METU MEMS Research and Applications Center

Reporting

Project Information

METU-MEMS

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Closed project

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1 December 2009

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30 November 2013

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FP7-REGPOT

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€ 2 700 000

Coordinated by
MIDDLE EAST TECHNICAL UNIVERSITY
Turkey

Final Report Summary - METU-MEMS (METU MEMS Research and Applications Center)

Executive Summary:

METU-MEMS Project is a one-partner Support Action project which is carried out by METU-MEMS Research and Applications Center, Ankara, Turkey. It is funded by the Research Potential (REGPOT) Activity of the EU FP7 Capacities Programme. The project with duration of 48 months was officially started on 1 December 2009.

In scope of the project, METU-MEMS Centre collaborates with its strategic partners, all of which are leading European research centres in the field of Microsystems Technology. These strategic partners are IMEC (Belgium), LAAS-CNRS (France), IMTEK Freiburg University (Germany), IMT Bucharest (Romania), ETH Zurich (Switzerland), DIMES University of Delft (The Netherlands), University of Perugia (Italy), University of Athens (Greece), FORTH-Crete (Greece), Fraunhofer-ISIT (Germany), FBK-IRST (Italy), Royal Institute of Technology (KTH) (Sweden), IEMN-ISEN (France), and EPFL (Switzerland).

The overall objective of the project is to increase the research capacity and capability of the METU-MEMS Centre and thus to reach the goal of becoming a competence centre for micro-electro-mechanical systems (MEMS) in Europe. In order to accomplish this objective, the following work packages are established:

• Acquisition and maintenance of MEMS fabrication equipment: Upgrading the equipment for 6” and 8” fabrication processes by purchasing various equipments.

• Recruitment of new researchers: Hiring new experienced researchers for successful operation of the METU-MEMS Centre.

• Networking and collaborative activities: Facilitating the knowledge transfer of researchers working in MEMS area at regional and international level through participating in and organising events as well as through mobility of researchers.

• Dissemination activities: Promoting MEMS technology and METU-MEMS Center through web portal and promotional materials.

Project Context and Objectives:

The overall objective of the METU-MEMS project is to increase the research capacity and capability of METU-MEMS Centre and thus become an excellence centre for micro-electro-mechanical systems (MEMS). In order to accomplish this strategic objective, the following specific objectives were established as indicated in the DoW document:

- Acquisition and maintenance of MEMS fabrication equipment
- Recruitment of new researchers
- Networking and collaborative activities
- Dissemination activities

To fulfil the objectives of this project, five work packages (WP), including management, corresponding to specific objectives are defined. The following section provides the project objectives in terms of each work package.

WP1: Project Management
The objective of this work package is to provide the administrative, legal, and financial management of the project as well as technical coordination and monitoring.

Task 1.1 Overall administration, financial management
Objective(s): (i) to create a Management Board that consists of the Project Coordinator and the Work Package Leaders to carry out the management of the project (managing the resources, meeting project’s schedules and goals, tracking the costs related to budget, etc.); and (ii) to establish a Project Management Office which is equipped and staffed properly to handle the routine project related tasks such as collecting

Office which is equipped and staffed properly to handle the routine project related tasks such as collecting, sorting, and distributing documents, as well as accounting and bank transfers.

Task 1.2 Monitoring the technical progress of the project
Objective(s): (i) to steer the project by determining the overall strategy for its execution and ensure compliance with legal obligations; and (ii) to realize high quality management of the project, to resolve possible risks.

Task 1.3 Delivering administrative reports
Objective(s): to ensure the preparation and submission of the related reports and deliverables to Project Officer on time.

WP2: Acquisition and Maintenance of Research Equipment
Main objective of this WP is to purchase critical equipment to upgrade the infrastructure for 6” and 8” wafer processing and for new and novel fabrication techniques.

Task 2.1 Purchasing equipments
Objective(s): (i) to purchase various equipment such as 8” Wet Benches, 8” Metal Sputter, Hard Bake Oven, Microfluidic Probe Station, and various parts for existing equipment (STS RIE, STS DRIE, etc.) for 8” fabrication upgrade together with related software and other equipments; and (ii) to provide continuous maintenance of the Centre’s equipments, in addition to purchasing activities.

Task 2.2 Installation of equipments
Objective(s): to install purchased equipments.

WP3: Recruitment of Experienced Researchers
Main objective of this WP is to enhance improvement of research potential and competence in microsystems and MEMS technology research activities at METU-MEMS through recruitment of new researchers.

Task 3.1 Recruitment of new researchers
Objective(s): to recruit a total of 2 experienced and 4 young researchers for an average of 20 months. The main expertise areas of the researchers to be recruited are expected to be MEMS packaging and advanced MEMS fabrication techniques, Bio MEMS, and surface treatment for micro-biosensors.

Task 3.2 Hiring and integration of new researchers into relevant projects
Objective(s): to ensure integration of the new researchers into relevant teams and projects through adaptation and orientation support.

WP4: Networking and Collaborative Activities
Main objective of this WP is to stimulate the production of S&T knowledge and research excellence for use of MEMS and to enable researchers to establish contact and collaborations with other national and

of MEMS and to enable researchers to establish contact and collaborations with other national and international experts.

Task 4.1 Participating in international conferences and other technical events
Objective(s): to participate in an average of 10 international conferences.

Task 4.2 Organising an international workshop
Objective(s): to organise an international workshop on “Emerging MEMS Technologies and MEMS/Nanotechnology Integration Areas” in Turkey with the participation of researchers from Turkey, Europe, and other countries.

Task 4.3 Organising annual national workshops
Objective(s): to organize 3 national workshops with the participation of researchers from academia, research institutes and industry.

Task 4.4 Organising a brokerage event

Objective(s): to organize one brokerage event in order to foster joint projects (especially under FP7) and other types of collaborations among universities, research centres, and industrial organisations.

Task 4.5 Exchange of researchers
Objective(s): to share best practices and knowledge transfer through mobility activities (incoming and outgoing experts).

WP5: Dissemination Activities
Main objective of this WP is to ensure that dissemination of project results and outputs will be continuously performed through website, leaflets/brochures and info days addressing the related stakeholders.

Task 5.1 Development and management of a web portal
Objective(s): to host, design and maintain the METU-MEMS web portal that will act as the project’s outer face to follow-up the project related activities, developments, as well as information about MEMS technologies, its applications, relevant news and events.

Task 5.2 Promotional materials
Objective(s): to prepare different types of promotional materials (like leaflets and brochures) to distribute during the implementation of the METU-MEMS Project.

Task 5.3 Organising Info days
Objective(s): to organise a total of three info days about METU-MEMS Centre and project activities as well as technology transfer, FP7 etc. for related stakeholders (researchers from academia, research institutes, and industry).
Project Results:
The project has reached the following results:

• Acquisition and maintenance of MEMS fabrication equipment: In order to extend the research activities

• Acquisition and maintenance of MEMS fabrication equipment: In order to extend the research activities of METU-MEMS Centre into new and exciting research areas including BioMEMS and PowerMEMS, and in order to realize novel approaches in micro/nano fabrication to increase the scientific and technological capacity of the Centre, METU-MEMS Project has started its purchasing processes from the very first day of the Project. As a result, the purchasing processes of 8” Wet Benches, 8” Metal Sputter, 8” Upgrading Parts, Microfluidic Probe Station, Hard Bake Oven, and software were completed. Moreover, additional essential systems; Vacuum Pumps and Accessories for 8” Tools, Lapping Machine for 8” Wafers, Optical Microscopes for 8” Wafers, Automatic Laser Cutter for 8” Wafers, and 8” Probe Stations were also purchased through approved budget reallocation. Besides acquisition of equipment, maintenance and preventive maintenance of the fabrication equipment were also carried out in order to continue internal and collaborative activities of the Centre without interruption.

• Recruitment of new researchers: A big effort was spent for finding new researchers to be recruited, which is expected to contribute for establishment of more professional collaborations with European research centres such as IMEC, TU Delft, IMTEK, EPFL, ETH etc. and for creating new job opportunities and better working conditions which can attract Turkish researchers who are working in abroad (mainly in USA) to

Turkey. During the implementation of the Project, total of four applications for RF-MEMS, twelve applications for BioMEMS, and two applications for PowerMEMS research positions were acquired. According to the results of the evaluation process, five young researchers were recruited: Dr. Yekbun Adiguzel (BioMEMS field), Dr. Serhan Ardanuc (MEMS fabrication techniques and PowerMEMS fields), Dr. Kivanc Azgin (BioMEMS field), Ayse Zamboglu (BioMEMS field), and Dr. Serkan Yazici (RF MEMS field). Moreover, Dr. Siebe Bouwstra from MEMS Technical Consultancy, the Netherlands was hired as an experienced researcher.

• Networking and collaborative activities: METU-MEMS Project has carried out several actions to fulfil its obligations regarding networking activities. Since the beginning of the project, researchers of the METU-MEMS Centre participated in 34 international events in order to enhance the collaboration opportunities with researchers in MEMS area for exchanging relevant knowledge and to disseminate Centre’s knowledge. In addition, three annual workshops, under the names of 1st National MEMS and Microsystem Technologies Workshop (MEMS-TR), 2nd National MEMS and Microsystem Technologies Workshop (MEMS-TR’11), and 3rd National MEMS and Microsystem Technologies Workshop (MEMS-TR’13) were organised on 24-25 December 2010, 23-24 December 2011, and 25 November 2013, respectively. Moreover, the 13th edition of the MEMSWAVE series, the International Symposium on RF MEMS and RF Microsystems (MEMSWAVE 2012), was organised on 2-4 July 2012, in Antalya, Turkey as an international workshop. Besides, the Brokerage Event was organised as a closing event of the METU-MEMS project, on 26-27 November 2013 at the Cultural and Convention Centre of METU, Ankara, Turkey. Also, during the whole period of the METU-MEMS Project, 24 research visits as incoming experts from different organisations were realized, and 12 researchers from METU-MEMS Centre performed 8 different technical visits to Centre’s strategic partners as outgoing experts for sharing information and knowledge and participating in collaborative studies.

• Dissemination activities: In order to promote METU-MEMS Project, dissemination activities have started from the beginning of the Project. First, a Project web portal was designed and put into service through the http://www.metu-mems.eu/ domain address. This domain name was purchased for 3 years and as the duration of the project was extended for an additional one year, a new domain name was acquired as

duration of the project was extended for an additional one year, a new domain name was acquired as “http://www.metu-mems.org/” for five years (until 2017). Moreover, leaflets that provide information about Centre’s facilities, research areas, services, major achievements, and ongoing FP7 METU-MEMS Project were prepared in the first period and they were updated during the second period. These leaflets were distributed during the kick-off meeting, national workshops, info days, international workshop, brokerage event, and other related events. Moreover, the first, second, and third info days were organised on 25 December 2010, 24 December 2011, and 27 November 2013, respectively.
Potential Impact:
MEMS technology has an enormous number of application areas including automotive, biomedical, telecommunication, household appliances, and information technologies. METU-MEMS Project is very important to boost the activities of the Centre not only in terms of development of new sensors but also in terms of promoting the MEMS technology specifically in Turkey and more generally in Europe.

Activities of the METU-MEMS Centre performed during the implementation of the METU-MEMS Project had important potential impacts. These are provided below:

* Acquisition and maintenance of MEMS fabrication equipment: As there is a good research potential in RF and microwave area in many universities and research centres in Turkey and Europe, purchasing and providing maintenance of MEMS fabrication equipment in scope of the METU-MEMS Project contributed to the Centre’s activities by establishing and providing standard processes to these universities and research centres. After purchasing of the new equipment, the Centre started to offer its RF MEMS process as a foundry service to these universities and research centres, and started to accept designs from different institutions to fabricate them at once in the same process run, like the Multi Project Wafer concept (MPW). The Centre is in close collaboration with Turkish research institutions (like Hacettepe University, Ankara University, Bilkent University, etc.) and other European institutions (like IMEC, IMTEK, etc.) to provide these services. Therefore, these activities ensure the optimal use of project results by other national and European institutions.

* Recruitment of new researchers: Recruitment of new researchers in scope of the METU-MEMS Project had an important impact in terms of creating new job opportunities and better working conditions for young Turkish researchers who are working outside of Turkey. Therefore, recruitment also contributed to reverse the brain drain problem. Moreover recruitment of experienced researcher, Dr. Siebe Bouwstra, also highly contributed to the Centre’s activities in terms of its visibility in Europe and collaboration opportunities with the different MEMS related organisations in Europe.

* Networking and collaborative activities:

- Participating in international conferences: Participation of the METU-MEMS Centre staff to different international conferences had many impacts by means of exchanging information on state-of-the-art in the MEMS field and bringing together MEMS researchers and engineers from several universities, research institutions, and industry organisations. Moreover, during these events, Centre representatives had a chance to build many new contacts and meet face-to-face with many of the strategic partners. In addition to these, potential collaboration opportunities with research entities having similar scientific interests are being followed, especially regarding the FP7 consortiums.

- International Workshop: MEMSWAVE 2012 lasted for three days, encompassing the “RF-MST Cluster Meeting” and the “MEMSWAVE Workshop”. The RF-MST Cluster Meeting, which was co-organized with the European Commission, was held during the first day of the event (July 2, 2012), and the achievements of 17 MEMS-related EU projects were presented and discussed. The last two days of the event (July 3-4, 2012) covered the MEMSWAVE Workshop, where a total of 36 invited and peer-reviewed papers were presented to provide an international forum for scientists and industrialists for the exchange of information on the most recent advances and best achievements in the area of RF-MEMS, RF MSTs, and RF-NEMS with emphasis on the recent European achievements. A total of 52 participants attended the MEMSWAVE 2012 Symposium, 8 of which are from national universities and the remaining 44 from international universities and research institutions. The topics of the presentations were well developed and the speakers made important contributions for awareness on state-of-the-art in RF-MEMS and related expectations. Also there had been effective exchanges of experience and views both during the plenary and break-out discussion sessions of the three-day event.

- Annual National Workshops: Annual National Workshops were important in terms of bringing the

important MEMS related Turkish stakeholders together. In each national workshop (MEMS-TR’10, MEMS-TR’11, and MEMS-TR’13) more than 100 participants attended the events from prestigious universities, research institutes, and industrial organisations that are active in relevant fields of MEMS technology. Specific attention was given to industry and SMEs in order to attract them to this emerging field by creating awareness about state-of-the-art in the MEMS field and in order to provide available opportunities for them for collaboration with the research organisations in the MEMS field. The events had a significant impact as there had been effective exchanges of experience and views. As there is no such other platform on the national level, the national workshops provided a unique environment for participants to discuss current MEMS issues in order to gain insights and validate their own processes, which are expected to provide many additional opportunities for bilateral exchanges and collaborations at the inter-personal and inter-institutional levels. It is expected that the dialogue platform created at national level will stimulate the motivation for participation to potential FP7 and Horizon 2020 consortiums. Broad participation from the leading organisations of Turkey which are active in MEMS related areas showed that the dialogue platform established during MEMS-TR event should be continued on a permanent basis. Therefore, the Board Meeting of the MEMS-TR events, decided to continue organising these events in yearly basis after the finalisation of the METU-MEMS Project.

- Brokerage Event: The Brokerage Event was important in terms of providing an effective dialogue platform for attendees to meet other providers of innovative technologies from Europe, to enter into contact with potential partners for future co-operation and to establish cross-border contacts for long-term business relationships. Participants had a unique networking opportunity to promote and present their own research results, technologies, and know-how as well as project concepts, and to meet representatives from companies/SMEs, universities, and research organizations in order to exchange ideas during pre-arranged meetings. 85 participants (universities, research institutes, industrial organisations, and SMEs) from Europe and Turkey attended to the Brokerage Event. 8 of these participants were from our strategic partners including Delft University of Technology (The Netherlands), Royal Institute of Technology - KTH (Sweden), Fondazione Bruno Kessler – FBK (Italy), EPFL (Switzerland), IMTEK (Germany), LAAS (France) and MEMS-TC (The Netherlands).

- Incoming and outgoing experts: 24 research visits as incoming experts from different organisations were realized and 12 researchers from METU-MEMS Center performed 8 different technical visits to Centre's strategic partners as outgoing experts for sharing information and knowledge and participating in collaborative experiments. As a result of these visits, different collaborative opportunities have been investigated and possible project topics were defined.

* Dissemination activities:

- Web portal: The portal acts as the outer face of the METU-MEMS Project. Job postings, information regarding national workshops, info days, international workshop, brokerage event, public deliverables, and all of the other related activities regarding METU-MEMS Project were posted on the portal. During the announcements of these activities, the link of the web portal has distributed among the strategic partners, MEMS related researchers in Turkey, etc. By this way, both the activities and the Project results were disseminated through important MEMS related stakeholders.

- Promotional materials: The prepared leaflets and brochures were disseminated during the participated and organised events, which contributed to the visibility of the Centre.

- Info days: Info days about the opportunities offered by FP7 and Horizon 2020 contributed to the potential of participation to the FP7 and Horizon 2020 projects not only for METU-MEMS Centre but also for related SME's, industrial companies, and research entities in the neighbourhood.

List of Websites:

http://www.metu-mems.org/

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Related documents

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