

MicroNanoFabrication Annual Review Meeting

Welcome !

- 6th MicroNanoFabrication Annual Review Meeting organized by the EPFL Center of MicroNanoTechnology (CMI)
- 7th will be organized by the CMI on May 16, 2006





Thank You !

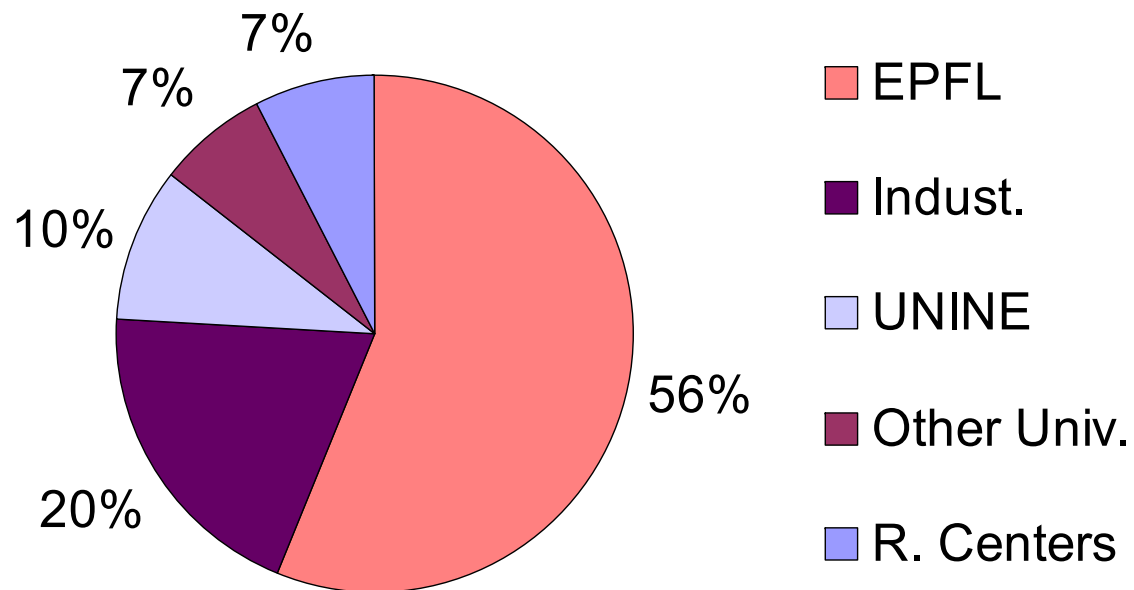
Many thanks to :

- the users of the CMI and the users of the COMLAB for submitting 130 abstracts
- the speakers
- our invited speaker who is traveling from Colorado to participate to our meeting
- the administration of EPFL who is strongly supporting the CMI
- all of you for taking the time to participate to this meeting



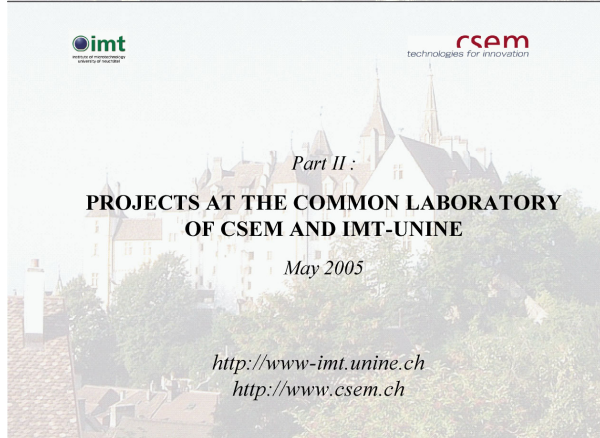
Participants (as of May 9th, 2005)

Total : 187 people





Abstracts



STI-IMM-LMIS-Renaud	12
STI-CMI	4
STI-IMM-LMIS-Brugger	10
STI-IMM-LMIS-Gijs	8
STI-IMM-LMIS-Popovic	5
STI-IMM-LEG-Ionescu	16
STI-IMM-LEG-Fazan	1
STI-IMX-LC-Muralt	5
STI-IMX-LC-Setter	4
STI-IMX-LTC-Manson	1
STI-IMX-LMCH-Mathieu	1
STI-IOA-LOA-Hoffmann	3
STI-IOA-LOA-Depeursinge	1
STI-IOA-LOA-Delacrétaz	1
STI-ITOP-NAM-Martin	2
STI-ISE-LMH-Avellan	1
STI-IPR-LSRO1-Bleuler	1
STI-IGBM-LRO-Leyvraz	1
SB-CIME-Buffat	3
SB-IPN-LNS-Brune	1
SB-IPMC-LCB-Meister	2
SB-ISIC-LEPA-Girault	2
SB-ISIC-LGCB-Stockar	1
SB-IPEP-LPHE1-Bay	1
SV-IBI-LHTC-Stergiopoulos	1
SV-BMI-LNMC-Markram	1
Externes académiques	7
CSEM	3
Compagnies	11
Travaux pratiques	3
Total	113

IMT - de Rooij	7
IMT - Staufner	4
IMT - Koudelka-Hep	2
IMT - Vettiger	1
CSEM	3
Total	17

The projects at CMI are driven by :

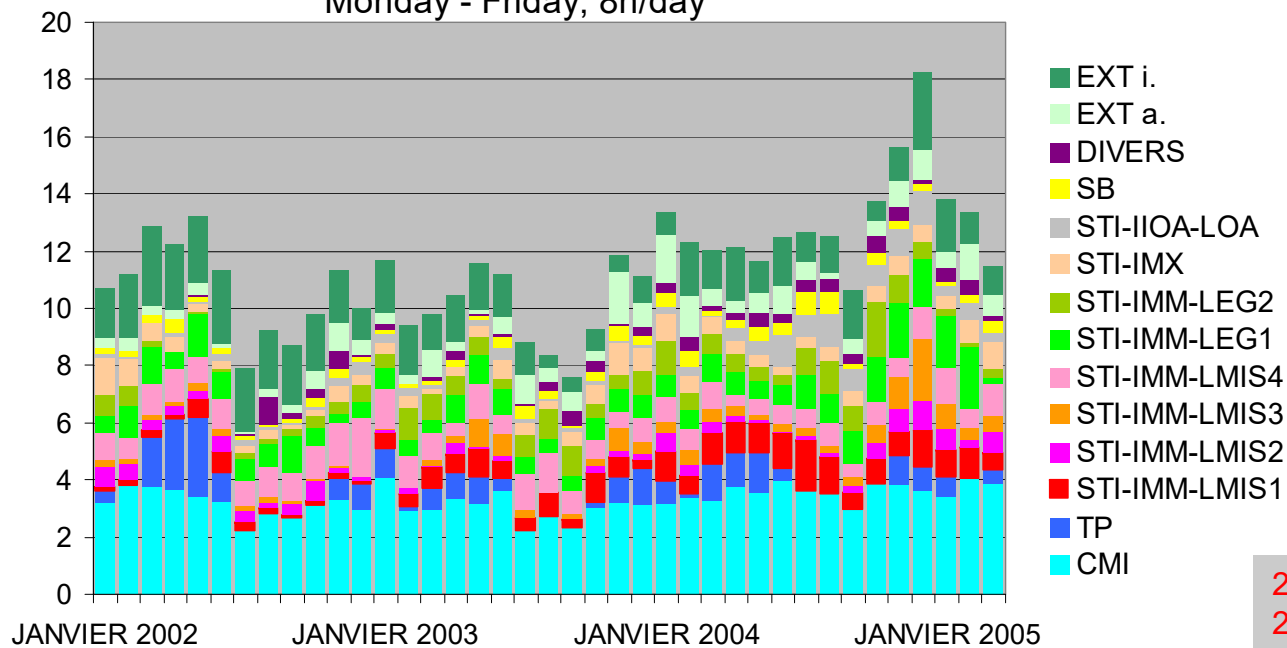
- 26 laboratories of EPFL (STI, STI, SV)
- 4 external laboratories
- 11 privates companies

+ 33% in 2005 compared to 2004



CMI Cleanroom Activity

Average number of people in cleanroom
Monday - Friday, 8h/day

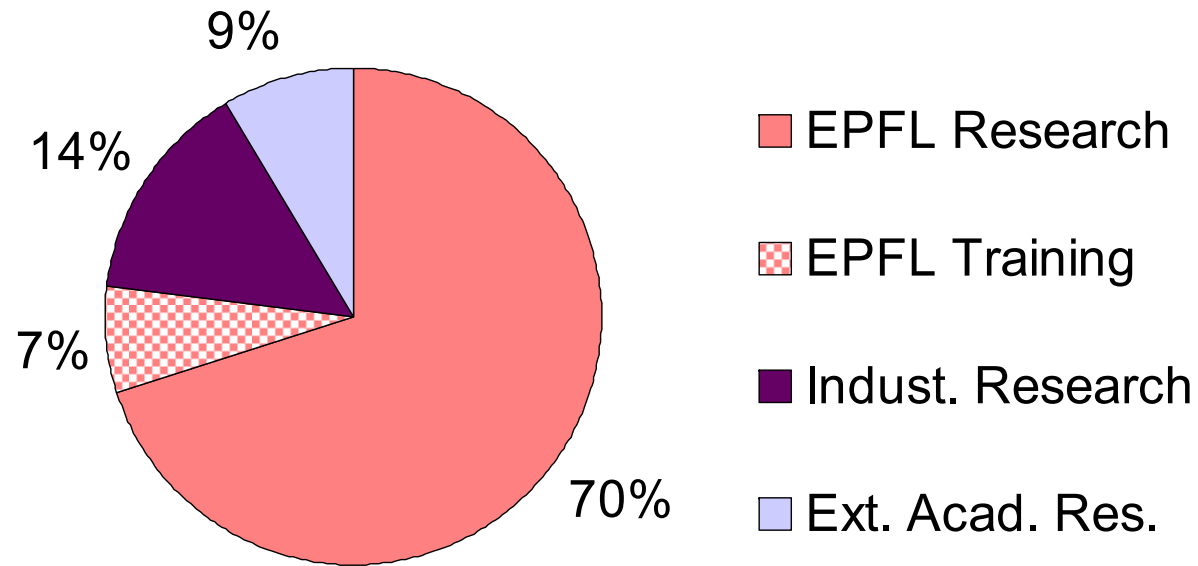


+ 25% in 2004 compared to 2003



CMI Cleanroom Activity (Staff Excepted)

Year 2004



CMI New Industrial Partner

Introduction to BRUKER BioSpin

- **Domain of activity**
 - NMR Spectroscopy
 - Electron Paramagnetic Resonance
 - Magnetic Resonance Imaging
- **BRUKER BioSpin AG, Fällanden, ZH**
 - Founded in 1965 as Spectrospin AG
 - 500+ employees
 - Products:
 - NMR spectrometers 300 - 700 MHz
 - all high-resolution NMR probes
 - 5mm CryoProbes

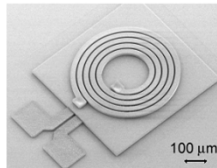


21 T NMR magnet

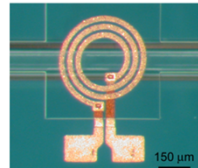
www.bruker-biospin.com

BRUKER BioSpin at PSE


- Local office of BRUKER BioSpin AG, Fällanden, ZH
- **Mission:**
Microfabrication R&D and prototyping for applications in NMR Spectroscopy, EPR and Micro-Imaging
- Agreement with CMI for clean-room access
- CTI project with LMIS3



100 μm



150 μm



NMR
Probe-head





CMI Finances

- CMI running costs in year 2004 (kCHF)**

Infrastructure : energy, N2, water, maintenance (covered by EPFL budget)	791
Processing : consumables, maintenance of processing equipments	968
TOTAL	1'759

- CMI resources in year 2004 (kCHF)**

CMI User's Fees (consumables) and CMI Services Revenues	1'034
TOTAL	1'034

Not included in this table are :
- the salaries of the staff
- the costs of the new investments

CMI Staff and Inventory

- Staff**

Number of people	15
TOTAL	15



- Inventory 2005 in kCHF**

Infrastructure	12'000
Scientific Equipment (including ordered equipment)	17'650
TOTAL	29'650



CMI New Equipments (installed)

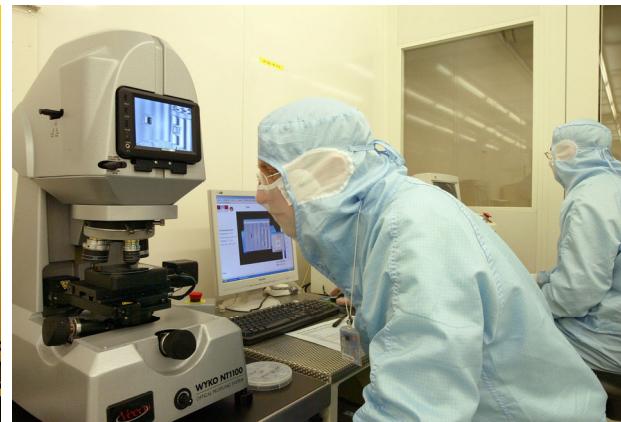
3 new equipments have been installed at CMI during the last 12 months



Coater/Developer

EVG150

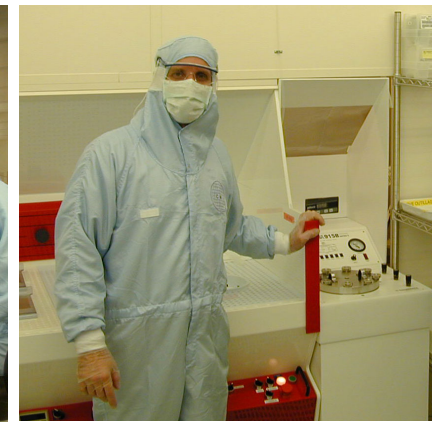
- Several wafer sizes : 2", 3", 100mm, 150mm
- Spin & spray coating



Optical profiler

Veeco NT1100

- quick
- non-contact 3D mapping



Supercritical CO2 Dryer

Tousimis 915B Series C

- for drying released structures
- after etching of sacrificial layers
- with minimum sticking problems

CMI New Equipments (ordered)

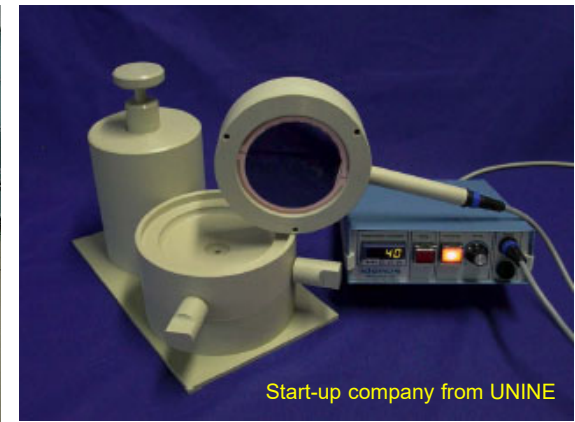
3 other new equipments will be installed at CMI in May 2005



Plasma etcher (ICP)
AMS 200 DSE (Alcatel)
 - deep SiO₂ etching (>20um)
 - SOI etching without notching
 - electrostatic chuck



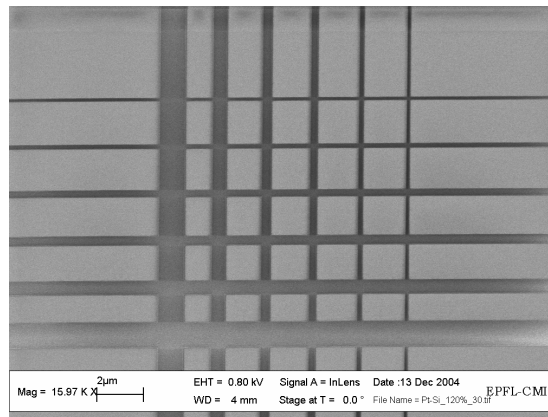
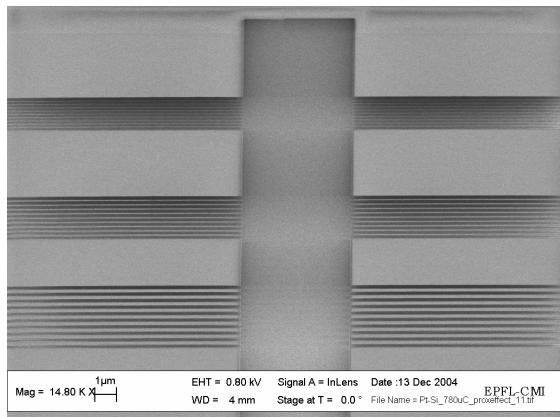
Thin film evaporator
LAB 600 H (Leybold Optics)
 - designed for lift-off
 - ion assisted evaporation



Vapor HF etcher
VPE100 (Idonus)
 - to etch SiO₂ sacrificial layers
 - without sticking of released structures

CMI New Equipments (under evaluation)

The CMI is now evaluating EBEAM lithography systems



- in close collaboration with the III/V laboratory of EPFL (IPEQ)
- the goal : to have a system installed at CMI in the beginning of 2006

Specifications :

- Resolution : 25nm
- Stitching accuracy : 40nm
- Overlay accuracy : 40nm



Conclusions

- The research activity at CMI has increased by 25% in 2004 compared to 2003
- 30 laboratories and 11 private companies are currently using the CMI cleanroom
- 6 new equipments will be installed during the years 2004 & 2005

- Good balance between teaching activities, academic research and industrial research

- Finances are OK

- The CMI is now in the process to purchase a powerful EBEAM lithography system



Conclusions

THE WORLD'S TOP 200 UNIVERSITIES

RANK	NAME	COUNTRY	PEER REVIEW SCORE	INT'L FACULTY SCORE	INT'L STUDENTS SCORE	FACULTY/STUDENT SCORE	CITATIONS/FACULTY SCORE	FINAL SCORE
	Max score		1000	100	100	400	400	1000.0
1	Harvard University	US	643	17	17	50	243	1000.0
2	University of California, Berkeley	US	665	6	7	7	169	880.2
3	Massachusetts Institute of Technology	US	484	13	18	28	221	788.9
4	California Institute of Technology	US	236	19	17	45	400	738.9
5	Oxford University	UK	560	57	18	30	45	731.8
6	Cambridge University	UK	541	65	19	31	46	725.4
7	Stanford University	US	420	9	13	28	197	688.0
8	Yale University	US	347	53	20	65	81	582.8
9	Princeton University	US	353	18	18	19	133	557.5
10	ETH Zurich	Switzerland	170	72	25	4	266	553.7
11	London School of Economics	UK	257	79	100	27	6	484.4
12	Tokyo University	Japan	371	3	3	30	60	482.0
13	University of Chicago	US	254	31	18	58	71	444.0
14	Imperial College London	UK	237	60	51	55	27	443.7
15	University of Texas at Austin	US	183	9	8	8	202	421.5
16	Australian National University	Australia	212	48	31	9	105	417.7
17	Beijing University	China	322	9	11	35	3	391.8
18	National University of Singapore	Singapore	266	35	46	10	18	385.9
19	Columbia University	US	213	10	18	56	75	384.1
20	University of California, San Francisco	US	21	5	0	39	300	376.5
21	McGill University	Canada	132	84	42	11	84	364.1
22	Melbourne University	Australia	207	49	51	12	23	353.2
23	Cornell University	US	202	10	16	19	91	348.8
24	University of California, San Diego	US	96	3	6	7	208	331.5
25	Johns Hopkins University	US	107	16	13	68	116	330.8
26	University of California, Los Angeles	US	180	2	8	12	106	316.4
27	Ecole Polytechnique	France	144	25	55	23	59	315.5
28	Pennsylvania University	US	142	14	23	31	87	306.9
29	Kyoto University	Japan	207	3	3	25	57	303.7
30	Ecole Normale Supérieure, Paris	France	105	11	22	100	51	298.4
31	Michigan University	US	173	17	11	19	60	293.3
32	Ecole Polytechnique Fédérale de Lausanne	Switzerland	56	100	67	13	44	289.4
33	Monash University	Australia	136	49	64	9	19	286.0
34	University College London	UK	108	48	40	44	36	284.2

EUROPE'S TOP 50 UNIVERSITIES

EURO RANK	NAME	COUNTRY
1	Oxford University	UK
2	Cambridge University	UK
3	ETH Zurich	Switzerland
4	London School of Economics	UK
5	Imperial College London	UK
6	Ecole Polytechnique	France
7	Ecole Normale Supérieure, Paris	France
8	Ecole Polytech Fédérale de Lausanne	Switzerland
9	University College London	UK
10	Manchester University and Umist	UK
11	School of Oriental and African Studies	UK
12	Heidelberg University	Germany
13	Edinburgh University	UK
14	Université Catholique de Louvain	Belgium
15	Brussels Free University	Belgium
16	Paris VI, Pierre et Marie Curie University	France
17	Sussex University	UK
18	Technical University Berlin	Germany
19	Copenhagen University	Denmark
20	Erasmus University Rotterdam	Netherlands
21	St Andrews University	UK
22	Paris 1 Sorbonne	France
23	Vienna Technical University	Austria
24	Delft University of Technology	Netherlands
25	Warwick University	UK
26	Eindhoven University of Technology	Netherlands



Source : *The Times Higher Education Supplement, November 5, 2004*



Enjoy your conference !

- Thank you for your attention and enjoy your conference