

**Organization:** Mission Research Corporation (MRC)

**Title:** Virtual Instrument Development and Test Suite (VIDTS)

**Start Date:** 4 January 2001

**End Date:** 4 September 2001

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### Project Goals

There is an urgent need for fast, man-portable point chemical and biological agent detection technologies for both civilian and military applications. Microsystems employing high volume air samplers integrated with microfluidics and highly specific detectors show great promise but many issues need to be resolved to develop this new class of technologies. To facilitate the development process, MRC will develop a Web-based, expert-assisted graphical user interface called a "Virtual Instrument Development and Test Suite". This comprehensive software package will encompass fundamental sensor component physics and scaling laws, full sensor and sensor system modeling, functional requirements definition and CONOPS models. The finished product will be compatible with the Virtual Proving Ground. Mission Research Corporation will perform the project in collaboration with the New Jersey Institute of Technology and the City College of New York.

The Phase I program will develop the prototype software with specific emphasis on dielectrophoresis separation of bioagents from natural species with Raman detection. Phase II will incorporate the full range of microsystem configurations from sample collection to detection and will include key supporting experimental measurements. At the end of the program, the completed software will be compiled on a CD-ROM and made available to technology developers and the Virtual Proving Ground.

### Technical Approach and Six-Month Schedule

The program is a six month Phase I SBIR. The tasks and approximate schedule for completion are presented as follows:

- Assessment of microsystem sensor technology and sensor system components. This task will require 2 months to complete.
- Development of a Web-based, expert assisted graphical user interface infrastructure to serve as a platform for the VIDTS tool. We have chosen a web format as this is the most familiar to users and it is compatible with other applications and highly transportable across a wide number of platforms. This task will be performed in the first 3 months of the program.

- Development of the VIDTS system. This software will be modular such that inclusion of additional component, sensor, and threat scenarios can be performed. This task will be performed from months 3-6 of the program.
- Selection of a single candidate technology, BioRaman, for detailed modeling and model validation in Phase I. This final task will be performed in the last 2 months of the program.
- Phase II will incorporate the full range of microsystem configurations from sample collection to detection and will include key supporting experimental measurements. The final product in Phase II will be the release of the VIDTS tool to the microsystem development community on CD-ROM.

### Recent Accomplishments

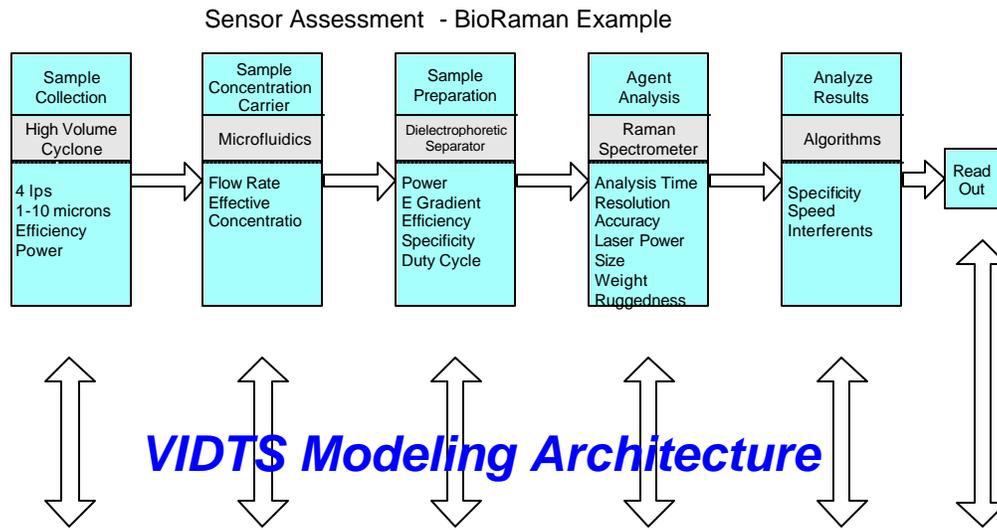
The program has just begun and is on schedule. We are currently examining the design features. The Virtual Instrument Development and Test Suite will be designed with a browser GUI client. The client will be used to enter parameters that will be used to query a database that holds a vast variety of information such as fluid transfer physics, detection system properties, detection system spectral, substance properties, etc. The query will take the given parameters and will return the results using known equations/algorithms. When the scientist has narrowed the results to a desirable level those results will be used to query the database for the components necessary to achieve the results from the previous query. How the information is contained within the database and how the tables are related to one another help to determine how the results are gathered. The queries will be sent to the database using an application programmed in a scripting language such as perl, php, or vbscript . The application will handle passing the query to the database, performing computations on the parameters and/or the results of the query, and formatting the end results in a presentable manner.

### Team Member Organizations

Mission Research Corporation is the program lead for the VIDTS project. The other team members include the New Jersey Institute of Technology and the City College of New York. The key personnel from these institutions and their areas of expertise are provided below.

| <u>Institution</u> | <u>Name</u>         | <u>Area of Expertise</u>                                  |
|--------------------|---------------------|---|
| NJIT               | Dr. Boris Khusid    | Particle separation and segregation via dielectrophoresis |
| CCNY               | Dr. Andreas Acrivos | Microfluidics expertise                                   |

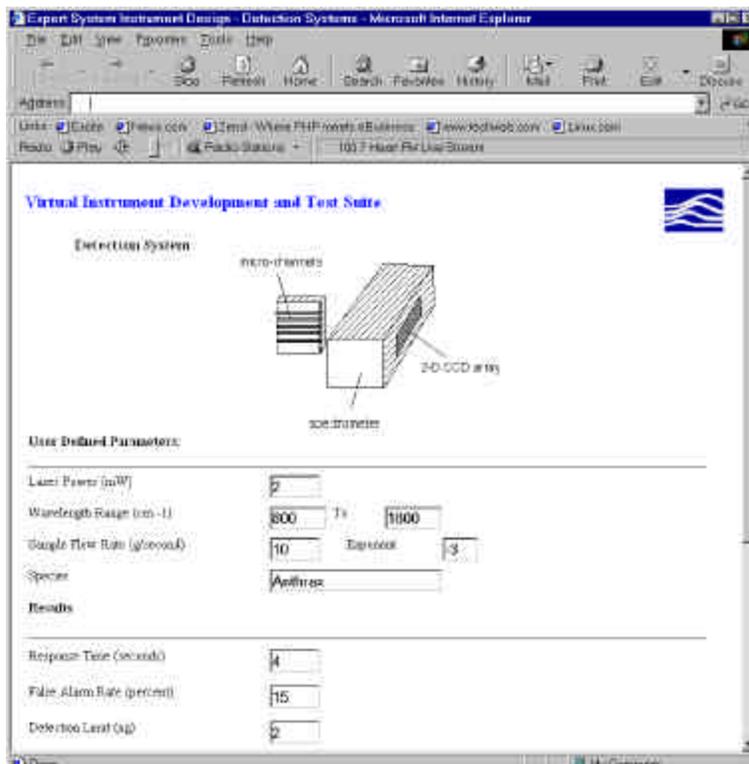
## Relevant Figures and Charts



**Sensor Component and Sensor Performance**

Fundamental physics and operational principles, Sensitivity (Pd), Specificity (Pfa), FAR, speed, maintenance requirements, reagent requirements, ability to target new threats, number of agents detected  
 Raman spectra, laser power

### Assessment Process to Develop the VIDTS Modeling Architecture



**Web Screen Mockup of a Detection System Component**

Relevant BioFlips Publications Since Program Inception

None at this time