Fraunhofer
INT

FRAUNHOFER INSTITUTE FOR TECHNOLOGICAL TREND ANALYSIS INT

ANNUAL REPORT 2009

PREFACE

The past year witnessed an important further development in the structure of INT. As of 2009, the Institute was absorbed into the Federal and State Funding program, in connection with a five-year start-up boost from the state of North Rhine-Westphalia. This was the final stage in adapting INT to the "Standard Fraunhofer Model", and we assume that this improvement in conditions will allow the strategic, resilient continuation of the positive development that contract research has experienced in recent years. The number of staff financed out of contract research again increased in 2009, and the new conditions are a basis for further growth. As with the other Fraunhofer institutes, especially the problem of own funding in research promotion projects can be solved in future, and the possibility of a contribution to central programs and sponsorships is also given. Against this background, we remain highly confident that the Institute's continued dynamic development can be lastingly secured.

Building work on further extensions to Institute infrastructure is scheduled to begin in late summer 2010. This team effort between the federal ministry of defense and the Fraunhofer-Gesellschaft should in all probability reach completion in line with the master plan drawn up together with the Fraunhofer Central Administration in 2008. Envisaged are a larger seminar room, a larger library, and above all, more workspace.

From the strategic viewpoint, the federal ministry of defense continues to be of major significance for INT. With basic funding, the ministry secures the continuity of the Institute's scientific work. For the ministry as well, basic thematic orientation increasingly involves technological aspects that result from the overlapping of the border between internal and external security.

The new definition of the role of national and international governmental and quasi-governmental bodies concerned with security and defense is not yet finalized. At the same time, it is evident that practically all institutions which depend on long-term strategic orientation require expert-based assessment capability and counseling with regard to long-term technological developments and their effects on precautionary planning.

INT's support of civilian protective bodies (e.g. the Commission on Civil Protection of the federal ministry of the interior, the Federal Office for Radiation Protection BfS, the Federal Office of Civil Protection and Disaster Assistance BBK, the Federal Criminal Police Office BKA), has continued to grow, and international cooperation to incorporate technological developments in state defense planning has intensified (NATO, European Defence Agency, LoI6[1]-Cooperation). In particular, there have been increasingly successful efforts to use research projects to support both civil European security research and associated planning and decision-making within European organizations (such as the EU Commission, the European Security Research and Innovation Forum ESRIF, the European Parliament, EuroTech SRG), especially through the existing network of defense-oriented European cooperation partners.

Also gratifying was INT's successful continuation of specialist research in nuclear technology. Additionally, there was a further increase in the volume of medium-sized industry projects analyzing the suitability of construction elements for use in radiation environments (space). Just for this purpose, it was possible to secure an additional investment sum of € 1.24m from the second Economy Stimulus Package, allowing INT to widen experimental opportunities considerably for its up-and-coming major field "space/survivability of space systems". This very encouraging development is also evidenced by INT successfully winning projects for the European Space Agency ESA in 2009.

A PR highlight last year was the presentation of the Fraunhofer truck on Euskirchen's Alter Markt, which served to increase regional awareness of the Institute and the Fraunhofer-Gesellschaft.

The federal ministry of defense continues to provide the funding that secures the scientific basis for the Institute's work, and at this juncture, I would again personally like to thank the ministry for its fruitful and friendly cooperation. I also wish to thank all other friends of the Institute, in particular the Advisory Board, for their support in this interesting and motivating phase of INT's history. At the same time, I would like to thank all the Institute staff for their deep commitment in recent years.

Prof. Dr. Uwe Wiemken

1 *Cooperation Agreement between France, United Kingdom, Italy, Sweden, Spain and Germany*

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BUSINESS UNIT 3
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The Fraunhofer Institute for Technological Trend Analysis INT creates and continuously updates a comprehensive overview of the general research and technology landscape and of the entire spectrum of national and international technological developments. In addition to this general overview, we generate our own specialized analyses and forecasts in selected technological areas. For more than 35 years, the Institute has advised the German Federal Ministry of Defense on questions of technology and on how to plan and realize new research and technology projects. In recent years, there has been an increase in the volume of research carried out for other public institutions involved in security precautions and long-term changes in society. In addition to this, INT performs its own experimental and theoretical research on the effects of ionizing and electromagnetic radiation on electronic components and systems. The Institute is equipped with state-of-the-art measurement technology. The major laboratory and large-scale apparatus are radiation sources and electromagnetic simulation facilities which cannot be found in this combination in any other civilian institution in Germany. Our main clients include authorities and organizations concerned with security and precaution, as well as the aerospace industry and its suppliers.

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FRAUNHOFER INT FACTS AND FIGURES

As in past years, 2009 saw the number of staff at INT increase slightly, from 73 to 75. The number of scientists remained more or less constant, with a figure of 60% for the year. In addition to its permanent staff, INT employs a further 15 people, of whom two are apprentices, the others being student or scientific assistants. There is also a network of freelance scientists who regularly support the Institute's research work.

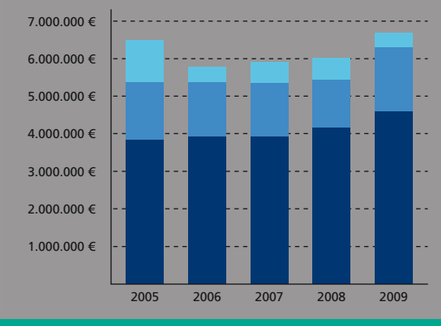
Budget

The Fraunhofer-Gesellschaft distinguishes between its operating and investment budgets. The operating budget covers all human resource and material expenses, while the investment budget deals with the procurement of capital goods such as scientific equipment and computers.

Expenses are financed by proceeds from research projects on the one hand and by basic funding on the other. In 2009, apart from federal defense ministry support for defense research, INT for the first time received funding from the Federal and State Funding program for civilian contract research on the Fraunhofer model. Owing to the growth in civilian contract research in recent years, the contract research proportion has constantly risen and is now at a good 40% of the INT budget.

Project volume again increased in 2009. There were 61 different contract research projects, of which 28 were for public clients and 33 for industry. The major part of income still came from the public sector, although income from industry continued to grow. The most important client remains the federal ministry of defense.

Budget from 2005 to 2009



Financial Development from 2005 to 2009

Human Resources

	2007		2008		2009	
	manned positions	People	manned positions	People	manned positions	People
Scientists	40,5	43	42,7	45	42,5	45
Postgraduate	11,5	13	12,5	13	15,5	16
Technicians, other	13,5	16	11,5	15	11,5	14
Total	**65,5**	**72**	**66,7**	**73**	**69,5**	**75**

Budget

Expenses Budget in 1000€	**2005**	**2006**	**2007**	**2008**	**2009**
Operating Budget	5368,0	5379,5	5356,8	5453,6	6297,3
of which Human Resources	3848,8	3930,3	3931,1	4177,8	4606,5
of which Material Expense	1519,2	1449,2	1425,7	1275,8	1690,8
Investment Budget	1133,7	425,3	560,2	569,2	391,1
Total	**6501,7**	**5804,8**	**5917,0**	**6022,8**	**6688,4**
Financing					
Funding	3910	3881	3881	4071	4042
Contract Research Projects	2591,7	1923,8	2037	1951,8	2646,4

BOARD OF TRUSTEES

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The Institute is advised by a board of trustees which is composed of people from industry, science, poltics and administration.

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- Dr. Dr. Axel Zweck; VDI-Technologiezentrum

1 *Board of Trustees meeting on June 18.2009. Representative of the Executive Board: Prof. Dr. Marion Schick*

THE FRAUNHOFER-GESELLSCHAFT

Research of practical utility lies at the heart of all activities pursued by the Fraunhofer-Gesellschaft. Founded in 1949, the research organization undertakes applied research that drives economic development and serves the wider benefit of society. Its services are solicited by customers and contractual partners in industry, the service sector and public administration.

At present, the Fraunhofer-Gesellschaft maintains more than 80 research units in Germany, including 59 Fraunhofer Institutes. The majority of the 17,000 staff are qualified scientists and engineers, who work with an annual research budget of €1.6 billion. Of this sum, more than €1.3 billion is generated through contract research. Two thirds of the Fraunhofer-Gesellschaft's contract research revenue is derived from contracts with industry and from publicly financed research projects. Only one third is contributed by the German federal and Länder governments in the form of base funding, enabling the institutes to work ahead on solutions to problems that will not become acutely relevant to industry and society until five or ten years from now.

Affiliated research centers and representative offices in Europe, the USA and Asia provide contact with the regions of greatest importance to present and future scientific progress and economic development.

With its clearly defined mission of application-oriented research and its focus on key technologies of relevance to the future, the Fraunhofer-Gesellschaft plays a prominent role in the German and European innovation process. Applied research has a knock-on effect that extends beyond the direct benefits perceived by the customer: Through their research and development work, the Fraunhofer Institutes help to reinforce the competitive strength of the economy in their local region, and throughout Germany and Europe. They do so by promoting innovation, strengthening the technological base, improving the acceptance of new technologies, and helping to train the urgently needed future generation of scientists and engineers.

As an employer, the Fraunhofer-Gesellschaft offers its staff the opportunity to develop the professional and personal skills that will allow them to take up positions of responsibility within their institute, at universities, in industry and in society. Students who choose to work on projects at the Fraunhofer Institutes have excellent prospects of starting and developing a career in industry by virtue of the practical training and experience they have acquired.

The Fraunhofer-Gesellschaft is a recognized non-profit organization that takes its name from Joseph von Fraunhofer (1787–1826), the illustrious Munich researcher, inventor and entrepreneur.

FRAUNHOFER VVS – GROUP FOR DEFENSE AND SECURITY

The Fraunhofer-Gesellschaft is indebted to society, state and economy in equal measure. On the grounds of this selfconception, it also assumes corporate social responsibilities next to its support of the economy. Since its foundation, the Fraunhofer-Gesellschaft has not only been committed to the German Ministry of Education and Research, but also to the German Ministry of Defence (BMVg) and, within its range of tasks, it covers the major part of institutional research for the BMVg. For some of the institutes in the Fraunhofer-Gesellschaft, this means that their scientific work is focused on military applications.

In addition to this, the recent developments in the field of security policy have created a new threat level. In the face of multilayered threats, today's industrial society and its highly complex and networked public or private infrastructures have become ever more vulnerable and increasingly call for solutions to provide for its citizens' security. At the same time, formerly clearly defined boundaries between internal and external security are fading, which has far-reaching consequences for the nature and deployment of modern security technologies. Present-day threat scenarios often originate outside the borders of Germany and have led to a new understanding of security. The challenges arising from these circumstances form the framework of contemporary security research. Particularly, the German Armed Forces, which are mainly active in the field of conflict prevention and the handling of crises, are confronted with various threats regarding technological as well as logistic questions in many operational areas. It is the declared aspiration of security research to develop the necessary solutions for the Armed Forces to address these tasks while being assured of the required protection.

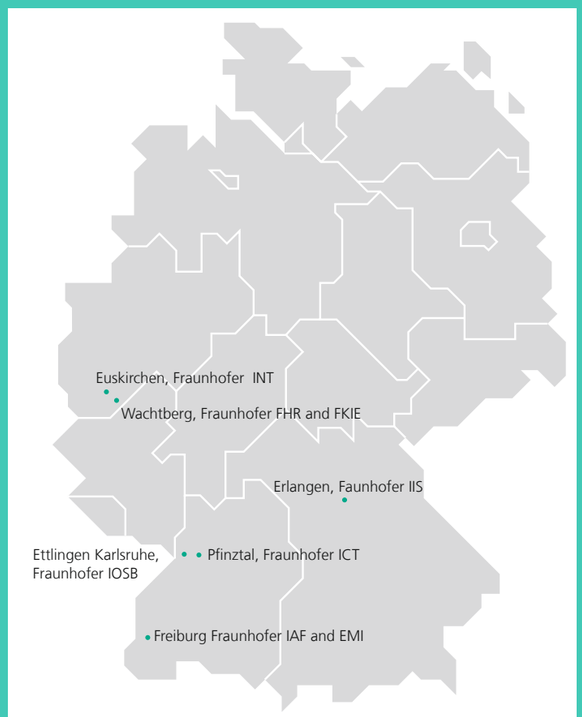
With this in mind, five Fraunhofer Institutes joined forces in November 2002 to coordinate their research activities in the field of defense and security research and to put them into action, with the additional premise to strengthen the position of military-technology research. The following institutes are the founding members of the Fraunhofer Group for Defense and Security: Fraunhofer IAF (Applied Solid State Physics), Fraunhofer ICT (Chemical Technology), Fraunhofer INT (Technological Trend Analysis), Fraunhofer EMI (High-Speed Dynamics, Ernst-Mach-Institut) and Fraunhofer IITB (Information and Data Processing). Fraunhofer IIS (Integrated Circuits) joined the group as guest member. The group's central office is located at Fraunhofer EMI.

According to longterm plans of the BMVg to bundle the government-funded research capacities in this sector and to open defense-related institutes to the civil market, the three institutes of the former Society of Applied Sciences FGAN were integrated into the Fraunhofer-Gesellschaft network. This way, the Fraunhofer Institute for High Frequency Physics and Radar Techniques FHR, the Fraunhofer Institute for Communication, Information Processing and Ergonomics FKIE – both located in Wachtberg close to Bonn – and the Fraunhofer Institute for Optronics and Pattern Recognition FOM in Ettlingen entered into the group. By January 1, 2010, FOM and IITB will merge into the newly created Fraunhofer-Institute of Optronics, System Technologies and Image Exploitation IOSB. The integration of these institutes massively sustains the group by increasing the performance in the area of reconnaissance and guidance systems and, thus, the whole field of competence concerning defense. Likewise, the connection of the institutes to the Fraunhofer science system permits to improve and expand civil application of research findings.

In addition to the intensive cooperation with the German Ministry of Defence and the support it provides in the development of new technologies for the protection of soldiers, the group considers its main tasks and objectives as follows:

- Guarantee dual-use research and civil/military know-how transfer
- Provide excellent academic quality through integration into the international scientific community
- Support the defense-related industry by means of joint research
- Research strategic orientation as regards application in the fields of:
  - Command and control capability
  - Intelligence and reconnaissance
  - Mobility
  - Effective engagement capability
  - Support and perseverance
  - Align the strategic orientation of the member institutes against the background of a future European security and defense policy

FRAUNHOFER VVS OVERVIEW



- Fraunhofer Institute for High-Speed Dynamics, Ernst-Mach-Institut, EMI
- Fraunhofer Institute for High Frequency Physics and Radar Techniques FHR
- Fraunhofer Institute for Communication, Information Processing and Ergonomics FKIE
- Fraunhofer Institute for Applied Solid State Physics IAF
- Fraunhofer Institute for Chemical Technology ICT
- Fraunhofer Institute for Integrated Circuits IIS
- Fraunhofer Institute for Optronics, SystemTechnologies and Image Exploitation IOSB
- Fraunhofer Institute for Technological Trend Analysis INT

BUSINESS UNIT TRENDS AND DEVELOPMENTS IN RESEARCH AND DEVELOPMENT

Dr. Matthias Grüne

The Business Unit "Trends and Developments in Research and Development" (TDRD) documents all Fraunhofer INT results that are based on a technologically sound and comprehensive overview of all developments relevant for state and economy. It provides planners and decision-makers with orientation in an increasingly complex environment . This environment is characterized by ever shorter technological development cycles and the constantly increasing dependence of all social processes on technical systems. Usually, future technical solutions can only be realised when research and development laboratories are already preparing for them today. The Unit's work thus mainly focuses on debating the substance of the research and development fields and on generating a workable dialogue with the specialist sciences concerned.

Work in this Unit is predominantly carried out by the Technology Analyses and Forecasts Department (TAV). Last year, the Department headship was progressively transferred from Dr. Thomas Kretschmer to Dr. Matthias Grüne, who also took over the Unit TDRD. This secured continuity as well as new impulses for further development.

For the first time in the Department's history, an invention stemming from a systematic study of technologies for public safety and security was thus patented in 2009. It was possible to increase industry's awareness of the Unit, for example through presentations at innovation management events, or through the Unit's first-time presence at an industrial materials fair. The methodological-scientific profile was also enhanced. Joining the futurology association "Zukunftsforschung e.V." thus laid the foundation for formal networking within the community. Support through start-up funding from the Federal State of North Rhine-Westphalia also made it possible to expand activity in bibliometrics, as documented by several conference contributions and peer-reviewed publications.

The Unit's work breaks down into four fields (with all TAV research staff working in all fields respectively) :

- Technology foresight
- Methodology of technology foresight
- In-depth technological analysis in selected technologies
- Future defence technology

Technology Foresight - an overview

Technology foresight serves to create the widest possible overview of future-relevant scientific and technological developments and their application potential. This calls for the continuous evaluation of all relevant sources, such as science and technology media and information services, conferences, research programmes and technological future studies. This mass of information is kept within limits by identifying key sources. Specialist consultation in the form of surveys or expert reports complements the information basis. Where appropriate, scientometric processes are used to help select key sources and experts.

The most important result of this work is the core themes. These are research or development themes that have high dynamics, a high technology relevance and a large use and application potential, and which are conducted with sufficiently large, even increasing, effort (highlights, thematic hotspots). The core themes are the basis of further investigations in the frame of technology analyses and experts' reports, the future defence technology analysis and for the Fraunhofer Defence and Security Group Round Table (Fraunhofer VVS). The results of general technology foresight work are usually published, for example in the monthly INT column "Neue Technologien" in the magazine "Strategie & Technik", in articles in specialist

magazines and books, and in 2009, in contributions to "Technology Guide" by the President of the Fraunhofer Institute.

Further development of methodological principles

The critical monitoring of one's own methodological principles and their further development is a self-evident part of the work of a scientific institute. Especially modern scientometrics (bibliometrics and associated processes) and text mining processes, as well as formalized evaluation, creativity and expert survey methods hold the promise of valuable supplements for the Unit's technology foresight capabilities. In 2009, the Unit continued to compile, categorize, analyze and evaluate tools and methods for predicting and researching the future. International future studies were examined and their methodology and relevance for future defence technology were analyzed. The results confirm INT's hitherto successfully used technology foresight methods.

Technology analyses in depth

In technology analyses, the Unit closely examines a series of technological questions with a view to their special future potential and/or their long-term defence technology relevance. Our own surveys are supplemented by outsourced expertise. In-depth fields are:

- Materials
- Energy technology
- Unmanned systems / Robotics
- Information and communications technology
- Biological technology / Life sciences
- Optical technologies
- Nanotechnology

In materials, it is especially the Unit's comprehensive, in-depth competence that demonstrates its universal selling position. This is regularly documented in the INT column "Werkstofftrends" in the magazine "Werkstoffe in der Fertigung", and in presentations at materials conferences.

Future Defence Technology Analysis - A radar on Technology for the Federal Ministry of Defense

In the case of Future Defence Technology, the task is to evaluate and describe the (especially long-term) relevance of technological future developments for the Federal Armed Forces in the light of foreseeable threats and the capabilities required. This builds on the results of technology foresight and in-depth technology analyses. The main result of this monitoring and relevance evaluation is the Defence Technologies Forecast (Wehrtechnische Vorausschau - WTV), which is made available to a wide circle within the Federal Ministry of Defence. In future, it is intended to transform this from a study that appears once every few years into a continuing process that reflects the Ministry's constantly active technology radar.

Participation in various international organs that cooperate on predicting defence technology serves the continued improvement and updating of evaluation yardsticks. In line with the analysis of future security policy, department staff also took part as technology experts in the Bundeswehr's Transformation Centre workshops (Zentrum für Transformation der Bundeswehr - ZTransfBw). The future defence technology analysis is supplemented by predictions on the technological aspects of public security and safety. In 2009, the focus was on criminal technology.

1 *Dr. Matthias Grüne*

CAR HORNS AS A PUBLIC WARNING SYSTEM

Dr. Ing. Guido Huppertz

Providing a nationwide warning system in case of natural disasters and other major catastrophes is an unsolved problem in Germany. During the Cold War and up until the 1990s, the job was done by sirens; but in the new millennium, Germany faces a warning gap. Since the end of the last century, the old siren system has been largely dismantled in order to save money. Today, only a fraction of the former capacity still exists, and most of that only serves the fire brigades.

Yet even in peacetime, in the event of large-scale dangers, such as extreme weather, industrial accidents or terrorist attacks, the public needs to be given specific warning by governments and local authorities. Very often, the authorities have only very little time to get the warning across to the public.

Closing the "Warning-Gap"

Although the Federal Government's SatWaS satellite system can pass warnings on to the media, what is still missing is the attention-grabbing effect of sirens that can tell people day and night "You are in danger! Turn your radio on!" So, for years, the search has been going on for ways to create a wake-up effect in the place of missing sirens. The use of land line telephones, radios, radio alarms or mass text messages on mobile phones has been discussed and rejected. Today, there are ideas about technically upgrading smoke detectors or mobile phones, so that authorities can broadcast warning signals through them. But both approaches would be difficult to implement.

For these reasons, Fraunhofer INT is examining a completely new possibility for a broadcast warning system, one that – like the sirens – generates a warning signal that is clearly audible over a wide area. INT registered this new warning system for a patent in January 2009. The idea is to create a signal using the horns of all cars parked in an affected zone. Instead of a central siren, many "small sirens" would thus warn the public.

Measured against the total number of vehicles registered in Germany, 15 % of all vehicles would be enough to generate a widespread warning. Added to this is the advantage that where there is high population density, the number of cars per household decreases, but in areas of low population density, the number increases to above average. This means that outside high population zones, where maintaining sirens is particularly expensive, car horns can give warning in the very area where people are to be found.

The EU Commission initiative for the introduction of the eCall emergency system should see a GPS receiver in almost all new series production cars within a few years. This will allow the warning area to be fixed exactly in accordance with the nature of the risk. Where a car system can only receive and not transmit signals, there is no conflict potential concerning data protection.

Even where power networks should fail, a car's independent power supply allows the warning system to function. So the car horn not only makes people aware of a danger, but the car radio can also be used to get more detailed information across to the people. The broadcasting functionality of this warning system and the average renewal rate for vehicles mean that the system would not require much time to set up. At the same time, the number of vehicles would provide for widespread multiple redundancy later. The cost of a car horn system is low: reckoned against the life of a car, it would be less than one Euro a year. Seen against the purchase price of a new small car, the cost is as good as negligible. In the CHORUS Project, Fraunhofer INT, together with partners from industry and other Fraunhofer institutes, is currently looking at how to realize secure radio transmission, to create a significant warning signal and to avoid extreme noise levels. Several approaches have been put forward, and in the next few months it will be a question of finding the best technical and economical method to introduce such a warning system.

ENHANCING HUMAN PERFORMANCE

Dipl.-Ing. Stefan Reschke

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Enhancing Human Performance One of the far-reaching fields under observation in Trends and Developments in Research and Development is life sciences. Over the last two decades, the fields of medicine, pharmacology, cognitive neurosciences and nanotechnology have produced a new complex of themes addressing the sustaining and, especially, the enhancement of human performance. The main triggers for this development is the aging society in industrial nations, the paradigm shift from restorative to regenerative medicine, and the optimisation of man's physical and mental performance to a degree beyond cosmetic intervention.

For several years, public attention has increasingly focused on the enhancement of human performance. Contributing to this is a variety of factors, only one facet of which is the ongoing discussion of doping in high-performance sport. In this context, what appears considerably more interesting is concepts such as "brain-doping", sleep deprivation over several days with only low-level negative effect, pharmacological, genetic and technological improvements to physical performance levels, or computer-brain interfaces. Many of these often visionary ideas were introduced and spread in the last 50 to 100 years, but with technology, medicine and pharmacology bringing their reality closer, they are currently experiencing a new quality of awareness, already sparking off ethics debates. One major aspect that can be observed here is the shift of the interfaces between man and machine towards the technological side, towards an increasing willingness of the human to integrate technology into the body. Another is the considerable increase in the off-label use of medicines by healthy people.

After selective analyses and studies in individual fields such as "cognitive ergonomics" or "brain-computer interfaces (BCIs)" in past years, INT embarked on its systematic approach to the whole complex in 2007. Based on the democratic change in western society, specialist literature and conferences produced a collation of major mental and physical disabilities that go hand-in-hand with aging, together with their causes and effects. In turn, this was compared with foreseeable life quality improvements that future technology, medicine and pharmacology should make possible. On this basis, in-depth studies and analyses were conducted on "enhancing human performance."

For more than two decades, technology has experienced a continual approximation between technology and cellular life. For example, on the nano and micrometre scale, it has for some time been able to grow lasting living tissue on structured IuK technology and to contact it electrically, and sponge-like structures made of synthetic materials such as polymers, ceramics or metals can serve as "digestible" frames for regenerating hard and soft tissue. Many research approaches and successes come from medical prosthetics, which together with science and engineering fields like materials science, nanotechnology and micro-systems, functions as a technology generator.

In medical diagnostics and therapy as well, science and engineering a central enablers. On the one hand, the analytical approach has already taken medical research as far as the cellular level of thought. On the other hand, the directed insertion and in principle also the expression of modified genetic information are functioning in various models. Closely linked with pharmacology are certain aspects of diagnostics and therapy that are summarized as "drug delivery" and "drug targeting". There is now successful work in introducing diagnostic and active substances exactly to the part of the body where they are needed, to be released in exactly the dosage required by the patient concerned. Nanotechnology processes also play a major role in such processes.

All three fields – technology, medicine and pharmacology – also show considerable potential for enhancing physical and mental performance in healthy, younger people. "Neural ergonomics" and "biological ergonomics" are two terms that are slowly becoming established here, describing a new generation and quality of man's adaptation to his tasks and environment. Neural ergonomics develops possibilities for enhancing physical and cognitive human skills by synergetically coupling man and technology beyond the level of conventional man-machine interfaces such as displays or joysticks. Biological ergonomics develops possibilities to improve physical and/or mental capacity and efficiency through biological means, for example through metabolic processes, smart drugs or genetic optimisation.

In many fields, achieving success is still a long way off, but science continues to find "body switches" that can lead selectively to enormous increases in performance. For example, muscle growth is controlled by the protein myostatin. If this protein is switched off, muscle growth follows spontaneously, even without corresponding training.

A selection of our studies and observation results were presented and discussed internationally in 2009, in the form of talks and publications. Part of this was a trilateral workshop in the Netherlands (NED, SWE, DEU), two contributions to a NATO-RTO symposium (HFM Symposium on Human Performance Enhancement for NATO Military Operations: Science, Technology, and Ethics), and further presentations at national institutes of higher education.

1 *Dipl.-Ing. Stefan Reschke*

BIBLIOMETRICS – FROM MEASURING BOOKS TO TECHNOLOGICAL FORECASTING

Miloš Jovanović, M.A. – Business Unit 2
Dr. Marcus John – Business Unit 1


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For years, there has been a rapid increase in the annual number of scientific publications. These constitute one of the main information channels through which researchers communicate their newest findings. If one wishes to stay up-to-date on current research topics or to evaluate the quality of research, a continuous monitoring of this channel is necessary. An individual assessment of every single publication by experts would be time-consuming and hardly possible. This is where the statistical methods of bibliometrics are applied in order to make the amount of scientific publications manageable.

Bibliometrics

The word bibliometrics is of Greek origin and translates into "the measurement of books". So this discipline measures books or publications in a broader sense. At the Fraunhofer INT, bibliometrics is used cooperatively by the business units 1 (Trends and Progress in Research and Technology) and 2 (Planning, Programs and Structure in Research and Technology).

The necessary information for a bibliometric analysis is extracted from various databases (e.g. the Science Citation Index Expanded in the Web of Science). The aims and the examined object (e.g. a technology or an institution) determine the choice of the database as well as the type and extent of the analysis. A basic bibliometric analysis deals with an institution's number of publications (e.g. a university's). For this purpose the formulation of a reasonable search query is mandatory. Subsequently, the found data has to be checked and cleansed iteratively. In a following step, the citations the publications of these universities have received from the scientific community can be contemplated. In so doing, those scientists who have read the university's publications are determined. The same is possible for individual authors or countries. These simple measures can be combined in so-called indicators, e.g. by calculating the number of citations per publication per year.

By means of bibliometric methods it is also possible to analyze particular technologies such as enzyme or submarine technology. The author-information reveals who is currently studying a given topic and what cooperation has been established. Increasing publication numbers over a period of time hint at growing research activity. Accordingly, decreasing publication numbers suggest the opposite, namely reduced research activity. Whether this description permits the prediction of future trends is still a matter of scientific discussion and thus needs to be examined carefully. However, it provides useful clues for political and economical policy-makers in research and technology. Additionally, it is possible to identify a topic's experts by examining the number of citations a publication received, its origins and up-to-dateness. This gives valuable hints for inviting speakers to workshops at the Fraunhofer INT.

Further research is aimed at author cooperation. Such a cooperation network can be analyzed and visualized in regard to its progress over time. For example, an analysis of the cooperation in former Yugoslavia has been conducted using this method. It was found that social crises like the civil war (from 1991 until 1995) negatively affect cooperation activity. Interestingly, it has also been shown that since the end of the civil war the amount of cooperation has again reached the pre-war level. In the context of this study, indicators were calculated that allow the analysis of cooperation strength and a country's dominance within a cooperation network.

Another bibliometric method is the footprint analysis, as developed and tested as part of a PhD-Thesis at the Fraunhofer INT. The central aim of this method is to gain a better understanding of the migration of scientific findings between pure and applied science. To this end, experts first identify an article which describes a scientific discovery or an idea for the first time. This is called the genesis article. The citations such an article receives over time can be interpreted as footprints in the scientific landscape. The analysis of these traces is an important aspect of the footprint analysis and gives it its name. At first, the number of citations over time is examined. The topic is current or of growing interest if this number increases. Next, the citing institutions are inspected. Declining publication numbers from universities and growing publication numbers from companies can be a possible indication for the technology's drive towards application. A look at the disciplines the citing publications originate from (e.g. engineering or mathematics) can also support or reject a possible application of the technology or discovery. For these questions, tools need to be programmed to enable such analyses.

Search query

A search query for patents for a technology is formulated by using the keywords of the scientific publications. With this data, it is possible to determine whether the number of patents has increased or decreased in the course of time. Furthermore, it is useful to examine whether the patents cite scientific papers. A strong connection to this literature is an important indication for possible application. Thus, with the footprint analysis a quantitative appraisal of a technology or discovery is conducted. It provides hints as to whether this technology might become interesting for the applied sector in the near future. To date, the topics "metamaterials" and "fullerenes" have been studied this way.

Over the years, bibliometrics has been established as a valuable instrument for technology and trend analysis. It augments its quantitative possibilities and thus supports the qualitative analysis done by experts of different disciplines. Bibliometric methods are continuously improved and applied to a growing number of problems.

1 *Miloš Jovanović, M.A.*
2 *Dr. Marcus John*

BUSINESS UNIT PLANNING, PROGRAMS AND STRUCTURE IN RESEARCH AND TECHNOLOGY

Dr. Joachim Schulze

The business unit Planning, Programs and Structures in Research and Technology (R&T) supports customers in their R&T planning and strategic decision making processes.

Based on years of experience, we analyze both method and substance of defense and security research plans, . This includes comparative studies on national defense and security research programs in Europe and the evaluation of different approaches in research management.

Our work also focuses on the assessment and planning of emerging technologies that are relevant for our customers. Among our strengths is the identification of relevant Information for R&T planning and the mapping of complex interactions in computer-based information systems.

Meta-analyses, e.g. interdisciplinary studies, are the backbone of strategic planning support in R&T. They guarantee that all factors of the broader environment are adequately taken into account. They are the basis for providing competent consultation for government, administration and industry, specifically in security and defense. Members of this business unit include experts from various scientific disciplines (Physics, Geophysics, Biology, Pharmacy, Biochemistry, Chemistry, Engineering, History, Economy and Informatics).

R&D Planning in Security and Defense: Structures, Programs, and Markets

This business unit supports the Ministry of Defense by designing strategic processes for R&T planning. Changes of strategic requirements and the R&T environment can lead to the ad hoc redesigning of the processes. Existing methodologies to be used for redesigning these processes are described in several reports and evaluated regarding their applicability in different R&T environments.

The development of European defense and security organizations has been monitored and documented. A comparative analysis of the European Defence Agency (EDA) and the NATO Research and Technology Organization (RTO) has also been conducted, and in addition, Germany's international R&T activities in security and defense have been studied.

Based on these research efforts, the German Ministry of Defense was supported in the performance of its duties in international committees. The detailed knowledge obtained about foreign R&T planning documents and processes is taken into account for the German planning process and for developing future cooperation projects.

Our activities within the European Security Research Programm (part of the Seventh Framework Programme) have been intensified. In the EU project "Demo for mass transportation security – road mapping study" (DEMASST), the Fraunhofer INT contributed to the development of strategic roadmaps. Similarly, the development of a European R&D roadmap was supported in the EU project "Coordination action on risks, evolution of threats and context assessment by an enlarged network for an R&D roadmap" (CRESCENDO).

The evaluation of projects submitted in the Second Call of the European Security Research Programme has been analyzed. Focal points of the evaluation have been identified, and strengths and weaknesses of the process currently used to select projects for funding have been discussed. Work on a future information system on European Security Research ("Europäische Sicherheitsforschung"/esfo) was started. The system will collect, connect and present information on national and supranational activities in security research.

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TECHNOLOGY ROADMAP "SELF-HEALING MATERIALS"

Dr. Sabine Müller

Assessment models for CBRN Threats and critical technologies

Supporting the Commission on Civil Protection of the Federal Ministry of the Interior, a Weighted Bit Assessment Table of Hazardous Chemicals (WBAT-C) has been developed and disseminated.
In addition, a computer-based representation of WBAT-C has been established in order to enable more efficient presentation of the method's features, and an expansion of the underlying Weighted Bit Assessment Method (WBAM) that resulted in the assessment within a European research project has been prepared. Also, the development of a tool addressing the assessment of biological hazards is currently being tested.

Text mining and Bibliometry for R&T planning

Text mining and bibliometry are applied to discover relevant knowledge for R&T planning in defense and security. Semi-structured data (e.g. from patent or publication databases) as well as unstructured data (e.g. documents with technical content) are used for this.

Methods from text mining and bibliometry have become a valuable instrument to support research planning. Results have been published as scientific articles in several journals and in the proceedings of scientific conferences.

Strategic planning with scenario studies and the creation of a technology roadmap for emerging technologies in security and defense

A scenario study "Research in Security and Defense in 2030" and a roadmap for "self-healing materials" was published.

Market enquiries in the field of security and defense

On behalf of the European Defence Agency (EDA), a study on the aspects of the European defense market has been conducted in cooperation with the Spanish ISDEFE. The Title of the study is "The Role of Ownership and Public Aid Practices".

1 *Dr. Joachim Schulze*

The objective of the Scenario Study "Security and Defence Research in 2030" was to show conceivable development directions in German research. Based on the results of this survey, possible risks and opportunities for research and development in a selected technology were investigated. The roadmap "Self-Healing Materials" was published in early 2010.

The Project

With the help of the scenario technology concerned, an expert workshop at the end of 2008 looked from various future perspectives at several scenarios that were consistent in themselves.

- The State as actor in a prospering environment in the face of globally growing symmetrical and asymmetrical threats
- The State as actor in an environment of economic and technological crises and a big increase in the number of natural disasters
- Private actors in a prospering environment in a stable political situation and a big increase in the number of natural disasters

The main result is that developments in research will largely be affected by the type and intensity of the prevailing threat. A further important factor was shown to be which key players will be responsible for the security of the people and the defence of the State, including the relevant research and development (private client vs. State client, research client, end-user etc.).
Not to be underestimated is the influence that the economy, society and politics will have on Germany's future research position.
Since more trends will be broken and the threat networks will become more complex in the future, what is above all necessary is preventive action for improved State resistance potential, to add greater strength to inner and external security, nationally, regionally and globally.

On the basis of the conclusions described, a series of explorative Technology Roadmaps is to be created. From the lessons learned in the Scenario Study and based on the supposition of various scenarios, this series should show possible developments in selected technologies. Viewed methodically, explorative roadmaps become meaningful when the (technological) development process is not steady, but is also affected by new discoveries, events or decisions.

More state-of-the-art results and a prognosis

To begin the series, we considered "Self-Healing Materials", with the focus on Security and Defence.
This is primarily a question of improved protection and a longer useful life for mobile platforms such as helicopters, or of optimum protection for personnel that needs to move in an insecure environment. The development of self-healing materials is also relevant for space technology (protecting satellites from damage, e.g. from space debris). In the next 10 to 15 years, rapid development is expected in the self-healing functions of polymer materials in particular.

Key Roadmap elements are

- Describing current developments in self-healing in various materials and processes
- Considering scenario-dependent influences and their changes for the years 2015, 2020 and 2025
- The November 2009 expert workshop, held together with outside experts, that produced possible development processes
- Documenting and marketing the resultant explorative technology roadmap

To answer the growing interest by the State and industry, it is planned to publish 1 to 2 roadmaps a year on selected security technologies, such as robust and intelligent logistics support or autonomous networked systems.

BUSINESS UNIT NUCLEAR EFFECTS, THREATS AND DETECTION SYSTEMS

Dr. Wolfgang Rosenstock

This work area conducts theoretical and experimental research and development in the fields "nuclear radiation effects in electronics and optoelectronics" and "nuclear defense policy and detection systems". Besides basic research, numerous contract research projects are carried out for clients from industry (aerospace suppliers, nuclear research and nuclear technology) and from the public sector (largely for public bodies and organizations with security tasks, and for major research centers). In the context of the basic funding from the Federal Ministry of Defense (MoD), GF 3 also deepens and expands the national ability to judge in the field of nuclear and radiological weapons and associated asymmetric threats.

To fulfill these tasks, GF 3 operates various nuclear radiation simulation and radiation facilities:

- several neutron generators (14 MeV and 2.5 MeV)
- a gamma-flash system for pulsed gamma and electron radiation
- Co-60 irradiation facilities
- a proton cyclotron irradiation station at the Nuclear Research Center (FZ) in Jülich
- a heavy ion irradiation station at the Heavy Ion Research Center (GSI) in Darmstadt
- an isotope laboratory

For the safe operation of these irradiation facilities and the handling of the numerous radioactive substances, INT has the appropriate radiation protection infrastructure and a permit to operate in third-party nuclear facilities. All experimental work is supported by a precision engineering laboratory which produces special mechanical parts for the experimental facilities, as well as by an electronics laboratory that handles production, maintenance and repair work for experimentation electronics.

Space weather investigations

Generally, further investigation deepened GF 3's knowledge of the impact of space weather on satellites in general, and on on-board electronics in particular. For the effects of ionizing radiation in electronic circuits, extensive studies were carried out on components, circuits and assemblies, as well as on optoelectronic components. The investigations were mostly conducted at the irradiation facilities of Fraunhofer INT, as well as at a proton irradiation station set up by INT on the cyclotron of the Nuclear Research Center FZ in Jülich. As part of a multinational project of the European Space Agency (ESA) under the direction of INT, a new irradiation station was constructed at the Helmholtz Center for Heavy Ion Research (GSI) in Darmstadt. In this project, "Investigation and Analysis of Very High Energy Accelerators for Radiation Simulation", one-particle effects in electronic components are investigated by irradiation with high energy heavy ions.

Initial results show significant differences from the conventional tests of low-energy accelerators. Cooperation with the Fraunhofer Ernst Mach Institute (EMI) has been expanded. Thus the impact detector MDD3 was qualified regarding radiation resistance, and INT is subcontractor in the EMI-led ESA project on the risks to solar generators from impacts and plasmas. To expand the irradiation and measurement facilities, more than € 1m was approved under the Economic Stimulus Package II. Among others, this allowed for the procurement and setting up of an additional gamma radiation source (Co-60), a 450 kV X-ray facility, a focused, pulsed picosecond IR laser for the place and time-resolved generation of single-event effects in semiconductor devices, and a UV solar simulator. In addition, with fiber Bragg gratings (FBG), new sensor technologies for use in radiation environments were investigated, for the first time at low temperatures (-50°C).

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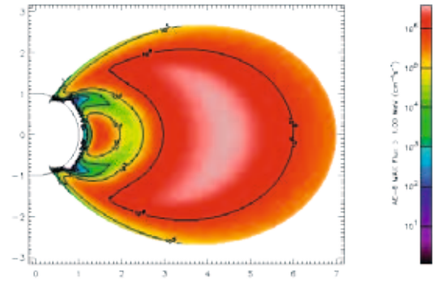
SPACE WEATHER – A HAZARD FOR SATELLITES

Dr. Stefan Metzger
Dr. Stefan K. Höffgen



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On the one hand, these can register temperature and tensile stresses, to which end they have to be so selected that no incorrect measurement results from concomitant radiation. On the other hand, radiation systems in particular serve as a radiation monitor.

Political and technological developments in nuclear disarmament and proliferation are continually observed, especially from the physical-technological aspect. Specifically, the nuclear developments in Iran have been observed and analyzed. In the European Security Research and Innovation Forum (ESRIF), Working Group 6 (WG 6, CBRN threats) was supported, in particular with contributions on nuclear and radiological risks and potential threats. There was intensive work on the final report, published in December 2009, and on the Road Map contained in Annex II. As part of the work in the ESARDA Working Group on Verification Technologies and Methodologies (VTM), which is organized by the Non Proliferation and Nuclear Safeguards Unit at the Joint Research Centre in Ispra, Italy, developments in international disarmament treaties were investigated, in particular the CTBT with the focus on on-site verification (OSI) and new safeguard technologies for the International Atomic Energy Association. For the prevention and early detection of terrorist activities involving nuclear or radioactive material, new detection and measurement systems for the non-destructive identification of such substances were studied with regard to their suitability for use on location. The systems were tested under difficult realistic conditions to establish their application qualities and limitations. To this end, and at facilties such as PERLA (Performance Laboratory) and PUNITA (Pulsed Neutron Interrogation Test Assembly) at the Joint Research Centre in the Institute for the Protection and Security of the Citizen (IPSC) in Ispra, various detector systems were used under different conditions to measure uranium and plutonium samples not available in this isotopic composition at INT. At EU level, the issue of CBRN threats and their countermeasures was further pursued. In the project "Ukrainian border crossing station", aimed at improving the combating of smuggling radiological and nuclear material at Ukraine's border points, INT scientists gained an impression on location and analyzed the processes that should prevent the smuggling of radioactive material. The project is being conducted under TACIS (Technical Assistance to the Commonwealth of Independent States) of the European Commission. Project promoter is the European Joint Research Centre in Ispra.

1 *Dr. Wolfgang Rosenstock*

Space weather endangers satellites, because it changes the radiation environment. The fluxes of high energy protons and electrons change by several orders of magnitude during solar events or magnetic storms, which occur especially frequently during the maximum of the 11-year sun cycle. These particles can create a wide range of effects in electronic satellite parts, and these can in certain cases cause disruptions and breakdowns in satellites.

With its various radiation facilities, the Fraunhofer INT is able to simulate these effects in order to help satellite equipment manufacturers to improve the survivability of their devices and systems.

Radiation in Space

The Earth's magnetosphere is exposed to a constant bombardment of high-energy charged particles from all directions. Most of the time, these are "naked" nuclei without electrons in the shell. These ions consist to 85% of protons, 14% of alpha particles (helium nuclei) and about 1% heavier ions, with relative accumulations at iron and carbon. These galactic cosmic rays (GCRs) are generally relativistic, which means they move close to the speed of light. They are partially shielded by the magnetic field and the atmosphere of the Earth but can penetrate deeper into the magnetosphere at the poles as compared to the equator.

The flux of the cosmic rays is influenced by the 11-year sun cycle..The solar wind, a constant flow of ionized gas from the sun, partially scatters the GCRs away from the heliosphere. Therefore, during solar maximum, fewer GCRs are able to reach the Earth's magnetosphere

Right now (spring of 2009), we are just at the beginning of a new cycle, the 24th. At the moment, cosmic ray intensity has reached its highest value since the 50s of the last century. The reason for this may be that the last solar minimum was the longest for a fairly long time.

The first flight of a radiation monitor on board a satellite in 1958 showed areas with very high count rates. The American scientist James Van Allen identified these regions as charged particles trapped inside the magnetic field of the Earth. Follow-up studies even showed that the Earth is actually surrounded by two radiation belts. An inner belt up to 2.5 Earth radii (ER) and an outer belt up to 9 to 10 ER with an area of low intensity in between, the so-called slot region. The inner belt is mainly composed of protons with energies up to several hundred MeV as well as electrons with energies up to several MeV. (An MeV is the energy of a single charged particle after being accelerated by a voltage of one million). The particle fluxes in the inner belt reach their maximum between 1 and 2 ER. The outer Van Allen belt consists mainly of electrons, whose number is largest around 5 ER (see Fig 1).

Due to intensive magnetic storms or strong coronal mass ejections, the radiation belts can be heavily distorted and their particle densities may vary considerably. In certain cases it is even possible that additional radiation belts emerge and exist for days to months.

In the years around the solar maximum, the sun increasingly emits high energy particles due to flares and coronal mass ejections. These solar particle events (SPE) last several days and consist of protons and heavy ions. The composition and the particle energies fluctuate considerably from event to event.

1 *Integral electron flux (E > 1 MeV) according to the AE-8 MAX model of NASA*

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SEARCHING AND IDENTIFYING RADIOACTIVE MATERIAL WITH HAND-HELD HIGH-RESOLUTION GAMMA DETECTORS

Dipl.-Phys. Wolfram Berky

Radiation Effects

The dose is used to quantify effects caused by the generation and accumulation of charge due to ionization. The unit is deposited energy per unit of mass with the SI-unit Gray (1 Gy = 1 J/kg = 100 rad). Most dose effects depend on the total dose as well as on the dose rate. The accumulation of dose results in changes of the threshold voltage of metal oxide semiconductors (MOSFETS) by trapping holes in the oxide below the gate. Additionally, dose deposition can lead to an increase of leakage currents. In bipolar transistors the accumulation of dose usually causes a decrease of the amplification.

Particles passing through matter lose a part of their energy, causing displacement damage to the crystal structure of the semiconductors. This means atoms are displaced from their lattice sites by the incoming particles and end up in intermediate positions. Examples of displacement damage effects are the decrease of the amplification of bipolar transistors, the reduction of the efficiency of solar cells or the degradation of detectors or CCDs.

Cosmic rays and solar protons usually have high energy and are densely ionizing. They produce free charge carriers along their track. If enough electron-hole pairs, compared to the critical charge, are created and collected by the electric fields inside the sensitive areas, single-event effects may be induced. These effects can be of temporal nature like single-event upsets (SEU). Here the stored information is flipped from "1" to "0" or vice versa. However, in some cases it might happen that electronic parts are destroyed by single-event latchup or burnout.

Electrically isolated surfaces of satellites can be charged up to a few hundred volts by moving through plasma. If the voltage differences between certain areas on the satellite surface exceed a threshold, discharges can occur, either spontaneously or triggered by movement of parts, for example of a robot arm. These discharges are accompanied by electromagnetic pulses which can couple via antennas, cables or openings into the body of the satellite.

Space Weather and Satellite Anomalies

The Aerospace Corporation made a survey among satellite operators to investigate the reasons for recent satellite anomalies. According to the satellite operators, 299 of the anomalies encountered might have been caused by space weather. The distribution of the causes is as follows:

Distribution of the causes of satellite anomalies

Diagnosis	Fraction
ESD and Charging	54%
SEU	28%
Total Radiation Damage	5%
Micrometeororid / Debris Impact	3%
Miscellaneous	9%

2 *Dr. Stefan Metzger*

3 *Dr. Stefan K. Höffgen*

Prevention of terrorist acts with nuclear or radioactive material is one of the most important challenges in the field of security today. Sophisticated detection methods are required to localize and identify illicit radioactive and nuclear material. Especially in the case of on-site surveys of places where nuclear or radiological material is suspected, hand-held detectors play an important role because relevant areas can be searched within a reasonable period of time. Additionally, an identification of radioactive material in-situ is helpful in case a localization of such material has been successful. We investigated the practicability of several hand-held detectors for the localization and identification of radioactive material in-situ.
To investigate the detectors' performances in an on-site survey we performed search and identification measurements in one of our labs which represented a relatively small area where radioactive material is suspected. The hidden radioactive material was represented by a Co-60 source (activity: 350 kBq). It was embedded in a transparent chip of Lucite (ø = 2.5 cm; thickness 3 mm). The general aim was to figure out if and how quickly test persons would be able to locate the source, based on the detectors' readings and signals only.
For the surveys, five search and identification detection devices from four different manufacturers were investigated, featuring different crystal materials, sizes, weights, and software. In addition, the widely-used dose rate measuring device FH40 was investigated for comparison. Figure 2-7 shows pictures of these detectors.

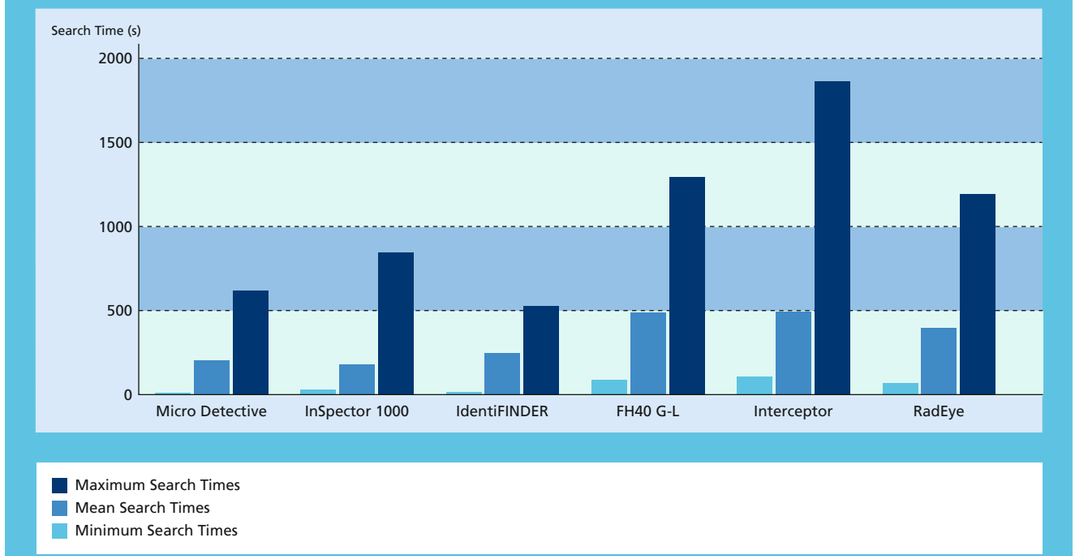
In order to gain comparable results for each detector, we selected 24 hideouts located at four different heights (6 per height) for the source, and had test persons searching the hidden source once for every height with each detector. The task of the search procedure was to locate the source as quickly as possible. The time necessary for locating the source was noted. Then an identification routine was run if the investigated detector featured such a routine.
The survey and therefore the time measurements always started at the lab entrance. The directions and walking speed during the survey were chosen by the test persons concerned.

Among the test persons were people both experienced in handling radiation detectors, and also who previously did not know the detectors at all. This survey method included several random factors that were dependent on the individual habits of the test persons; but also in a real situation it would be very difficult to predict the searcher's behavior and action.
Because of the relatively small number of test persons, we had to accept large variations in the measurement's results. These variations occurred because of both device handling differences and the test persons' individual search strategies, e.g. walking speed, walking directions, etc. Figure 2 illustrates the results of the search times including all search results.

Identification measurements were performed with the IdentiFINDER, the InSpector 1000, the Interceptor, and the Micro Detective. In general, a "confidence factor" given in percent is shown after the end of the measurement, specifying the certainty of a nuclide being identified.
A comparison of the runtimes the detectors required in order to identify the Co-60 source would not have been informative, as some runtimes were fixed and others were variable. Consequently, only the confidence factors given by the detectors were compared. Additionally, we were interested to see if the detectors gave false identification results. Figure 3 illustrates the comparison of the mean confidence factors for all four detectors, as well as the number of measurements where false identification results were given. The mean confidence factor was calculated from all measurements with each detector.
Only in the case of the Interceptor did false results occur. This detector also showed the lowest mean confidence factor, but these results partially occurred because of an insufficient energy calibration of the device. The three other detectors turned out to be sufficiently reliable and did not show any false identification results at all.

In general, the Micro Detective, the InSpector 1000, and the IdentiFINDER are significantly superior to the other three detectors in localizing the source, with the InSpector 1000 showing the shortest mean search time of all detectors.

Figure 2: **Comparison of minimum, mean, and maximum search times for all detectors and all groups of height**



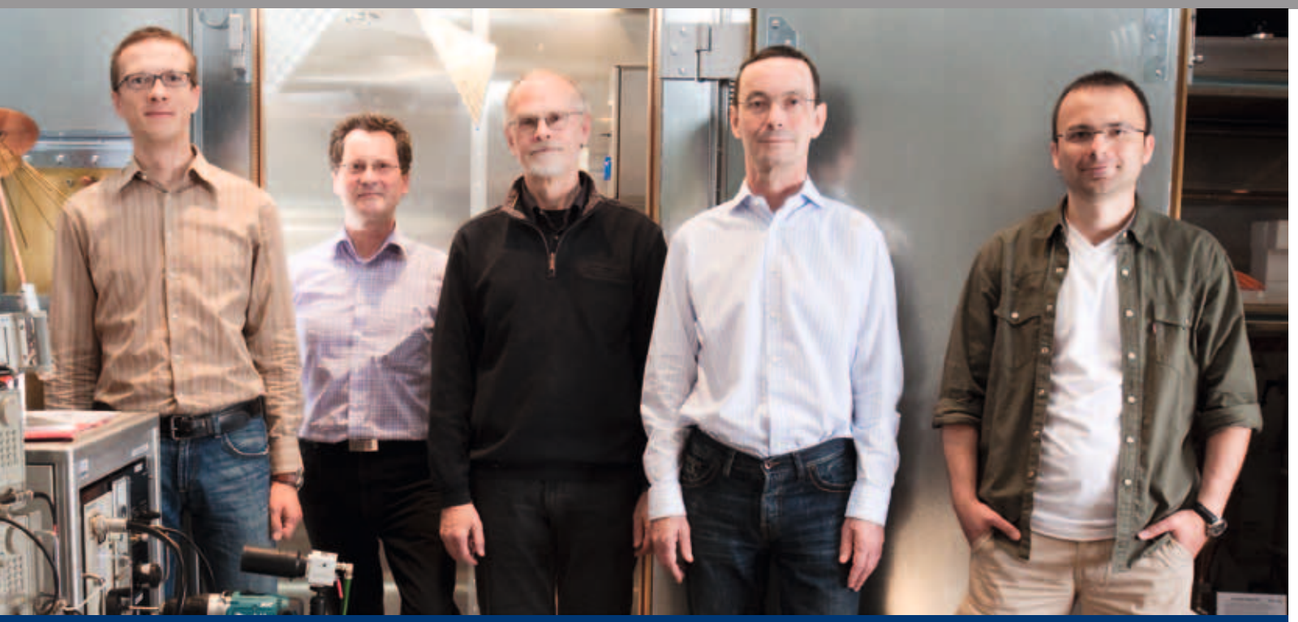
However, one has to take into account that detector weights vary drastically and therefore handling varies accordingly. The duration of a survey performed with the RadEye can vastly exceed that of a survey done with the Micro Detective, because the latter weighs approximately 40 times more than the former (RadEye). On the other hand, the Micro Detective features the option of identifying localized material with a high degree of certainty, which could be immensely valuable in a real scenario. A simple dose rate measuring device like the FH40 G-L is, in our opinion, not suitable for on-site surveys. If radioactive or nuclear material is suspected within a certain area and no further information is given about the location, a medium-weight detector featuring a reliable identification mode such as the InSpector 1000 or the IdentiFINDER would probably be the best choice of instrument. A user experienced in radiation measurements, however, may prefer to use the Micro Detective despite its heavy weight, if the search area is reasonably small.

1 *Dipl.-Phys. Wolfram Berky*

2 *FH40 G-L (Thermo)*
3 *RadEye PRD (Thermo)*
4 *Interceptor (Thermo)*
5 *IdentiFINDER (ICx Radiation)*
6 *InSpector 1000 (Canberra)*
7 *Micro Detective (Ametek/ORTEC)*

BUSINESS UNIT ELECTROMAGNETIC EFFECTS & THREATS

Dr. Michael Suhrke



In the framework of base funding by the German Federal Ministry of Defence (BMVg) the business area Electromagnetic Effects (EME) has the task to contribute to the development of assessment ability in the area of electromagnetic effects concerning military threats. Since this task is not performed at all in the non-military sector and only in small subsections in the military sector the INT conducts its own theoretical and experimental research.

In addition to the base funding, project research for clients outside BMVg (authorities and organizations with security tasks, space flight area) becomes increasingly important. The business area is supported by a mechanical laboratory which produces most of the mechanic parts for the experimental equipment and by an electronic laboratory responsible for production, maintenance and repairs of experimental electronic equipment.

The experimental work in the business area on the electromagnetic threat (particularly the threat by high-power microwaves, HPM) is coordinated in consultation with the German Federal Ministry of Defence (Rü IV2) in part by the "Virtual Competence Center EME of the German Bundeswehr (VCC-EME)". Investigations are taking place as well in cooperation with companies active in the field of defence what in 2009 again ensued specific HPM susceptibility analyses. Research is performed on coupling of electromagnetic fields (e.g. HPM) into structures and specific systems as well as on vulnerability of electronics by HPM and other electromagnetic fields of high intensity. In doing so, we take into account both basic circuit technologies and component families and effects in specific devices and systems. The main focus of work is presently on EME vulnerability of IT equipment and systems on the basis of current technology, in particular wire-bound and wireless data transmission technology (network technology). Moreover, basic investigations and first experimental work have been done on detection techniques for electromagnetic threats, especially HPM threats, and on EME vulnerability of HPM detectors.

The INT operates a self-developed TEM waveguide field simulation facility in a shielded hall for a frequency range from 1 MHz to 8 GHz. The facility allows linear coupling measurements for the determination of transfer functions and investigations on electromagnetic compatibility (EMC) as well as interference measurements with constant and pulsed fields and field strengths up to several kV/m on objects with volumes up to several m3. An example for the use of the TEM waveguide in 2009 was EMC testing (emission and susceptibility measurements) of electronic equipment for space applications. For measurements outside the institute, e.g. in the EMC hall of WTD 81 in Greding or at airports, the INT possesses a self-developed mobile HPM irradiation facility, which, by means of horn antennas, generates field strengths up to 5 kV/m within a frequency range from 450 MHz to 4 GHz. The facility is integrated into a Bundeswehr telecommunications cabin and can be transported by truck to the measuring site. Furthermore, the INT owns a small absorption room for frequencies up to 40 GHz, and comprehensive high-frequency and microwave measurement equipment. With funding by the German Federal Land Nordrhein-Westfalen within the economic stimulus package II we started to expand the capability of HPM sources and measurement equipment to higher frequencies in order to account for the growing number of applications of modern sensor and communication technology in the higher Gigahertz range up to 5 GHz.

The extension of the metrological possibilities of the INT was also the purpose of first investigations on the operation of a reverberation chamber purchased in 2008. In the available working volume of 1.00 x 0.70 x 1.25 m3 a statistically homogeneous and isotropic electric field can be generated in the frequency range between 520 MHz and 18 GHz with field strengths up to 180 V/m for an input power of 1 Watt. With our pulse generator high powers of more than 10 kW can be injected into the chamber in a wide frequency range. Field strengths above 20 kV/m can be obtained in the empty

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INT REVERBERATION CHAMBER

Dipl.-Ing. Christian Adami

chamber. Besides basic research on its use with pulsed microwave signals the chamber is intended for susceptibility tests of smaller test objects.

Results of investigations on pulsed operation of the reverberation chamber have been presented at the conference Wehrtechnisches Symposium EME 2009 in Mannheim and a subsequent contribution at the conference EMV 2010 in Düsseldorf won a best paper award in the meantime.

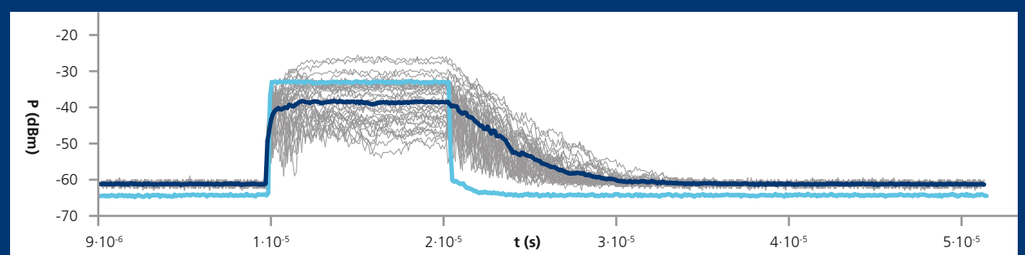
The participation in the NATO RTO SCI-198 Task Group "Protection of Military Networks against High Power Microwave Attacks" has been continued also in 2009. Here the business area was responsible for configuration and planning of test execution within an international test campaign on HPM susceptibility of a modern military IT network under participation of USA, Great Britain, France, Germany, Czech Republic, Norway and Denmark and it conducted also its own tests within the campaign.

The computer infrastructure of the business area for numerical simulations consists besides workstations of a Linux cluster of 12 PCs (P4, 3 GHz, altogether 24 GB RAM) for parallel calculations. In order to enhance our numerical capabilities it was updated in 2009 by acquisition of a modern blade cluster (64 computing nodes, Intel Xeon QuadCore, 2.4 GHz, altogether 256 GB RAM). It is used to run commercial software packages for electromagnetic radiation and coupling calculations by solution of Maxwell's equations in time and frequency domains (CST Studio Suite, CONCEPT II).

In the framework of funding of new research areas by the German Federal Land Nordrhein-Westfalen we started in 2009 with the extension of numerical investigations of complex electromagnetic systems. Specific subjects are the description of coupling of electromagnetic pulses in the INT waveguide and in the reverberation chamber as well as the new research topic of electromagnetic properties of metamaterials with artificial refraction index. In the latter area we submitted a proposal in response to an ESA call on "Metamaterials for Optical and Photonic Applications in Space" which was successfully accepted by ESA in the meantime. Finally, we provided theoretical studies on HEMP and HPM threat scenarios, HPM source development and specific questions from German BMVg and its operational area. Own numerical calculations were carried out on current scenarios of the HEMP threat.

1 *Dr. Michael Suhrke*

Figure 1: **Power at the receiving antenna, measured for different stirrer positions in the INT reverberation chamber**



For immunity and emission measurements the reverberation chamber (RC) is an increasingly attractive alternative to traditional EMC tests with TEM fields in anechoic chambers or GTEM cells. A reverberation chamber is a rectangular cavity with an additional mechanical stirrer, which changes the electromagnetic boundary conditions within the measurement environment. In this way the electromagnetic field strength distribution varies continuously in the test volume, so that a test object is in a statistical sense uniformly illuminated. For emission measurements the total power radiated by the DUT is detected by the receiving antenna inside the chamber without any special influence of the directional characteristics of the sample.

At INT, failure threshold investigations are carried out for electronic devices and systems with pulsed RF signals. For this purpose an RF pulse generator (Lukas Epsco) from 150 MHz to 3.4 GHz with power levels up to 35 kW can be used with both the TEM waveguide of the INT and a mobile unit with horn antennas. The use of the pulse generator with the RC allows generation of higher electric field strengths compared to the TEM waveguide as required, for example, for immunity tests in the automotive and aircraft industries.

We operate a small aluminum RC with a working volume of 0.7 m × 1.0 m × 1.2 m at outer dimensions of 1.2 m × 1.9 m × 2.5 m. Besides basic investigations on the applicability for time dependent measurements with microwave pulses, our RC is intended for susceptibility measurements on smaller test objects with high field strengths. According to the calibration, field strengths between 100 and 180 V/m are obtained for an input power of 1W in the frequency range from 520 MHz to 18 GHz. In order to couple high power above 10 kW into the chamber in a wide frequency range we use a self-developed discone antenna. Investigations at low input power with this transmitting antenna yield almost no differences to commercial horn antennas. The same applies to the use of an E-field probe as receiving antenna in comparison to such horn antennas. Alternatively to the pulse generator we use power amplifiers (200 W) for CW measurements in the frequency

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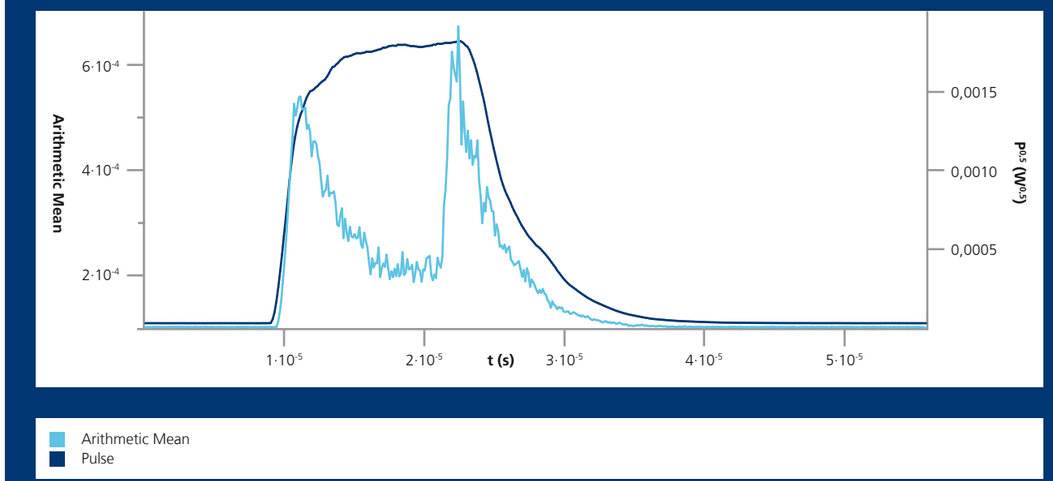
SCIENTIFIC-TECHNICAL INFRASTRUCTURE

Figure 2: **Standard deviation (light blue) of pulses with respect to different stirrer positions in the INT reverberation chamber after subtracting the time-smoothed pulse (dark blue)**



range from 0.8 to 7.5 GHz. The quality factor and the time constant of the chamber are determined from the decay time of the received signal and have values between 3000 and 30000 and of about 1 µs, respectively. In the loaded RC field strengths up to 17 kV/m can be obtained in a frequency range from 520 MHz to 3.4 GHz. The measured pulses show strong time dependent fluctuations of the signals for different stirrer positions and an overshooting of the signals in the transient regime during switch-on and switch-off of the pulses (Figure 1). A statistical representation of this behavior is shown in Figure 2 for f = 2.5 GHz. For this purpose, the time-smoothed pulse was subtracted from the measured values for each stirrer position to separate the temporal fluctuations of the pulses from the systematic trend in switch-on, switch off, and plateau regions.

1 *Reverberation chamber at INT*

2 *Dipl.-Ing. Christian Adami*

All experimental working business units are supported by an electronics laboratory which handles the manufacturing, maintenance and repair of all experimental electronics, and by a precision engineering laboratory which produces most of the mechanics for the experimentation facilities. The third support leg is the departmental secretarial office. The following provides an overview of some of the responsibilities of the individual units:

Precision Engineering Laboratory:

Special experimental set-ups and conversions
Holders and fixtures for radiation processes
Modifications to special antennae (Discone antenna) and holders
Couplers and amplifier housings for high frequency structures
10/24 GHz hollow conductor radiators
Set-ups for presentations

E-Laboratory:

Comprehensive support for all work groups in preparing and performing measuring tasks
Developing printed circuit boards for irradiation
Electronics for security systems (radiation protection interlock)
Neutron generator: support for the start-up of additional tubes (in cooperation with an American manufacturer)
Change-over and expansion of the measuring computer network
Internships: 6 internships (ranging from 1 to 4 weeks) for pupils and internships for students; most of these are handled by the E-Laboratory.

Secretarial Office:

Compiling and formatting posters
Documenting reports on radiation protection
Preparing and compiling EU applications

BUSINESS ADMINISTRATION AND CENTRAL SERVICES

Dr. Harald Wirtz

Business Administration is the department responsible for all commercial and administrative tasks in the Institute. As well as providing the central infrastructure, department staff also carry out employer duties such as workplace safety and security.

Tasks:

Finance and Accounting, Purchasing

This area carries out the Institute's book-keeping in accordance with German commercial and tax law. Current transactions are simultaneously booked in finance and cost accounts to make costs available for both internal accounting and controlling. The area also handles the purchase of all consumer items and investment goods, in compliance with purchase guidelines and the official German terms for awarding service and construction contracts (VOL/VOB). In cooperation with the Fraunhofer Gesellschaft HQ in Munich, Business Administration invites Europe-wide tenders for major procurements. The department also manages the INT cash office, handling all cash and non-cash payments.

Controlling and Project Administration, Auditing

This area's task is to control all monetary processes within Fraunhofer INT, which includes the continuous supervision and control of the Institute's entire budget. To this end, the department evaluates cost and performance accounts as well as the finance accounts, and produces monthly control data showing projections on a cost and payment basis. There is also administrative support for project budgets in other departments, involving help in drafting quotations and applications, calculating, concluding contracts and budget supervision. Since sponsors continuously conduct internal and external audits of the Institute, the department also deals with all audit inquiries.

Human Resources

Human Resources supports Institute management in personnel planning, and processes all personnel tasks such as job advertising, hiring, job evaluations and resultant income-group classification, as well as contract extenuation. In addition to general administrative duties such as personal file and data management, HR supports INT departments in selection procedures, providing references and other services. Staff members are also given advice on all questions of labour and pay law.

Travel Management

Travel Management assists staff on every aspect of official travel, from planning and preparation, to transport and hotel booking and, finally, travel expense accounting in accordance with Federal Law.

In 2009, in spite of the economic crisis, the number of official trips increased. Travel Management was nonetheless able to provide the best possible support on every occasion.

Facility Management / Internal Services

Tasks for this section include registering and organizing necessary repairs, coordinating user interests in construction work, equipment administration, managing and maintaining the vehicle fleet, procuring and managing furniture and office material, organizing office cleaning and operating the INT printing office. In 2008, Business Administration's Central Services were responsible for the master plan that was drawn up for extensions to INT. In cooperation with the responsible authorities, this plan is for the construction of a new seminar room, an office building and a library and archive.

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Marketing and Public Relations

This section does all the necessary communications and marketing work for results produced by INT's various departments. All activities are closely coordinated with the scientists concerned.

Especially noteworthy in 2009 was bringing the Institute's public image in line with the Fraunhofer Gesellschaft's new corporate design. This involved exchanging the Institute logo in all areas, including business equipment, internal and external signposting and the Internet presence. The Institute's brochures were also redesigned accordingly, and the comprehensive upgrade of the Institute's website was initiated. Another large-scale and successful project was the production of the Federal Defence Ministry's Annual R&D Reports.

Library and Specialized Information Services

Key element of this work is procuring and managing the media needed by the Institute, and supporting the scientists in research and information accessing.

The section continues its comprehensive contribution to the Institute's publishing work. In 2009, it was thus possible to publish two books as well as a variety of magazine articles, conference contributions and reports.

Central IT Services

This section is responsible for the whole of the Institute's IT infrastructure, providing 1st level support for the users.

As in previous years, 2009 saw technical upgrades that improved capacity and reliability for the IT equipment at hand. The existing storage cluster was split to create a redundant unit, and rebuilt in two separate sectors for fire safety. In co-operation with Department NE, a blade system with 64 cores, 256 GB memory, was planned, set up and put into operation for the project "Numerical Studay of Complex Electromagnetic Systems (Numerische Untersuchung komplexer elektromagnetischer Systeme)". The new computer-assisted time and attendance system was planned and put into operation after completing the technical groundwork and procuring the necessary hardware. After equipping all user workplaces with new PCs, IT security was improved by changing user policy and limiting user rights.

These steps, as well as others for which this report lacks space, created considerable improvements for the Institute's work, laying the path for further successful research.

1 *Dr. Harald Wirtz*

DATES AND EVENTS

Bestowing of the title of Honorary Professor of the Bonn-Rhein-Sieg University of Applied Sciences upon Dr. Uwe Wiemken

On November 9, 2009, Prof. Dr. Hartmut Ihne, President of the Bonn-Rhein-Sieg University of Applied Sciences (H BRS) and Prof. Dr. Michael Krzeminski, Dean of the Department Electrical Engineering, Mechanical Engineering and Technical Journalism (EMT), presented Dr. Uwe Wiemken, the Director of INT, with the certificate that bestows upon him the title of Honorary Professor.

The appointment follows years of cooperation between the university and the institute. Both bodies are greatly interested in further deepening their collaboration in the future.

Round table security and defense research

Representatives of all VVS institutes (Fraunhofer Group for Defense and Security) met for a workshop in Euskirchen from December 7 through 8, 2009, where they jointly identified new defense technology trends and priorities for the German Federal Ministry of Defense. Experts from the individual institutes introduced a variety of technologies and conducted podium discussions on their current and future relevance. The results of the round table are integrated into the presentation given annually at the German Federal Ministry of Defense by Prof. Wiemken in his function as head of INT.

Working group meeting in the Federal Interior Ministry's Commission on Civil Protection

On July 7, 2009, the Civil Protection Commission's ad-hoc working group met with the development of a point system for biological agents on the agenda. The aim of this network of experts is technical support in developing a system that enables the scenario-specific evaluation of the danger potential of biological agents. As well as from INT, participating experts come from the Robert Koch Institute, the Bundeswehr Research Institutes, various universities and the Federal Office of Civil Protection and Disaster Assistance.

CONFERENCE “PRACTICAL IT SECURITY“ 2010, CHAMBER OF INDUSTRY AND COMMERCE (IHK) IN NEUSS, GERMANY

Dipl.-Inform. Dirk Thorleuchter
Dipl.-Math. Wilfried Gericke

Practical IT Security (previously called the Rhineland Convention on IT Security) is an annual industry and science conference on IT security, which Germany has hosted since 1991. The results of the conference (identified IT security issues and solution proposals) are used in science and policy making, and by industry. Scientific and policy implementation is handled by the specialist group Betrieb von Informations- und Kommunikationssystemen (BIK, Operation of Information and Communications Systems) of the Gesellschaft für Informatik (GI, Society for Information Processing). At the industrial end, the results are used by the makers of IT security hardware and software, with the objective of further optimizing their products.

The conference objective is to offer an integral view of IT security. During the convention, issues are identified and solution ideas from science and industrial users are introduced and discussed on different levels of abstraction. The delegates share experience and information from technical, legal and strategic viewpoints. Ultimately, the aim is that everyone involved in IT security takes home practical benefits for their everyday work.

42 experts and a wide range of topics

Last year the 19th Practical IT Security Conference was organized by the Fraunhofer INT and Infodas GmbH, taking place on November 11/12, 2009. A total of 42 IT experts attended the event, which, as usual, focused on the exchange of IT security experience. The presentations addressed such issues as the protection of know-how, the threats to Internet use inherent in organized crime, and the security aspects of cloud computing and virtualization. On the premises of the Chamber of Industry and Commerce (IHK) in Neuss, keynote speakers and participants gave interesting insights into the practical implementation of IT security strategies, generating much follow-on discussion. During the opening phase, the Gesellschaft für Informatik (GI) and the user association Connect Deutschland (formerly DECUS) welcomed participants and provided a brief overview of their activities. In addition, the Organization Committee reported on the latest conference developments and placed strategies for the organization of the 20th Practical IT Security Conference on the agenda. The Ministry of the Interior of the German State of North-Rhine Westphalia addressed the subject of industrial espionage. Wilfried Karden gave the delegates an overview of the enormity of the threat for our business and research secrets and explained why more and more time and money needs to be spent to achieve a reasonable level of information security – independent of the cost of complying with statutory requirements. Introduced were findings from the communications sector (use of mobile phones, e-mail), data media (such as Notebooks, USB sticks, etc.), as well as new insights into the use of key loggers, malware and risks inherent in special procedures. Robert Jäger of the BKA (German Federal Criminal Police Office) reported on the threats that organized crime poses for the Internet. His report also covered hot button issues such as credit card abuse and online banking attacks.

Dr.Gerhard Weck (Infodas) explained how the BSI (German Federal Office for Information Security) interprets terms such as information security audits on the basis of fundamental IT protection and stated that periodic audits on this basis will become mandatory for the institutions of the Federal Administration. At the close of Day I, Sven Türpe (Fraunhofer SIT, Institute for Secure Information Technology) highlighted browser security. He explained the parameters that have to be set up for the most frequently-used browsers, to ensure that the browsers actually provide a minimum level of security. Mr. Türpe works in a testing laboratory at a Fraunhofer Institute and dampened our hopes for a truly secure Internet browser.

No absolutely secure webbrowser in sight

On the second day, various developments such as cloud computing, GRID computing and virtualization were analyzed. Mark-Philipp Kost (EMC) titled his presentation „From the virtualized data center to the private cloud – strategies and solutions for cloud computing of VMware, CISCO and EMC“ , which highlighted EMC’s stance on the matter. Benjamin Schmidt of Zimory provided a similar overview from the angle of a German research institution and Germany’s largest software developer, T-Systems. Harald Speckbrock of RSA gave the presentation that had been announced the year before, on the topic of secure virtualization utilizing VMware. Reinhard Zimmer, of Syncsort, subsequently elaborated on the secure implementation of effective back-up in a virtual environment.

Security officers racing against hackers

The final highlight was the presentation Information Security 2010 by Prof. Hartmut Pohl from the Bonn-Rhein-Sieg University of Applied Sciences. He demonstrated the technical aspects of the race between the discovery of a security gap (for instance in an operating system) and criminals taking advantage of such gaps, and the attempt to close this gap as expeditiously as possible. One of the major insights gained during the event was that while IT security breaches are performed by highly qualified and well trained specialists with superior insider knowledge, many less well trained hackers are indeed in a position to launch almost professional level attacks because of their access to easily obtainable tools. Given the wide variety of configuration and combination options that today’s hacker tools offer, defense against these attacks proves to be extremely difficult. Cyber crime is unfortunately a field that allows perpetrators to earn so much money that the sometimes immense costs at the hackers’ end appear to be worth it. Ultimately, it must be noted that IT security measures can never guarantee 100 % security, meaning that the confidential information of a company, which usually totals only about 5 % of the overall data volume, should either not be processed with information technology tools at all, or only in physically separated networks.

This conference was co-sponsored by

- Innenministerium NRW
  (Ministry of the Interior of North Rhine-Westphalia)
- Bundeskriminalamt (BKA)(Federal Criminal Police Office)
- Bundesamt für Sicherheit in der Informationstechnik (BSI)
  (Federal Office for Information Security
- EMC Deutschland GmbH
- Syncsort GmbH
- Zimory GmbH
- Hochschule für Telekommunikation Leipzig (HfTL)
  (Deutsche Telekom University of Applied Sciences)
- Fraunhofer SIT (Institute for Secure Information Technology)
- Fraunhofer IAIS
  (Institute for Intelligent Analysis and Information Systems)
- Fraunhofer INT (Institute for Technological Trend Analysis)
- Connect Deutschland
- Gesellschaft für Informatik e.V. (GI) - Fachgruppe BIK
  (Society for Information processing - specialist group Operation of Information and Communications Systems)

FRAUNHOFER-TRUCK

As part of its road show, the Fraunhofer Truck also made a stopover at Euskirchen's Alter Markt, right in the pedestrian zone. One idea behind the event was to give those Euskirchen inhabitants who have hardly anything to do with the Institute an insight into the work of INT's scientists. The truck was also intended to promote local awareness of the name Fraunhofer. The situation in Euskirchen is much the same as in most Fraunhofer centers: the Gesellschaft's decentral structure is unclear to many; the local press often simply print the general line "The Fraunhofer Institute develops …"

The truck was on view from 8 to 10 October, with the dates widely broadcast in advance in regional and local media such as Radio Euskirchen or the Bonner General Anzeiger newspaper. Dr. Uwe Friedl, Euskirchen's mayor, also visited. Being shown around the truck by Prof. Dr. Wiemken, he showed great interest in the work of the Institute.

The INT Presentation

The truck itself housed a small selection of representative exhibits from the whole Fraunhofer-Gesellschaft, without focusing on any one particular field or institute. To give the Euskirchen population a clearer picture of work in INT, two tents were set up next to the truck. Here, Business Units 3 and 4 mounted experiments, including a demonstration of a Co60 radiation facility and a fully-equipped measuring vehicle used for the undercover detection of radioactive material. Business Units 1 and 2, where the emphasis lies more in producing studies and analyses than in experimentation, presented their work with the aid of posters and information material, as well as by speaking personally to the many interested visitors.

Networking researchers and the next generation

To demonstrate the close connection to local education, a joint project was conducted with students of the Emil Fischer Gymnasium . Under the heading "Nuclear Measurement Technology Yesterday and Today", teacher Heinz Felten's basic physics course demonstrated the principle of a cloud chamber, which was used to make radiation visible until well into the last century. Right next door, there was a presentation of the state-of-the-art measuring instruments used at INT. Additionally, the INT scientists guided several of the secondary school's science courses through the exhibition.

The Michael-Gymnasium in Bad Münstereifel, which constantly shines with high scores in the young researchers' contests "Jugend-forscht", also showed its presence in the Fraunhofer tent. Euskirchen-Burgfey's Rotary Club, long an active promoter of education and research in the Euskirchen district, also made use of the opportunity of the truck's presence to demonstrate its current projects.

FUTURE SECURITY 2009

An event hosted by the Fraunhofer-Verbund Verteidigungs- und Sicherheitsforschung, VVS (Fraunhofer Group for Defense and Security), the 2009 Future Security Conference once again offered the German and international security research community a forum for the presentation of new scientific insights and an opportunity for the fruitful exchange of ideas. The conference took place in Karlsruhe, Germany, from September 30 through October 1, 2009, under the auspices of Germany's Federal Ministry of Education and Research (BMBF).

At the heart of the event was the conference with its numerous presentations, which were spread over both days. Dr. Wolfgang Rosenstock elaborated on the topic Covert Search and Detection of Illicit Nuclear as well as Radioactive Material, while Mr. Hans-Martin Pastuszka provided the introduction to the concluding podium discussion with his presentation Future Planning of EU Security Research – a Contribution to the Discussion. Prof. Dr. Uwe Wiemken moderated the concluding Session 5, creating a perfect segue into the subsequent podium discussion Science-Society Dialogue on Security, which he led as well. Prof. Dr. Wiemken and Dr. Joachim Schulze, the Vice President of the Institute, had also been appointed to the Program Committee of the Conference. The event was accompanied by a poster session that offered conference delegates the opportunity to obtain detailed information from the individual experts. The INT (Institute for Technological Trend Analysis) was also well represented in this module, with a total of four contributions from all business sectors of the institute.

Projects from domestic and European security research programs

With a total of 30 expert presentations accepted for the program, contributions came from a number of German and international universities, corporations and government agencies, as well as from the VVS institutes. Presentations that introduced the latest national or European research projects drew particularly keen attention. Among those were several projects from the domestic BMBF security research program, e.g. that of the University of Wismar and Fraunhofer FKIE (Institute for Communication, Information Processing and Ergonomics), which focused on Project VESPER – Optimization of the Safety of Individuals in Ferry Transportation (Verbesserung der Sicherheit von Personen in der Fährschifffahrt), or that of the Fraunhofer ICT (Institute for Chemical Technology), the WIS (Institute for Defense Technologies) and others, which gave insights into Project EXAKT – Molecule Specific Adsorption Materials in Combination with Rapid Mass Spectroscopy. Additionally, some of the projects from the European security research program were presented, including Project DECOTES-SC1 – Demonstration of Counterterrorism System-of-Systems against CBRNE phase 1, in which INT participates as a project partner and heads an action module.

In addition to presentations and posters, the VVS institutes and a number of industrial corporations, such as Diehl or Rheinmetall, took advantage of the opportunity to put their latest developments on display at an exhibition. In 2010, the Future Security Conference is slated to change venues and relocate to Berlin, also ultimately because of the proximity to related associations and political decision makers.

APPENDIX

University Courses

Chmel, S.: Advanced Physics I (Atomphysik), Masterstudiengang, Wintersemester 2008/2009, Fachhochschule Koblenz, Rhein-Ahr-Campus

Chmel, S.: Leitung des Praktikums „Physikalische Grundlagen“, Wintersemester 2009/2010, Fachhochschule Bonn-Rhein-Sieg, Fachbereich angewandte Naturwissenschaften, Rheinbach

Jovanović, M.: Projektmanagement im Studium, Wintersemester 2009/2010, Universität Düsseldorf

Jovanović, M.: Bibliometrische Analysen, Sommersemester 2009, Universität Düsseldorf

Wiemken, U.: Einführung in die Technik, Fachhochschule Köln, Fakultät für Informations- und Kommunikationswissenschaft, Köln

Wiemken, U. in Zusammenarbeit mit Burbiel, J.; Grüne, M.; John, M.; Jovanović, M.; Kohlhoff, J.; Neupert, U.; Pastuszka, H.-M.; Reschke, S.: Aktuelle Entwicklungen in der Technik, Hochschule Bonn-Rhein-Sieg, Fachbereich Elektrotechnik, Maschinenbau und Technikjournalismus, Sankt Augustin, WS 2008/09 und WS 2009/10

Wirtz, H.: Finanzierung, Hochschule Fresenius, Köln, WS 2009/2010

Wirtz, H.: Investition, Finanzierung, Steuern, berufsbegleitender Diplomstudiengang, Hochschule Fresenius, Köln, SS 2009, WS 2009/2010

Wirtz, H.: Investition, Finanzierung, Steuern, Bachelorstudiengang, Hochschule Fresenius, Köln, WS 2008/2009

Wirtz, H.: Accounting & Taxes, FOM Fachhochschule für Oekonomie und Management, Essen, WS 2008/2009

International Cooperation

Berky, W.; Friedrich, H.; Köble, T.; Risse, M.; Rosenstock, W.: JRC, Institute for the Protection and Security of the Citizen (IPSC), Nuclear Security Unit, G08, European Commission - Joint Research Centre, 21027 Ispra, Italy, cooperation in active neutron interrogation techniques and in situ methods of identification of fission material.

Kock, D., Schulze, J.: European Security Research and Innovation Forum (ESRIF), Working Group 9 “Innovation”, Januar 2008 – September 2009

Köble, T, Rosenstock, W.: Mit Prof. Vadim L. Romodanov, Experimental Reactor Physics Institute, MEPhI, 115409, Moscow, Kashirskoe Shosse 31, Russian Federation, und seiner Arbeitsgruppe wurde im Rahmen des kanadisch - europäischen Projekts ISTC 2978 „Digital technology for the control of fissile materials in devices with pulsed sources“ Detektionsverfahren für Spalt- und Explosivstoffe in Koffern an Flughäfen diskutiert (Kö, Ro). Weitere Kooperationspartner sind Universita Degli Studi di Bari / Dipartimento Interateneo di Fisica (Italien) und Bubble Technology Industries Inc. (Canada).

Kuhnhenn, J.; Henschel, H.: Chiral Photonics produziert Faser Bragg Gitter nach einem völlig neuartigen Verfahren (Chirale Faser Bragg Gitter). Die Untersuchung der Strahlenempfindlichkeit erfolgte durchs INT.

Metzger, S.; Höffgen, S.: Communication Research Center , Canada: Gemeinsame Untersuchung der Strahlenempfindlichkeit von fs IR Faser Bragg Gittern

Neupert, U.; Römer, S.: NATO-RTO-SAS-082 Task Group „Disruptive technology Assessment Game: Extension and Applications“

International Cooperation (continued)

Pastuszka, H.-M., Missoweit, M.: European Security Research and Innovation Forum (ESRIF), Sherpa-Tätigkeiten für ESRIF AG 4 Krisenmanagement, Januar 2008 – Dezember 2009
Rosenstock, W.: Teilnahme an den Sitzungen der Working Group on Verification Technologies and Methodologies (VTM), die von der Non Proliferation and Nuclear Safeguards Unit im Joint Research Centre in Ispra, Italien, organisiert wird. Das Gebiet Verifikation (allgemein, nicht nur nuklear) wird dort permanent für die ESARDA (European Safeguards Research and Development Association) bearbeitet.

Rosenstock, W.: European Security Research and Innovation Forum (ESRIF), WG 6 CBRN, speziell: R&N-Bedrohungen und Gefahren

Rosenstock, W.; Chmel, S.: Mitwirkung im europäischen Konsortium DECOTESSC1 bei der Bewerbung für ein CBRNE-Demonstrationsprojekt, Phase 1 im Rahmen des 7. Forschungsrahmenprogramms der EU.

Rosenstock, W.; Chmel, S.: Mitwirkung im europäischen Konsortium bei Bewerbung im Rahmen des 7. Forschungsrahmenprogramms der EU: Adaptation of the European Decision support Systems ARGOS and RODOS to new radiological threats (ADART), Forschungszentrum Karlsruhe GmbH, Institut für Kern- und Energietechnik (IKET) Accident Consequence Group.

Suhrke, M.: Mitarbeit in der NATO RTO SCI-198 Task Group Protection of Military Networks Against High Power Microwave Attacks Treffen: Liptovski Mikulas, Slowakei, 24.-26.3.2009, Prag, 07.-09.07.2009, Washington, 27.-29.10.2009

International Reviews

Burbiel, J.; Journal of Heterocyclic Chemistry

Burbiel, J.; Tetrahedron Letters

Höffgen, S.: IEEE Transactions on Nuclear Science

Höffgen, S.: RADECS Conference

Kuhnhenn, J.: IEEE Transactions on Nuclear Science

Kuhnhenn, J.: RADECS Conference

Kuhnhenn, J: Session Chair, RADECS 2009 – Photonics Session

Köble, T.; Rosenstock, W.: Journal of Nuclear Materials Management, Technical Manuscript Review

Metzger, S.: IEEE Transactions on Nuclear Science

Metzger, S.: RADECS Conference

Schmidt, H.U.; Suhrke, M.: IEEE Transactions on Electromagnetic Compatibility

Suhrke, M.: IEEE Transactions on Electromagnetic Compatibility

Suhrke, M.: Mitglied des Programmkomitees des Wehrtechnischen Symposiums EME 2009 „Elektromagnetische Effekte“, BAkWVT Mannheim

Thorleuchter, D.: Decision Support Systems

Thorleuchter, D.: Technological Forecasting and Social Change

Collaboration in Committees

Chmel, S.: AG Luftverkehr (Innovationsplattform „Schutz von Verkehrsinfrastrukturen“), 3 Sitzungen im Airport Center, Frankfurt

Köble, T.; Rosenstock, W.: Nationale Arbeitsgruppe Radiologische Bombe (NAG RB), organisiert vom BMVg, Rü IV

Köble, T.: UAG 2: Physikalische Wirkung, 2 Sitzungen

Missoweit, M.: European Defence Agency, Unterstützung BMVg RüIV 2, fortlaufend

Missoweit, M.: Letter of Intent 6 – Framework Agreement (LoI6), Unterstützung BMVg RüIV 2, fortlaufend

Pastuszka, H.-M.: FP7 Security Advisory Group der EU-Kommission, Generaldirektion Unternehmen und Industrie (DG ENTR)

Schulze, J.: Schutzkommission beim Bundesministerium des Innern

Rosenstock, W.: UAG 1 Bedrohungsanalyse, 2 Sitzungen

Schulze, J., Kock, D.: Vertreter der Fraunhofer-Gesellschaft in der EUROTECH Security Research Group der EARTO (European Association of Research and Technology Organisations)

Schulze, J.: Arbeitsgruppe „Proliferation“ der Stiftung Wissenschaft und Politik

Schulze, J.: Nationale Expertengruppe CTBT (Comprehensive Test-Ban Treaty) beim Auswärtigen Amt

Participation in Norming Processes

DIN/Normenstelle Elektrotechnik:
NA 140-00-20AA
Erstellung der EMV-VG-Normen, Obleuteausschuss
(H.U.Schmidt)

NA 140-00-19-02AK
Erstellung der VG-Normen VG96900-96907, NEMP- und Blitzschutz, Erstellung der VG-Normenteile Grenzwerte für Geräte
(H.U.Schmidt, Ch. Adami)

NA 140-00-20-02UA
Erstellung der VG-Normen VG95370 ff., Elektromagnetische Verträglichkeit
(H.U.Schmidt, Ch. Adami)

VDE/DIN (Deutsche Elektrotechnische Kommission):
DKE 767.4.4 TEM-Wellenleiter und Modenverwirbelungskammern (VDE/DIN-EMV-Normen)
(H.U.Schmidt, M.Suhrke)

J. Kuhnhenn: Überbearbeitung IEC/TR 62283
J. Kuhnhenn: Erarbeitung IEEE P1682

Lectures and Presentations

Kohlhoff, J.:
Roboter - Vom Handhabungsautomaten zum Personal Robot, Vorlesung „Technik und gesellschaftlicher Wandel - Rückblick und Ausblick“, U. Wiemken et al., FH Bonn-Rhein-Sieg, Sankt Augustin, 09.01.2009

Schmidt, H.U.:
Personensicherheit bei EMV-Arbeiten im Hochfrequenzbereich, Vorlesung „Technik und gesellschaftlicher Wandel - Rückblick und Ausblick“, U. Wiemken et al., FH Bonn-Rhein-Sieg, St.Augustin, 14.01.2009

Rosenstock, W.:
Statusbericht zum Projekt SR 08 01650, Januar 2009: Einführung – Überblick, BfS, Berlin, 14.01.2009

Berky, W.:
Statusbericht zum Projekt SR 08 01650, Januar 2009: Ergebnisse der Literaturrecherche, BfS, Berlin, 14.01.2009

Köble, T.:
Statusbericht zum Projekt SR 08 01650, Januar 2009: Aktueller Stand zur Simulation der Strahlungsfelder von Kernwaffen, BfS, Berlin, 14.01.2009

Braun, Ch.; Clemens, P.; Schmidt, H.-U.; Suhrke, M.; Taenzer, A.:
Susceptibility of Network Components to Pulsed Medium Power Microwave Fields, EMC Zürich 2009, ETH Zürich, 12.-16.01.2009

John, M.:
Das Cochlea Implantat - eine Innovation im Spannungsfeld von Kultur und Technik, Vorlesung „Technik und gesellschaftlicher Wandel - Rückblick und Ausblick“, U. Wiemken et al., FH Bonn-Rhein-Sieg, Sankt Augustin, 16.01.2009

Rosenstock, W.:
Fraunhofer – INT work on active neutron techniques. Joint Meeting JRC/Fraunhofer-INT on active neutron interrogation for security in Ispra, Italy, 22.01.2009

Schmidt, H.U.:
Gefährdungspotential von Hochleistungs-Mikrowellen (HPM) für Rechenzentren, Seminar Sicherheit und Höchstverfügbarkeit von Serverparks, Rechenzentren und IT-Räumen, Simedia-Fachseminar, Stuttgart, 23.01.2009

Wiemken, U.:
Langfristige Technologieentwicklungen, Sitzung der Strategiegruppe F&T, Bonn, 18.02.2009

Schmidt, H.U., Rosenstock, W.:
Vorstellung der Abteilung NE – Nukleare und elektromagnetische Effekte, Landeskriminalamt NRW, Neuss, 02.03.2009

Rosenstock, W.:
NAG „Radiologische Bombe“: Planung – Diskussion der zukünftigen Schwerpunkte Arbeitsgruppe 1 – Bedrohungsanalyse, 9. Sitzung bei dem Bundesamt für Bevölkerungsschutz und Katastrophenhilfe (BBK) in Bonn, 11.-12.03.2009

Reschke, S.:
Future Ergonomics - Neural and Biological Enhancement of Humans, Trilateral Workshop on Brain-Machine-Interfaces, Soesterberg, Niederlande, 10.-11.03.2009

John, M.:
Cochlear Implants: Technological, cultural and future aspects, Trilateral Workshop on Brain-Machine-Interfaces, Soesterberg, Niederlande, 10.-11.03.2009

Wiemken, U.:
Das INT – ein Überblick, „MINToring Veranstaltung“, Euskirchen, 13.03.2009

John, M.:
Das Cochlea Implantat - eine Innovation im Spannungsfeld von Kultur und Technik, „MINToring Veranstaltung“, Euskirchen, 13.03.2009

Huppertz, G.:
Wirbelschleppen – Aspekte für die zukünftige Entwicklung des internationalen Luftverkehrs, „MINToring Veranstaltung“, Euskirchen, 13.03.2009

Thorleuchter, D.:
Mining innovative ideas to support new product research and development, IFCS@GFKL - Classification as a tool for research: 11th Conference of the international federation of classification societies (IFCS 2009) - jointly with the 33rd conference of the German classification society (GfKl), University of Technology Dresden, 13 - 18. 03.2009

Rosenstock, W.:
Recent improvements in on-site detection and identification of radioactive/nuclear material: Presentation held at International Symposium on Nuclear Security, Vienna, Austria, 30.03 - 03.04.2009,

Risse, M.:
Mobile Sensorik zur Detektion von radioaktiven sowie nuklearen Stoffen. CBRNE Informationstag, FGAN, FKIE Wachtberg, 02.04.2009

Metzger, S.:
Presentation – Preliminary Results of Electronic Device Irradiation – ESA Project 029-102733 Investigation and Analysis of Very High Energy Accelerators for Radiation Simulation. Informal Meeting GSI Darmstadt, Darmstadt, 09.04.2009.

Kohlhoff, J.:
Langfristige technologische und wehrtechnische Trends, Seminar „Maritime Potentiale und Seestrategische Konzepte“ im Lehrgang „General-/Admiralstabsdienst National“, FüAkBw Hamburg, 15.04.2009

Höffgen, S.:
Presentation – Radiation sensitivity of Bragg gratings written with femtosecond IR lasers, SPIE Defense, Security + Sensing, Orlando, USA, 15.04.2009

Rosenstock, W.:
Detection of concealed fissionable material by delayed neutron counting. International topical meeting on nuclear research applications and utilization of accelerators: IAEA, Wien, Österreich, 04. -08.05 2009

Suhrke, M.:
Vorstellung der EME-Gruppe des INT, Besuch FGAN 07.05.2009

Wiemken, U.:
Technological Trends - some implications of nanotechnology for defence and security -, 13th International Symposium on the Interaction of the Effects of Munitions with Structures, Brühl, 11.- 15.05.2009

APPENDIX

Schmidt, H.U.:
Personensicherheit bei EMV-Arbeiten im Hochfrequenzbereich, Vorlesung „Technik und gesellschaftlicher Wandel - Rückblick und Ausblick", U. Wiemken et al., FH Bonn-Rhein-Sieg, St.Augustin, 13.05.2009

Wiemken, U.:
Fraunhofer and Fraunhofer-INT, a brief survey for our Rotary friends from Nigeria, Euskirchen, 25.05.2009

Rosenstock, W.:
Recent improvements in on-site detection and identification of radioactive respectively nuclear material. Meeting of the ESARDA Working Group on Verification technologies and methodologies (VTM), Vilnius, Lithuania, 25.05.2009

Köble, T.:
Neutron measurement techniques for hand-held devices. 31th ESARDA Annual Meeting (European Safeguards Research and Development Association), in Vilnius, Litauen, 26.-28.05.2009

Kernchen, R.:
Enzyme stabilization in nanostructured materials for use in organophosphorus nerve agents detoxification and prophylaxis; Conference „Biodefence - Advanced Materials and Methods for Health Protection", NATO, Advanced Study Institute on Science for Peace and Security Series: Biodefence: Advanced materials and methods for health protection, Tashkent, 09.06.2009

Kock, D.:
Security and Defence Research in 2030 – a scenario planning study, Arbeitstreffen der ESRIF Working Group 9, Ispra, Italien, 9. - 10.06.2009

Wiemken; U.:
Neue Entwicklungen in der sicherheitstechnischen Forschung, 4. Petersberger Dialog der sicherheits- und wehrtechnischen Wirtschaft in NRW, Petersberg/Bonn, 10.06.2009

Kohlhoff, J.:
Spezielle Werkstoffe im Maschinenbau – Ein Projekt für den VDMA; Kuratoriumssitzung des Fraunhofer INT, Euskirchen, 18.06.2009

Jovanović, M.:
Bibliometric Analyses at the Fraunhofer INT, Seminar at the CDSTIC, Beijing, China, 06.2009

Missoweit, M.:
„Das F&T Direktorat der European Defence Agency (EDA) - Organisation und Forschung", Seminar at the CDSTIC, Beijing, China, 06.2009

Kuhnhenn, J.:
Presentation – Project Web Page – ESA Project 029-102733 Investigation and Analysis of Very High Energy Accelerators for Radiation Simulation. Progress Meeting Fraunhofer INT, Euskirchen, 22.06.2009

Höffgen, S.:
Presentation – Preliminary Results of Analysis of Energy Effects and Accelerator Needs – ESA Project 029-102733 Investigation and Analysis of Very High Energy Accelerators for Radiation Simulation. Progress Meeting Fraunhofer INT, Euskirchen, 22.06.2009

Metzger, S.:
Presentation – Preliminary Results of Electronic Device Irradiation – ESA Project 029-102733 Investigation and Analysis of Very High Energy Accelerators for Radiation Simulation. Progress Meeting Fraunhofer INT, Euskirchen, 22.06.2009

Köble, T.:
Statusbericht zum Projekt SR 08 01650, Juni 2009: Aktueller Stand zur Simulation der Strahlungsfelder von Kernwaffen, BfS, Berlin, 23.06.2009

Pastuszka, H.-M.:
Crisis Management – Co-ordination and Interoperability, STRAW-Workshop (Security Technology Active Watch), Rom, 23.06.2009

Kuhnhenn, J.:
Radiation effects in optical fibres, Invited presentation at Huber+Suhner, Herisau, Schweiz, 03.07.2009

Neupert, U.:
Der INT-Ansatz zur Technologieanalyse und –vorausschau, China Defense Science and Technology Information Center (CDSTIC), Peking, China, 03.07.2009

Metzger, S.; Alpat, B.; Caraffini, D.; Desorgher, L.; Durante, M.; Harboe-Sørensen, R.; Höffgen, S.;Kuhnhenn, J.; La Tessa, C.; Menichelli, M.; Menicucci, A.; Nieminen, P.; Pleskac, R.; Renzi, F.; Schardt, D.:
Investigation and Analysis of Very High Energy Accelerators for Space Radiation Simulation. Poster presented at Heavy Ions in Therapy and Space Symposium 2009" in Cologne, 06.-10.07.2009

Wiemken, U.:
Prognosen - ihre Grenzen und ihre Rolle in der Planung -, Hochschule Bonn-Rhein Sieg
Fachbereich Elektrotechnik, Maschinenbau und Technikjournalismus, 08.07.2009

Jovanović, M.:
Footprint Analysis – The example of Metamaterials, ISSI Konferenz 2009, Rio de Janeiro, Brasilien, 14.07.2009

Wiemken, U.:
INT – ein Überblick, ABC-Schutz – Symposium im Fraunhofer – INT, Euskirchen, 08.09.2009

Risse, M.:
Mobile Sensorik zur Detektion und Identifizierung von radioaktiven sowie nuklearen Stoffen. ABC-Schutz – Symposium im Fraunhofer – INT, Euskirchen, 08.09.2009

Rosenstock, W.:
Risiken durch radiologischen/nuklearen Terror. ABC-Schutz – Symposium im Fraunhofer – INT, Euskirchen, 08.09.2009

Wiemken, U.:
INT – ein Überblick, Besuch der Hochschule Bonn-Rhein Sieg im Fraunhofer-Institut für Naturwissenschaftlich-Technische Trendanalysen INT, Euskirchen, 09.09.2009

Suhrke, M.:
Die Modenverwirbelungskammer als EMV-Testeinrichtung, Wehrtechnisches Symposium EME 2009 „Elektromagnetische Effekte", Mannheim, BAkWVT, 14.-16.9.2009

Adami, C.; Braun, C.; Clemens, P.; Schmidt, H.-U.; Suhrke, M. Taenzer, J.:
Eine Modenverwirbelungskammer mit Hochleistungs-Pulsquellen für Störfestigkeitsuntersuchungen, Wehrtechnisches Symposium EME 2009 „Elektromagnetische Effekte", Mannheim, BAkWVT, 14. 16.9.2009

Höffgen, S.:
Presentation – Influence of Manufacturing Parameters and Temperature on the Radiation Sensitivity of Fiber Bragg Gratings, 10th European Conference on Radiation Effects on Components and Systems, Brügge, Belgien, 17.09.2009

Wiemken, U.:
Eröffnungsvortrag, 4. Symposium Nukleare und radiologische Waffen - Technologische Urteilsfähigkeit und nukleare Sicherheit in Deutschland, Euskirchen, 22.-24.09.2009

APPENDIX

Rosenstock, W.:
Aktuelle Systeme zur zerstörungsfreien Detektion und Identifizierung von nuklearem Material vor Ort. 4. Symposium Nukleare und radiologische Waffen - Technologische Urteilsfähigkeit und nukleare Sicherheit in Deutschland, Euskirchen, 22.-24.09.2009

Suhrke, M.:
Der Nukleare Elektromagnetische Puls, 4. Symposium Nukleare und radiologische Waffen, Euskirchen, 22.-24.09.2009

Reschke, S.:
Undenkbar war Gestern - Werkstoffe & Wissenschaft heute, „Werkstoffkompetenz in NRW“, Rheinbach, 23.09.2009

Grüne, M.:
Nanotechnologie - Grundlagen, Anwendungen, Wehrtechnik, Séminaire franco-allemand „Wissenschaft und Krieg“, Université de Strasbourg, Straßburg, 24.09.2009

Pastuszka, H.-M., Missoweit, M.:
Future planning of EU security research – a contribution to the discussion, Fraunhofer Conference “Future Security 2009”, Karlsruhe, 01.10.2009

Reschke, S.:
Neural and Biological Soldier Enhancement: From SciFi to Deployment, NATO RTO HFM-181 Symposium, Sofia, Bulgarien, 07.10.2009

Schmidt, H.U.:
Gefährdungspotential von Hochleistungs-Mikrowellen (HPM) für Rechenzentren, Seminar Sicherheit und Höchstverfügbarkeit von Serverparks, Rechnenzentren und IT-Räumen, Simedia-Fachseminar, Berlin, 09.10.2009

Grüne, M.:
Nanotechnologie - Querschnittstechnologie des 21. Jahrhunderts?, Vorlesung „Technik und gesellschaftlicher Wandel - Rückblick und Ausblick“, U. Wiemken et al., FH Bonn-Rhein-Sieg, Sankt Augustin, 09.10.2009

Missoweit, M.:
Germany: Defence S&T Plans, Programmes & Projects Comparing business models, Workshop on Advanced International Defence S&T Collaboration, Den Haag, Niederlande, 10.2009

Jovanović, M.:
Bibliometrische Analysen mit dem Web of Science, Arbeitstagung der Fraunhofer Bibliotheken 2009, 13.10.2009

Reschke, S.:
Futuring - Strategische Frühaufklärung, 2. Jahrestagung Strategisches Technologie- und Innovationsmanagement in produzierenden Unternehmen 2009, Düsseldorf, 13. 14.10.2009

Metzger, S.:
Weltraumwetter – Eine Gefahr für Satelliten. Forum Weltraum 2009, Studiengesellschaft der Deutschen Gesellschaft für Wehrtechnik GmbH, Bad Godesberg, 20.-21.10.2009

Höffgen, S.; Kuhnhenn, J.; Kündgen, T.; Lennartz, W.; Loosen, T.; Mathes, M.; Metzger, S.; Weinand, U.:
Ausstellungsstand – Arbeitsgebiet Nukleare Effekte in Elektronik und Optik. Forum mit Ausstellung Weltraum 2009, Studiengesellschaft der Deutschen Gesellschaft für Wehrtechnik GmbH, Bad Godesberg, 20.-21.10.2009

Kock, D.:
Forschung im Bereich Sicherheit und Verteidigung im Jahr 2020 – Ergebnis einer Szenario-Studie, Fachinformationstagung des Report Verlag: Forschung und Technologie für Sicherheit und Verteidigung – zukunftsorientiert und ressortübergreifend, Bonn, 22.-23.10.2009

Berky, W.:
Statusbericht zum Projekt SR 08 01650, Oktober 2009: Aktueller Stand zum Nachweis der modellierten improvisierten Kernwaffen mit kommerziellen Detektoren, INT Euskirchen, 26.10.2009

Köble, T.:
Statusbericht zum Projekt SR 08 01650, Oktober 2009: Aktueller Stand zur Simulation der Strahlungsfelder von Kernwaffen, INT Euskirchen, 26.10.2009

Rosenstock, W.:
Bedrohung durch radiologischen/nuklearen Terror – Lehren aus Unfällen. 18. Forum Zivil-Militärische Zusammenarbeit (ZMZ) im Gesundheitswesen „Besondere radiologische Schadenslagen - eine Herausforderung für Rettungsdienste, Krankenhäuser und den ÖGD“ in Bad Neuenahr, 27.-29.10.2009

Kuhnhenn, J.:
Präsentation – Overview of the Radiation Effects Group at INT. Universität Düsseldorf, 29.10.2009

Metzger, S.:
Präsentation – Overview of the ESA Project Investigation and Analysis of Very High Energy Accelerators for Radiation Simulation. Universität Düsseldorf, 29.10.2009

Rosenstock, W.:
NAG „Radiologische Bombe“: Planung – Diskussion der zukünftigen Schwerpunkte Arbeitsgruppe 1 – Bedrohungsanalyse. 10. Sitzung der NAG RB AG1bei IABG in Ottobrunn, 11. – 12.11.2009

Reschke, S.:
Neurale & Biologische Ergonomie: Optimierung menschlicher Leistungsfähigkeit, Vorlesung „Technik und gesellschaftlicher Wandel - Rückblick und Ausblick“, U. Wiemken et al., FH Bonn-Rhein-Sieg, Sankt Augustin, 12.11.2009

Wiemken, U.:
Warnung der Bevölkerung durch ein flächendeckendes Broadcast-Warnsystem
Dipl.-Ing. Guido Huppertz (Projektverantwortlicher), Vortrag heute: Uwe Wiemken, Rotary-Treffen 13.11.09

Reschke, S.:
Anbindung und Nutzung von Methoden des TIM in der Strategischen und Technologischen Frühaufklärung, Vortrag im Rahmen des Referententreffens, IHK Innovation, Kassel, 19.11.2009

Kuhnhenn, J.:
Radiation tests of electronics for space applications - Applications, Options and Perspectives, Invited Talk at the Workshop “Metrology Using Ion Beams”, PTB Braunschweig, 23.11.2009

Höffgen, S.:
Presentation – Analysis of Energy Effects and Accelerator Needs – ESA Project 029-102733 Investigation and Analysis of Very High Energy Accelerators for Radiation Simulation. Progress Meeting ESA-ESTEC, Noordwijk, Niederlande, 26.11.2009

Metzger, S.:
Presentation – Electronic Device Irradiation Test Plan – ESA Project 029-102733 Investigation and Analysis of Very High Energy Accelerators for Radiation Simulation. Progress Meeting ESA-ESTEC, Noordwijk, Niederlande, 26.11.2009

Metzger, S.:
Presentation – Results of Electronic Device Irradiation – ESA Project 029-102733 Investigation and Analysis of Very High Energy Accelerators for Radiation Simulation. Progress Meeting ESA-ESTEC, Noordwijk, Niederlande, 26.11.2009

John, M.:
Das Cochlea Implantat - eine Innovation im Spannungsfeld von Kultur und Technik, Vorlesung „Technik und gesellschaftlicher Wandel - Rückblick und Ausblick", U. Wiemken et al., FH Bonn-Rhein-Sieg, Sankt Augustin, 27.11.2009

Neupert, U.:
Energie Ernten / Energy Harvesting, Vorlesung „Technik und gesellschaftlicher Wandel - Rückblick und Ausblick", U. Wiemken et al., FH Bonn-Rhein-Sieg, Sankt Augustin, 04.12.2009

Wiemken, U.:
Der Runde Tisch Verteidigungs- und Sicherheitsforschung, Symposium/Workshop zur langfristigen Entwicklung der Verteidigungs- und Sicherheitsforschung, Euskirchen, 07.-08.12.2009

Neupert, U.:
Digitale Erde / Geoinformationssysteme, Runder Tisch Verteidigungs- und Sicherheitsforschung, Fraunhofer VVS und Fraunhofer INT, Euskirchen 07.12.2009

Kohlhoff, J.:
Roboterautonomie – Ein Technologiethema mit großer Relevanz für die wehrtechnische FuT, Runder Tisch Verteidigungs- und Sicherheitsforschung, Fraunhofer VVS und Fraunhofer INT, Euskirchen 07.12.2009

Suhrke, M.:
HPM-Detektion, Runder Tisch Verteidigungs- und Sicherheitsforschung, Fraunhofer VVS und Fraunhofer INT, Euskirchen 07.12.2009

Köble, T.:
Abschlusspräsentation zum Projekt E/E590/7Z001/7F143: Analyse der Möglichkeiten von Neutronenradiographie zum Einsatz vor Ort, WIS, Munster, 09.12.2009

Burbiel, J.:
Psychopharmaka - Chemie für die Seele, Vorlesung „Technik und gesellschaftlicher Wandel - Rückblick und Ausblick", U. Wiemken et al., FH Bonn-Rhein-Sieg, St. Augustin, 18.12.2009

Publications

Adami, C. ; Braun, C. ; Clemens, P. ; Schmidt, H.U. ; Suhrke, M. ; Taenzer, A.:
Eine Modenverwirbelungskammer mit Hochleistungs-Pulsquellen für Störfestigkeitsuntersuchungen. (Wehrtechnisches Symposium „Elektromagnetische Effekte" <12, 2009, Mannheim>) In: Bundesakademie für Wehrverwaltung und Wehrtechnik, Mannheim:Symposium EME 2009 „Elektromagnetische Effekte". CD-ROM : Mannheim, 14.09. - 16.09.2009, Mannheim : BAkWVT, 2009

Adami, C.; Braun, C.; Clemens, P.; Schmidt, H.U.; Suhrke, M.; Taenzer, A; Weber, U.:
High power microwave susceptibility of IT network components. (Security Research Conference „Future Security" <4, 2009, Karlsruhe>), In: Elsner, P. ; Fraunhofer Verbund Verteidigungs- und Sicherheitsforschung ; Fraunhofer-Institut für Chemische Technologie -ICT-, Pfinztal: Fraunhofer Symposium Future Security. 4th Security Research Conference 2009: September 29th - October 1th 2009, Karlsruhe, Germany, Stuttgart: Fraunhofer Verlag, 2009, S.400-410

Berky, W. ; Chmel, S. ; Friedrich, H. ; Köble, T. ; Risse, M. ; Rosenstock, W.:
Searching and identifying radioactive material with hand-held high-resolution gamma detectors. (Institute of Nuclear Materials Management (Annual Meeting) <50, 2009, Tucson/Ariz.>) In: Institute of Nuclear Materials Management -INMM-: INMM 50th Annual Meeting 2009. Proceedings. CD-ROM : July 12-16, 2009, Tucson, Ariz. USA, Madison, Wisconsin : Omnipress, 2009, 10 S.

Berky, W.; Chmel, S.; Engelen-Peter, J.; Friedrich, H.; Köble, T.; Risse, M.; Rosenstock, W.; Weber, U.:
Advanced hand-held detection system for on-site localization and identification of nuclear and radioactive material. (Security Research Conference „Future Security" <4, 2009, Karlsruhe>), In: Elsner, P. ; Fraunhofer Verbund Verteidigungs- und Sicherheitsforschung ; Fraunhofer-Institut für Chemische Technologie -ICT-, Pfinztal: Fraunhofer Symposium Future Security. 4th Security Research Conference 2009: September 29th - October 1th 2009, Karlsruhe, Germany, Stuttgart: Fraunhofer Verlag, 2009, S.423-428

Berky, W.; Chmel, S.; Engelen-Peter, J.; Friedrich, H.; Köble, T.; Risse, M.; Rosenstock, W.; Weber, U.:
Detector systems for fast search and identification of R&N material in situ: Poster at CREATIF Stakeholder Workshop „Testing of CBRNE detection equipment", 2009, Brussels, Belgium. (Workshop „Testing of CBRNE detection Equipment" <2009, Brussels>), 2009

Braun, C.; Clemens, P.; Schmidt, H.U.; Suhrke, M.; Taenzer, A.:
Susceptibility of network components to pulsed medium power microwave fields. (International Zurich Symposium on Electromagnetic Compatibility (EMC) <20, 2009, Zurich>), In: TH Zürich -ETH-, Laboratory for Electromagnetic Fields and Microwave Electronics: 20th International Zurich Symposium on electromagnetic Compatibility 2009. Proceedings. CD-ROM: 12-16 January 2009, Zurich, Switzerland,Zürich: ETH, 2009, 4 S.

Burbiel, J.:
Creativity in research and development environments: A practical review, In: The international journal of business science & applied management 4 (2009), Nr.2, S.35-51

Burbiel, J.; Engelhard, N.; Grigoleit, S.; John, H.; Schulze, J.: Gefahrenpotentiale von chemischen Kampfstoffen und toxischen Industriechemikalien - das Punktesystem, In: Bundesamt für Bevölkerungsschutz und Katastrophenhilfe -BBK-, Bonn: Gefahren und Warnung : Drei Beiträge, Rheinbreitbach : MedienHaus Plump, 2009, S.27-58, (Schriften der Schutzkommission 1)

Euting, T.:
Zukünftige Mobilfunksysteme, In: Strategie und Technik 52 (2009), Nr.4, S.23

Euting, T.; Weimert, B.:
Information security, In: Bullinger, H.-J.: Technology guide: Principles, applications, trends, Berlin: Springer, 2009, S.498-503

Euting, T.:
Netzwerkcodierung, In: Strategie und Technik 52 (2009), Nr.9, S.55

Gericke, W.; Thorleuchter, D.; Weck, G.; Reiländer, F.; Loß, D.:
Vertrauliche Verarbeitung staatlich eingestufter Information - die Informationstechnologie im Geheimschutz, In: Informatik-Spektrum 32 (2009), Nr.2, S.102-109

Grobnic, D. ; Henschel, H. ; Höffgen, S.K. ; Kuhnhenn, J. ; Mihailov, S.J. ; Weinand, U.:
Radiation sensitivity of Bragg gratings written with femtosecond IR lasers. (Fiber Optic Sensors and Applications Conference <6, 2009, Orlando/Fla.>) In: Udd, E. ; Society of Photo-Optical Instrumentation Engineers -SPIE-, Bellingham/Wash.: Fiber optic sensors and applications VI : 15 - 17 April 2009, Orlando, Florida, United States, Bellingham, WA : SPIE, 2009, Paper 73160C (Proceedings of SPIE 7316)

Grüne, M.; Nätzker, W.:
Disaster response, In: Bullinger, H.-J.: Technology guide: Principles, applications, trends, Berlin: Springer, 2009, S.532-535

Grüne, M.; Kohlhoff, J.:
Defence technologies forecast. (Security Research Conference „Future Security" <4, 2009, Karlsruhe>), In: Elsner, P. ; Fraunhofer Verbund Verteidigungs- und Sicherheitsforschung ; Fraunhofer-Institut für Chemische Technologie -ICT-, Pfinztal: Fraunhofer Symposium Future Security. 4th Security Research Conference 2009: September 29th - October 1th 2009, Karlsruhe, Germany, Stuttgart: Fraunhofer Verlag, 2009, S.416-422

Henneka, A.; Jovanović, M.:
Report on the third session - regional conflicts and the nuclear question. (International Amaldi Conference of Academies of Sciences and National Scientific Societies on Scientific Questions of Global Security <17, 2008, Hamburg>), In: Gottstein, K.; Union der Deutschen Akademien der Wissenschaften, Hamburg: XVII International Amaldi Conference on Academies of Sciences and National Scientific Societies on Scientific Questions of Global Security 2008. Proceedings : 14-16 March 2008, DESY, Hamburg, Hamburg: DESY, 2009, S.273-274

Huppertz, G.; Heyduck, S.:
Warnsystem mit Weckeffekt basierend auf Personenkraftwagen: Konzept eines neuen Systems zur Warnung der Bevölkerung, Euskirchen: Fraunhofer INT, 2009

Heyduck, S.:
Alarm per Hupe, „weiter.vorn", Das Fraunhofer-Magazin (2009), Nr. 4, S. 50

John, M.:
Kernfusion, In: Strategie und Technik 52 (2009), Nr.11, S.23

John, M.; Jovanović, M.; Reschke, S.:
Dominance in cooperation networks, Poster AGSOE 14.9 bei 72th Annual Meeting of the DPG and DPG Spring Meeting of the Condensed Matter Section, Dresden, März 2009, Verhandlungen der DPG (VI) 44 (2009), S. 650

Jovanović, M.:
Report on the third session - regional conflicts and the nuclear question, International Amaldi Conference of Academies of Sciences and National Scientific Societies on Scientific Questions of Global Security, 2008, Hamburg
Jovanović, M.; John, M.; Reschke, S.:
Footprint analysis - the example of metamaterials. (International Society for Scientometrics and Informetrics (International Conference) <12, 2009, Rio de Janeiro>), In: Larsen, B. ; International Society for Scientometrics and Informetrics -ISSI- ; Latin American and Caribbean Center on Health Sciences Information of the Pan American Health Organization ; World Health Organization -WHO-: ISSI 2009, 12th International Conference on Scientometrics and Informetrics. Proceedings. Vol.2, 14-17 July, 2009 - Rio de Janeiro, Brazil, Sao Paulo, 2009, S.948-949

Kernchen, R.:
Biomonitoring, In: Strategie und Technik (2009), Nr.2, S.62

Kernchen, R.; Ruhlig, K.:
Defence against hazardous materials, In: Bullinger, H.-J.: Technology guide: Principles, applications, trends, Berlin: Springer, 2009, S.510-515

Kernchen, R.:
Enzyme stabilization in nanostructured materials for use in organophosphorus nerve agents detoxification and prophylaxis. (Conference „Biodefence - Advanced Materials and Methods for Health Protection" <2009, Tashkent>), In: NATO, Advanced Study Institute on Science for Peace and Security Series: Biodefence: Advanced materials and methods for health protection. Book of abstracts: 12-25 May 2009, Tashkent, 2009, S.43

Köble, T.; Rosenstock, W.; Berky, W.; Friedrich, H.; Risse, M.:
New radionuclide measurement systems improving search and detection capabilities for OSI deployment. (International Scientific Studies Conference (ISS) <2009, Vienna>), In: Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization -CTBTO-: ISS09, International Scientific Studies Conference. Book of abstracts: 10-12 June 2009, Hofburg Palace, Vienna, Austria, 2009, S.65

Köble, T.; Rosenstock, W.; Berky, W.; Friedrich, H.; Risse, M.:
New radionuclide measurement systems improving search and detection capabilities for OSI deployment : Poster at ISS09, International Scientific Studies Conference, 10-12 June 2009, Hofburg Palace, Vienna, Austria. (International Scientific Studies Conference (ISS) <2009, Vienna>), 2009

Köble, T.; Rosenstock, W.:
Mit Neutronen sehen, In: Bundesministerium der Verteidigung -BMVg-, Unterabteilung Rü IV, Bonn: Wehrwissenschaft Forschung & Technologie. Jahresbericht 2008 : Wehrwissenschaftliche Forschung für deutsche Streitkräfte im Einsatz, Bonn, 2009, S.38-39

Köble, T.; Rosenstock, W.:
See it with neutrons, In: Bundesministerium der Verteidigung -BMVg-, Unterabteilung Rü IV, Bonn: Annual Research and Technology Report 2008 : Defence research for the German armed forces on operations, Bonn : BMVg, 2009, S.38-39

Köble, T.; Rosenstock, W.; Risse, M.; Friedrich, H.; Berky, W.; Chmel, S.:
Neutron measurement techniques for hand-held devices. (Annual Symposium on Safeguards and Nuclear Material Management <31, 2009, Vilnius>), In: European Commission, Joint Research Centre -JRC- ; European Safeguards Research and Development Association -ESARDA-: 31th Annual Meeting - Symposium on Safeguards and Nuclear Material Management. CD-ROM, Luxembourg: Office for Official Publications of the European Communities, 2009, 6 S.

Kock, D.; Müller, S.; Schulze, J.; Schwarz-Geschka, M.; Thesing, P.; Thorleuchter, D.:
Szenario-Studie „Forschung im Bereich Sicherheit und Verteidigung im Jahr 2030". (Szenario-Workshop „Forschung im Bereich Sicherheit und Verteidigung im Jahr 2030" <2008, Euskirchen>), Euskirchen: Fraunhofer INT, 2009, (Bericht - Fraunhofer-Institut für Naturwissenschaftlich-Technische Trendanalysen 209)

APPENDIX

Kohlhoff, J.; Reschke, S.; Grüne, M.:
Werkstofftrends: Klebverfahren, In: Werkstoffe in der Fertigung (2009), Nr.2, S.3

Kohlhoff, J.:
Weapons and military systems, In: Bullinger, H.-J.: Technology guide: Principles, applications, trends, Berlin: Springer, 2009, S.504-509

Kohlhoff, J.:
Roboterautonomie, In: Strategie und Technik (2009), Nr.7, S.65

Kuhnhenn, J.; Höffgen, S.K.; Weinand, U.:
Quality assurance for irradiation tests of optical fibers: Uncertainty and reproducibility, In: IEEE Transactions on Nuclear Science 56 (2009), Nr.4, S. 2160-2166

Lieder, E.O.; Pasternak, A.A.; Lieder, R.M.; Bark, R.A.; Lawrie, E.A.; Lawrie, J.J.; Mullins, S.M.; Murray, S.; Ntshangase, S.S.; Papka, P.; Kheswa, N.; Przybylowicz, W.J.; Sechogela, P.T.; Zell, K.O.:
Stopping power of Nd, Pm and Sm ions in Cd determined with gamma-ray lineshape analysis, In: Nuclear instruments and methods in physics research, Section A. Accelerators, spectrometers, detectors and associated equipment 607 (2009), Nr.3, S.591-599

Metzger, S. ; Höffgen, S.:
Weltraumwetter - eine Gefahr für Satelliten. (Forum Weltraum <2009, Bonn>) In: Studiengesellschaft der Deutschen Gesellschaft für Wehrtechnik:Weltraum 2009. CD-ROM : Forum und Ausstellung der Studiengesellschaft der Deutschen Gesellschaft für Wehrtechnik mbH am 20. und 21. Oktober 2009 in der Stadthalle Bad Godesberg, Bonn : SGW, 2009, 12 S.

Missoweit, M., Pastuszka, H.-M.:
ESRIF – Das European Security Research and Innovation Forum, Bevölkerungsschutz 4/2009, S. 30 f

Müller, S.:
Die Auswirkungen des Klimawandels auf sicherheits- und verteidigungspolitische Fragestellungen, Euskirchen : Fraunhofer INT, 2009, (Bericht - Fraunhofer-Institut für Naturwissenschaftlich-Technische Trendanalysen 208)

Neupert, U.; Euting, T.; Kretschmer, T.; Notthoff, C ; Ruhlig, K.; Weimert, B.:
Energiespeicher - Technische Grundlagen und energiewirtschaftliches Potenzial, Stuttgart: Fraunhofer IRB Verlag, 2009, ISBN 978-3-8167-7936-0

Neupert, U.:
Wind, water and geothermal energy, In: Bullinger, H.-J.: Technology guide: Principles, applications, trends, Berlin: Springer, 2009, S.340-345

Neupert, U.:
Bioraffinerien, In: Strategie und Technik 51 (2009), Nr.6, S.76

Neupert, U. ; Römer, S. ; Wiemken, U. ; Rademaker, J.G.:
Assessment of potentially disruptive technologies for defence and security. (Security Research Conference „Future Security“ <4, 2009, Karlsruhe>) In: Elsner, P. ; Fraunhofer Verbund Verteidigungs- und Sicherheitsforschung ; Fraunhofer-Institut für Chemische Technologie -ICT-, Pfinztal:Fraunhofer Symposium Future Security. 4th Security Research Conference 2009 : September 29th - October 1th 2009, Karlsruhe, Germany, Stuttgart : Fraunhofer Verlag, 2009, S.310-315

Nitsch, J. ; Tkachenko, S. ; Magdowski, M. ; Potthast, S. ; Adami, C. ; Braun, C. ; Schmidt, H.U. ; Suhrke, M.; Vick, R.:
Transiente Anregung von Resonatoren: Flüchtige und eingeschwungene Moden. (Wehrtechnisches Symposium „Elektromagnetische Effekte“ <12, 2009, Mannheim>) In: Bundesakademie für Wehrverwaltung und Wehrtechnik, Mannheim:Symposium EME 2009 „Elektromagnetische Effekte“. CD-ROM : Mannheim, 14.09. - 16.09.2009, Mannheim : BAkWVT, 2009

Notthoff, C.:
Tailored light, In: Strategie und Technik 52 (2009), Nr.1, S.37

Pastuszka, H.-M.; Missoweit, M.:
Future planning of EU security research - a contribution to the discussion. (Security Research Conference „Future Security“ <4, 2009, Karlsruhe>), In: Elsner, P. ; Fraunhofer Verbund Verteidigungs- und Sicherheitsforschung ; Fraunhofer-Institut für Chemische Technologie -ICT-, Pfinztal: Fraunhofer Symposium Future Security. 4th Security Research Conference 2009: September 29th - October 1th 2009, Karlsruhe, Germany, Stuttgart: Fraunhofer Verlag, 2009, S.251-256

Pekala, E.; Burbiel, J.; Müller, C.E.:
Preparation of enantiopure (R)-hydroxy metabolite of denbufylline using immobilized Lactobacillus kefiri DSM 20587 as a catalyst, In: Chirality 21 (2009), Nr.8, S.713-718

Reschke, S ; Grüne, M.; Kohlhoff, J.:
Werkstofftrends: Multiferroika, In: Werkstoffe in der Fertigung (2009), Nr.1, S.3

Reschke, S.; Grüne, M.; Kohlhoff, J.:
Werkstofftrends: Ortsauflösende Volumenanalytik, In: Werkstoffe in der Fertigung (2009), Nr.6, S.3

Reschke, S.:
Selbstheilende Werkstoffe, In: Strategie und Technik 51 (2009), Nr.10, S.82

Reschke, S.; Kohlhoff, J.; Grüne, M.:
Werkstofftrends: Korrosionsschutz, In: Werkstoffe in der Fertigung (2009), Nr.3, S.3

Reschke, S.; Grüne, M.; Kohlhoff, J.:
Werkstofftrends: Siliziumcarbid in der Elektronik, In: Werkstoffe in der Fertigung (2009), Nr.5, S.3

Rosenstock, W.:
Detection of concealed fissionable material by delayed neutron counting. (International Topical Meeting on Nuclear Research Applications and Utilization of Accelerators <2009, Vienna>), In: International Atomic Energy Agency -IAEA-, Wien; American Nuclear Society -ANS-: International Topical Meeting on Nuclear Research Applications and Utilization of Accelerators 2009. Book of Abstracts: 4-8 May 2009, Vienna, Austria, Wien: IAEA, 2009, S.139-140

Rosenstock, W.; Köble, T.; Risse, M.:
Non-destructive measuring techniques for on-site detection and identification of illicit nuclear material, In: Kerntechnik 74 (2009), Nr.4, S.181-187

Rosenstock, W.; Berky, W.; Chmel, S.; Friedrich, H.; Köble, T.; Risse, M.:
Covert search and detection of illicit nuclear as well as radioactive material. (Security Research Conference „Future Security“ <4, 2009, Karlsruhe>), In: Elsner, P. ; Fraunhofer Verbund Verteidigungs- und Sicherheitsforschung ; Fraunhofer-Institut für Chemische Technologie -ICT-, Pfinztal: Fraunhofer Symposium Future Security. 4th Security Research Conference 2009: September 29th - October 1th 2009, Karlsruhe, Germany, Stuttgart: Fraunhofer Verlag, 2009, S.176-185

Rosenstock, W.; Köble, T.; Berky, W.; Friedrich, H.; Risse, M.; Chmel, S.:
Recent improvements in on-site detection and identification of radioactive/nuclear material. International Symposium on Nuclear Security, 30 March - 3 April 2009, Vienna, Austria, (URL: http://www-pub.iaea.org/MTCD/Meetings/PDFplus/2009/cn166/ CN166_Presentations/Session%206/015%20Rosenstock.pdf)

APPENDIX

Rosenstock, W.:
Bedrohung durch radiologischen/nuklearen Terror - Lehren aus Unfällen. (Forum Zivil-Miltärische Zusammenarbeit (ZMZ) im Gesundheitswesen „Besondere radiologische Schadenslagen - eine Herausforderung für Rettungsdienste, Krankenhäuser und den ÖGD“ <18, 2009, Bad Neuenahr>), In: Bundesamt für Bevölkerungsschutz und Katastrophenhilfe -BBK-, Bonn; Deutsche Gesellschaft für Katastrophenmedizin -DGKM- ; Deutsche Gesellschaft für Wehrmedizin und Wehrpharmazie: 18. Forum Zivil-Militärische Zusammenarbeit (ZMZ) im Gesundheitswesen „Besondere radiologische Schadenslagen - eine Herausforderung für Rettungsdienste, Krankenhäuser und den ÖGD“. CD-ROM : 27.10. - 28.10.2009 im Dorint Parkhotel Bad Neuenahr, am 29.10.2009 in der AKNZ Bad Neuenahr-Ahrweiler, Bonn: BBK, 2009

Ruhlig, K.:
Cloud Computing, In: Strategie und Technik 52 (2009), Nr.5, S.15

Ruhlig, K.:
Multirobotersysteme, In: Strategie und Technik 52 (2009), Nr.12, S.84

Schulze, J.; Rosenstock, W.:
Wozu der Atomwaffensperrvertrag einen Beitrag leistet, In: The European. Online journal (2009), 28. November 2009

Suhrke, M.:
Die Modenverwirbelungskammer als EMV-Testeinrichtung. (Wehrtechnisches Symposium „Elektromagnetische Effekte“ <12, 2009, Mannheim>) In: Bundesakademie für Wehrverwaltung und Wehrtechnik, Mannheim:Symposium EME 2009 „Elektromagnetische Effekte“. CD-ROM : Mannheim, 14.09. - 16.09.2009, Mannheim : BAkWVT, 2009

Thorleuchter, D.; Fenner, J.:
Textmining-Analyse von Forschungsvorhaben des National Institute of Standards and Technology, Euskirchen : Fraunhofer INT, 2009, (Bericht - Fraunhofer-Institut für Naturwissenschaftlich-Technische Trendanalysen 199)

Thorleuchter, D.; Poel, D. van den; Prinzie, A.:
Mining innovative ideas to support new product research and development. (International Federation of Classification Societies (IFCS Conference) <11, 2009, Dresden>), In: TU Dresden: IFCS@GFKL - Classification as a tool for research: 11th Conference of the international federation of classification societies (IFCS 2009) - jointly with the 33rd conference of the german classification society (GfKl). March 13 - 18, 2009, University of Technology, Dresden, Germany, Dresden, 2009, S.372

Thorleuchter, D.:
Methoden und Verfahren für F&T-Planungsprozesse. Teil 1: Die Strategische Frühaufklärung und Analyse, Euskirchen: Fraunhofer INT, 2009, (Bericht - Fraunhofer-Institut für Naturwissenschaftlich-Technische Trendanalysen 210)

Thorleuchter, D.:
Methoden und Verfahren für F&T-Planungsprozesse. Teil 2: Die F&T-Programmplanung, Euskirchen: Fraunhofer INT, 2009, (Bericht - Fraunhofer-Institut für Naturwissenschaftlich-Technische Trendanalysen 211)

Thorleuchter, D.:
Methoden und Verfahren für F&T-Planungsprozesse. Teil 3: Vorhabenbewertung zur transparenten Diskussion, Euskirchen: Fraunhofer INT, 2009, (Bericht - Fraunhofer-Institut für Naturwissenschaftlich-Technische Trendanalysen 214)

Weimert, B.:
Mikrosystemtechnik, In: Strategie und Technik 52 (2009), Nr.8, S.71

Weimert, B.; Reschke, S.; Kohlhoff, J.; Grüne, M.:
Werkstofftrends: Werkstoffe der Mikrosystemtechnik, In: Werkstoffe in der Fertigung (2009), Nr.4, S.3

Wiemken, U.:
Prognosen und Planung : Technologievorausschau vor dem Hintergrund staatlicher Vorsorge, Euskirchen: Fraunhofer INT, 2009, (Diskurs Technik und gesellschaftlicher Wandel)

Wiemken, U.:
Kreativität und Planung - passt das zusammen?, Euskirchen: Fraunhofer INT, 2009, (Diskurs Technik und gesellschaftlicher Wandel)

Wiemken, U.:
Warum wir nicht immer die große Lösung erwarten sollten: Karl Popper und die Wirtschaftskrise - eine Reminiszenz, Euskirchen: Fraunhofer INT, 2009, (Diskurs Technik und gesellschaftlicher Wandel)

Wiemken, U.:
Zur Rolle der Schulwissenschaft in der Planung, Euskirchen: Fraunhofer INT, 2009
(Diskurs Technik und gesellschaftlicher Wandel)

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Institute Course

Reschke, S. (Fraunhofer INT, Euskirchen):
Neurale & Biologische Ergonomie: Optimierung menschlicher Leistungsfähigkeit,
Euskirchen 04.02.2009

Goymann, S. (Fraunhofer INT, Euskirchen):
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Euskirchen 11.02.2009

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Euskirchen 18.02.2009

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Methoden der Technologiefrüherkennung,
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Protection from cosmic radiation for the mission to Mars,
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Schardt, D. (GSI Darmstadt):
Zielgenaue 3D-Bestrahlung von Tumoren mit hochenergetischen Ionen,
Euskirchen 11.03.2009

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Foresight,
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Behrend, H. (AmtGeoBw Euskirchen):
Sicherheitspolitische Aspekte des Klimawandels,
Euskirchen 01.04.2009

Groenwold, K. (MCSG Materialdepot Service GmbH Erftstadt):
Erfahrungen bei der Beseitigung konventioneller militärischer Altlasten im Machtbereich der ehemaligen Sowjetunion,
Euskirchen 22.04.2009

Jonen, R. (ETC Jülich):
Geschichte der Uranzentrifugen,
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Kuhnhenn, J. (Fraunhofer INT, Euskirchen):
Die Beiträge des Fraunhofer INT zum Aufbau des LHC,
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Von der Lösung des Archimedes zur Isotopenanalyse - Zukunftsrelevante technologische Entwicklungen in der Kriminaltechnik,
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Der Grüne Reifen - Magie oder Chemie?,
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Huppertz, G. (Fraunhofer INT, Euskirchen):
Warnung der Bevölkerung,
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Mock, M. (Fraunhofer IAIS Sankt Augustin):
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Statistische Methoden in der Datenverarbeitung,
Euskirchen 07.10.2009

Rupp, S. (Fraunhofer IGB Stuttgart):
Technische Enzyme in der Anwendung,
Euskirchen 28.10.2009

Sauer, M. (Fraunhofer EMI Freiburg):
Simulation endballistischer Prozesse bei der Abwehr ballistischer Flugkörper,
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Müller, M. (Fraunhofer INT, Euskirchen):
Bionische Infrarotsensorik,
Euskirchen 18.11.2009

Appel, B. (Bundesinstitut für Risikoberwertung Berlin):
Biologische Sicherheit im Spannungsfeld natürlicher und absichtlich herbeigeführter Gefahren - betrachtet am Beispiel der Lebensmittelketten,
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Ebel, A. (Rheinisches Institut für Umweltforschung Universität Köln):
Schadstoffausbreitung in der Atmosphäre: Impakt- und Risikoabschätzung mit Hilfe von Modellen,
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Kretschmer, T. (Fraunhofer INT, Euskirchen):
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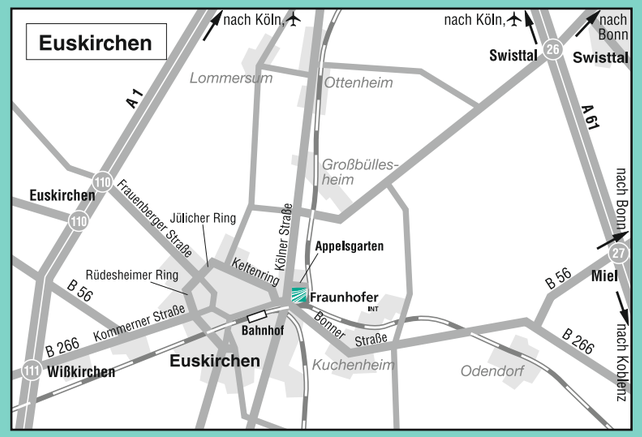

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