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Publisher:
WIS Munster
Responsible: Staff

April 2022

BUNDESWEHR

AUSRÜSTUNG

RESEARCH - VERIFICATION - GUIDANCE FOR THE SAFETY OF OUR SOLDIERS

Bundeswehr Research Institute for Protective Technologies and CBRN Protection

BUNDESWEHR

AUSRÜSTUNG

Our Roadmap

- Research and service under one roof
- Our research concept
- Acquire and further qualify skilled personnel

- Quality - our responsibility (obligation)
- Leadership - our claim

We want to go further ...

- Present results
- Create synergies

- Success through co-operation
- Benefit through competition

Technical Service and Support Department

- New molecules for the detection of BW-relevant agents
- immunological and molecular genetic laboratory procedures for the detection of pathogens and toxins
- sampling and processing of environmental samples for the detection of BW-agents and „mixed samples“; alternativ methods for surfaces and indoor disinfection
- analytics of CW-relevant chemicals
- detection and identification of explosives
- assessment of exposition to hazardous substances in the workplace

Detection

- New radiological detection technologies
- innovative biodetection methods
- miniaturization of bio-sample management
- detection equipment for CBRN-recce vehicles
- selective ToF-mass spectrometry
- active chemical standoff-detection; fast BWA-detection by immunoarray
- LIDAR-system for bio-standoff-detection

Nuclear Weapons Effects, HPEM and Fire Protection

- Gamma- and Neutron-induced damages to defense electronics
- hazard analysis of nuclear blast effects
- radiation antennae for High Power Microwaves (HPM)
- experimental HPM-simulation
- analysis of electromagnetic effects
- Hardening of military IT-systems against EMP
- protection against effects of electromagnetic weapons
- fire extinguishants and extinguishing procedures
- Halon replacement
- modern extinguishing systems
- environmentally friendly extinguishants

CBRN Protective Equipment, Water Treatment and Decontamination

- Micro-emulsions with various effectors
- Decontamination using Cold Atmospheric Plasma
- reactive nano-particles for decontamination purposes
- radiological low-level decontamination of infrastructure after „dirty bomb“-events
- decontamination control
- treatment of CBRN-contaminated raw water to drinking water quality e.g. by reverse osmosis; physiological monitoring of IPE (PSA); personal aerosol protection
- system tests of IPE
- innovative CBRN-Collective Protection (ColPro)
- Metal Organic Frameworks (MOF)

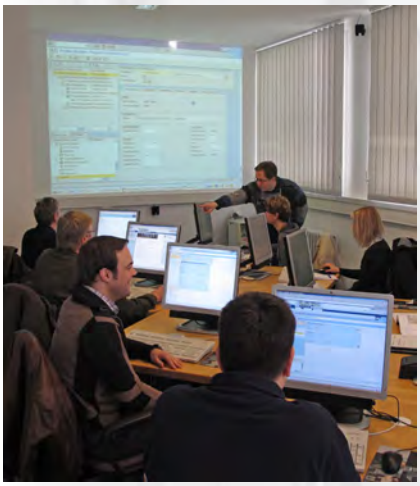
STAFF

MANAGEMENT SUPPORT AND COMPREHENSIVE TASKS

Mission

- Strategic and operational assistance for the management of WIS
- Quality, knowledge and process management
- Research and Technology (R&T) coordination and responsibility for the technology area “CBRN; Fire Protection”
- Public relations and contact to media
- Infrastructure management
- Support by controlling, monitoring and statistical analysis
- Control of defense technical tasks
- Handling of the Continual Improvement Program (CIP)
- Operation of the expert information center and photo production center

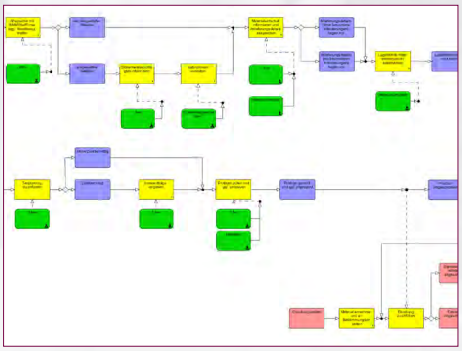
Deployable exhibition



IT training room

Resources

- Conference hall with IT and video systems for up to 60 persons
- Boardroom with videoconference system
- IT training room with 10 IT workstations
- Deployable exhibition of WIS
- Photo production center with color printing up to DIN A0, photo studio and bindery



Implementation of processes

Infrastructure/building site

Current focus

- Implementation of knowledge and process management at WIS
- Advancement of the quality management system
- Administrative assistance of R&T activities
- Coordination of and assistance building projects at WIS
- Visitor care for national and international guest
- Support and training for the business software SASPF

Bundeswehr Research Institute
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Staff 010

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April 2022

BIOLOGICAL LABORATORY

CORE COMPETENCES IN BACTERIOLOGY, VIROLOGY, TOXINOLOGY AND MYCOLOGY

Mission

Result of an immunological and biochemical analysis of a toxin-containing sample

- The focus of the Biological Laboratory is the qualitative and quantitative analysis of potential B-weapons. Since 2017, various identification methods viruses and bacteria up to risk category 3 as well as for diverse toxins have been accredited according to DIN EN ISO/IEC 17025.
- The laboratory supports the areas of detection, decontamination and drinking water treatment with know-how and experience in experimental work.
- Moreover, the Biological Laboratory supports the Laboratory of Verification in protein biotoxin exercises organized by the Organization for the Prohibition of Chemical Weapons (OVCW) with the aim of a later designation.
- The relevant tasks of the laboratory consist of microbial, molecular-biological and immunological basics as well as the cultivation and production of reference pathogens and toxins.
- Cytotoxicity studies, mass spectrometry and chromatographic analysis complete the portfolio of the laboratory.
- Ideally, our established analytics lay the foundation for future field methods.
- Individual employees are involved in committees such as the NaLaDiBa and the European third-party projects EuroBiotox.

Propagation of monkeypox virus, work in a glove box of safety level 3

Resources

- Highly motivated employees with technical and analytical expertise
- Microbiological laboratories of safety levels 1 to 3 and S1 laboratories for genetic engineering work
- Immunological, molecular biological and cell culture laboratories
- Chromatographic and mass spectrometric equipment
- An extensive and unique strain, hybridoma cell culture and antibody collection
- Microscopic equipment for pathogen identification and material analysis

Determination of the protein concentration of a suspicious sample

Current focus areas within the framework of CPM

PRELIMINARY PHASE

- The laboratory conducts preliminary research on topics such as the stability and persistence of pathogens and toxins. Moreover, mass spectrometry for strain identification is a topic

REALIZATION PHASE

- AF110 also supports the business of other units in various projects of level 1. For example, AF110 provides the standardized reference material in the course of „B detection tests & evaluation“ and „BC decontamination using plasma technology“. In addition, the laboratory determines the recovery rates of bacteria, spores and toxinsimili after aerosol spreading or plasma treatment of germ carriers.

IN-SERVICE SUPPORT PHASE

- The laboratory is also in the microbiological testing of devices such as water treatment plants and decontamination systems.

Mass spectrometric evaluation of a toxin finger print

Bundeswehr Research Institute
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Mission Field 110

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April 2022

CHEMICAL LABORATORY

CHEMICAL ANALYSIS OF TOXIC SUBSTANCES AND CHEMICAL WARFARE AGENTS IN VARIOUS MATRICES - THE RIGHT ANALYTIC METHOD FOR EACH PURPOSE

Mission

- The chemical laboratory is specialized in the identification, as well as the qualitative and quantitative analysis, of chemical warfare agents and explosive-type compounds. The laboratory has been continuously accredited according to DIN EN ISO/IEC 17025 since 1998
- Investigation of (suspicious) samples with regard to chemical warfare agents
- Assistance of the institutes other operational branches with measuring technology in trials and research activities, with an emphasis on chemical warfare agents (CWA), toxic industrial chemicals (TICs), and explosive substances, as well as their degradation products
- Provision and establishment of analytic methods for the examination of chemical warfare agents, (highly) toxic substances, pollutants relevant to the Bundeswehr in various matrices
- Administration and maintenance of the WIS on-site chemical storage facility

Suspect sample of a fact-finding mission (soil, textiles, rubber, organic solvents) prior to sample preparation and analysis

Trace analysis of warfare agents in aqueous solutions using UHPLC-MS (ultra high performance liquid chromatography mass spectrometry)

Analysis of VOC using thermodesorption and GC-MS (gaschromatography / Mass spectrometry)

Resources

- Accreditation as testing laboratory according to DIN EN ISO/IEC 17025 Highly qualified and specialized work-force having long-standing experience in analytical questions
- Well-equipped laboratories with a wide range of efficient analytical systems
- Expertise and experimental experience in the area of chemical warfare agent analysis and their degradation products in different materials
- By accreditation bodies supervised analytical procedures for the analysis of industrial chemicals and explosives in different matrices

Current focus areas within the framework of CPM

ANALYSIS PHASE

- Establishing new analytic methods to detect and analyze warfare agents and their degradation products; build-up databases with relevant analytical data

REALIZATION PHASE

- Support of branch 340: Analysis of fire extinguishing agents and waste waters to the presence of polyfluorinated compounds.
- Routine analysis in the field of occupational safety for the Northern Hazardous Substances Measuring Office

CURRENT FOCUS AREAS WITHOUT THE FRAMEWORK OF CPM

- Providing support for the WIS branches (e.g. individual protection, water treatment, decontamination) by analyzing chemical warfare agents (i.a. quantitative analysis, purity control)
- Lab-analytic assistance to maintain the status as a designated laboratory of the Organization for the Prohibition of Chemical Weapons (OPCW)

Bundeswehr Research Institute
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Mission Field 120

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April 2022

HAZARDOUS SUBSTANCES MEASURING LABORATORY

Mission

- Detection, measurement and assessment of hazardous substances, in the ambient air and materials, in workplaces and interior spaces (according to the Ordinance on Hazardous Substances, GefStoffV §7, Abs. 10)
- Commissioning of the Northern Hazardous Substances Measuring Laboratory (NHSML) of the Bundeswehr according to the central regulation A1-2030/0-6001 "Einsatz von Gefahrstoffmessstellen"
- Since 1997, NHSML´s continuing certificated competence as an external accredited testing laboratory according to DIN EN ISO/IEC 17025
- Responsible for the northern and eastern military districts all naval vessels of the Bundeswehr

Determining the exposure of elemental carbon and particle concentrations in fire tests

Resources

Examination of the pollutant load in operating rooms on marine ships (F125)

- Specific sampling procedures for measurements at working places and interiors
- Approved measuring procedures utilizing the latest technology in this field
- Excellent qualification and expertise of the work-force certified by the accreditation body
- Compilation of about 200 experts reports per year for various Bundeswehr departments
- Performing sampling and numerous analyses of hazardous substances, for example:
  - ⇨ Volatile organic compounds (VOCs) by gas chromatography in combination with mass spectrometry (GC-MS)
  - ⇨ Asbestos and artificial mineral fibres by scanning electron microscopy combined with energy dispersive X-ray spectroscopy
  - ⇨ Aldehydes, explosives, polycyclic aromatic hydrocarbons (PAH), or isocyanates by liquid chromatography
  - ⇨ Dusts and ingredients of dusts, e.g. heavy metals in welding smoke, or shooting gases
  - ⇨ Diesel engine emissions by coulometric determination of elemental carbon (EC) on filter media

Current focus areas within the framework of CPM

REALIZATION PHASE

- Support by sampling and analysis at proof of performance frigate 125

IN-SERVICE SUPPORT PHASE

- Workplace measurements for the Bundeswehr
- Determination of conctration of hazardous substances in the mechanical rooms and accommodations of boats and ships
- Investigations of hazardous materials on ex-naval units within the context of the costumer product management (CPM) nov. (e. g. heavy metals, asbestos)

CURRENT FOCUS AREAS WITHOUT THE FRAMEWORK OF CPM

- Workplace measurements within the Bundeswehr (i. a. solvents, welding smoke, and diesel engine emissions)
- Investigation of the ambient air quality in operation rooms and living quarters on naval vessels and submarines
- Experts reports with regard to the quality of ambient air in interiors
- Investigations of hazardous materials on ex-naval units within the context of disposal (e. g. heavy metals, asbestos)
- Determination of elemental carbon and particle concentrations at fire extinguishing tests

Investigations at workplaces: precision engineering workshop

Bundeswehr Research Institute
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Mission Field 120

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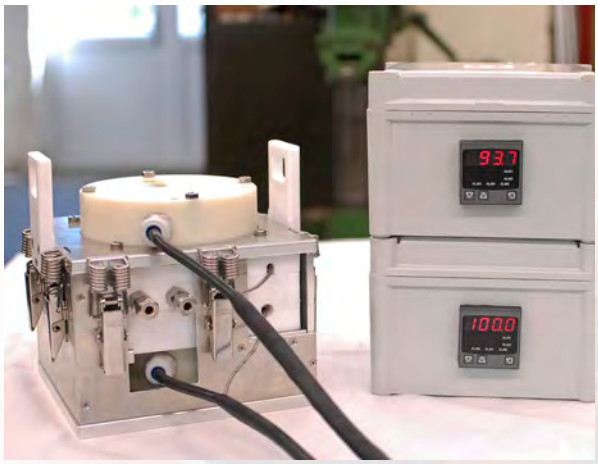
WORKSHOPS



Temperature controlled hot steam cell for implementation of C-chemical decontamination tests on test-lacquer carriers

Mission

- Design and production of not commercially available test setups
- Repair and adjustment of test sources
- Advice of scientific working groups regarding the feasibility auxiliary devices for testing
- Application of imaging media for preparation, presentation and documentation of scientific results
- Administrative operations (e. g. maintenance of databases, monitoring of maintenance intervals
- of WIS-owned vehicles, assistance in checking the electrical safety of equipment)

Resources

- Engineering with associated preparation work
- Different workshop areas (locksmith, fine mechanics, carpentry, paint shop, electrical workshop, section)
- Choice of special equipment such as e. g. 3D CAD systems, CNC
- Competence for handling/processing various materials (e. g. stainless steels, aluminum alloys, tungsten, silver, wood and plastics of all kinds)

Pivoting device laser unit BALI and its integration into a BW vehicle 2t

Container for the determination of the air to water ratio of medium expansion foam

Current focus

- Filter fixture for leak tests on glove materials using a controlled rotatable hand body with movable finger joints
- Production of an outdoor aerosol dispensing device for C-martial tests
- Modification of a motor driven human doll for carrying out clothing experiments in a wind-tunnel

Bundeswehr Research Institute
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Mission Field 130

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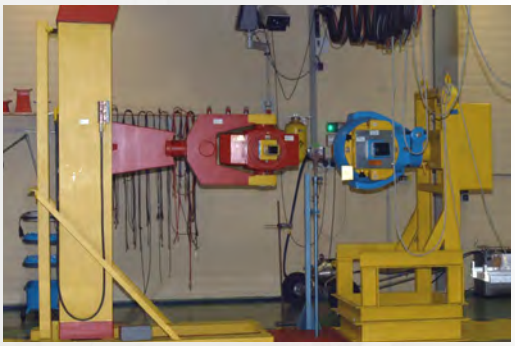
April 2022

NUCLEAR DETECTION

Mission

- Development and assessment of new concepts and materials for sensors, analysis and evaluation in the field of new technologies for nuclear detection, as well as available devices and systems and their links with platforms of the German Forces by R&D
- Scientific advice in IPTs (realisation, integrated verification, utilisation)
- Support of national and international panels (e. g. NATO NAAG JCBRND-CDG DIMP)
- Providing technical support and interdepartmental advice (AA, BKA, BPol, MAD) for example in the field of nuclear non-proliferation
- Performance of training courses
- Proof of operability for detection systems including the technical aspects



Gamma-Lab

Generic UGV as platform for technology carrier

Resources

- Scientific and technical expertise in the field of radiological detection
- Radiological detection- and identification-laboratory with mobile and portable measurement systems
- Gamma ray-, X ray- and neutron labs for the generation of defined radiation (Gamma lab - (accredited to DIN EN ISO/IEC 17025), neutron generator (14 MeV))
- Open area testside (tube-source system (Cs-137, Co-60) and Cf-252 installation for irradiation)
- Radiological / physical measurement systems for non-destructive investigations in accordance with Chemical Weapons Convention (CWC)

Current focus areas within the framework of CPM

PRELIMINARY PHASE, ANALYSIS PHASE

- R&D for German Forces in the field of analysis and evaluation of new materials and systems to combine gamma- and neutron-detection
- Development of concepts for smart RN-sensors within CBRN area protection
- Further scientific and technical developments of systems and procedures

REALIZATION PHASE

- Providing technical and scientific advices within the realisation of the deployable lab (ABC-U mobile, Fraction A/C (IPT))
- Resourcing of defined radiation in the field of first calibrations for RN-probes for maritime applications

IN-SERVICE SUPPORT PHASE

- Technical support for regeneration of specific navy equipment, multi-purpose used equipment, systems and accessories

New air reconnaissance equipment (LSA-R)

Bundeswehr Research Institute
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Branch 210

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April 2022

CENTRAL STORAGE FACILITY FOR RADIOACTIVE MATERIAL OF THE BUNDESWEHR (ZESAM)

Mission

- Technical support and guidance of the Bundeswehr in all phases regarding to the Customer Product Management (CPM) concerning the handling and management of radioactive waste
- Conceptual design of specific of equipment and procedures for the determination of the nuclide and compound composition
- Acceptance of all discarded, items containing radioactive substances formerly used by Bundeswehr, Nationale Volksarmee (NVA) and Wehrmacht
- Interim storage of radioactive materials
- Production of repositorable containers and final disposal to „KONRAD“
- Enforcement of test and measurement campaigns with respect to the radiation protection regulation at the WIS

Delivery of ascertained equipment at ZESAM

200 l-drum with electronic components which used radionuclides for pre-ionization

Storaged 200 l drums containing radioactive waste

Resources

- Central Building for the disassembling, removal and processing of radioactive material
- Bunker for the storage of primary waste, storage facilities for ascertained equipment
- Technical equipment and infrastructure in order to guarantee radiation protection
- Equipment for dose, dose rate and contamination measurement
- Disassembling workshop
- Vaporization system for contaminated liquids
- Disintegrator and compactor for solid waste
- Grouting system for the production of repositorable containers
- Facility for the processing of radioactive contaminated sewerage

Current focus areas within the framework of CPM

PRELIMINARY PHASE, ANALYSIS PHASE

- Classification of the stored waste in order to design a processing and clearance strategy

REALIZATION PHASE

- Acceptance of items containing radioactive substances and interim storage
- Monitoring of the environment (Gamma-radiating nuclides, Tritium, Radon) at WIS and the surrounding area in compliance with §48 StrlschV
- Personal dosimetry and area monitoring at WIS in compliance with §41 StrlschV
- Clearance measurements in compliance with §44 StrlschV
- Radiation Safety Officer for WIS GF 230
- Leak Test and administration of radioactive sources located at WIS
- Participating at the advisory committee for the final waste repository „Schacht Konrad“
- Participating at the ERFA coordination board

Facility for the processing of radioactive contaminated sewerage

Bundeswehr Research Institute for Protective Technologies and CBRN Protection

Branch 210

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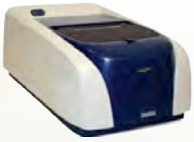
April 2022

BIOLOGICAL DETECTION

Mission

- advisory service and support in all questions concerning B detection (MoD, agencies etc.)
- development and operation of laboratory infrastructure for the testing and evaluation of detectors and comprehensive detection systems
- participation in national and international committees (NATO, EDA, ABAS etc.)



BioFire® - PCR-Film-Array

Lateral Flow Assay miPROTECT®

Molecular genetics- and immunology-based B detectors

Mobile B laboratories for the field

BSL 3-containment on the B-technology platforms YAK

B analysis area (EGV Bonn)

Resources

- scientific and technical staff with substantial expertise in the areas of stationary and mobile fieldable detection/identification of biological warfare agents (BWA)
- stationary laboratories (biosafety levels 1-3) for the testing and evaluation of detectors and comprehensive detection systems
- mobile deployable high safety containment (biosafety level 3)
- mobile technology platforms and demonstrators
- aerosol test chamber (12 m3) and testing field for the evaluation of aerosol detectors and sampling devices
- testing procedure for the evaluation of detectors and comprehensive detection systems accredited according to DIN EN ISO/IEC 17025
- cooperation with other WIS divisions providing testing and evaluation facilities for biological, chemical, and physical testing (central laboratory for biology, central laboratory for chemistry etc.)

CBRN Sampling Equipment (Navy)

Case 3: Biological Sampling Equipment

CBRN Sampling Equipment

Current focus areas within the framework of CPM

PRELIMINARY PHASE

- R&D studies to develop a knowledge base and to provide equipment for the detection/identification of BWA in the field considering both current and future threats and operational scenarios

ANALYSIS PHASE

- expert/scientific support of the Integrated Project Teams (IPT)
- project-related coordination of R&T activities

REALIZATION PHASE

- expert/scientific support
- integrated compliance demonstration as well as testing and evaluation of detectors and comprehensive detection systems

IN-SERVICE SUPPORT PHASE

- maintaining and restoring the operational viability of equipment
- obsolescence management

Bundeswehr Research Institute for Protective Technologies and CBRN Protection

Branch 220

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April 2022

CHEMICAL DETECTION

Mission

- Consultation and in-service support for all equipment of the Bundeswehr with relation to detection and identification of toxic industrial chemicals (TIC), chemical warfare agents (CWA) and explosive substances including homemade explosives (HME) during all phases of the CPM
- Qualification of point- and stand-off-detection devices for TICs, CWAs and explosives during the realisation phase and in-service use
- Research and further development of detection systems, test environments and standardised test procedures in national and international context, as well as in cooperation with civil customers and suppliers
- Management and execution of research activities in the field of the detection of TIC, CWA and explosives within the CPM element integrated planning
- Participation in national and international standardisation commities.
- Assistance of the Federal Ministry of Defence (BMVg) in questions concerning chemical detection as a fundament for administrative or political decisions

Rear view of the FUCHS NC-reconnaissance vehicle with extended probe and double wheels

Variety of handheld and portable detectors for CWA

Stand-off detection system SIGIS II after testing and commissioning by WIS 230 during a field operation.

Resources

- Laboratories suitable for the handling of highly toxic substances
- Systems for the generation of highly diluted test gases, including highly toxic compounds
- Laboratories for various questions concerning point- and stand-off-detection, including optical laboratories
- Test ranges for field trials of stand-off detection systems
- Methods for reference analytic for TIC, CWA and explosive substances
- Accredited test laboratory according to DIN EN ISO/IEC 17025, certification body for products according to DIN EN ISO/IEC 17065 (planned)
- Highly trained and experienced staff members that are qualified for the handling of energetic and highly toxic substances

Current focus areas within the framework of CPM

ANALYSIS PHASE

- Research activities on detection devises suitable for autonomous use on land- and sea-based systems
- Research activites on the stand-off detection of TICs, CWAs and explosives

REALIZATION PHASE

- Cooperation on current armaments project, for instance NBC-investigation site, mobile
- Optimisation of the generation of highly diluted test gases
- Optimisation of the test infrastructure

CURRENT FOCUS AREAS WITHOUT THE FRAMEWORK OF CPM

- Support of other security agencies in the field of detection and identification of hazardous chemicals

Magnetic suspension balance for the generation of highly diluted CWA containing test gases.

Bundeswehr Research Institute
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Branch 230

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April 2022

VERIFICATION

INTERFACE BETWEEN THE BUNDESWEHR RESEARCH INSTITUTE FOR PROTECTIVE TECHNOLOGIES AND CBRN PROTECTION AND THE CHEMICAL WEAPONS

Convention (CWC) as well as the Biological and Toxin Weapons Convention (BWC)

Mission

- Support of the Organisation for the Prohibition of Chemical Weapons (OPCW) by maintaining a designated laboratory
- Assist the OPCW in the implementation of international analytical proficiency tests
- Analysis of authentic samples in the context of various OPCW missions
- Assistance of the Federal Foreign Office (FFO) with the consolidation of the BWC by confidence-building measures
- Competent advice for all government levels (e. g. FFO, Federal Ministry of Defence, OPCW) regarding threats with potential chemical weapons worldwide

Authentic samples from a TAV mission of the OPCW

Peer Review Compliance Visit Exercise 2016 in Munich

Resources

- Five highly qualified staff members with long-standing analytical and synthetical experience
- A highly qualified employee with expert knowledge concerning the German Biosecurity Programme of many years
- Biological and chemical laboratories with accredited analytical methods

Designation certificate of the OPCW 2021-2022

Current focus

- Investigation of environmental samples within the scope of various OPCW missions
- Analysis of authentic samples for national security authorities in the context of administrative assistance
- Participation at the Peer Review concept and the Compliance Visit Exercises of the FFO

Preliminary practice of the Peer Review Compliance Visit Exercise in Georgia

Results

- Continuously established designation by the OPCW since 1999
- In 2018 the OPCW made use of the Research Institute's competences thrice
- National security authorities (e. g. Federal Intelligence Service, Federal Criminal Police Office) request the Verification's assistance
- Three Research Institute's specialists provided advice for and attended the preliminary practice of the GER Peer Review Compliance Visit Exercise 2016 in Munich
- One Research Institute's specialist participated in the preliminary practice of the Peer Review Compliance Visit Exercise 2018 in Georgia

Bundeswehr Research Institute
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Branch 240

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April 2022

NUCLEAR WEAPON EFFECTS / IONIZING RADIATION

Mission

- Planning, execution and accompanying of research activities in the area of Balanced Nuclear Hardening (blast, heat flash and initial radiation), Transient Radiation Effects on Electronics (TREE) and defense material.
- Setting up nuclear protection concepts, assessment of nuclear protection requirements and consultation of armament technical issues with respect to nuclear weapon effects and protection
- Integrated verification management on defense material to requirements on TREE and heat flas

Gamma flash-facility for Transient Radiation Tests on Electronics

Free field heat flash-facility

Resources

- Scientific and technical educated staff with extensive experience in research and test/qualification
- TREE-test/qualification facilities
- Gamma flash-facility: Gamma dose rate-test (up to 5*109 cGy/s)
- Co-60 radiation facility: Gamma dose-test (up to 0,5 cGy(Ti)/s), renewal of sources are initiated
- (d,d)-Neutron generator: Neutron fluence-test (starting in the mid of 2019)
- Heat flash- test/qualification facilities
- Free field-Heat flash-facility illuminat. area up to 10 m^2, strength up to 2 MW/m^2
- Laboratory Heat flash illuminat. area up to 25 cm^2, strength up to 5 MW/m^2

Current focus areas within the framework of CPM

ANALYSIS PHASE

- Research on defense technology in radiation defects on semiconductors (e. g. RAMs), which are caused by radiation that are similar as the ionizing radiation released by a detonation of a nuclear weapon.
- Research cooperation with France and Fraunhofer EMI to investigate combined heat and blast effects.
- Setting up balanced and marketable requirements for nuclear protection in close co-operation with customer and project manager
- Participation at international boards, e. g. NATO AEP-4 Team, data exchange program with USA on nuclear defense

Radiation hardened autonomous model system (R&T-H.S.U./WIS)

REALIZATION / IN-SERVICE SUPPORT PHASE

- TREE-tests/qualification on equipment and components (e. g. with respect to armament projects BOXER, PUMA, LEOPARD 2 A7V, TLVS, GepPioMaschine, MGCS)
- Heat flash-tests/ qualification on systems, equipment and components (e. g. NBC-protection mask 2000)

Bundeswehr Research Institute
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Branch 310

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April 2022

ELECTROMAGNETIC EFFECTS AND HPEM

Mission

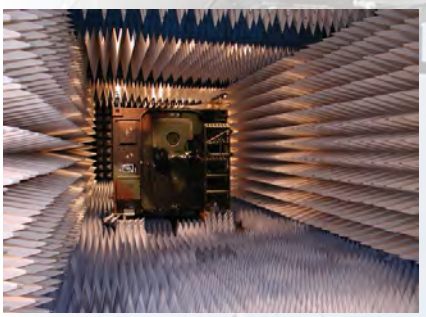
- Advisory activity in the armament community concerning protection of military equipment and ordnance against Nuclear Electromagnetic Pulse (NEMP), High-Power Microwave (HPM) and other High-Power Electromagnetics (HPEM) attacks and incidents
- Qualification testing to ensure the hardness of military equipment and ordnance against HPEM threats
- Further development of HPEM test environments, HPEM standardization and test procedures in the scope of national and international cooperation with military and civil partners
- Management and implementation of research projects in the realm of interaction analysis of HPEM environments on electronic devices, systems and ordnance and development of protection strategies

NEMP qualification test MARS GMLRS (waveguide)

Resources

- High-Power Microwave Facility (675 MHz – 3 GHz, max. 500 MW)
- NEMP outdoor test facility (waveguide + transportable hybrid dipole antenna)
- GTEM-Cell (0 – 18 GHz, max. 50 kV input voltage)
- EMP/DS/UWB pulse generators
- Broadband antennas (horn antenna, IRA, HIRA)
- Open TEM-waveguide (laboratory system)
- Extensive measuring equipment for short electromagnetic pulses
- Electronics laboratory

NEMP qualification test Eurofighter (hybrid dipole antenna)



Military test object in der anechoic chamber of the HPM facility

View of the generator part of the HPM facility

Current focus areas within the framework of CPM

ANALYSIS PHASE

- R&D activities
- Susceptibility of networked IT systems to HPEM environments
- Electromagnetic interaction analysis for critical infrastructure and autonomous systems
- Electromagnetic analysis of complex systems
- Development of widely accepted test procedures for HPEM qualification testing in national and international committees
- Accreditation of the NEMP qualification testing procedure at WIS

REALIZATION PHASE

- HPEM qualification testing of military equipment and ordnance (NEMP, HPM, UWB, WB)
- Extension of the HPM testing facility to accommodate protected vehicles up to MBT size

Bundeswehr Research Institute
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and CBRN Protection

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April 2022

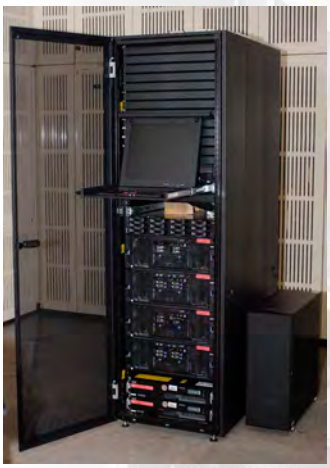
IT SERVICE AND SCIENTIFIC COMPUTING

COMPUTER SCIENCE, IT AND DATA CENTER

Mission

- Operating the datacenter and WIS-Network
- User support for laboratory and scientific workstations
- Ensuring access to Bundeswehr network und services
- Support for special purpose and custom software
- Providing capacities for numerical simulations
- R&D in scientific computing with emphasis on
  - ⇨ Ionizing radiation
  - ⇨ HF radiation
  - ⇨ Health and safety

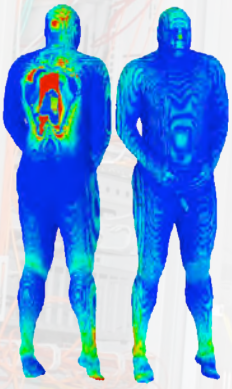
Server and backup infrastructure for the WIS-network



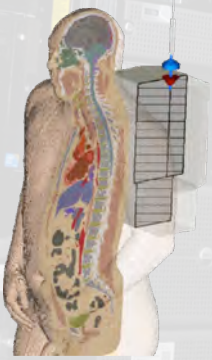
Shared-memory parallel computer and GPU-supercomputer for scientific computing applications

Resources

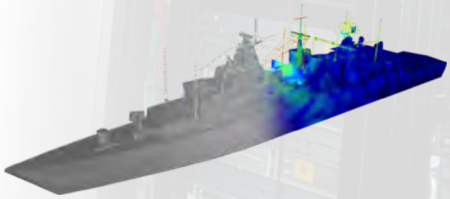
- Two virtualization servers
- redundant RAID-Arrays
- Domainadministration for WIS
- Magnetic tape library for data backup operation
- Shared-memory parallel computer
- GPU-supercomputer
- Simulation applications
- special purpose and custom software
- anatomic models of the human body



Electromagnetic field simulation employing anatomic models for Health and Savety applications



Numerical simulation of the health risks of a man-portable transmitter



Numerical model for electromagnetic field propagation

Scale model for the verification of numerical simulation codes

Current focus areas within the framework of CPM

- Infrastructure and datacenter regeneration
- Implementation of computer-assisted test procedures
- IT support for WIS

ANALYSIS PHASE

- Development and implementation of a certification scheme for simulation services
- Development of simulation software in the field of CBRN

REALIZATION PHASE

- Providing and enhancing numerical capabilities as a service

Bundeswehr Research Institute
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April 2022

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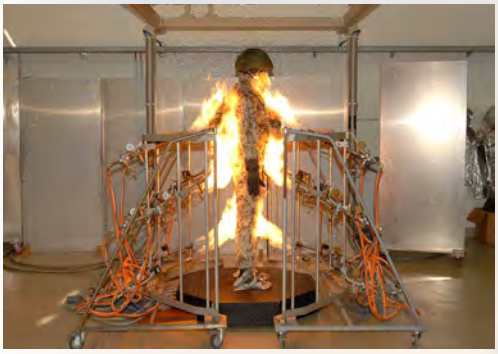
FIRE PROTECTION ENGINEERING

Mission

- Ensuring a uniformly high technical standard of the fire extinguishing systems, extinguishing agents and handheld fire extinguishers used in the Bundeswehr
- Determining the performance standards of extinguishing systems newly introduced in the Bundeswehr in ships and vehicles (Analysis phase)
- Examine the technical performance of handheld fire extinguishers, extinguishing systems and extinguishing agents (Realization and In-Service Support phase)
- Identification of potential for further development of the Bundeswehr technical equipment in the area of fire protection and initiation and implementation of research projects oriented towards it (Preliminary phase)
- Management of smaller procurement projects and responsibility for operational readiness of about 600 commodities

Foam use test



Fire resistance test of combat clothing

Resources

- Miscellaneous fire extinguishing foam and powder labs
- Various mockups of interiors of armored vehicles for tests with fire suppression systems, some of them pressure-resistant
- Gas measuring technology for common and less frequently used extinguishing gases
- Temperature-resistant FTIR for analyzing the composition of smoke gases and fire extinguishing gases
- Electronics workshop for the adaptation of temperature, pressure and other sensors to the specific requirements of a fire test
- Fire hall for liquid fires up to 7 m² and comparable solid fires
- Open area test site for liquid fires up to 200 m²

Current focus areas within the framework of CPM

PRELIMINARY PHASE

- Investigation of technical possibilities to increase the performance of very fast-responding extinguishing systems in armored vehicles, so-called fire suppression systems, while maintaining the most environmentally friendly design

REALIZATION / IN-SERVICE SUPPORT PHASE

- Replacement of the water film-forming foam extinguishing agents used in the Bundeswehr by more environmentally friendly alternatives not using persistent fluorine compounds
- Project management and usage management for fire protection equipment used in all org areas of the Bundeswehr

Standardized deflagration used to test various automatic fire suppression systems

Bundeswehr Research Institute
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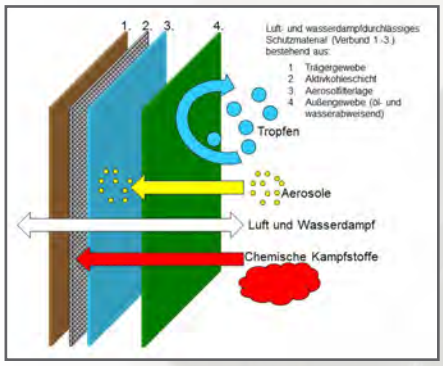
April 2022

NBC DETECTION AND PROTECTIVE EQUIPMENT

Mission

- National and international research and development work for the permanent optimization of individual protection equipment
- Quality assurance for purchases of individual protective articles
- International cooperation for the standardization of test procedures
- Technical support during the development and the procurement of new CBRN protective equipment

Lightweight NBC Overgarment



Permeable CBRN protective fabric with aerosol barrier layer

Resources

- Scientific and technical staff with extensive experience in applied research & development of individual protection components
- Special test benches for chemical warfare tests as well as for the testing and evaluation of different systems and components regarding protection performance and tightness

Current focus areas within the framework of CPM

ANALYSIS PHASE

- R & D work for the optimization of the individual protective equipment by e.g. innovative materials and protection concepts

REALIZATION PHASE

- Drafting of property descriptions and technical specifications, evaluation and qualification of protection technology

IN-SERVICE SUPPORT PHASE

- Quality assurance for procurements, technical support for individual protective equipment in service

CURRENT FOCUS AREAS WITHOUT THE FRAMEWORK OF CPM

- Basic research and development of protective materials with regard to their properties against chemical warfare agents
- Physiological optimization of individual protective equipment
- Testing of special CBRN respiratory protective gear for special Forces (KSK)
- Technical support of projects sponsored by external institutions, R & T projects and procurement of CBRN protective gear

Product modification: New Zodiac

Results

- Introduction of new individual protectice gear, e. g:
- CBRN lightweight protective coverall
- CBRN protective mask M2000
- Mask pouch & CBRN poncho
- Decon suit Zodiac 2nd generation

Bundeswehr Research Institute for Protective Technologies and CBRN Protection

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COLLECTIVE PROTECTION

Mission

- Technical advice and support for the integration of CBRN collective protection into Bw projects in the pre-phase as well as during development and use
- Component assessment for CBRN collective protection systems such as continuous dust collectors, high efficiency particulate filters, gas filters, CBRN air filtration units and air locks
- Testing, qualification and integrated verification of CBRN collective protection for vehicles, shelters, containers, ships and critical infrastructure
- Research and advisory capability on innovative approaches
- International cooperation, participation in NATO committees

System testing of the CBRN collective protection of the weapon system “GTK Boxer”

Hydrocyanic acid test stand for filters

Resources

- System testing:
- Test hall for vehicles and containers
- Test laboratories:
- Dust test bench for the assessment of the permeability of coarse and fine dust filters
- various gas test rigs for retention determination against various warfare agents and toxic industrial gases,
- testing of filters for masks up to ship ;
- Aerosol test stands for the assessment of the permeability on the flat medium up to the ship size HEPA filter
- Mobile test equipment:
- Leakage test equipment for gas and aerosol
- R&D-Test benches:
- Case to case adapted provision of laboratory capacity with high-quality measurement and analysis

Current focus areas within the framework of CPM

ANALYSIS PHASE

- Defence research concerned with innovative filtration technologies adapted to changing threat scenarios
- Impact of dust and climate on effective filtration systems designated for worldwide use

REALIZATION PHASE

- Qualification tests in the context of integrated verification of components and systems of CBRN collective protection systems
- Drafting of property descriptions and technical specifications

IN-SERVICE SUPPORT PHASE

- Quality assurance for procurements
- Technical support for collective protection in service

Testing of permeability of filter with aerosol

Bundeswehr Research Institute
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April 2022

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DECONTAMINATION

Mission

- Scientific processing of all issues concerning decontamination in context with chemical, biological and radiological/nuclear contamination resulting from military use of the respective agents, terrorist attacks or industrial incidents
- Test and evaluation of the decontaminability of military equipment and different types of surfaces as well as the capabilities and efficiency of Decontamination systems and procedures
- Research, development and testing of more efficient, more gentle and environmentally friendly decontaminants, decontamination equipment and –methods and the optimization of existing technologies
- Build up and maintenance of assessment abilities for new threats (e. g. new toxic chemicals, nuclear terrorism)
- Participation in international bodies and working groups

Decontamination of sensitive equipment – vacuum chamber

Resources

Decontamination of a vehicle with JSDS 90

- Highly skilled employees, working on innovative scientific and technical questions and preserving the expertise in the field of CBRN decontamination
- Chemical laboratories and a large scale experimental hall for research with live agents, the implementation of technologies and procedures in fielded military equipment and the support for the training of the NBC defence Corps
- Nuclide laboratories and technical facility to carry out radiological contamination /decontamination investigations at large scale using short-lived radioactive material under optimum conditions for safety and radiation protection

Current focus areas within the framework of CPM

Decontamination of infrastructure

ANALYSIS PHASE

- Defence research and technology
- efficient, material-, environment- and resource saving decontaminants and decontamination technologies (e.g. plasma, self-decontaminating materials, dry fog etc.)
- Operationally applicable control of decon efficiency
- Decontamination of Infrastructure
- Cooperations with national/international research facilities and industry (contracts, data exchange, technical agreements)

REALIZATION PHASE

- Expertise/consulting during development and construction of new decon system (Lightweight Decon Systems, System for Decontamination of Sensitive Equipment, Decon Land Systems)
- Integrated compliance demonstration; decontaminability of new systems (IRIS T, PUMA, BOXER etc.)
- Performance verification of new decontamination equipment

IN-SERVICE SUPPORT PHASE

- Optimization of fielded equipment and procedures, e.g. efficiency of vacuum decontamination for sensitive equipment or operability of TEP 90 modules
- Expertise/consulting during life cycle of decontamination methods, equipment or systems
- Evaluation of delivery terms, substitution of parts or components, quality control
- Participation in Integrated Project Teams (IPT)

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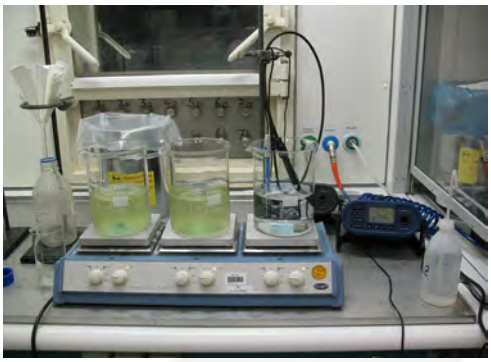
April 2022

WATER PURIFICATION

Mission

- Initiate, implement and accompany research activities aimed at new, mobile water treatment and purification technologies for CBRN–contaminated waters under the aspect of worldwide mobile operation
- Evaluate new technologies for drinking water production and waste water treatment
- Integrated verification:
  - ⇨ Assurance of the technical suitability of water purification plants by accompanying the industrial development
  - ⇨ Field test in co-ordination with the military community, the user and the operator



Investigations on the flocculation of arsine with iron III-chloride

Test bed for Nanofiltration and Reverse Osmosis membranes

Resources

- Scientific and technical personnel with comprehensive expertise and experience in the research and testing of water purification equipment
- Large water test facility to execute concept testing of water purification processes from lab to life-size scale
- Infrastructure, test beds and fixtures/fittings for Reverse Osmosis-, Nano-, Ultra- and Microfiltration membrane testing
- Interdisciplinary competence by close co-operation with the radiological, biological and chemical laboratories and facilities of the WIS
- Co-operation with the Bundeswehr Central Medical Institute (ZInstSanBw)

Current focus areas within the framework of CPM

ANALYSIS PHASE

- Defense research addressing test waters, standardization of test methods and elimination characterization of membranes
- Cooperation with research institutes, e. g. Ostfalia HaW and industry, scientific thesis
- Collaboration in international committees, e. g. data exchange program with USA, international symposia

REALIZATION PHASE

- Water purification plant for decontamination purposes

IN-SERVICE SUPPORT PHASE

- Technical supervision of mobile equipment for water supply and wastewater disposal, e. g. revision of technical specifications, analysis of substitutability of hazardous substance from the NBC detection kit water, recommendations for remineralization of reverse osmosis treated water, replacement of obsolete Filterpen, governmental procurement quality assurance of packed emergency drinking water

Water purification plant for decontamination purpose; technical test set-up

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April 2022