



# Memorandum of Understanding

*between*

Ministry of Education, Universities and Research (MIUR), Italy  
Ministry of Science & Technology, India

Co Schmister

Prof. S. K. S.  
ECE Dept

108

for the establishment of a Joint Research Hub  
on

## MEMS (Micro-electro-mechanical-systems)

*Italian Research Hub:*

Centre for Scientific and Technological Research  
Istituto Trentino di Cultura (ITC),  
Trento, Italy

### Indian Research Hub:

Advanced Technology Centre  
Indian Institute of Technology,  
Kharagpur, India

New Delhi  
February 15th, 2005





**ITC  
irst**

CENTRO PER LA RICERCA  
SCIENTIFICA E TECNOLOGICA



## **Memorandum of Understanding**

*between*

**Ministry of Education, Universities and Research (MIUR), Italy  
Ministry of Science & Technology, India**

**for the establishment of a Joint Research Hub**

*on*

**MEMS (Micro-Electro-Mechanical-Systems)**

*Italian Research Hub:* **Centre for Scientific and Technological Research  
Istituto Trentino di Cultura (ITC), Trento, Italy**

*Indian Research Hub:* **Advanced Technology Centre  
Indian Institute of Technology, Kharagpur, India**

**New Delhi  
February 15<sup>th</sup>, 2005**

## **Memorandum of Understanding between Italy and India for the establishment of a *Research Hub* on MEMS Micro-Electro-Mechanical-Systems**

The M.O.U. details the means for establishing a Research Hub made of joint research laboratories involving Indian and Italian researchers in the strategic areas of **Micro-Electro-Mechanical-Systems - MEMS** with emphasis on **BioMEMS** and **Microdevices for Special Imaging**. The joint laboratories will share objectives, human resources, equipment and funding to develop forefront research programs defined by *ad hoc* protocols. This M.O.U. traces back to a long standing tradition of collaboration and scientific exchange between India and Italy, which has led to previous agreements among public research institutions.

The Scientific Topics of interest for the *Research Hub* on MEMS are:

- Innovative MEMS devices for gene sequencing and transfection
- Microbiotechnology and hybrid devices
- Lab-on-chip based Microsystems
- Methodologies for patterning, functionalization and immobilization of biomolecules on MEMS surfaces
- Electro-optical MEMS
- Cryogenic bolometers and uncooled IR detectors
- Arrays of smart pixels
- Advanced optical sensors
- Terahertz detectors
- Mechatronics and embedded systems
- Pervasive Computing

The Italian contribution to the *Research Hub* programs will be funded by the Ministry of Education, Universities and Research (MIUR) and by the Istituto Trentino di Cultura (ITC). The headquarters for the collaborative work will be the Centre for Scientific and Technological Research – IRST, of ITC, Trento, led by Dr. Mario Zen and the IIT Kharagpur led by Prof. Santiram Kal. The *Research Hub* aims at enhancing the Italy-India collaboration by involving several Italian and Indian groups active in MEMS, namely:



### **From Italy:**

Olivetti – IJET, Arnad (Aosta)

Università "La Sapienza", Roma

Università di Trento, Dipartimento di Informatica e Telecomunicazioni

Università di Catania, Dipartimento di Chimica

Università di Genova, Dipartimento di Ingegneria Biofisica ed Elettronica (DIBE)

Università di Firenze, Consorzio Interuniversitario per lo Sviluppo dei Sistemi a Grande Interfase (CSGI)

Università "La Bicocca", Milano

INFN, Milano

CNR - IMM

Centro di Ricerca Interdipartimentale per le Biotecnologie Innovative (CRIBI), Padova

### **From India:**

IIT – Indian Institute of Technology, Kharagpur

CEERI – Central Electronics Engineering Research Institute, Pilani-Rajasthan

SSPL – Solid State Physics Laboratory, Dehli

University of Hyderabad, Hyderabad

SCL - Semiconductor Complex Limited, Chandigarh

Bharat Electronics Limited, Bangalore

It is expected to allocate around 20 Indian and 20 Italian researchers at the hub, with frequent exchanges of people between Italy and India.

### **Detailed definition of Agreement**

The definition of the collaboration between the nodes of the hub will be ruled by specific bilateral agreements, duly signed by the responsible institutions. Each agreement will define the research and training program as well as the IP rights. The technical logistic and financial details of the agreements will be the subjects of forthcoming meetings among the parties in the next 4 months. The breakdown of expected cost for the activity is reported below. The duration of the project is three years, to be renewed upon evaluation of the parties.

	Italy	India
<b>BioMEMS</b>	635 k€	635 k€
<b>Microdevices for Special Imaging</b>	610 k€	610 k€

The overall budget expected will be 2490 k€ over a period of three years, and planned to be equally shared among the parties.

*Delhi, February 15<sup>th</sup> 2005*

*Santiram Kal*  
 Indian Signatory  
 Prof. Santiram Kal  
 Indian Institute of Technology, Kharagpur

*Mario Zen*  
 Italian Signatory  
 Dr Mario Zen  
 ITC-irst, Trento





**Advanced Technology Centre  
IIT Kharagpur**


*Subject : MOU for the establishment of a Research Hub on MEMS between  
Italy and India*

08-02-2005

ITC-irst, Trento and IIT Kharagpur have a long R&D collaboration in the area of MEMS and Microsystems since 2001 under POC and ITPAR programme. Dr Mario Zen, Director, ITC-irst, and Italian collaborator of our project was recently summoned by Italian Ministry in Rome and asked him to strengthen further the research collaboration with India by establishing an Indo-Italy research hub in the area of MEMS and Microsystems. Dr Zen was made the coordinator from Italian side. As IIT Kharagpur is one of the pioneering Institutes in the MEMS research, they identified IIT Kharagpur to be the research hub from India and requested me to be the coordinator. Many Indian and Italian research Institutes and Universities will be joining the research program under these hubs. Prof. Kota Harinarayana, Vice chancellor, Hyderabad University and Theme Coordinator of Indo-Italy ITPAR programme and Dr A R Upadhaya, Director, NAL, Scientific coordinator of ITPAR MEMS programme have strongly recommended DST that IIT Kharagpur will be the ideal institute to act as MEMS research hub in India and requested me to lead the programme from Indian side.

Dr Mario Zen has already prepared an MOU in consultation with me for establishing a Research Hub in the strategic areas of MEMS with emphasis on BioMEMS and Microdevices for Special Imaging. It is expected to allocate around 20 Indian and 20 Italian researchers at the hub, with frequent exchanges of people between Italy and India. The overall budget will be around 2500 K Euro for a period of three years and planned to be shared by both the Governments. The detail modalities of funding will be decided after mutual discussion between both the parties. The MOU will be finalized and accepted by both the parties during the ensuing presidential delegation meet at New Delhi on 14-15 Feb., 2005. Italian Counterpart has requested me to take part in the discussion on 14<sup>th</sup> Feb'05 at New Delhi.

Director is kindly requested to permit me to act as the coordinator of the Indo-Italy MEMS research Hub in India and to be present in the presidential delegation level meeting at New Delhi on 14<sup>th</sup> February, 2005. IIT Kharagpur will not have any financial commitment in the programme.

  
(Santiram Kal)  
Chairman, ATC

Dean SRIC

Director

*I am aware that Professor Kal has taken great pain to develop this programme. It is strongly recommended that he be the Principal Investigator of this activity. Director may kindly approve. J 8/2/05*

*approved*  
  
प्रोफेसर शिशिर कुमार दुबे  
Prof. Shishir Kumar Dubey  
निदेशक  
Director  
भारतीय प्रौद्योगिकी संस्थान  
Indian Institute of Technology

**Prof. Partha P Chakrabarti**  
Dean  
Sponsored Research & Industrial Consultancy  
I.I.T. Kharagpur - 721302, India

*08.02.05*



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**Subject:** ITPAR Programme  
**From:** kota@uohyd.ernet.in  
**Date:** Thu, January 27, 2005 7:09 pm  
**To:** sreli@alpha.nic.in  
**Cc:** ar\_upadhya@rediffmail.com ([more](#))  
**Priority:** Normal  
**Mailer:** SquirrelMail/1.4.2  
[View Full Header](#) | [View Printable Version](#)  
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Dear Sadhana,

Please refer to the discussions that we had during the ITPAR meeting in New Delhi as regards the establishment of joint centres as part of the ITPAR Programme. As you are aware, ITC-first, Trento has been identified as the nodal centre for MEMS. Dr. Mario Zen is the coordinator from the Italian side. From the Indian side I propose IIT Kharagpur with Professor Santiram Kal as the coordinator.

During the recent workshop held at TIFR, Mumbai, a draft document was prepared between Professor Shyamsunder of TIFR and Professor Fausto from Italy. I expect that we will be getting their plan of action shortly. We should support this.

I have requested Professor D. Narayana Rao, School of Physics of University of Hyderabad to be in touch with Professors Dalba and Ferari of Trento and prepare a joint plan of action to set up a Centre in the area of Nanoscience and technology.

You may kindly discuss these recommendations with Professor Ramamurthy and give a go-ahead so that the work could be expedited. We need to have these proposals ready for the discussions planned between DST and the Italian team in the middle of February.

With best wishes,

Kota Harinarayana

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This email was sent using UOH MAIL SERVER.  
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<http://www.uohyd.ernet.in/>



**Main Identity**

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**From:** "A R upadhya" <ar\_upadhya@rediffmail.com>  
**To:** <srkal@ece.iitkgp.ernet.in>  
**Cc:** <kota@uohyd.ernet.in>  
**Sent:** Friday, January 28, 2005 7:13 PM  
**Subject:** Re: Virtual MEMS Lab\_Indo-Italy

Dear Mrs Relia,

This has reference to the email from Prof S Kal regarding joint research centre between ITC-irst Trento and IIT, Kharagpur. I strongly recommend the proposal from Dr Mario Zen, Director, ITC-irst for such a centre and IIT Kharagpur being the Indian hub of this centre. This will definitely promote enhanced interaction and advanced research in this area.

With kind regards.

Yours sincerely,

Dr A R Upadhya  
 Director  
 National Aerospace Laboratories  
 Bangalore 560 017

On Wed, 26 Jan 2005 srkal wrote :

>  
 >Respected Dr Kota and Dr Upadhyay,  
 >  
 >  
 >Kindly refer to the recent mail on the MEMO of the meeting of Italian Minister with Dr Mario Zen (dated Jan 20, 2005) regarding setting up an Indo-Italian research centre on MEMS. I am happy to note that Dr Mario Zen, Director, ITC-irst, Trento, Italy has proposed ITC-irst, Trento and IIT Kharagpur to be the joint Indo-Italy MEMS research centre as both the Institutes are actively involved on MEMS R&D under ITPAR and POC programme since last three years. We (IIT-Kharagpur) will be glad to work as a coordinating hub from India as MEMS research centre.  
 >  
 >Today, Dr Zen discussed the matter with me over Telephone and want our consent so that he can finalize the MOU. He has drafted the MOU and hopefully Italian presidential delegation will come to India during 12-15 Feb., 2005 to finalize the matter. After receiving telephone call from Dr Zen, I talked to Mrs Sadhana Relia over phone and she advised me to discuss with Dr Kota and Dr Upadhyay. So I request your opinion, advise and guidance regarding this. As the matter is very urgent and Dr Zen want to finalise the draft MOU with Indian counterpart before submitting the same to Italian Ministry, I need your quick suggestion.  
 >

2/11/2005

>I am giving below the justification of IIT-Kharagpur to be a hub of MEMS Research centre.....

>

>As you know IIT Kharagpur has a strong research base on MEMS since last 10 years and we are already running successfully ITPAR program along with many challenging National MEMS project supported by NPSM, DRDO, DAE and ISRO. We are the first in our country who have designed and developed MEMS based quartz inertial sensors for ISRO (in 2001), silicon MEMS accelerometers under NPSM (in 2004) and MEMS Microthruster for ISRO (in 2004). Dr Mario Zen, Director IT-irst will probably coordinate MEMS research area from Italian side. Dr Zen has visited many places and labs in India and he strongly feels that IIT Kharagpur has strong potential on MEMS research, in particular Inertial MEMS, RF MEMS and BioMEMS areas. We have a very strong Biotechnology department, Medical Science & Technology department and Mechanical Engg department in addition to conventional Electronics, Electrical, Civil, Physics, Chemistry and Material science departments. MEMS research require coordinated R&D effort from all these important disciplines. Dr Zen desires to further strengthen Indo-Italy joint MEMS research with Indian research Institutes like IIT Kharagpur. I need your support in this regard and our Institute is ready to be a partner hub with ITC-irst, Trento in creation of a joint Indo-Italy MEMS research centre.

>

>

>S. Kal

>

>

>\*\*\*\*\*

>Dr Santiram Kal, FIE(India), SMIEEE(USA)

>Professor

>Department of Electronics & Elec Comm Engg.

>Indian Institute of Technology, Kharagpur

>Kharagpur - 721302, India

>

>E Mail: srkal@iitkgp.ac.in

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>URL: [www.ecdept.iitkgp.ernet.in/faculty/srkal.htm](http://www.ecdept.iitkgp.ernet.in/faculty/srkal.htm)

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>CIC Network Security Group, IIT Kharagpur

>\*\*\*\*\*

Dr. A R Upadhya

Director

National Aerospace Laboratories

2/11/2005



**Main Identity**

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**From:** "Nadia Ossapapot" <ossapapot@itc.it>  
**To:** "Santiram Kal" <santiramkal@yahoo.co.in>  
**Cc:** "Mario Zen" <zen@itc.it>  
**Sent:** Monday, January 17, 2005 2:14 PM  
**Subject:** on behalf of Dr Zen

Hi, how are you?

I have a very important news to communicate to you. I have been summoned (on Friday) by the Italian Ministry in Rome. As you probably know, in February the Italian Presidential delegation at the maximum level will visit the Indian counterpart. The meeting will be probably around the 20th of February in Dehli. The intention of the Italian Research Minister is that of proposing a certain number of fellowships (around 100) and the creation of 4 joint labs on selected research fields among which MEMS has been selected.

As far as I understood, the economic mechanism will be similar to the ITPAR project, which means that the equivalent amount of money will be provided by both parties. For a joint lab they guess that 1ML Euro (for three years) and for each party, will be more or less appropriated.

They asked me whether we are interested in leading the Italian MEMS activity. They recognized that the ITPAR project already set established partnerships (e.g. IRST-Kharagpur), which can be a great advantage.

I think that the link between our Ministry and the Indian counterpart will pass through DST, so that probably they have already informed you.

I think that it can be a great opportunity, also in view of the suggestion of the DST representatives during the last meeting in Dehli, of enhancing the projects at a higher level (i.e. Italy and not only Trentino).

They need a couple of pages very soon with the main idea on which the joint lab must be based (they prefer a complementary action aimed at some challenging idea), the list of cooperatig partners as well as the cost break down.

Please, let me know your opinion about this opportunity as soon as possible and whether the DST people (Rehlya or Upadhia for example) have already noticed this opportunity to you or not.

Looking forward to hearing from you soon,  
mario

2/11/2005

## MEMO

### Participants:

Alexander Tenenbaum, General Director, Ministry for research and university (MIUR)  
Gianluca Salvatori, Regional Minister for research, Autonomous Province of Trento  
Mario Zen, ITC-irst Director (R&D center owned by Autonomous Province of Trento)

Location: MIUR – Roma

Date: January 14, 2005

### Topics of discussion:

*visit of Italian President and Italian Minister of Research to India scheduled for Feb. 14-17, 2005:*

- *fellowships to be assigned by the Italian Ministry (about 100) to Indian PhD and post docs;*
- *set up of 4 hubs in the fields of robotics, nanotechnologies, life sciences and MEMS.*

Dr Tenenbaum suggested that ITC-irst could be the candidate (from the Italian side) to lead the MEMS hub, as network of Italian and Indian labs, given its expertise in this particular field and its availability of facilities for the design, fabrication and testing of MEMS as well as, in particular, because the Microsystems Division of ITC-irst is involved in the ITPAR Programme. The ITPAR programme is considered as a good example of scientific collaboration with India. In the field of MEMS the Microsystems Division of ITC-irst has established a fruitful collaboration with the Indian side of ITPAR, represented by the Indian Institute of Technology (IIT) in Kharagpur. The idea is that of having the two centres (ITC-irst and IIT) acting as *hubs* in their countries, thus establishing a kind of network cooperating on common research topics.

Dr Salvatori and dr Zen reacted positively to this proposal, as implementation of the new ITPAR scenario developing towards the establishment of a joint lab, discussed in Delhi in occasion of the recent meeting of Steering Committee.

Dr Tenenbaum asked for a short proposal describing the project of this hub on MEMS specifying objectives, timing and costs. Deadline for editing this document is January 26, 2005.