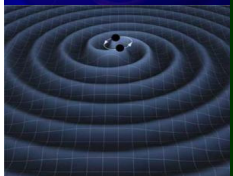
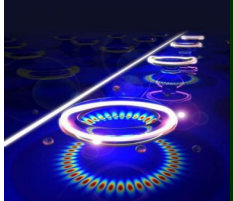


# 4i Lab

- Innovation ● Integration ●
- Incubation ● Implementation ●



# Some Innovation Metrics



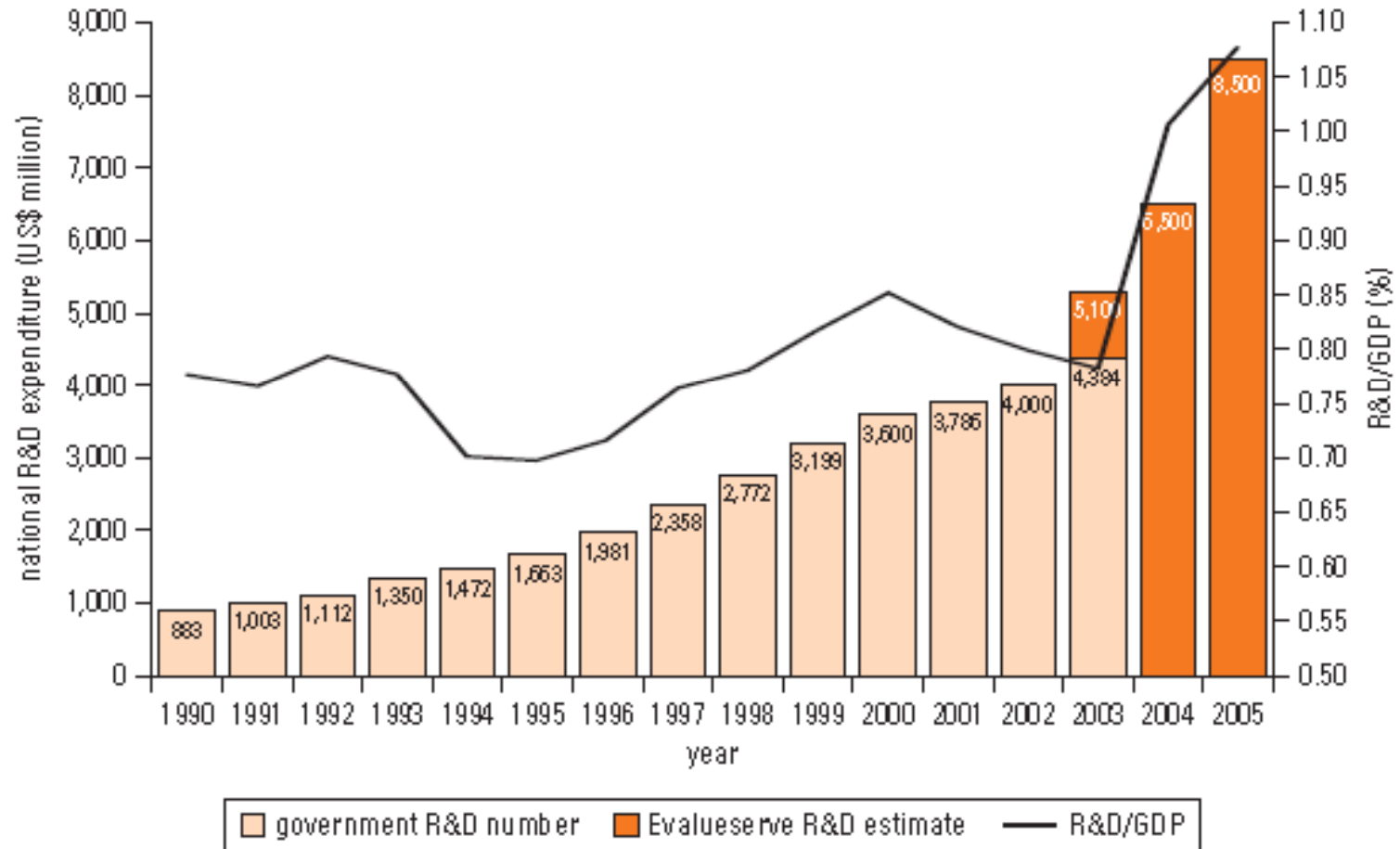
Indicator	Brazil	Russian Fed.	India	China	Korea, Rep. of	Mexico
Researchers in R&D, 2003	59,838	477,647	117,528	926,252	151,254	26,800
R&D researchers per million population, 2004	344	3,319	119	708	3,187	268
Spending on R&D (\$ billions), 2004	5.9	6.8	5.9	27.8	17.9	2.7
Spending on R&D (percentage of GDP), 2004	0.98	1.17	0.85	1.44	2.65	0.43
Scientific and technical journal articles, 2003	8,684	15,782	12,774	29,186	13,746	3,747
R&D spending (\$ thousands) per scientific and technical article <sup>a</sup>	682	431	460	953	1,332	722
Scientific and technical journal articles per million population, 2003	47.9	109.1	12.0	22.7	287.5	37.1
Patents granted by U.S. Patent Office, 2004	161	173	376	597	4,671	102
R&D spending (\$ millions) per patent granted <sup>a</sup>	376.7	39.3	15.6	46.6	3.8	26.9
Patent applications granted by U.S. Patent Office per million population, 2004	0.90	1.21	0.35	0.46	97.03	0.98

Source: Compiled from data in World Bank (2006g, 2006h).



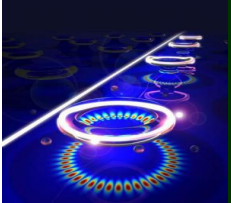
# Increasing R&D Expenditures

Figure 1.4 R&D Expenditure in India, 1990–2005



Source: Department of Science and Technology 2006; Evaluesserve 2006.



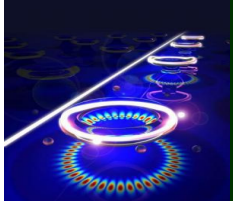


# A Center for Facilitating Innovation

- ❖ Central facility for concept design and product realization.
- ❖ Facilitate design, simulation and manufacturing at prototype level
- ❖ Users
  - Students
  - Academia and research community
  - Industries



# Current Facilities



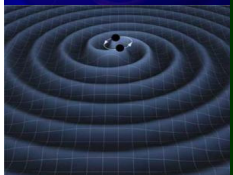
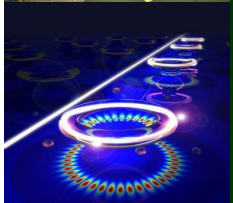
**CNC Turning Center –**  
Fully digitally controlled  
Precision: 7 microns  
24" X 8" axi-symmetric parts  
Metals, plastics, and wood

**CNC Vertical Milling Ctr. –**  
Fully digitally controlled  
3-Axes system  
Precision: 7 microns  
25" X 20" X 20"  
Metals and plastics





# Current Facilities



## Abrasive Water Jet Machining Tool

Fully digitally controlled

Size: 52" X 26"

Precision: 0.001"

Inconel, ceramics, etc.

## Laser Engraving & Cutting Machine

Laser dia: 10 microns

Size: 24" X 12"

Materials: Glass, leather, wood etc.





# Current Facilities



## Rapid Prototyping Machine

Fully digitally controlled

Any shape

Size: 16" X 14" X 16"

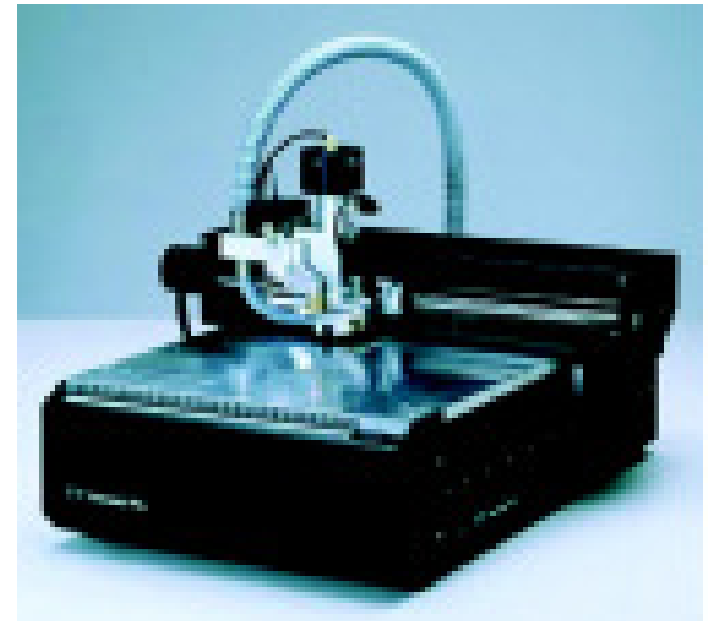
Materials: ABS & PC

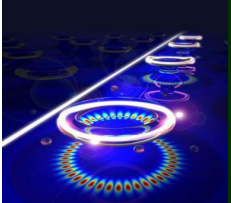
## PCB Making System

PCB Size: 15" x 12"

Two layer PCBs

Integrated with de-soldering machine



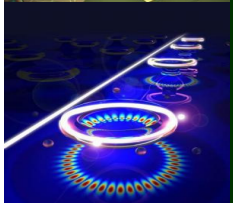


# Popularizing the 4i Lab

## □ Expanded hours

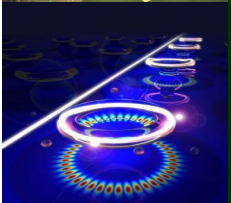
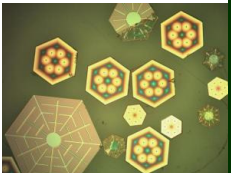
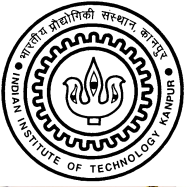
- ❖ Trained 14 students to support expanded hours of lab.
- ❖ New hours
  - Mon-Fri: 9:00 am to 9:00 pm
  - Saturday: 10:00 am to 2:00 pm.
- ❖ Posters all across the campus





# Expanding its Capabilities

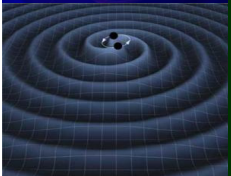
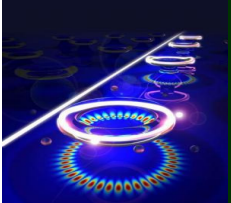
- ❖ Coordinate measuring machine
- ❖ Multi-layer PCB making facility
- ❖ Pick and place robot for electronic components
- ❖ Upgrading milling machine to a 4-axis system
- ❖ Bench-top 4-axis milling machines
- ❖ Sheet metal cutting and bending facility
- ❖ Robust inventory of elec. & mech. Hardware
- ❖ Injection molding
- ❖ Library of standards (BIS, FDA, MIL, ISO, UL, etc.)
- ❖ Hand tools



## Needed –

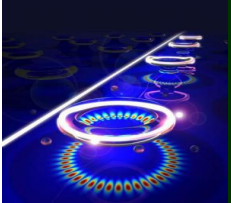
### *Stronger Engagement w Departments*

- ❑ Presentations about 4i Lab to departments
  - ❑ EE, ME, CE, AE, BSBE, MME, MDes...
  
- ❑ PG students as TAs for the lab from each department
  
- ❑ Encourage your departmental personnel and students to use it.



# New equipment being procured

- ❑ CMM machine
- ❑ Bench-top milling machines
- ❑ Mutli-layer PCB pressing machine
- ❑ Solder-masking machine for PCBs
- ❑ Pick and place robot to put surface mounted parts on PCBs
- ❑ Injection molding machine



**Thank you**