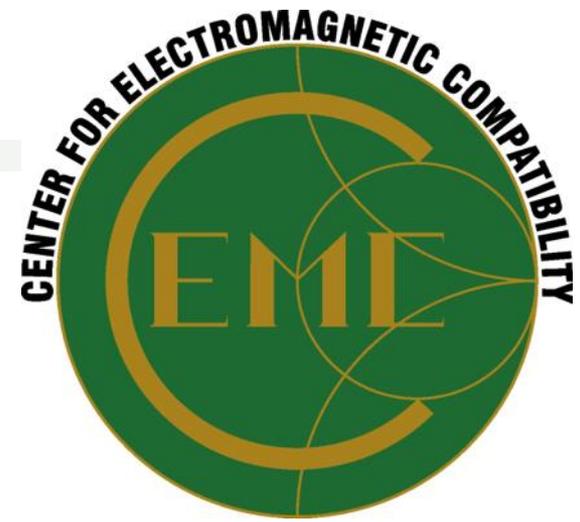


CEMC Status and History

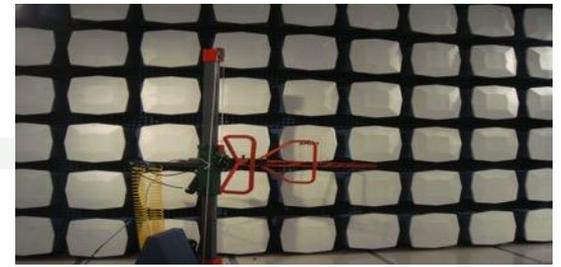


- Lead Site: Missouri S&T
 - Phase I (02/15/2009 – 01/31/2014)
 - Phase II started on 08/15/2014
- One Partner Site: University of Houston (UH)
- Current Center Memberships
 - Missouri S&T: 22 full and 1 associate memberships
 - UH: 4 full and 1 associate memberships
- Ranked 4-6 among all IUCRC centers in terms of the total collected membership fees (2011-2013): a young but fairly large center
- Phase I started with four sites: Missouri S&T (lead site), Clemson, UH, and OU. Both the OU and Clemson sites dropped off before the completion of Phase I.
- The center was established based on an industry consortium at the Missouri S&T EMC Laboratory, which had a 15-year history of success prior to the start of the center.

Challenges and Difficulties

- The Missouri S&T site has built on its previous consortium history:
 - It has a significant number of sustained memberships. Majority of the sponsorships continue year after year.
 - It has a large core faculty team (5 tenured/tenure-track faculty members)
 - It has a reputation in industry as a leader in EMC research. Other sites have similar reputations, but in narrower fields.
 - The previous EMC consortium at Missouri S&T had established a solid foundation in terms of team, equipment and facility, prior knowledge, partners, research direction, and student recruiting
- The other three sites had difficulties attracting and maintaining memberships. Two of them eventually dropped off before the completion of Phase I. All three were single-professor investigator sites (UH recently added one faculty).
- Center leadership transition: Prof. Dick DuBroff served as the director of the Center and the Missouri S&T EMC Laboratory during most of Phase I, but he planned to retire before the completion of Phase I.
- Center operating model: The 1 membership 1 project model used in the prior EMC consortium was naturally adopted when the center started, which limited further growth of the center

Solution for Leadership Transition



- Plan, plan, plan
- Began process of identifying new center leader 1 ½ years prior, and started the transition 1 year prior to the actual transition.
- During the transition period, the incoming and outgoing directors essentially worked as co-directors.
- The incoming director attended the NSF IUCRC Directors meeting in 2013, the year prior to becoming director.
- The transition period was approximately 1 year to allow a time frame that provided experience in most aspects of center – reporting, meetings, working with OSP, budgeting, etc.
- Leader transition occurred a few months before the completion of Phase I. Both directors (outgoing and incoming) were then involved in the proposal preparation for Phase II.
- Our faculty team-based approach was another key element of this successful transition, where all our faculty are partners, and the director is really the managing partner and responsible for big direction, center leadership and planning for center needs.

Analysis of Unsuccessful Sites

- University of Oklahoma site: had a faculty change from Prof. Grant to Prof. Refai, who decided to pursue a communications systems based approach rather than an electromagnetics based approach to electromagnetic compatibility. Unfortunately this approach did not appear to resonate with the IAB.
- Clemson site: Prof. Hubing was one of the original faculty members that started the EMC Consortium at Missouri S&T. After he joined Clemson as a chaired professor in automotive electronics, he planned to establish a site for automotive EMC. Unfortunately the difficult economic climate may have contributed to the growth in IAB memberships from the automotive electronics sector.



Lessons Learned for Site Sustainability

- Long-term faculty support is essential. In our area, the one-faculty-member sites struggled to thrive, possibly due to:
 - Limited human resources: the number of faculty at a site mainly determines the size of the research team (post docs, graduate and undergraduate students, staff, etc.)
 - Limited research area scope, e.g., automotive EMC, bio-EMC
 - Lack of necessary diversity of faculty in terms of their seniority and technical maturity, in addition to the diversity of technical expertise required to respond to evolving industry needs

There are now 2 professors at the UH site - Dave Jackson and Ji Chen, who guide students and share some of ancillary work together to keep the site functioning.

- Long-term industry support is essential too. Most of the Missouri S&T partners are long-term collaborators, which contributes to relatively stable memberships with the site. The UH site is now moving toward attracting and maintaining long-term partners as well, in particular in the medical devices industry.

Lessons Learned for Site Sustainability – Cont'd

- Our research is a portfolio, not unlike investments. We try to work at a balance that can help us sustain leadership in our area, instead of the job-shop things that do not contribute to moving us ahead. It is particularly important when accepting new members to ensure there is a right fit and synergism, and that the intent up-front is for a long-term partnership, even though, the memberships are committed annually. Be selective when possible.
- Strong IAB leadership has also been instrumental for us – throughout our consortium history we have had a core group of strong IAB leaders, each of whom are technical leaders, senior managers, or distinguished engineers in their companies, that can command resources from the company, push us when we need to be pushed, and manage expectations with both sides well. We are now working on an expanded, carefully selected core leadership team.

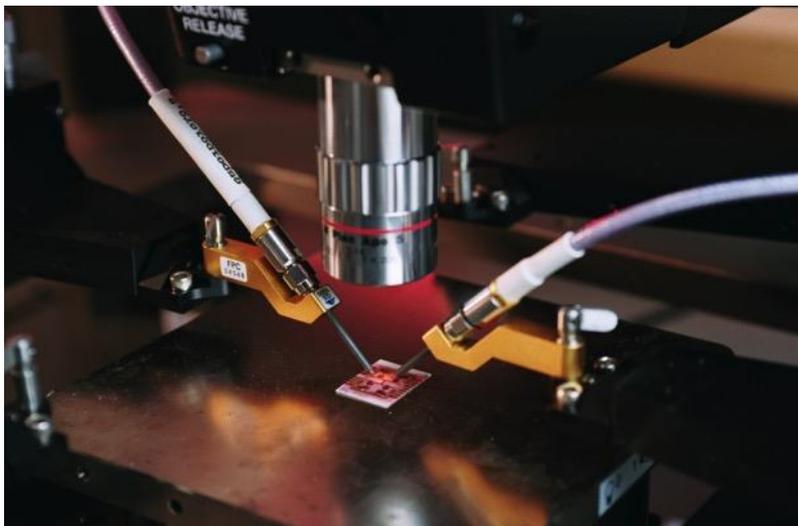
Addressing Non-Even Memberships Among Sites

- Rotate the semi-annual IAB meetings at different sites
- Promote collaborative projects among the sites
 - Shared challenge projects: shared projects, shared funding
 - Fundamental Research Program
 - Student exchanges
 - Joint project proposals
 - Joint publications
- Share equipment and facilities
- Assist in recruiting members
- Share student employment and internship opportunities



Center Model Transition

- Moving from the one-member-one-project model to the collaborative research model
- Identified research focus areas and changing project voting from project based to area based
- Shared challenge projects: projects are proposed by the center faculty and selected by the IAB. There are 3 or more proposals, but only 2 are selected each year.
- Frequent roadmap discussions to constantly update the research focus areas and the specific objectives within each area.



Conclusions and Recommendations

- Plan ahead for leadership transition
- Develop long-term faculty and industry support at each site
- Develop IAB leadership
- Involve and develop new faculty members at each site when possible
- Be selective with new industry memberships
- Obtain necessary institutional support in terms of faculty, teaching release, facility needs
- Promote true and in-depth collaborations among sites

