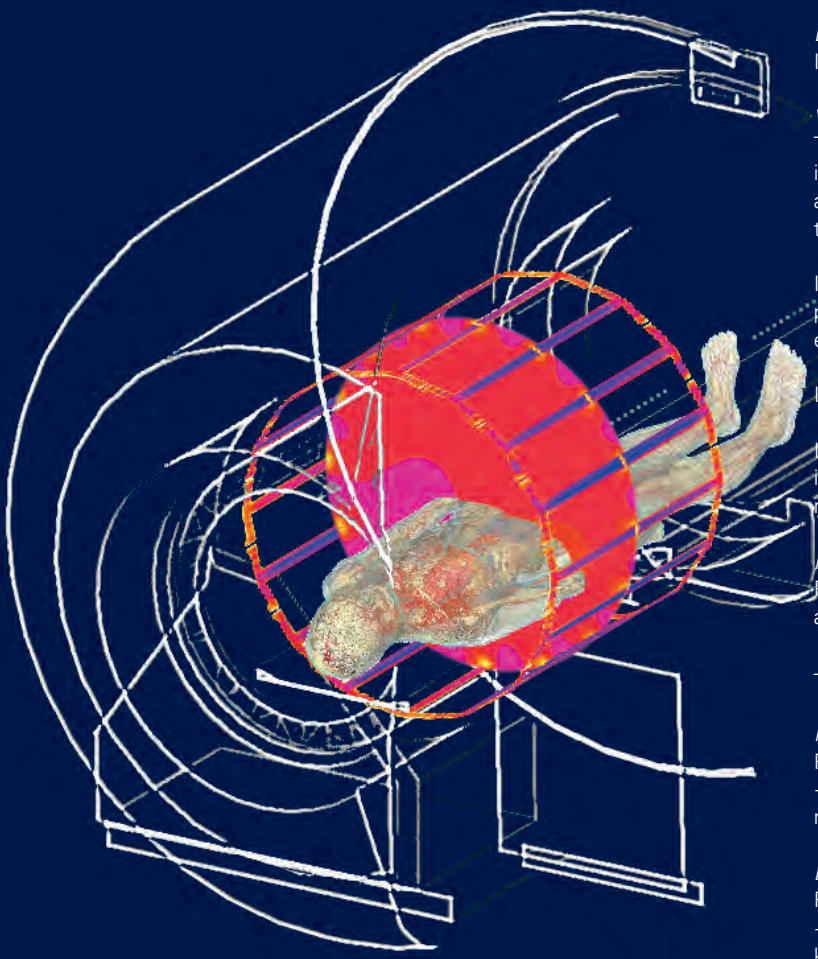
IT'IS FOUNDATION



History
The IT'IS Foundation was established in 1999 through the initiative and support of the Swiss Federal Institute of Technology in Zurich (ETH), the global wireless communications industry and several government agencies. IT'IS stands for Information Technologies in Society.

Legal status
IT'IS is a non-profit tax-exempt research foundation.

Vision
The Foundation for Research on Information Technologies in Society is dedicated to expanding the scientific basis of the safe and beneficial application of electromagnetic energy in health and information technologies.

IT'IS is committed to improving and advancing the quality of life of people with disabilities through innovative research and application of emerging technologies.

IT'IS Foundation is an independent research institute.

IT'IS Foundation endeavors to provide a proactive, creative and innovative research environment for the cultivation of sound science/research and education.

Funding
Private and industry sponsorship, public and industry research projects and information services.

President
Prof. Peter Niederer
+41 44 245 9696
niederer@itis.ethz.ch

Director
Prof. Niels Kuster
+41 44 245 9690
kuster@itis.ethz.ch

Sensing Techniques
Dr. Myles Capstick
+41 44 245 9743
capstick@itis.ethz.ch

Computational Techniques
Dr. Nicolas Chavannes
+41 44 245 9740
chavanne@itis.ethz.ch

Dosimetry
Dr. Andreas Christ
+41 44 245 9685
christ@itis.ethz.ch

Health Risk Assessment
Dr. Myles Capstick
+41 44 245 9743
capstick@itis.ethz.ch

Health Support Systems
Dr. Michael Oberle
+41 44 245 9692
oberle@itis.ethz.ch

Services
Sven Kühn
+41 44 245 9694
kuehn@itis.ethz.ch

Main Office Address
IT'IS Foundation
ETH Zentrum ETZ
CH-8092 Zurich
Switzerland

Phone +41 44 245 9696
Fax +41 44 245 9699

Mailing Address and Labs
IT'IS Foundation
Zeughausstrasse 43
CH-8004 Zurich
Switzerland

info@itis.ethz.ch

www.itis.ethz.ch