

NSRL-ICCHIBAN Brief Report, ICCHIBAN-7&8 Announcement and Future ICCHIBAN Experiments

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E.R. Benton (Eril Research Inc.) and J. Miller (LBNL)
on behalf of ICCHIBAN Working Group and Participants

<http://www.nirs.go.jp/ENG/rd/1ban/index.html>

Sep. 7-9, 2005, 10th WRMIS in Chiba, Japan

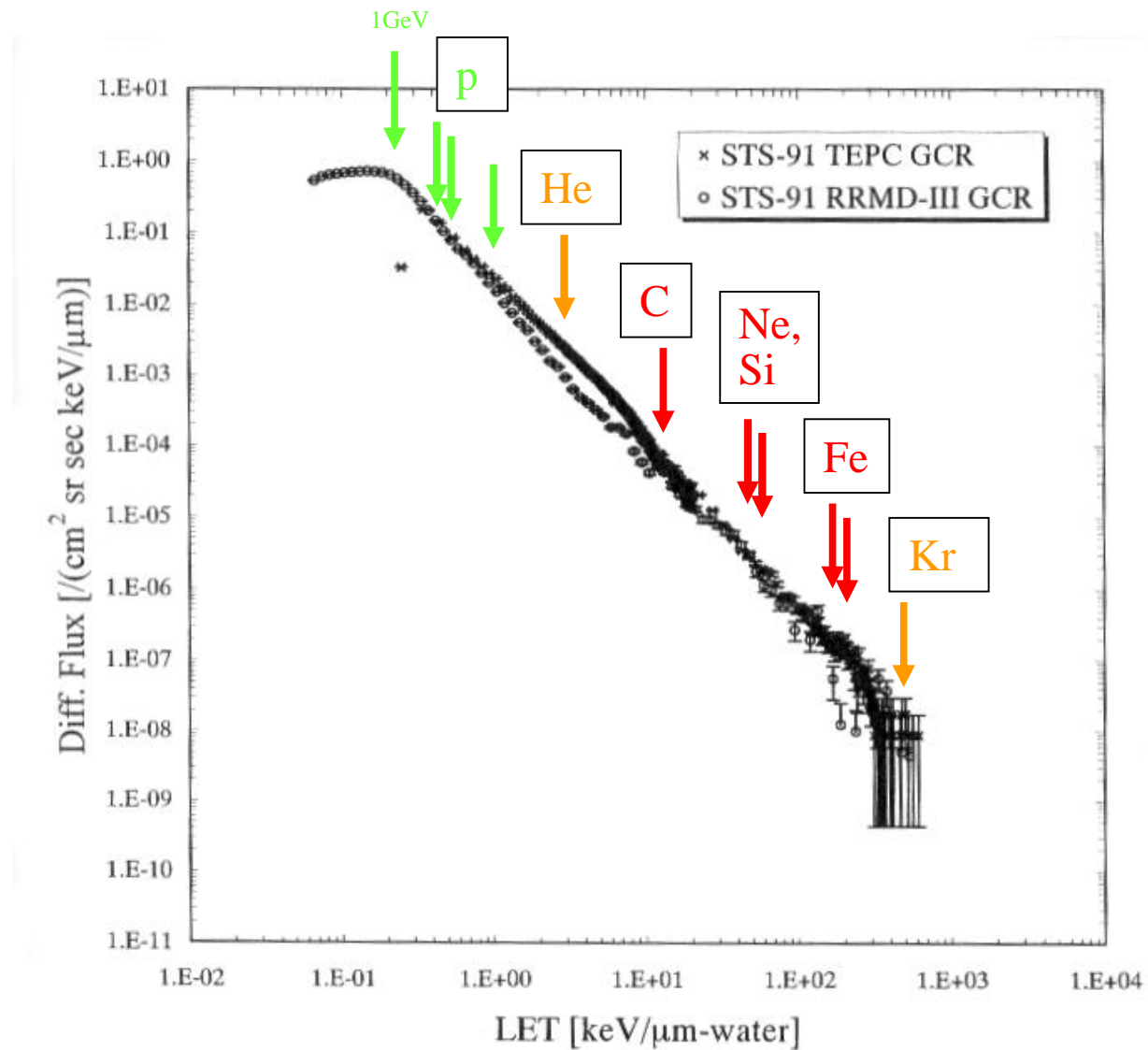
Working Group

- Yukio Uchihori (Project Coordinator), NIRS, Japan
- Kazunobu Fujitaka (Chair), NIRS, Japan
- Eric Benton (Deputy Project Coordinator), Eril Research, USA
- Nakahiro Yasuda (Deputy Project Coordinator), NIRS, Japan
- Hisashi Kitamura, NIRS, Japan
- Masashi Takada, NIRS, Japan
- Tadayoshi Doke, Waseda University, Japan
- Cary Zeitlin, LBNL, USA
- Jack Miller, LBNL, USA
- Takeshi Takashima, JAXA/ISAS, Japan
- Thomas Berger, DLR, Germany
- Michael Hajek, ATI, Austria

History of ICCHIBAN runs

Feb. 11-13, 2002	1 st ICCHIBAN Experiment (For Active Detectors)	C400, Fe400
May 23-28, 2002	2 nd ICCHIBAN Experiment (For Passive Detectors)	He150, C400, Si490, Fe500
Feb. 3-6, 2003	3 rd ICCHIBAN Experiment (For Active Detectors)	Si800, Fe500
May 19-30, 2003	4 th ICCHIBAN Experiment (For Passive Detectors)	He150, C400, Ne400, Fe500, ...
Sep. 6-7, 2003	1 st Proton ICCHIBAN Experiment (For All Detectors)	p70-250
Feb. 14-17, 2004	5 th ICCHIBAN Experiment (For Active Detectors)	He150
June 4-15, 2004	6 th ICCHIBAN Experiment (For Passive Detectors)	C135, Ar500, Kr400, ...
Sep. 24-26, 2004	1 st NSRL ICCHIBAN Experiment (For All Detectors)	p1000, O1000, Fe1000

Covered LET Region in ICCHIBAN Exp.



T.Doke et al.,
Rad. Meas. 33
(2001) 373

1st NSRL-ICCHIBAN

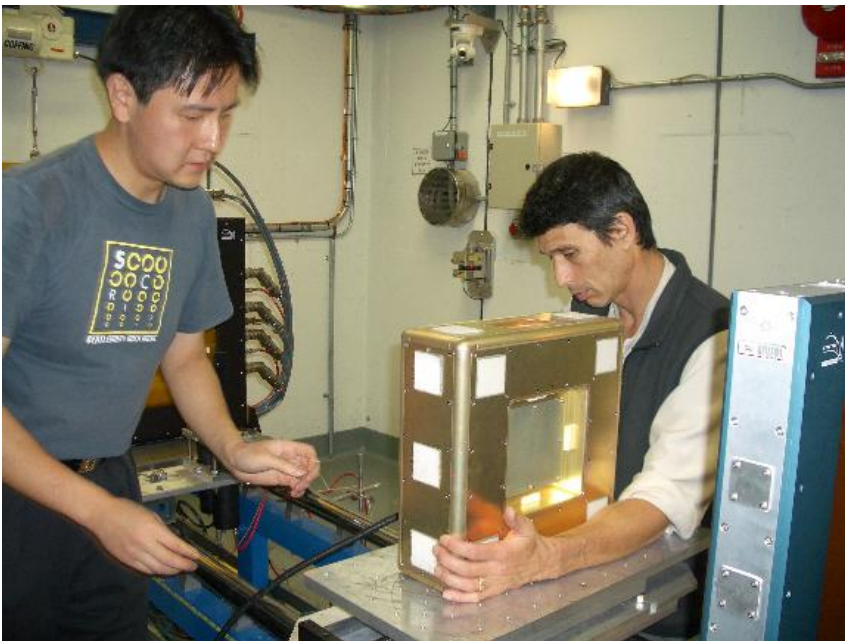
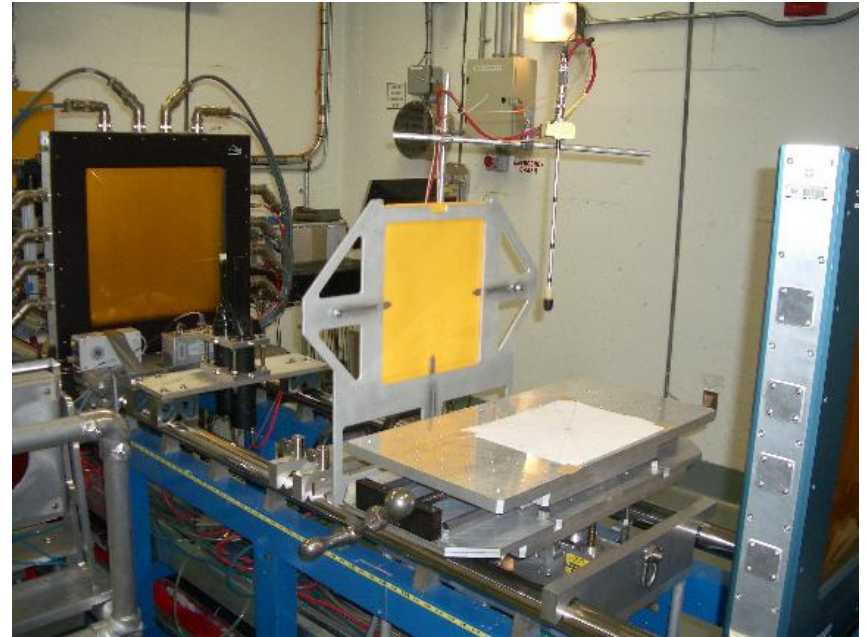
1st NSRL-ICCHIBAN Participants

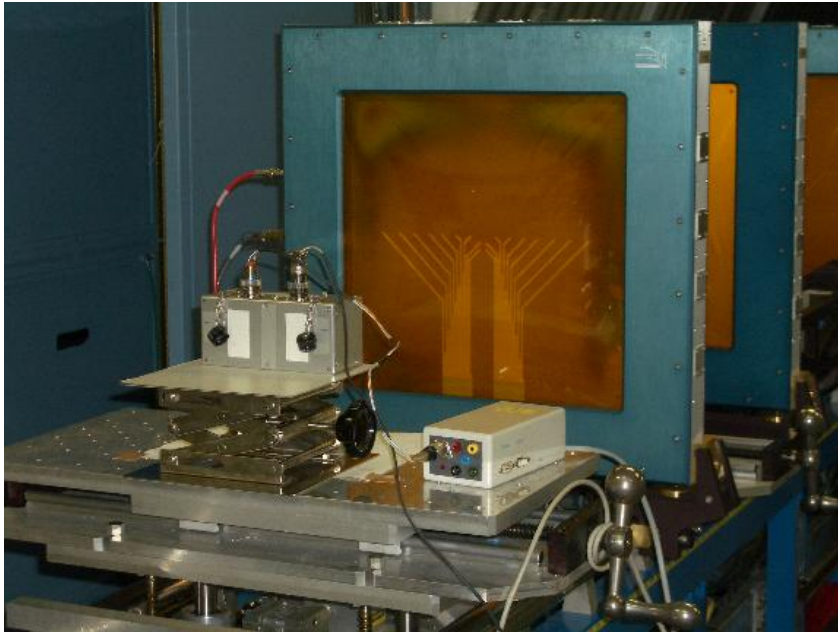
Institution	Nation	Name	Instrument and Dosimeter
BNL	USA	A. Rusek, T. Sakaguchi	Beam Line
ERI	USA	E.R. Benton	Passive Dosimeter
JAXA	Japan	T. Komiyama	RRMD-III
Kiel Univ.	Germany	R. Beaujean, S. Burmeister	DOSTEL
LBNL	USA	S. Gutersloh, L. Heilbronn, J. Miller, C. Zeitlin	Ground Base Detectors
NASA-JSC	USA	E. Semones	Passive Dosimeter
NIRS	Japan	Y. Uchihori	Liulin-4J
Prairie View A&M Univ.	USA	B. Gersey, J. Sodolak, J. Wedeking	Shuttle-type TEPC
Waseda Univ.	Japan	T. Doke, K. Takizawa, K. Terasawa	RRMD-III

1st NSRL-ICCHIBAN Run (2004)

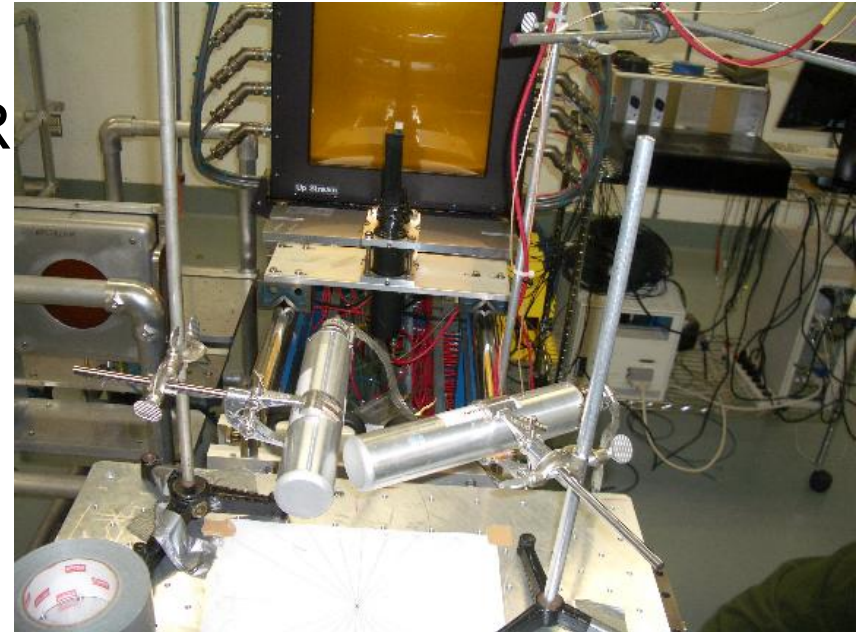
Date	Time		Ion & Energy	Range in H ₂ O	LET in H ₂ O
Sep. 25	2:00~2:00	24 hrs	p(1GeV/u)	329.0 cm	0.22 keV/um
Sep.26	2:00~2:00	24 hrs	Fe(1GeV/u)	27.2 cm	146.2 keV/um
Sep. 27	10:00~10:00	24 hrs	O(1GeV/u)	82.2 cm	13.8 keV/um

↑
Discuss later

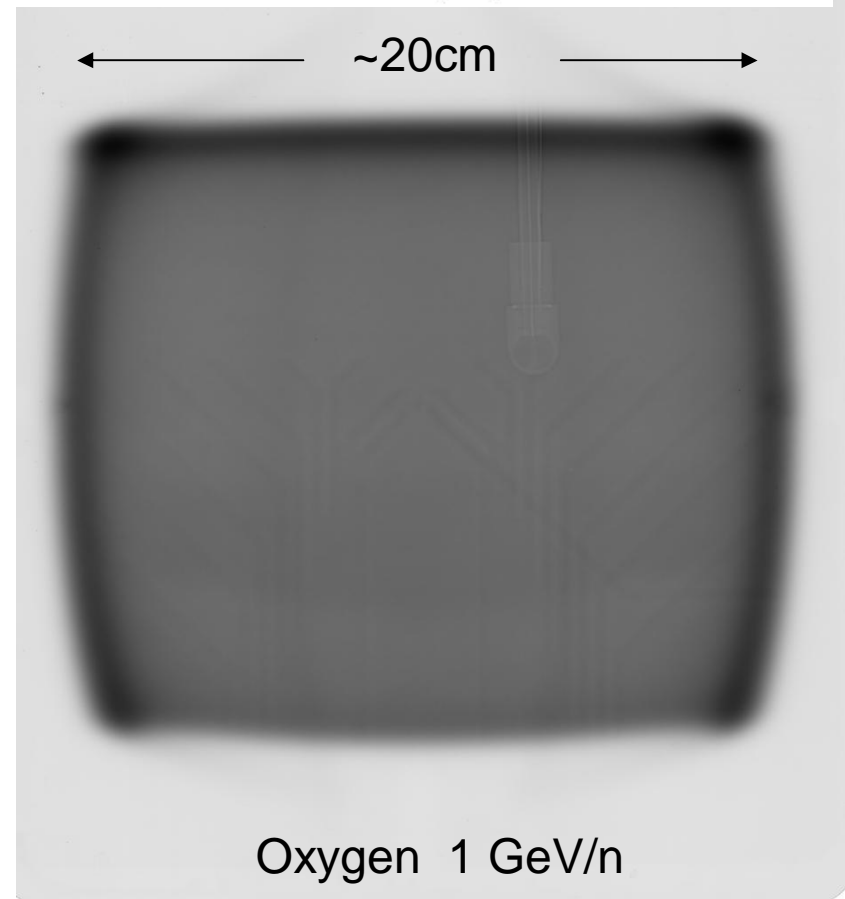
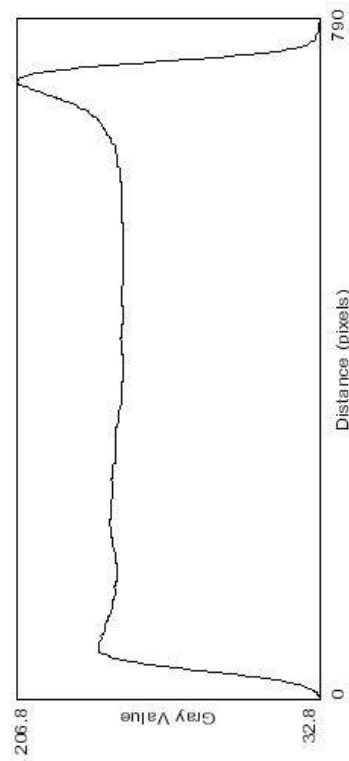
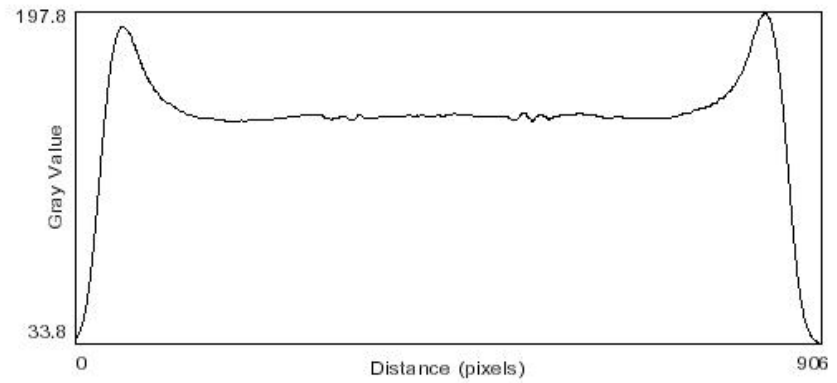




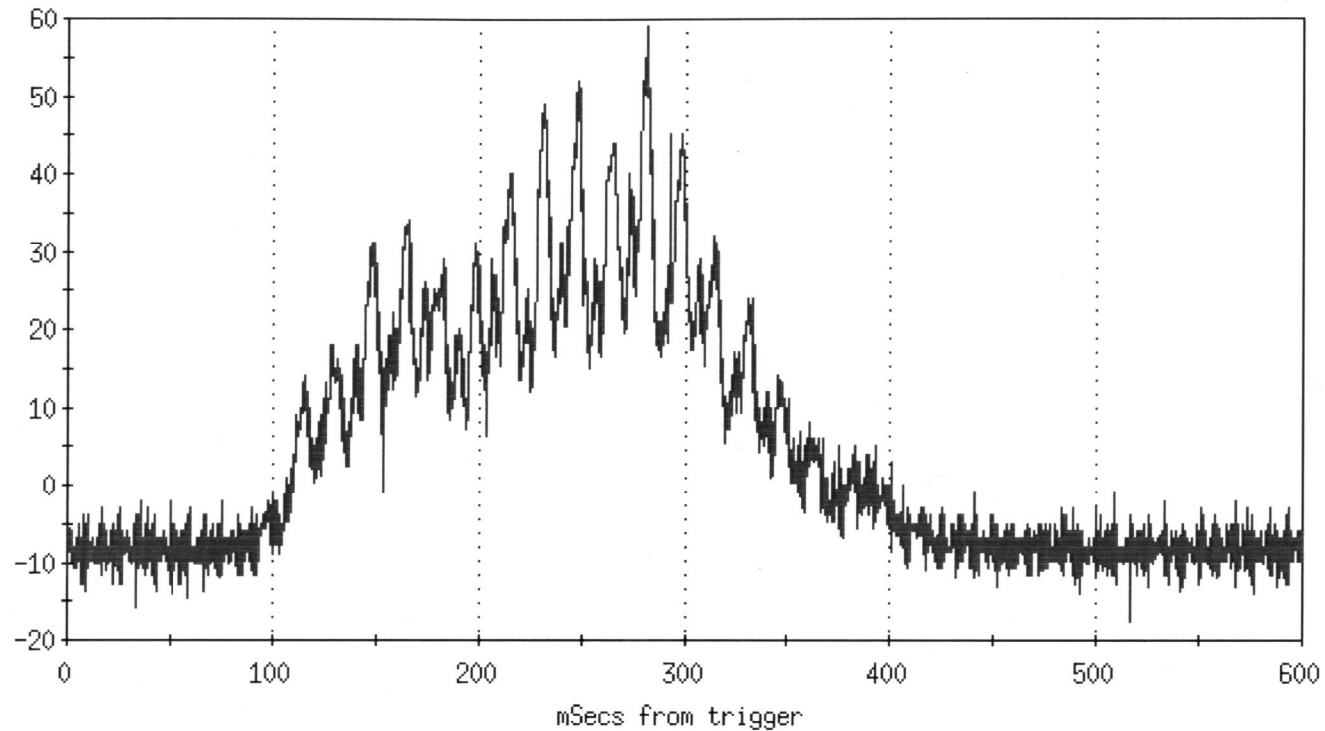
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Beam Profile



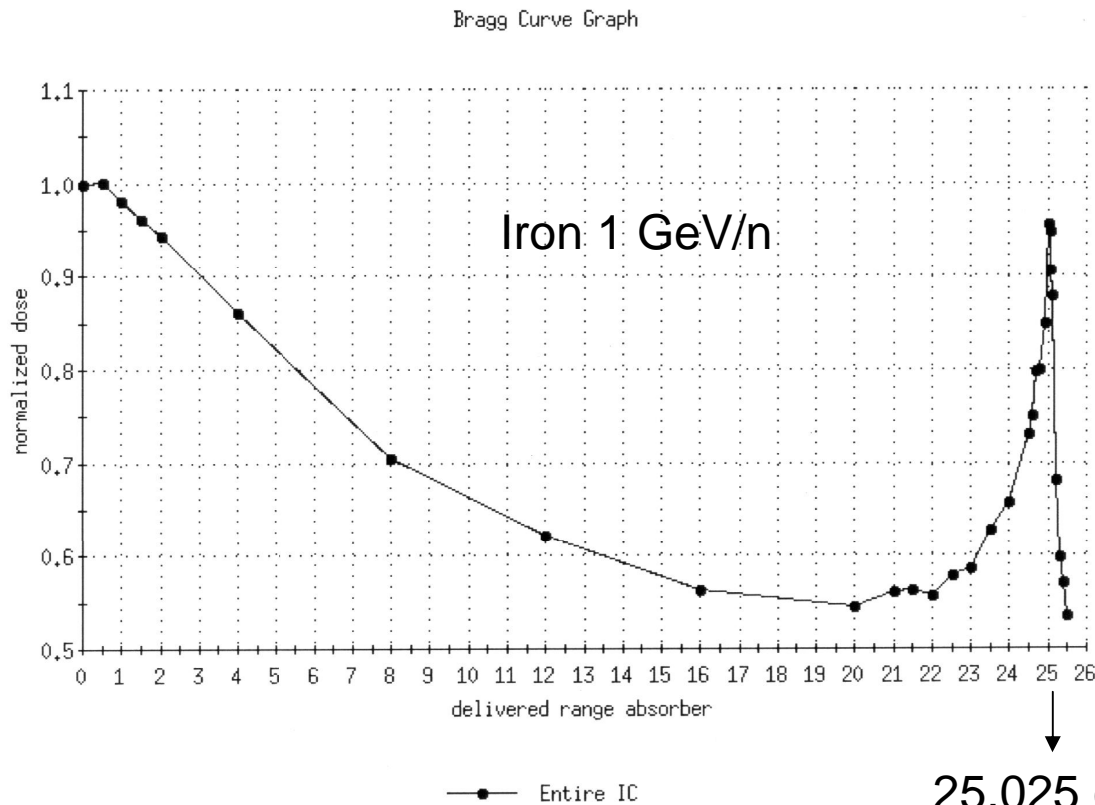
Time Profile



← 300 msec →

every 3.0 seconds

Range Measurement



Bragg Curve can be measured for Iron beams because of limited thickness of binary filters.

	Range (mm) by SRIM
Fe 1 GeV/n	273.8
O 1 GeV/n	814.9
P 1 GeV/n	3200

25.025 cm
in High-Density-
Polyethylene

25.63cm
in H₂O

952.7 MeV/n
by SRIM2003.26
but NSRL announced
968 MeV/n...

Estimated LET

SRIM2003.26

	Energy 968 MeV/n	Energy 953 MeV/n
Fe	148.0 keV/um	148.5 keV/um



Materials

12 mm H₂O



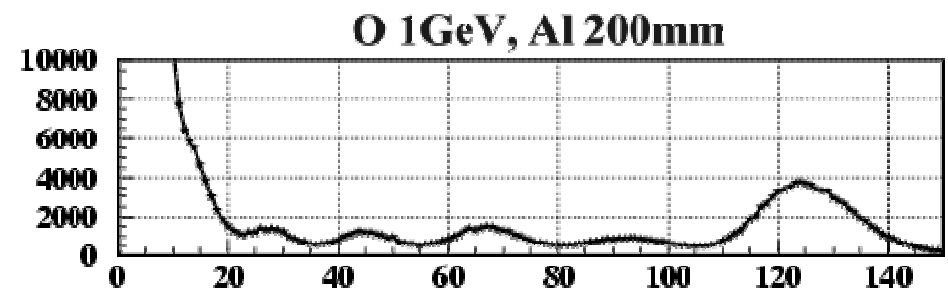
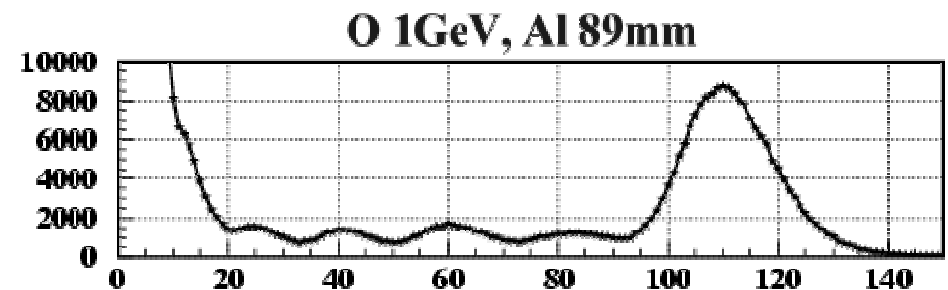
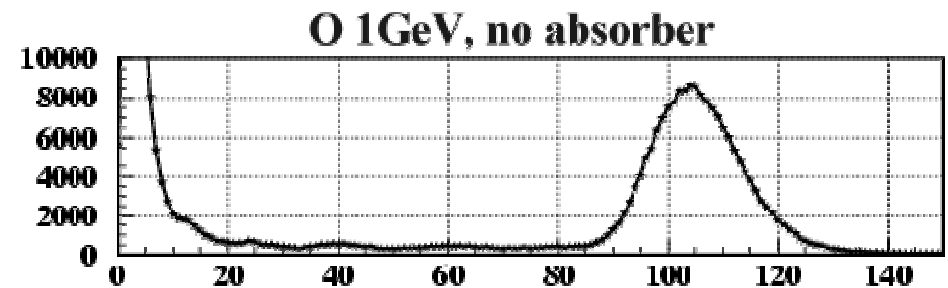
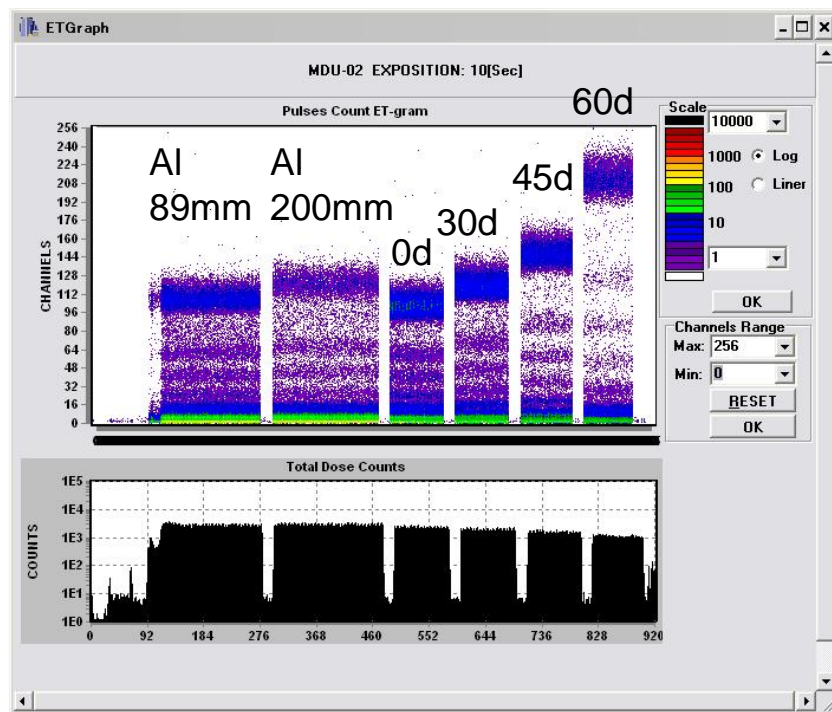
17 mm H₂O

	Energy 990 MeV/n	Energy 985 MeV/n
O	14.13 keV/um	14.14 keV/um

	Energy 990 MeV/n	Energy 990 MeV/n
p	0.223 keV/um	0.223 keV/um

Preliminary Results from Liulin-4J

- Oxygen 1 GeV/n to Liulin-4J



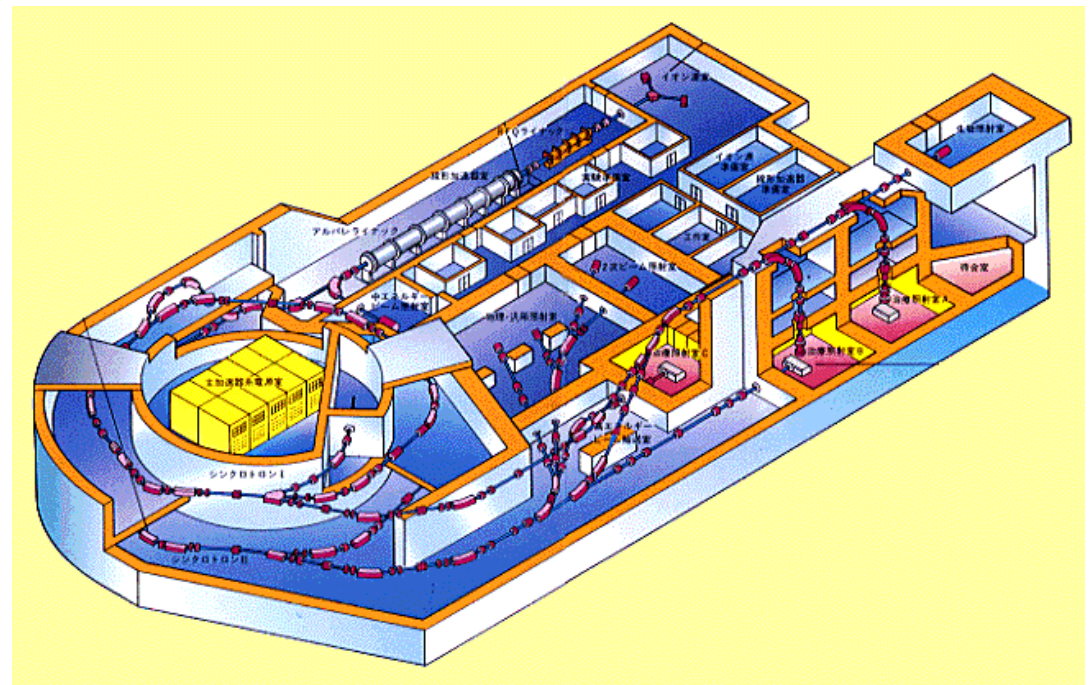
7th and 8th HIMAC-
ICCHIBAN

7th HIMAC-ICCHIBAN Run (2005)

SRIM2003.26

Date	Time		Ion & Energy	Range in H ₂ O	LET in H ₂ O
Sep. 13, 14, 15	21:00~31:00	10 hrs x 3	O(400 MeV/u)	20.5 cm	19.4 keV/um
Sep.16	21:00~20:00	23 hrs	Fe(300 MeV/u)	4.4 cm	234.4 keV/um

PH2 course in
General Physics
Exposure Room, on
lower ground floor
two, HIMAC



8th HIMAC-ICCHIBAN Run (2005)

SRIM2003.26

Date	Time		Ion & Energy	Range in H ₂ O	LET in H ₂ O
Sep. 13	25:00~30:00	5 hrs	Ar(500 MeV/u)	(13.9 cm)	(92.2 keV/um)
Sep. 15	22:00~27:00	5 hrs	O(400 MeV/u)	(20.5 cm)	(19.4 keV/um)
Sep. 17	10:00~15:00	5 hrs	He(150MeV/u)	(15.6 cm)	(2.2 keV/um)
Oct. 22	25:00~30:00	5 hrs	Fe(200 MeV/u)	(2.2 cm)	(299 keV/um)

BIO course in HIMAC

ICCHIBAN Participants Meeting

- At 18:00 on Sep. 7 in Lecture Hall.

Future Schedule of ICCHIBAN runs

Sep. 7-9, 2005	10 th WRMIS Workshop in Chiba
Sep. 13-17, 2005	7 th and 8 th ICCHIBAN Experiment (For Active and Passive Detectors)
June 2006	Deep Space ICCHIBAN
2006	GSI-ICCHIBAN Experiment ??? (For Active and Passive Detectors)

Future Possibility

- The **GSI-SIS** is a candidate facility to perform next ICCHIBAN experiments.
- Members of “Bio-Physics” group in the GSI have interest in the ICCHIBAN project. We can expect their support to perform experiments.
- Beam Spot Scanning and Fast Beam Energy Change must be very useful for our purpose.
- Although several procedure will be required to obtain beam time of GSI-SIS, we may be better to consider the possibility.

Facilities

Facility	Institution	Ions	Energy MeV/n
HIMAC	NIRS, Japan	p, He, C, O, Ne, Si, Ar, Fe, Kr, Xe	150~800
LLUMC	Loma Linda Univ., USA	p	30~250
NSRL	BNL, USA	p, C, O, Ti, Fe	200~2000
CERF	CERN, Switzerland	Neutron	~1000(?)
SIS	GSI, Germany	C, O,..., Fe, Au, U	~2000(?)

Conclusion

- 1st NSRL-ICCHIBAN run was performed successfully on Sep. 25-28 at NASA Space Radiation Laboratory in Brookhaven National Laboratory, USA.
- We would like to summarize the results from 5th and 6th HIMAC-ICCHIBAN and 1st NSRL-ICCHIBAN experiments in this year. Would you please send us your reports separately by Dec. 15, 2005.
- We will publish the results from 3rd and 4th ICCHIBAN experiments as a HIMAC Report very soon.
- 7th and 8th HIMAC-ICCHIBAN run will be performed on Sep. 13-17 at HIMAC
- Future ICCHIBAN experiments will be announced when we fix it.