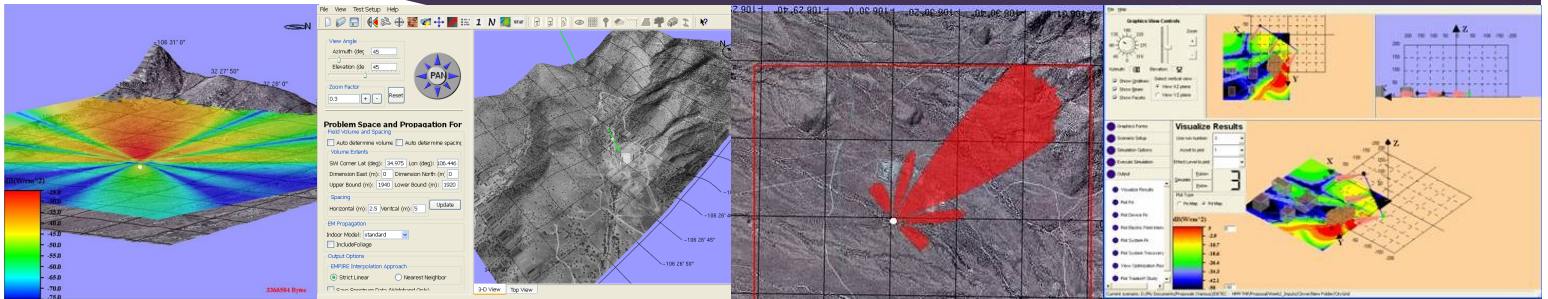




High Power Microwave Test Hazard Prediction



HPM THP Capability Summary

- Determines test hazard boundaries for personnel and electronics that may exist in open-air, live-fire HPM tests
- Predicts radio frequency propagation phenomena, such as ducting, channeling, and terrain effects
- Supports safety and regulatory compliance, aids in test planning, facilitates frequency clearance approvals, and aids in identifying potential harmful effects to non-test site electronics
- Provides decision aids that include field and hazard boundaries and frequency clearance forms
- Interfaces with the HPM Propagation Environment Measurement and HPM Sensor Suite Capabilities
- Developed by ATK Mission Research of Albuquerque, NM
- Available from the Naval Air Warfare Center Weapons Division

HPM THP System Specifications

- Narrowband and wideband frequencies characterization: 50 MHz - 35 GHz
- Millimeter band characterization: 94 GHz - 96 GHz
- Pulse width characterization: Continuous wave to 10 ns
- Operates on a standard personal computer running Windows XP

The High Power Microwave (HPM) Test Hazard Prediction (THP) Capability was developed by the Directed Energy Test and Evaluation Capability (DETEC) project. The HPM THP Capability determines test hazard boundaries for personnel and electronics during open-air, live-fire HPM testing in all environments. This capability responded to a high-priority shortfall identified by the 2004 DETEC Tri-Service Study (T-SS), which developed, scoped, and prioritized directed energy (DE) test and evaluation (T&E) infrastructure shortfalls. The shortfall represented a need for a capability to predict test hazard boundaries for personnel and electronics during HPM weapon systems testing.

HPM THP Overview

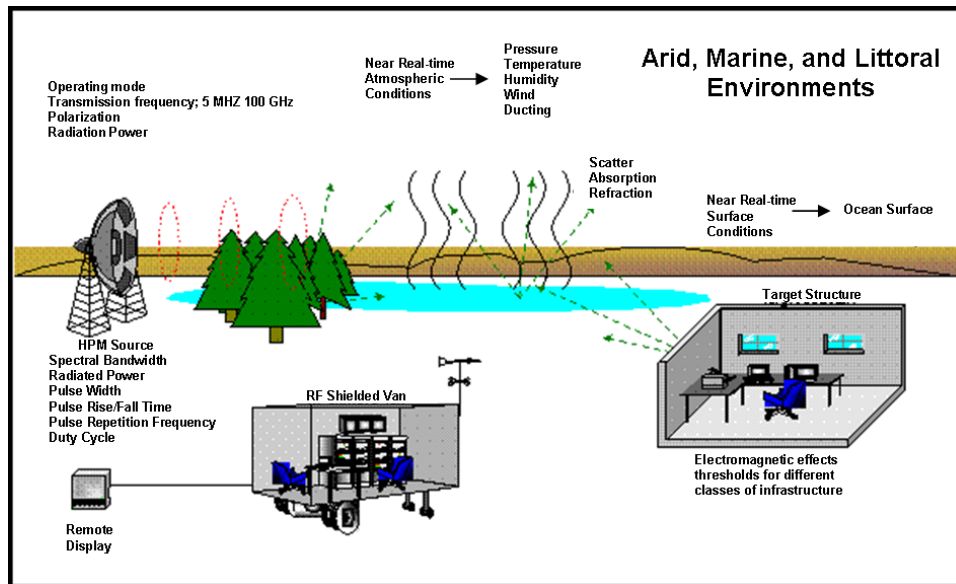
The HPM THP Capability determines test hazard boundaries for personnel and electronics that may exist in open-air, live-fire HPM tests. This capability has four specific essential functions:

- Support safety and regulatory compliance by displaying a contour that shows the boundary at which permissible human exposure standards occur
- Aid test planning by displaying boundaries to allow safe placement of instrumentation or other electronic equipment required
- Facilitate frequency clearance approval
- Aid in identifying potential harmful effects to non-test site electronics

The HPM THP Capability provides a planning tool and interface to the HPM Sensor Suite (SS) and to the HPM Propagation Environment Measurement (PEM) Capabilities. The HPM SS measures HPM fields in the vicinity of a ground target during an HPM test, whereas the HPM PEM Capability measures atmospheric and oceanic parameters to aid in assessing propagation impacts on the day of test.

The HPM THP planning tool provides a predictive tool for HPM test planning. HPM THP prepares a map of an HPM test site that depicts areas where predicted radio frequency (RF) field strength exceeds user-specified values. The HPM THP models the test area using terrain elevation data and provides user tools to incorporate local anthropogenic features, such as structures and excavations, as well as natural culture, such as foliage. Users can also include test-unique input, such as weapon locations and their characteristics and climatologic conditions.

The HPM THP interface feature provides the capability to integrate HPM THP with HPM PEM and HPM SS to provide near-real-time test hazard prediction and evaluation based on the measured environment at the time of a test. The predictions may be updated based on HPM field strengths measured by the HPM SS during a test event. This feature also adds the capability to collect meteorological information



from the HPM PEM Capability on the day of test, providing the test manager information regarding conditions for ducting and ocean surface conditions. The test manager may use this information as part of the test/no-test decision process. This spiral also uses field strength data from the HPM SS Capability to verify the predicted hazard boundary. Following a test event, the HPM THP will compare these data to the predictions, allowing the test manager to decide whether to continue with the test.

Operational Description

The HPM THP Capability can be used before and during an HPM test. Prior to a test, the HPM THP user inputs test-related data – such as the HPM system, test geometry, surrounding terrain, and structures – into the HPM THP software to create a basis for predicting fields and hazard boundaries. HPM THP then produces test hazard decision aids that the user can use in determining the logistics of an HPM test. On the day of the HPM test, the HPM THP user can update the predictions by using input from the HPM SS and HPM PEM Capabilities. After an HPM test, the user can input the post-test field strengths measurements, and the HPM THP software will compare these measurements to the predicted values, using the results to form a figure of merit for the predictions.

Program Status

The DETEC Systems Integration Contractor (SIC) managed the development and fielding of the HPM THP Capability. The DETEC SIC competitively awarded the HPM THP Capability development contract to ATK Mission Research of Albuquerque, NM on 27 September 2005. DETEC identified the Naval Air Warfare Center Weapons Division (NAWCWD) as the HPM THP Capability's host site. The capability was delivered to the host site in November 2008.

HPM THP Capability Integrated Product Team

To guide the development process, DETEC formed the HPM THP Capability Integrated Product Team (IPT) with representatives from the Major Range and Test Facility Base (MRTFB), the military Services, and the HPM community. The IPT represents future users of the HPM THP Capability. The DETEC SIC structured the HPM THP development to engage the IPT members to actively participate in the development effort by providing guidance and expert advice. The HPM THP Capability IPT members also participated in key reviews at significant points during design, manufacturing, testing, and fielding to verify the benefits and completeness of the capability for its intended users.

About DETEC

DETEC is funded by the Department of Defense Test Resource Management Center's Central Test and Evaluation Investment Program (CTEIP) to address joint service DE weapon system T&E infrastructure needs and implement solutions to these identified needs. DETEC develops and fields capabilities to address high-priority shortfalls identified in the 2004 CTEIP-funded Tri-Service Study.

The DETEC SIC, Science Applications International Corporation (SAIC), implements the DETEC project by working with Government and industry teammates to develop functional specifications for certain DE T&E infrastructure capabilities. The SIC acquires these capabilities in competitive procurements and integrates the capabilities into the MRTFB to help meet the testing requirements for current and future high energy laser and high power microwave weapon systems. ■

For further information about the HPM THP Capability, please contact Tamera Walters at tamera.walters@navy.mil or Roberto Garcia at roberto.m.garcia@navy.mil

To obtain a copy of the HPM THP Capability, please go to https://mynavair.navair.navy.mil/portal/server.pt/community/test_hazard_prediction/1198