





# Participant Profile

for the  
**Turkish-German Strategy Workshop 2006**  
**TÜBİTAK Marmara Research Center,**  
**Istanbul- Gebze Turkey**  
**13 – 15 December 2006**



International Bureau (IB)  
of the Federal Ministry of  
Education and Research  
(BMBF)

material microstructure design

**Key technologies:** Material, Design and Manufacturing

**Infrastructures:** Top of the line Workstations, Advanced Material Characterization and Processing Equipment: TGA, DTA, DSC, AFM, SEM, High Temperature Furnace, Agilent S Network Analyzer

**Key publications:**

**Book Chapter**

G. Kiziltas and S. Koulouridis, "Antenna Design and Optimization using FE-BI Methods" in: Frequency Domain Methods, IEEE Press (in press)

**Journal Papers**

1. Stavros Koulouridis, Gullu Kiziltas, Yijun Zhou, Derek Hansford, and John L. Volakis, "Polymer – Ceramic Composites for Microwave Applications: Fabrication and Performance Assessment", *Transactions on Microwave Theory and Techniques, TMTT Manuscript 3981* (accepted)
2. Yijun Zhou, Stavros Koulouridis, Gullu Kiziltas, and John L. Volakis, "A Novel 1.5" Quadruple Antenna for Tri-Band GPS Applications", *Antennas and Wireless Propagation Letters (AWPL) 0020-2006* (accepted)
3. J. L. Volakis, G. Mumcu, K. Sertel, C.-C. Chen, M. Lee, B. Kramer, D. Psychoudakis and G. Kiziltas, "Antenna Miniaturization using Magnetic Photonic and Degenerate Band Edge Crystals", *IEEE Magazine*
4. Y. Koh, J. W. Halloran, G. Kiziltas, D. Psychoudakis, and J. L. Volakis, "Thermoplastic Green Machining for Textured Dielectric Substrate for Broadband Miniature Antenna," *Journal of Am. Ceramic Society*, Vol. 88, Nr: 2, 2005, pp: 297-302
5. G. Kiziltas, J. L. Volakis and N. Kikuchi, "Design of a frequency selective structure with inhomogeneous substrates as a thermo-photovoltaic filter," *IEEE Transactions on Antennas and Propagations*, Vol: 53, Nr: 7, 2005, pp 2282-2289.
6. G. Kiziltas, N. Kikuchi, J. L. Volakis and J. Halloran, "Dielectric material optimization for electromagnetic applications using SIMP," *Archives of Computational Methods in Engineering*, Vol: 11, Nr: 4, 2004, pp: 355-388
7. G. Kiziltas, D. Psychoudakis, J. L. Volakis and N. Kikuchi, "Topology design optimization of dielectric substrates for bandwidth improvement of a patch antenna," *IEEE Transactions on Antennas and Propagation*, Vol: 51, Nr: 10, Oct. 2003, pp: 2732 – 2743



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## 2. Past and present research collaborations

Are you familiar  
with the European  
Framework  
Programme?

Yes

No

- with Framework Programme 5
- with Framework Programme 6
- with Framework Programme 7

EU-projects you are  
involved in:

Past projects

Present projects

**Programme title / contract number / title / acronym / your function  
(coordinator / partner / contractor)**

“Structuring the European Research Area” - Call identifier: FP6  
2004-Mobility-12, Proposal N° 041588, Title: “Optimal Design and  
Fabrication of Electromagnetic Metamaterials for Millimeter and  
Microwave Applications”, Acronym: 4M, Coordinator

Other international  
collaborations:

ESL, Ohio State University, Columbus, OH, USA

Name(s) and  
contact details of  
potential partners:

**If you would like to suggest the participation of particular partners from the  
partner country based on existing contacts or collaboration experience,  
you are welcome to indicate their names and contact details below:**

## 3. Presentation at the Workshop

I will give a presentation at the workshop (approx. 10 min.) to present my institution, my expertise, and my collaboration interests. The contents of my presentations is summarised below (max. 1 page).

**INSTITUTION:** Sabancı University (SU), established in 1999, is one of the most innovative research-intensive universities in Turkey. It is located in Tuzla, southeast of Istanbul and is close to GOSB Technopark (only 7 km apart) and all other GOSB Technopark partners (i.e. Kocaeli University, Kocaeli Chamber of Industry, and Gebze Chamber of Commerce). In October 1998, after its overall structure has been planned for 4 years via an international consortium, Sabancı University applied for membership in European Foundation Quality in October 1998. Our university is the first university in Turkey that applied for and was granted membership. The current student body of about 3000 students represents Turkey’s best and brightest. Since the University’s inception, 40% of enrollment has consistently come from the first 3000 students nationwide, an assessment based on the rigorous annual Student Selection Examination. The university has about 180 full-time faculty members, who are internationally recognized in their area of expertise. Academically competitive student body benefits from this internationally educated and experienced staff: 84% of the University’s full-time faculty obtained PhD degrees abroad. An average of 11.6 years academic experience post PhD and age of 41 profile a dynamic and experienced faculty, whose research is supported with generous funding. Within a short time, Sabancı University has joined the ranks of Turkey’s top universities, a group of well-established private and public institutions with strong international reputations.

A state of the art campus, carefully designed graduate and undergraduate programs, projects responding to national as well as international communities, exceptional students, staff, and faculty—all these components enable Sabancı University to thrive as a dynamic and innovative institution of higher education. Sabancı University has adopted a revolutionary approach unlike any other university in Turkey in undergraduate education. The students initially register to faculties and not to departments (or programs). They choose their diploma programs (majors) in their third year after taking a number of courses from different areas to make an intelligent choice. Unlike any other university in Turkey, the students are given outmost freedom in building their careers by choosing



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their program and then the courses according to their interests and capabilities. Sabanci University Faculty of Engineering and Natural Sciences promotes and encourages inter-disciplinary research among its faculty members.

**EXPERTISE:** Design optimization for electromagnetic applications has traditionally been a process based on the creativity, past experience and knowledge of the designer. It has thus focused mostly on the shape design or geometry of the device for performance improvement with little emphasis on the material property itself. The researcher's expertise is on material synthesis efforts for the development of novel metamaterials for microwave and millimeter wave antennas. These metamaterials are created from conventional substances, using powerful topology optimization methods to engineer the property tensors and to optimize application-specific figures of merit. They are fabricated using sophisticated fabrication techniques suitable for multi-material composites varying in full three dimensions (3D). More specifically, a new class of artificial materials with prescribed electromagnetic properties, created to a custom design via topology optimization and advanced multimaterial fabrication technologies is investigated. These artificial materials, or *meta-materials*, are composites of dielectrics and magnetic oxides, combined to produce new electromagnetic property tensors and previously unobtainable figures of merit specifically for antennas and filters. Unlike traditional antenna design approaches based on surface metallization (where an experienced antenna designer can bypass formal design tools), exploitation of novel engineered material volumes for antennas (and other RF applications) can only be realized with generalized design methodologies. Topology optimization is such a method and allows for novel material microstructure and topology designs from scratch. The combination of *powerful optimal design* techniques with *practical realization* for specific applications, will serve as a general example for a new approach for creating designed metamaterials, useful for other functional materials. The new functionality of metamaterials will enable new technology for several microwave and millimeter wave applications. By reducing size and adding functionality to a radiator element, avenues will be opened for many new and practical phased array applications such as RF sensing, miniaturized transceivers and covert RF tags to mention a few. This in turn will lead to cheaper and much more efficient configurations for the much smaller and network-centric future systems.

**COLLABORATION:** Past work addressed some of the challenges of system design from an interdisciplinary engineering perspective, with a focus on using automated design tools (such as topology optimization) and artificially engineered composite materials for RF applications. Although the target application of the past research relates to miniaturized broadband antennas, since the design, fabrication and modeling aspects of the research are at its core, it is flexible enough to be extended to other domains such as the burgeoning fields of micro electro-thermo-mechanical and micro biomedical devices to electrical interfaces and nanotechnology. This are some of the areas where collaboration is sought for.

**I agree with the publication of my data on the Workshop website!**

**PLEASE FILL IN THIS FORM UNTIL 22 SEPT. 2006 AND RETURN IT TO:**

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