

Proposal On The Electromagnetic Range Consortium

Introduction

The Ohio State University ElectroScience Laboratory serves as principal member and research and development contributor for a consortium whose purpose is to exchange information and guide research and development in the area of electromagnetic measurement facilities. This document discusses this consortium, which is under the auspices of The Ohio State University ElectroScience Laboratory (OSU-ESL). It begins with a brief history of the ElectroScience Laboratory to show its qualifications in this area. The specific goals and operating principles of the consortium are articulated. The people involved at OSU are identified. Specific requirements for participating in the consortium are stated at the end of the proposal

Background

The Ohio State University ElectroScience Laboratory is part of the Department of Electrical Engineering which is engaged in research and development in areas related to electromagnetics, antennas, optics, propagation, and communications. The ESL has more than sixty years tradition of graduate student education, faculty participation, and advances in the state-of-the-art.

Two areas of innovation in the late 1960's and early 1970's began our involvement in the area of modern radar cross-section research. First, Lab members pioneered the concept and application of the impulse radar signature [1,2,3] which is the equivalent of Time Domain Reflectometry for microwave and coaxial devices and is sometimes referred to as one-dimensional target imaging. Secondly, several Lab members developed very powerful analysis techniques which are suitable for computer simulation of object scattering characteristics: the Uniform Theory of Diffraction techniques for electrically large objects and the quasi-optical scattering mechanisms [4,5,6], and the Moment Method or integral equation techniques for electrically small structures [7,8,9].

In 1981, these advances were followed by the acquisition of components for a compact scattering range under sponsorship of the Office of Naval research. Since that time, OSU-ESL has devoted a substantial part of its research efforts to continually improving the capability of compact ranges for antennas and RCS measurements; to application of measurement and analysis for control of antenna and scattering patterns; and to application of measurements and data analysis along with scattering theory for object radar identification studies. Systems at other locations have been designed, installed, and evaluated based on OSU experience. In many cases, these have been state-of-the-art facilities for both antenna and RCS measurements. Furthermore, OSU has been disseminating information in this area through publications and reports. OSU-ESL has the combination of analytical and experimental capability to serve as a focus for continued research and development in electromagnetic measurement technology.

The non-profit, university-affiliated status of the OSU-ESL has advantages concerning this program. Recent installations, contracts and meetings have shown that OSU-ESL can effectively communicate with competing technology approaches and competing organizations in this arena. Also, our close involvement in the graduate education process permits the training of a body of young scientists in conjunction with the research and development efforts.

Specific Goals of the Consortium

- To support exchange of information and experimental data on recent advances in the area of electromagnetic measurement technology.
- To support education and training of graduate students on designated topics of mutual interest to the community of electromagnetic measurement system users.
- To promulgate standard practices for evaluation of electromagnetic range performance.
- To collect and disseminate information on state-of-the-art electromagnetic design and application techniques.

Operating Principles of the Consortium

- OSU-ESL conducts a research and development program in accordance with the research and development priorities as recommended by the consortium at the annual conference. The principal investigator will schedule and coordinate these efforts, and may substitute new topics on short notice, when he thinks it is in the consortium's best interest, in order to take full advantage of results of other related programs.
- An annual conference of member sponsors and sponsored researchers will be held at OSU. The conference includes:
 - Technical presentations of all research and development projects in electromagnetic measurement technology conducted at OSU-ESL or elsewhere (with permission of sponsor).
 - Presentations by all students being specifically supported by the consortium.
 - Round table discussions on future areas of interest in measurement technology.
 - A written document is drawn up at the conference to guide research and development for the coming year at OSU-ESL.
 - Free registration for two individuals from each sponsoring company.
 - Both a banquet and a reception are included which involve all the OSU personnel doing measurement research and development.

- Technical reports, covering the work of all OSU personnel supported by the consortium in areas mutually agreed upon are distributed free to all sponsoring organizations (and only to sponsoring organizations). Publication in the open literature of the results in the report will be delayed for six months from the date of the technical report.
- The ESL senior and junior staff is available to member sponsors for consultation at OSU up to 24 man-hours per year. All requests for such consultation will be routed through the Consortium Principal Investigator for coordination and scheduling.
- The compact range system at OSU-ESL is made available for testing up to 16 hours per year to each sponsoring organization, under the following conditions:
 - At least 30 days notice is required
 - A plus or minus one-week tolerance on scheduling plans required by OSU-ESL to compensate for system modifications, etc.
 - Title of measurements would be released to the whole consortium group (but not necessarily the data).
- The consortium may advise OSU-ESL to invite outside individuals to participate in consortium conferences and/or joint research and development efforts, and may endorse the use of OSU consortium support funds to partially or fully compensate such participation.
- Terms of operation and participation will be renegotiated annually and may be modified on the consortium sponsor's initiative in specific areas by a vote of 2/3 of the sponsors.
- A written summary report of results and the conference recommendations will be published annually and distributed to each consortium member.
- The consortium will familiarize OSU-ESL with individual sponsor problem areas, which might lead to separate specific sponsored research programs in some instances.

Personnel

The principal investigator of this effort is Dr. Inder J. Gupta. Participants are expected to include the majority of ESL staff and faculty members, depending on the technical areas selected for study on this program by the members of the consortium. A complete list of the scientific faculty and staff, identified with areas of expertise, is available on request.

Requirements for Participation in the Consortium

The membership fee for 2004-2005 is \$22,000. It covers the period from July 1, 2004 to June 30, 2005. Participation in any part of the consortium is contingent on receipt of the total fee.

References:

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