

# *A new joint research and teaching project on micro- and power electronics*

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**Abstract— This paper describes the motivation and approach for setting up joint study and research programs in the field of Power Electronics and Micro-Electronics at Reutlingen University and University of Stuttgart initiated by and focused at the need of the Robert Bosch Automotive Electronics division.**

**Keywords- industry-university cooperation; joint research, joint teaching**

## I. INTRODUCTION

The increasing importance of micro- and power electronics in the automotive world as well as in the energy sector sets a special focus on an excellent education in engineering.

To strengthen this education the Robert Bosch GmbH, the University of Stuttgart and Reutlingen University signed an agreement in November 2009 to cooperate in this field. Therefore the Robert Bosch Centre for Power Electronics (RBZ) has been established. Bosch funds the education and research with about 15 million EUR in a period of 10 years. The federal state government adds 12 million EUR in the same timeframe to form an excellence cluster for power and microelectronics in the heart of Baden-Württemberg.

## II. KEY ASPECTS

- Technical motivation: electro-mobility will play a key role in the future automotive and supplier market. Energy generation by solar systems as well as wind power plants require electronic power conversion based on similar technologies.
- Increasing demand for highly skilled graduates in all fields of Power Electronics as well as in certain specialized fields in Micro-electronics, currently only rarely available on the HR market.

- Economic motivation: The area of Stuttgart-Reutlingen is one of the most intense industrial areas in Europe, dominated by car manufacturers and automotive suppliers. The Bosch Automotive Electronics division is currently investing a total of about 600 Mio € in a new semiconductor fab at the Bosch plant of Reutlingen, which has been inaugurated by the president of Germany, Horst Köhler, on March 18<sup>th</sup> 2010. Reutlingen University is located very close to the Bosch plant; distance to the University of Stuttgart is only 30 km. By combining high-tech semiconductor production and lab equipment of Bosch with the excellence of 2 close-range universities as well as additional financial support by Bosch this offers a great opportunity to set-up a unique centre of excellence in the above mentioned fields.
- A new 4-semester Master of Science program in Micro- and Power Electronics is currently established at Reutlingen University, existing Master programs at University of Stuttgart are extended by specialisation areas in Power Electronics. Both Master programs will start in October 2010 for the first time and students may enter these programs every term.
- At both universities existing or emerging Bachelor programs are extended with respect to form a basis for the postgraduate programs. However, holding a degree from Reutlingen University or University of Stuttgart is not mandatory at all to apply for the Master programs. Those are also open to alumni from other, even international, universities.
- Both University of Stuttgart as well as Reutlingen University of applied sciences will run a joint doctorate program, which is unique in the German academic community.

- The joint research and study centre will consist of a total of 7 chairs located at both Universities, one of the professors being employed in mutual consent between the Universities. 2 existing chairs at the University of Stuttgart, which are members of the RBZ, will be joined by 5 new professors at both universities. The structure of the RBZ with the consisting chairs can be found in fig. 1.

### III. DETAILS

The Robert Bosch Centre for Power Electronics ([www.RBZentrum.de](http://www.RBZentrum.de)) is set up as a joint research and teaching centre, where the partners focus on complementary topics. Reutlingen University has its main focus on microelectronic and power electronic modules as well as on integrated circuits whereas the University of Stuttgart with its cleanroom facilities focuses on technological aspects supplemented by the research on system aspects.

Aspects of reliability and robustness, which are important for both modules and systems, are covered by the jointly appointed professor; therefore he is the link between the universities not only in a formal manner but also in questions of research.

With the set up described before, the RBZ covers all aspects in the development of micro- and power electronics, starting from technology up to systems.

Concerning teaching, the Curricula of both universities are closely coordinated between all three partners and therefore fit very well the industry's need for education in the field of

micro- and power-electronics. Whereas the University of Stuttgart extends its existing Master in Electronics towards special topics in power electronics, Reutlingen University sets up a completely new Master program. Both Master programs can be attended by all students with a relevant bachelor degree in Electrical Engineering, Electronics or a comparable bachelor degree with appropriate focus.

Besides the funding of the professors and of a part of the labs and facilities in Reutlingen, Bosch enables multichip wafer runs within its new 200mm fab. Students may design their own chips within a corresponding lesson for integrated circuit design and run these designs afterwards at Bosch. Finally, the devices will be characterized by the students either in university labs or in Bosch labs.

Very worth mentioning is the joint doctorate program of the RBZ funded by the German state of Baden-Württemberg, which may be entered by all students with a relevant Master degree. A professor of Reutlingen University and a professor of the University of Stuttgart always form a corporate pair of reviewers, independently from the PhD student working in Stuttgart or Reutlingen.

The close cooperation on the one hand enables the students to acquire the know-how of up to date technology and tools and on the other hand makes sure that they are well prepared for the work in an industrial environment.

The RBZ provides the possibility of excellent education in the field of micro- and power electronics starting from a Bachelor, complemented by a Master and finally completed by a doctorate program.

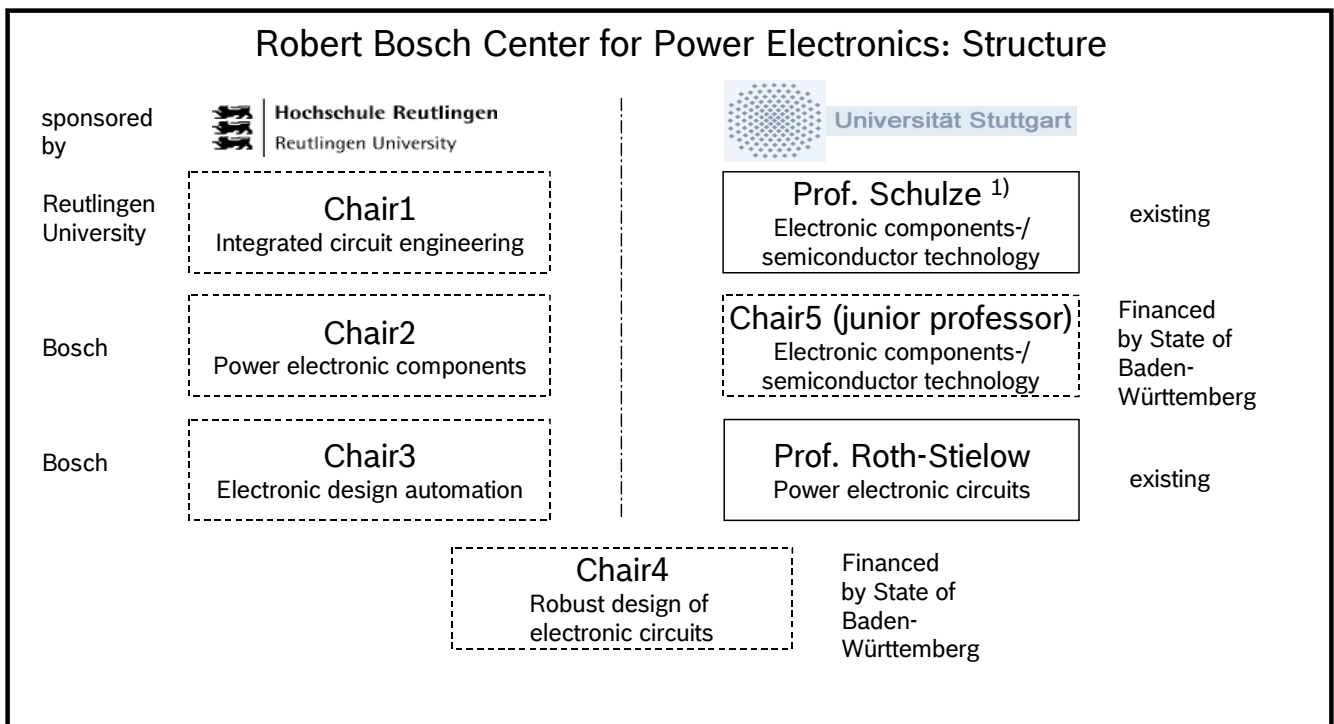


Fig.1: Structural Chart of the RBZ