BROOKHAVEN
NATIONAL LABORATORY

NSRL-07A RUN

March-April-May 2007

FINAL REPORT

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http://www.bnl.gov/medical/NASA

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EXECUTIVE SUMMARY

During the spring of 2007, a series of radiobiological and physics experiments were performed using the proton and heavy ion beams available at the NASA Space Radiation Laboratory (NSRL). These experiments were part of the twelfth NSRL scientific run (NSRL-07A) sponsored by NASA's Space Radiation Health Program (SRHP) heavy ion radiobiology research program at BNL.

A total of fifty proposals were approved and forty six participated in the NSRL-07A run. One hundred and sixty five users from forty five institutions were represented, forty two from the United States, and three foreign institutions. More than 4200 biological samples were exposed at the NSRL beam line, employing 277:35 hours of beam time (44:28 hours for in vivo studies, 157:43 hours for in vitro studies, 1:59 hours for plant studies, and 73:24 hours for physics experiments) delivered in a ten week period. In addition, 12:27 hours were used for dosimetry and beam development. Machine set-up took a total of 90:00 hours, and 22:30 hours for wrap-up of the beam. Accelerator problems with the NSRL beam accounted for 15:07 hours lost. This gave a total NSRL usage time of 417:39 hours. In addition to the NSRL beam time, there were 66:59 hours during which operations at NSRL were suspended while waiting for RHIC to fill, or waiting for RHIC to resolve problems that were specific to RHIC. These hours are recorded for informational purposes only.

During NSRL-07A, Booster provided iron (300, 600 and 1000 MeV/nucleon), protons (250, 500 and 1000 MeV/n), carbon (200 and 290 MeV/n), silicon (300, 600, and 1000 MeV/n), and titanium (1000 MeV/n) beams for biology and physics experiments. The maximum dose rates used for biology experiments were as high as 10 Gy/min (Fe 600 MeV/n). The general spill rate employed was 15 spills per minute with durations of 300 msec/spill. The spill fluence range was (particles/spill) from 1.5×10^{11} (max) and 2×10^{2} (min). Square beam spots as big as 20×20 cm^2 and as small as 1×1 cm^2 were employed for biology and physics experiments.

Tandem-Booster set-up started on 10 March 2007 with the transport and circulation of Carbon beams at the NSRL complex. Beam was tuned into the target cave on June 7 and 290 MeV/n C beams were available for tuning at 7:00 AM 12 March 2007. NSRL-07A officially ended at 9:14 PM 18 May 2007.

Projects Reviewed by the BNL Scientific Advisory Committee in Radiobiology

Exp.	Participant	Sponser	NSRL 07A Participation
B-7	**Rabin, Bernard**	NASA	Yes
B-10	**Chang, Polly**	NASA	No
B-44	**Durante, Marco**	ASI	Yes
B-52	**Gewirtz, Alan†**	NSBRI	Yes
B-67	**Blakely, Eleanor**	NASA	No
N-86	**Wang, Ya**	NASA	Yes
N-88	**Sutherland, Betsy**	NASA	Yes
N-89	**Held, Kathy**	NASA	Yes
N-90	**Bailey, Susan**	NASA	Yes
N-97	**Kronenberg, Amy**	NASA	Yes
N-99	**Zhao, Yongliang**	NASA	Yes
N-102	**Hall, Eric†**	NASA	Yes
N-103	**Barcellos-Hoff, Mary Helen†**	NASA-NSCOR	Yes
N-104	**Ullrich, Robert†**	NASA	Yes
N-116	**Benton, Eric**	NASA	Yes
N-134	**Chen, David†**	NASA	Yes
N-135	**Pluth, Janice**	NASA	Yes
N-153	**Minna, John†**	NASA-DOE	Yes
N-154	**Maurer, Richard Hornsby**	NASA-NSBRI	Yes
N-155	**Raber, Jacob**	NASA	Yes
N-156	**Pisacane, Vincent**	NSBRI	Yes
N-157	**Schiestl, Robert†**	NASA	Yes
N-159	**Hall, Eric†**	NASA	Yes
N-160	**Spence, Harlan**	NASA	Yes
N-163	**Wiese, Claudia**	NASA	Yes
N-166B	**Kennedy, Ann**	NASA-NSBRI	Yes
N-167	**Burma, Sandeep**	NASA	Yes
N-171	**Dynlacht, Joseph**	NASA	Yes
N-173	**Geard, Charles†**	NASA	Yes
N-174	**Ware, Jeffrey Hart**	NASA	Yes
N-175	**Fike, Jeffrey**	DOE-NASA-NSCOR	No
N-176	**Cucinotta, Francis A.**	NASA-DOE	Yes
N-177	**Morgan, William†**	NASA	Yes
N-178	**Yu, Yongjia**	NASA	Yes
N-179	**Grosovsky, Andrew**	NASA	No
N-180	**Carson, William**	NASA	Yes
N-181	**Obenaus, Andre**	NASA	Yes
N-182	**Dilmanian, Avraham**	Pilot	Yes
N-185	**Sutherland, Betsy**	DOE-NASA	Yes
N-188	**Green, Lora Murray**	NASA	Yes

Exp.	Participant	Sponser	NSRL 07A Participation
N-189	**Britt, Anne**	DOE-BES	Yes
N-190	**Ianzini, Fiorenza**	NASA	Yes
N-194	**Kucik, Dennis**	NASA	Yes
N-195	**DiGiuseppe, Michael†**	Northrop	Yes
N-196	**Azzam, Edouard Iskandar**	NASA	Yes
N-200	**Hlatky, Lynn**	NASA	Yes
N-202	**Shi, Yufang†**	NASA	Yes
E-3	**Christian, James**	NASA-SBIR	Yes
E-4	**Hassler, Donald**	NASA-ESMD	Yes
E-5	**Shinpaugh, Jeff**	PB-Pilot	Yes

†Not Present During Actual Run

PARTICIPANTS (Principal Investigators are highlighted)

Exp.	Participant	Affiliation	Guest Title
B-7	**Rabin, Bernard**	University of Maryland	Guest Scientist
	Carrihill, Kirsty	University of Maryland	Guest Research Associate
	Cheng, Vivian	University of Maryland	Guest Jr Research Associate
	Shukitt-Hale, Barbara	U.S. Department of Agriculture	Guest Scientist
B-44	**Durante, Marco**	Universita di Napoli	Guest Scientist
	Bertucci, Antonella	Universita di Napoli	Guest Research Assistant
	Mendonca, Marc	Indiana University @ Indianapolis	Guest Scientist
	Vazquez, Marcelo	Baylor College of Medicine	Guest Scientist
B-52	**Gewirtz, Alan**	University of Pennsylvania	Guest Scientist
N-86	**Wang, Ya**	Thomas Jefferson University	Guest Scientist
	Wang, Hongyan	Thomas Jefferson University	Guest Scientific Associate
N-88	**Sutherland, Betsy**	Brookhaven National Laboratory	Senior Scientist
N-89	**Held, Kathy**	Massachusetts General Hospital	Guest Scientist
	Purschke, Martin	Massachusetts General Hospital	Guest Research Associate
	Yang, Hongying	Massachusetts General Hospital	Guest Research Associate
N-90	**Bailey, Susan**	Colorado State University	Guest Scientist
N-97	**Kronenberg, Amy**	Lawrence Berkeley National Laboratory	Guest Scientist
	Gauny, Stacey	Lawrence Berkeley National Laboratory	Guest Scientific Associate
	Kwoh, Ely	Lawrence Berkeley National Laboratory	Guest Scientific Associate
N-99	**Zhao, Yongliang**	Columbia University	Guest Jr Research Associate
N-102	**Hall, Eric†**	Columbia University	Guest Scientist
N-103	**Barcellos-Hoff, Mary Helen†**	Lawrence Berkeley National Laboratory	Guest Scientist
	Costes, Sylvain Vincent	Lawrence Berkeley National Laboratory	Guest Scientist
	Groesser, Torsten	Lawrence Berkeley National Laboratory	Guest Research Associate
	Kronenberg, Amy	Lawrence Berkeley National Laboratory	Guest Scientist
	Mukhopadhyay, Rituparna	Lawrence Berkeley National Laboratory	Guest Jr Research Associate
	Rydberg, Bjorn E.	Lawrence Berkeley National Laboratory	Guest Scientist
N-104	**Ullrich, Robert†**	Colorado State University	Guest Scientist
	Genik, Paula	Colorado State University	Guest Scientist
	Peng, Yuanlin	Colorado State University	Guest Scientist
	Ray, Frank	Colorado State University	Guest Scientist
	Weil, Michael Michaelis	Colorado State University	Guest Scientist

Exp.	Participant	Affiliation	Guest Title
N-116	**Benton, Eric**	Eril Research, Inc.	Guest Scientist
N-134	**Chen, David†**	University of Texas Southwestern	Guest Scientist
	Aroumougame, Asaithamby	University of Texas Southwestern	Guest Scientist
N-135	**Pluth, Janice**	Lawrence Berkeley National Laboratory	Guest Scientist
	Whalen, Mary	Lawrence Berkeley National Laboratory	Guest Scientific Associate
N-153	**Minna, John†**	Hamon Cancer Center - Radiation Oncology	Guest Scientist
	Ding, Lianghao	University of Texas Southwestern	Guest Scientist
	Park, Seongmi	University of Texas Southwestern	Guest Research Associate
	Roig, Andres	University of Texas Southwestern	Guest Jr Research Associate
N-154	**Maurer, Richard Hornsby**	Johns Hopkins University	Guest Scientist
	Roth, David Richard	Johns Hopkins University	Guest Scientist
N-155	**Raber, Jacob**	Oregon Health & Science University	Guest Scientist
	Villasana, Laura	Oregon Health & Science University	Guest Jr Research Associate
N-156	**Pisacane, Vincent**	U.S. Naval Academy	Guest Scientist
	Dicello, John	Johns Hopkins University	Guest Scientist
N-157	**Schiestl, Robert†**	UCLA Schools of Medicine and Public Health	Guest Scientist
	Hafer, Kurt	University of California @ Los Angeles	Guest Jr Research Associate
	Reliene, Ramune	University of California @ Los Angeles	Guest Scientist
	Yamamoto, Mitsuko	University of California @ Los Angeles	Guest Jr Research Associate
N-159	**Hall, Eric†**	Columbia University	Guest Scientist
	David, Janice	Columbia University	Guest Scientific Associate
	Kleiman, Norman	Columbia University	Guest Scientist
N-160	**Spence, Harlan**	Boston University	Guest Scientist
	Foster, Richard	Massachusetts Institute of Technology	Guest Scientific Associate
	Kasper, Justin	Massachusetts Institute of Technology	Guest Scientist
	Mazur, Joseph	Aerospace Corporation	Guest Scientist
N-163	**Wiese, Claudia**	Lawrence Berkeley National Laboratory	Guest Scientist
N-166B	**Kennedy, Ann**	University of Pennsylvania	Guest Scientist
	Davis, James	University of Pennsylvania	Guest Scientist
	Nuth, Manunya	University of Pennsylvania	Guest Research Associate
N-167	**Burma, Sandeep**	University of Texas Medical Branch	Guest Scientist
	Mukherjee, Bipasha	University of Texas Southwestern	Guest Scientist
N-171	**Dynlacht, Joseph**	Indiana University @ Indianapolis	Guest Scientific Associate
	Caperell-Grant, Andrea	Indiana University @ Indianapolis	Guest Scientific Associate
N-173	**Geard, Charles†**	Columbia University	Guest Scientist

Exp.	Participant	Affiliation	Guest Title
	Grabham, Peter	Columbia University	Guest Scientist
	Hu, Burong	COLUMBIA NEVIS LAB	Guest Research Associate
N-174	**Ware, Jeffrey Hart**	University of Pennsylvania	Guest Scientist
	Wambi, Christel	University of Pennsylvania	Guest Research Associate
N-176	**Cucinotta, Francis A.**	NASA - Johnson Space Center	Guest Scientist
	Anderson, Jennifer	Medical Research Council	Guest Scientific Associate
	Elliott, Todd	Wyle Laboratories @ Houston	Guest Scientific Associate
	George, Kerry Ann	Wyle Laboratories @ Houston	Guest Scientific Associate
	Huff, Janice	Universities Space Research Association	Guest Scientist
N-177	**Morgan, William†**	University of Maryland School of Medicine	Guest Scientist
	Baulch, Janet	University of Maryland	Guest Scientist
	Dziegielewski, Jaroslaw	University of Maryland	Guest Research Associate
	Goetz, Wilfried	University of Maryland	Guest Scientific Associate
N-178	**Yu, Yongjia**	University of Texas Medical Branch	Guest Scientist
	Gao, Yuanyuan	University of Texas Medical Branch	Guest Scientific Associate
N-180	**Carson, William**	NASA - Johnson Space Center	Guest Research Assistant
	Delaune, Paul	NASA - Johnson Space Center	Guest Scientific Associate
	Dungan, Larry	NASA - Johnson Space Center	Guest Scientific Associate
	Hall, Gregory	National Aeronautics and Space Administration	Guest Scientific Associate
	Klyachko, Alexander	Indiana University @ Bloomington	Guest Scientist
	Sokol, Paul Eugene	Indiana University @ Bloomington	Guest Scientist
	Solberg, Keith	Indiana University @ Bloomington	Guest Scientific Associate
N-181	**Obenaus, Andre**	Loma Linda University	Guest Scientist
	Jones, Tamako A.	NASA - Loma Linda University Medical School	Guest Scientific Associate
	Smith, Anna Lucille	Loma Linda University	Guest Scientific Associate
N-182	**Dilmanian, Avraham**	Brookhaven National Laboratory	Scientist
N-185	**Sutherland, Betsy**	Brookhaven National Laboratory	Scientist
N-188	**Green, Lora Murray**	Loma Linda University Medical Center	Guest Scientist
N-189	**Britt, Anne**	University of California @ Davis	Guest Scientist
N-190	**Ianzini, Fiorenza**	University of Iowa	Guest Scientist
	Sjogren, Christina	University of Iowa	Guest Scientific Associate
	Kosmacek, Elizabeth	University of Iowa	Guest Research Assistant
N-194	**Kucik, Dennis**	University of Alabama	Guest Scientist
	Bakke, James	SRI International	Guest Scientific Associate
	Chang, Polly Yee	SRI International	Guest Scientist

Exp.	Participant	Affiliation	Guest Title
	Gupta, Kiran	University of Alabama	Guest Jr Research Associate
	Khaled, Saman	University of Alabama	Guest Jr Research Associate
	Wu, Xing	University of Alabama	Guest Scientist
N-195	**DiGiuseppe, Michael†**	Northrop Grumman Corp.	Guest Scientist
	Eimer, Benjamin	University of Tennessee	Guest Research Associate
	Zeitlin, Cary	Lawrence Berkeley National Laboratory	Guest Scientist
N-196	**Azzam, Edouard Iskandar**	University of Medicine and Dentistry of NJ	Guest Scientist
	Autsavapromporn, Narongchai	University of Medicine and Dentistry of NJ	Guest Jr Research Associate
	Buonanno, Manuela	University of Medicine and Dentistry of NJ	Guest Research Assistant
	Yang, Zhi	University of Medicine and Dentistry of NJ	Guest Research Associate
	de Toledo, Sonia	University of Medicine and Dentistry of NJ	Guest Scientist
N-200	**Hlatky, Lynn**	Tufts University	Guest Scientist
	Beheshti, Afshin	Tufts University	Guest Scientist
	Burg, Aaron	Tufts University	Guest Scientific Associate
	Girdhani, Swati	Tufts University	Guest Scientist
	Hahnfeldt, Philip	Tufts University	Guest Scientist
	Lamont, Clare	Tufts University	Guest Scientific Associate
	Perkins, Matthew	Tufts University	Guest Scientific Associate
N-202	**Shi, Yufang†**	Robert Wood Johnson Medical School	Guest Scientist
	Roberts, Arthur	University of Medicine and Dentistry of NJ	Guest Jr Research Associate
	Xu, Guangwu	University of Medicine and Dentistry of NJ	Guest Scientist
E-3	**Christian, James**	Radiation Monitoring Devices, Inc.	Guest Scientist
	Johnson, Erik	Radiation Monitoring Devices, Inc.	Guest Research Associate
E-4	**Hassler, Donald**	Southwest Research Institute	Guest Scientist
	Bokman, Ryan	Southwest Research Institute	Guest Scientific Associate
	Kortmann, Onno	Christian-Albrechts	Guest Jr Research Associate
	Martin, Cesar	University of Kiel	Guest Research Associate
	Posner, Arik	Southwest Research Institute	Guest Scientist
	Weigle, Gerald	Southwest Research Institute	Guest Jr Research Associate
E-5	**Shinpaugh, Jeff**	East Carolina University	Guest Scientist
NSRL(NASA)	**Sulzman, Frank Michael**	NASA - Johnson Space Center	Guest Scientist
NSRL	Guida Peter‡	Brookhaven National Laboratory	Scientist
NSRL	Tafrov, Stefan ‡	Brookhaven National Laboratory	Associate Scientist
NSRL	Keszenman, Deborah‡	Brookhaven National Laboratory	Associate Scientist
NSRL	Pyatt, Beatrice ‡	Brookhaven National Laboratory	Medical Associate

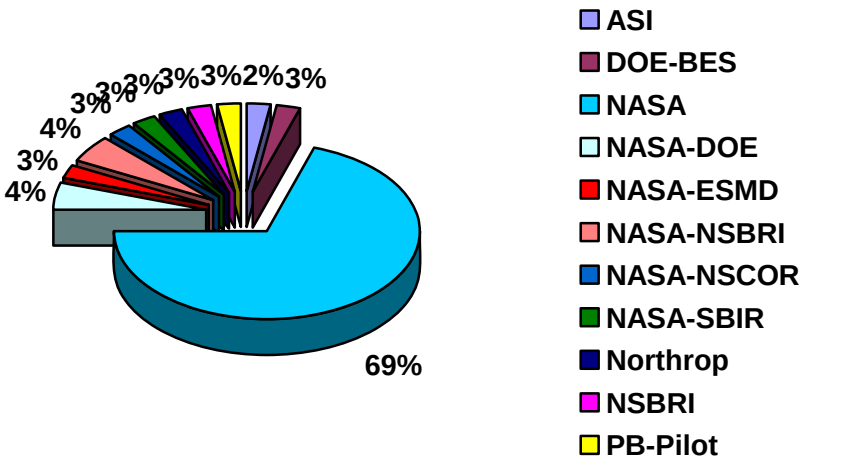
Exp.	Participant	Affiliation	Guest Title
NSRL	Abele, William	Brookhaven National Laboratory	Associate Scientist
NSRL	Sutherland, John ‡	Brookhaven National Laboratory	Senior Scientist
NSRL	Bennett, Paula ‡	Brookhaven National Laboratory	Biology Associate I
NSRL	Trunk, John ‡	Brookhaven National Laboratory	Senior Technical Associate
NSRL	Hein, Patricia ‡	Brookhaven National Laboratory	Senior Administrative Assistant
NSRL	Kershaw, Maryann‡	Brookhaven National Laboratory	BLAF Manager
NSRL	Jardine, James ‡	Brookhaven National Laboratory	Laboratory Specialist
NSRL	Sivertz, Michael‡	Brookhaven National Laboratory	Scientist
NSRL	Naidu, Mamta ‡	Brookhaven National Laboratory	Associate Scientist
NSRL	Kim, Angela ‡	Brookhaven National Laboratory	Medical Associate
NSRL	Billups, Adele‡	Brookhaven National Laboratory	Medical Associate
NSRL	Thompson, Laura‡	Brookhaven National Laboratory	Medical Associate
NSRL	Rusek, Adam‡	Brookhaven National Laboratory	Scientist

† Not present during actual run.
‡ BNL Personnel who participated in many different experiments throughout the run.

PARTICIPANT INSTITUTIONS

Universities (29)	**National Laboratories/Institutions (2)**
Baylor College of Medicine	Brookhaven National Laboratory
Boston University	Lawrence Berkeley National Laboratory
Christian-Albrechts University	
Colorado State University	
Columbia Nevis Lab	**NASA Related Centers/institutions (3)**
Columbia University	NASA - Johnson Space Center
East Carolina University	NASA - Loma Linda University Medical School
Indiana University @ Bloomington	National Aeronautics and Space Admin. (NASA)
Indiana University @ Indianapolis	
Johns Hopkins University	
Loma Linda University	**Private Institutions (8)**
Massachusetts Institute of Technology	Aerospace Corporation
Oregon Health & Science University	Eril Research, Inc.
Robert Woods Johnson Medical School	Hamon Cancer Center – Radiation Oncology
Thomas Jefferson University	Massachusetts General Hospital
Tufts University	Northrop Grumman Corp.
U.S. Naval Academy	Radiation Monitoring Devices, Inc.
Universita di Napoli	SRI International
Universities Space Research Association	Southwest Research Institute
University of Alabama	
University of California @ Davis	
University of California @ Los Angeles	**Government (3)**
University of Iowa	Medical Research Council
University of Kiel	U.S. Department of Agriculture
University of Maryland	Wyle Laboratories @ Houston
University of Medicine and Dentistry of NJ	
University of Pennsylvania	
University of Tennessee	
University of Texas Southwestern	

RESEARCH PROJECT SPONSORS



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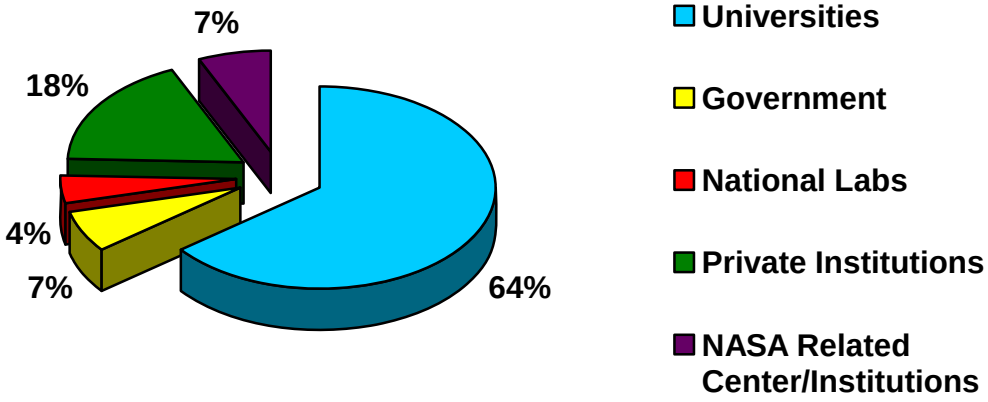
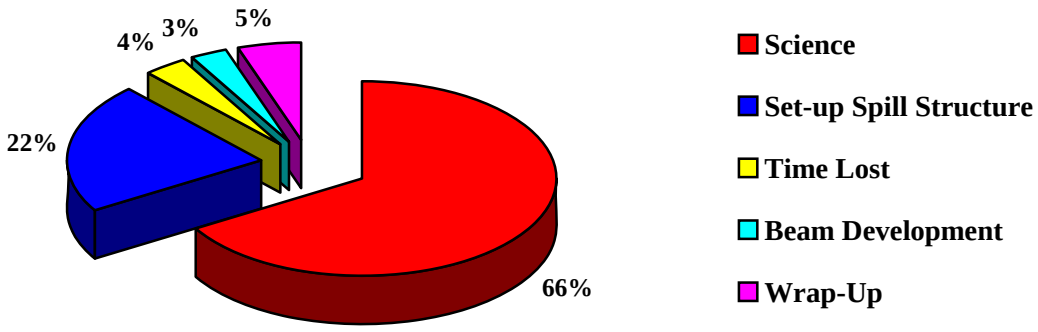
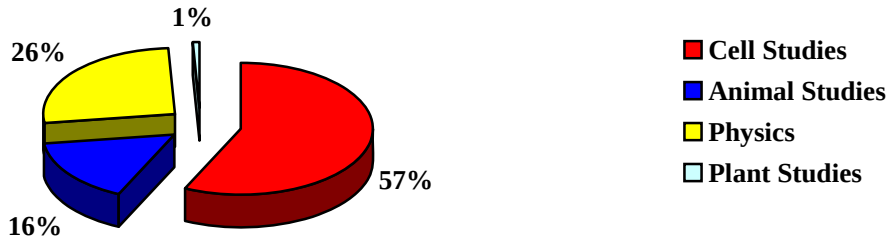
INSTITUTION STATISTICS



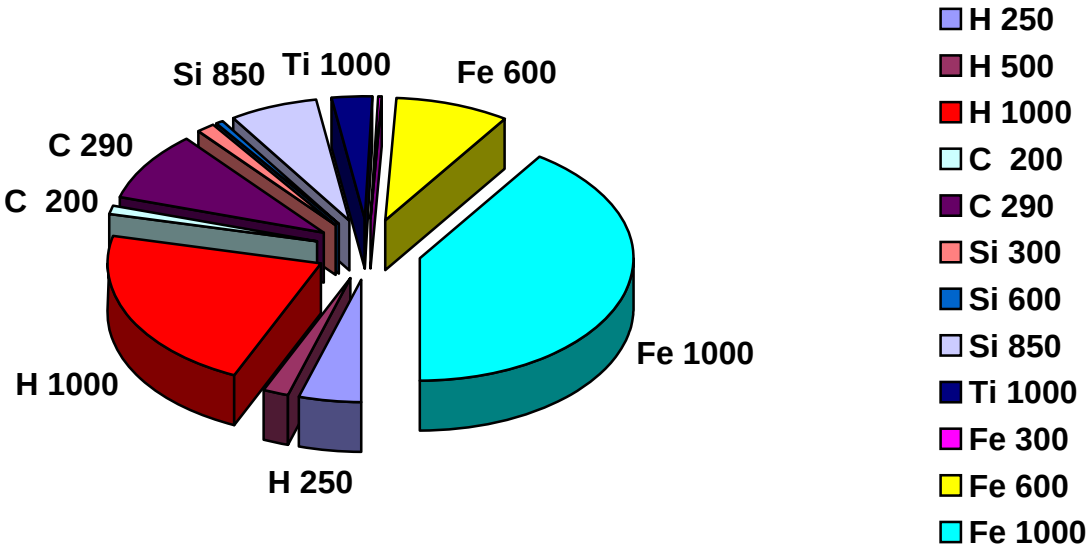
TOTAL RUN-TIME STATISTICS



SCIENCE STUDIES STATISTICS



ION SPECIES AND ENERGY (MeV/n) DISTRIBUTION



RUN TIME DESCRIPTION (hours)

NSRL-07A	ION SPECIES AND ENERGIES (MeV/nucleon)												
	H			C		Si			Ti	Fe			Total
	250	500	1000	200	290	300	600	850	1000	300	600	1000	
Machine Set-Up	4:00:00	2:00:00	18:00:00	0:00	8:00:00	2:00:00	0:00:00	4:00:00	4:00:00	0:00:00	8:00:00	40:00:00	**90:00**
Wrap-Up	0:30:00	0:30:00	4:30:00	0:30:00	1:30:00	0:00:00	0:00:00	1:30:00	1:00:00	0:00:00	1:30:00	11:00:00	**22:30**
Non-Science Sub-Total:													**112:30**
Development	0:00:00	0:00:00	4:49:00	0:00:00	0:45:00	0:00:00	0:00:00	2:19:00	0:00:00	0:00:00	0:00:00	4:34:10	**12:27**
Biology													
In Vitro	4:53:10	6:00:08	43:05:03	0:00:00	14:47:40	1:25:53	1:38:31	8:04:48	7:48:31	1:12:09	5:57:03	62:50:14	**157:43**
In Vivo	0:00:00	0:00:00	4:29:00	0:00:00	5:16:02	0:00:00	0:00:00	2:26:45	0:00:00	0:00:00	17:26:52	14:49:24	**44:28**
Others	0:00:00	0:00:00	0:00:00	0:00:00	0:00:00	0:00:00	0:00:00	0:00:00	0:00:00	0:00:00	0:00:00	1:59:30	**1:59**
Physics	9:00:02	0:00:00	14:30:04	3:49:47	7:01:26	2:46:21	0:00:00	6:06:16	0:00:00	0:00:00	1:55:34	28:15:01	**73:24**
Science Sub Total:													**277:35**
RHIC Time Lost*	0:00:00	0:00:00	0:00:00	0:00:00	0:00:00	0:00:00	0:00:00	0:00:00	1:10:00	0:00:00	10:20:00	55:29:00	66:59
NSRL Time Lost	1:00:00	0:30:00	2:00:00	0:00:00	0:50:00	0:00:00	0:50:00	2:55:00	0:07:00	0:00:00	1:05:00	5:50:00	**15:07**
Totals	**19:23**	**9:00**	**91:23**	**4:20**	**38:10**	**6:12**	**2:29**	**27:22**	**12:56**	**1:12**	**35:54**	**169:18**	**417:39**

*Time lost due to RHIC filling and other RHIC-associated activities are reported, but do not contribute to the total hours

BEAM CHARACTERISTICS

Ion	H			C		Si			Ti	Fe		
Energy (MeV/n)												
Planned	250	500	1000	200	290	300	600	850	1000	300	600	1000
Extracted	250	500	1000	200	290	300	600	850	1000	300	600	1000
On Target	250	500*	1000*	200	293	296	591	834	972	300*	593	968
Fluence (particles/cm^2/sec)												
Maximum on target	1.13E+09	1.13E+09	1.13E+09	1.13E+08	1.13E+08	1.28E+08	1.28E+08	1.28E+08	6.75E+06	7.50E+06	7.50E+06	7.50E+06
Minimum on target	200	200	200	200	200	200	200	200	200	200	200	200
Spill Period (sec)	4	4	4	4	4	4	4	4	4	4	4	4
Spill rate (spills/min)	15	15	15	15	15	15	15	15	15	15	15	15
Spill length (msec)	300	300	300	300	300	300	300	300	300	300	300	300
Particles/spill												
Maximum	1.50E+11	1.50E+11	1.50E+11	1.50E+10	1.50E+10	1.70E+10	1.70E+10	1.70E+10	9.00E+08	1.00E+09	1.00E+09	1.00E+09
Minimum	200	200	200	200	200	200	200	200	200	200	200	200
Beam Cut Off Accuracy	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%
Actual LET on Target (keV/µm)	0.392*	0.276*	0.222*	16	13	69	50	45	108	239*	174	151
Max. Dose Rate (Gy/min) 20 cm x 20 cm	0.0001	1	1	0.1	4	4	1.3	10	2	0.5	10	5
Total Dose (Gy)												
Maximum	N/A	50	7.2	N/A	5	50	50	100	2	1	20	100
Minimum	N/A	0.0001	0.0001	N/A	0.01	0.5	0.5	0.25	0.0001	1	0.1	0.0001

* No Bragg results are available for H running at 500 or 1000 MeV, or Fe at 300 MeV/nucleon. Only calculated LET is quoted.

DOSIMETRY AND BEAM DEVELOPMENTS

Target Room Access:

Since NSRL experiments overlapped with RHIC for most of the NSRL-07A running, extra safeguards were required for access to the target room. This necessitated longer access time for experimenters. Typical times for target room entrances and exits were five minutes longer than during running periods when RHIC was off. This made exposures slower, and generally prolonged the schedule, emphasizing the importance of making NSRL access independent of Booster/AGS/RHIC beam components.

Microscope room:

In preparation for NSRL 07A, major modifications to the fluorescence microscope set up at NSRL were made. The most significant of these was the purchase and installation of an air-driven anti-vibration table (63-500 series from Technical Manufacturing Corporation) dedicated solely to the Zeiss microscope. In addition, re-configuration and updates to the AxioVision software were made to optimize and stabilize time lapse image acquisition. In the aftermath of these changes, Dr. Sylvain Costes reported that he was "very satisfied" with the results he obtained during NSRL 07A with the new fluorescence microscope set up.

Concurrent running with RHIC:

During the NSRL 07A running, access time was made longer because of additional safeguards preventing beam from entering the target room when personnel may be inside. This additional time stretched out most of our running schedules making for delayed experiments and long shifts. In addition to the longer access time, whenever RHIC was filling during heavy ion running, NSRL had to be off for the duration of that fill; typically 1-2 hours. Since a RHIC fill occurred every 4-6 hours, this added additional delay to the already stretched schedule. Lastly there were the unscheduled delays in NSRL running caused by problems getting RHIC running. During a regular funding cycle, RHIC expects to turn on in November or December each year. When the "Spring" NSRL run begins in March, most of the "turn-on" problems have been worked out of the system. This year RHIC did not begin turning on until after NSRL 07A started, thus making the NSRL running much more frequently interrupted by RHIC's teething problems. Apart from making scheduling very difficult, the effect of all these delays and uncertainties was to add work load to the personnel tasked with making these experiments a success.

New Beams:

During NSRL 07A the flowing beams were developed and used for the first time:

Protons at 250 and 500 MeV,
Carbon at 200 MeV/n and
Silicon at 850 MeV/n.

RUN DATES

Ion	Energy	Scheduled Start	Scheduled End	Actual Start	Actual End
Carbon	290	3/12/07 7:00	3/13/07 13:00	3/12/07 7:00	3/13/07 13:47
Carbon	200	3/13/07 13:00	3/13/07 16:00	3/13/07 13:47	3/13/07 17:36
Carbon	290	3/13/07 16:00	3/15/07 14:30	3/13/07 17:36	3/15/07 14:16
Silicon	300	3/16/07 7:00	3/16/07 10:00	3/16/07 7:00	3/16/07 10:30
Silicon	600	3/16/07 10:00	3/16/07 11:00	3/16/07 10:30	3/16/07 12:58
Silicon	850	3/16/07 11:00	3/20/07 11:00	3/16/07 12:58	3/20/07 13:00
Silicon	300	3/20/07 11:00	3/20/07 13:30	3/20/07 13:00	3/20/07 15:46
Silicon	850	3/20/07 13:30	3/20/07 17:30	3/20/07 15:46	3/20/07 18:43
Protons	1000	3/21/07 7:00	3/22/07 13:30	3/21/07 7:00	3/22/07 12:45
Protons	250	3/23/07 7:00	3/23/07 18:30	3/23/07 7:00	3/23/07 18:30
Protons	1000	3/26/07 7:00	3/26/07 16:30	3/26/07 8:29	3/26/07 17:50
Protons	250	3/27/07 7:00	3/27/07 14:00	3/27/07 7:00	3/27/07 13:53
Protons	1000	3/27/07 14:00	3/27/07 15:30	3/27/07 13:53	3/27/07 15:55
Protons	500	3/29/07 7:00	3/29/07 14:30	3/29/07 7:00	3/29/07 14:30
Protons	1000	3/30/07 7:00	3/30/07 19:30	3/30/07 7:00	3/30/07 22:39
Iron	1000	4/2/07 7:00	4/5/07 10:00	4/2/07 8:29	4/5/07 14:10
Iron	300	4/5/07 10:00	4/5/07 12:00	4/5/07 14:10	4/5/07 15:22
Iron	1000	4/5/07 12:00	4/5/07 13:30	4/5/07 15:22	4/5/07 18:40
Iron	600	4/5/07 13:30	4/5/07 18:00	4/5/07 19:30	4/6/07 2:00
Iron	1000	4/6/07 7:00	4/6/07 13:30	4/6/07 2:00	4/6/07 9:23
Iron	600	4/6/07 13:30	4/6/07 18:00	4/6/07 19:00	4/6/07 23:10
Iron	1000	4/9/07 7:00	4/10/07 18:00	4/9/07 16:30	4/12/07 0:26
Titanium	1000	4/12/07 7:00	4/13/07 17:30	4/12/07 22:01	4/13/07 21:37
Iron	1000	4/14/07 7:00	4/16/07 15:30	4/14/07 12:21	4/16/07 19:30
Protons	1000	4/17/07 7:00	4/18/07 17:30	4/17/07 10:30	4/18/07 14:06
Iron	600	4/19/07 7:00	4/19/07 12:30	4/19/07 17:04	4/19/07 21:00
Iron	1000	4/19/07 12:30	4/20/07 13:30	4/19/07 21:00	4/20/07 10:30
Iron	600	4/20/07 13:30	4/20/07 17:00	4/20/07 10:30	4/20/07 17:20
Protons	1000	4/23/07 7:00	4/23/07 19:30	4/23/07 7:00	4/23/07 13:40
Iron	1000	4/24/07 7:00	4/24/07 16:30	4/23/07 13:40	4/23/07 20:24
Protons	1000	4/25/07 7:00	4/25/07 17:30	4/25/07 15:15	4/25/07 20:18
Iron	1000	4/26/07 7:00	4/26/07 18:00	4/26/07 20:31	4/27/07 0:36
Protons	1000	4/27/07 7:00	4/27/07 19:30	4/27/07 10:30	4/27/07 20:30
Iron	1000	4/30/07 7:00	4/30/07 18:30	4/30/07 10:20	4/30/07 17:38
Iron	600	5/1/07 7:00	5/1/07 20:00	5/1/07 16:30	5/2/07 0:01
Iron	1000	5/3/07 7:00	5/15/07 12:00	5/2/07 18:45	5/14/07 19:08
Iron	600	5/15/07 12:00	5/15/07 16:30	5/15/07 10:30	5/15/07 20:47
Iron	1000	5/17/07 7:00	5/18/07 16:30	5/15/07 20:47	5/18/07 21:14

EXPERIMENTERS AND RUN STATISTICS

Proposal Number	Principle Investigator	Ion	Energy	Beam Time Approved	Beam Time Used	Dose Range	Dose Rate	Number of Samples
B-7	Rabin, Bernard	Carbon	290	5:00:00	5:16:02	10-200	50-100	98
B-7	Rabin, Bernard	Iron	1000	6:30:00	5:35:00	50-200	50-100	125
B-10	Chang, Polly	Protons	1000	18:30:00	0:00:00			
B-44	Durante, Marco	Iron	1000	5:00:00	5:44:32	100	100	1
B-44	Durante, Marco	Protons	1000	4:30:00	9:43:37	50 - 250	.8 - 100	10
B-52	Gewirtz, Alan	Iron	1000	1:30:00	0:36:32	5-30	20	15
B-52	Gewirtz, Alan	Protons	1000	5:00:00	5:59:00	low	low	24
B-67	Blakely, Eleanor	Titanium	1000	11:00:00	0:00:00			
N-86	Wang, Ya	Iron	1000	3:00:00	1:40:06	50-300	100	40
N-88	Sutherland, Betsy	Protons	250	See note [1]	4:53:10	low	low	22
N-88	Sutherland, Betsy	Protons	500	See note [1]	6:00:08	0.000001 - 5000	very low	35
N-88	Sutherland, Betsy	Protons	1000	5:00:00	6:07:31	low	.000001	3
N-88	Sutherland, Betsy	Silicon	300	2:00:00	1:25:53	50-5000	100-400	12
N-88	Sutherland, Betsy	Silicon	600	See note [2]	1:38:31	50-5000	130	12
N-89	Held, Kathy	Carbon	290	6:12:00	6:15:40	0.00001 - 500	0.00001-230	60
N-89	Held, Kathy	Iron	1000	7:00:00	4:43:20	0.0001-200	0.0001-200	94
N-89	Held, Kathy	Protons	1000	6:12:00	6:16:09	low	low	60
N-89	Held, Kathy	Titanium	1000	6:18:00	4:28:07	.00001-200	0.0001 - 200	350
N-90	Bailey, Susan	Iron	1000	2:00:00	0:49:56	100-200	100-200	24
N-97	Kronenberg, Amy	Iron	1000	9:00:00	0:00:00			
N-97	Kronenberg, Amy	Protons	1000	10:30:00	5:55:37	50-530	30-70	32
N-99	Zhao, Yongliang	Iron	1000	1:30:00	0:25:54	10-100	100	8
N-102	Hall, Eric	Iron	1000	2:12:00	0:51:45	150	50	18
N-103	Barcellos-Hoff, Mary Helen	Iron	1000	10:00:00	10:20:22	50-500	100	76
N-104	Ulrich,Robert	Iron	1000	4:36:00	2:00:00	10-100	20-100	200
N-104	Ulrich,Robert	Silicon	850	3:15:00	2:26:45	100-300	100	100
N-116	Benton, Eric	Protons	1000	3:00:00	7:20:52	200	20	120
N-116	Benton, Eric	Silicon	850	6:00:00	6:06:16	100-10000	1-1000	12
N-134	Chen, David	Iron	1000	3:00:00	2:12:36	100	50-100	46
N-134	Chen, David	Silicon	300	1:30:00	0:00:00			
N-134	Chen, David	Silicon	850	1:30:00	2:23:39	100	50	29

Proposal Number	Principle Investigator	Ion	Energy	Beam Time Approved	Beam Time Used	Dose Range	Dose Rate	Number of Samples
N-135	Pluth, Janice	Iron	1000	8:00:00	6:26:38	5-500	10-200	250
N-153	Minna, John	Iron	300	0:00:00	1:12:09	100	50	4
N-153	Minna, John	Iron	1000	19:00:00	1:11:56	50-100	50	28
N-153	Minna, John	Silicon	850	0:00:00	5:41:09	100-300	100	42
N-153	Minna, John	Protons	1000	3:00:00	0:00:00			
N-154	Maurer, Richard	Iron	1000	6:00:00	12:23:36	low	low	1
N-154	Maurer, Richard	Silicon	1000	6:00:00	0:00:00			
N-155	Raber	Iron	600	7:42:00	1:01:21	300	200	60
N-156	Pisacane, Vincent	Carbon	200	0:00:00	3:49:47	low	1000/spill	1
N-156	Pisacane, Vincent	Carbon	290	8:00:00	7:01:26	low	1000/spill	1
N-156	Pisacane, Vincent	Protons	250	8:00:00	9:00:02	low	low	1
N-157	Schiestl, Robert	Iron	1000	2:00:00	1:11:24	100	100	65
N-159	Hall, Eric	Iron	1000	5:30:00	2:40:24	20-200	20-100	50
N-160	Spence, Harlan	Iron	600	1:48:00	1:55:34	low	low	1
N-160	Spence, Harlan	Iron	1000	1:48:00	1:27:48	low	low	1
N-160	Spence, Harlan	Protons	1000	2:06:00	2:15:00	low	low	1
N-160	Spence, Harlan	Silicon	300	2:24:00	2:46:21	low	low	1
N-163	Wiese, Claudia	Iron	1000	6:00:00	2:39:02	31.5-400	200	117
N-164	Yu, Yongjia	Iron	1000	2:00:00	0:51:00		50-150	7
N-166B	Kennedy, Ann	Iron	1000	3:30:00	1:45:28			100
N-166B	Kennedy, Ann	Protons	1000	9:30:00	9:35:47	40-720	70-80	286
N-167	Burma, Sandeep	Iron	1000	2:00:00	2:43:12	100-500	200	130
N-167	Burma, Sandeep	Silicon	1000	2:00:00	0:00:00			
N-171	Dynlacht, Joseph	Iron	600	7:30:00	8:05:19	10-25	50-100	176
N-173	Geard, Charles	Iron	1000	3:42:00	1:29:32	20-320	100	65
N-173	Geard, Charles	Protons	1000	1:48:00	2:07:13	10-320	10-50	30
N-174	Ware, Jeffrey	Protons	1000	2:30:00	0:00:00			
N-174	Ware, Jeffrey	Iron	1000	1:30:00	0:00:00			
N-175	Fike	Iron	600	2:00:00	0:00:00			
N-176	Cucinotta, Francis	Iron	1000	3:30:00	2:39:13	7-200	10-100	100
N-176	Cucinotta, Francis	Titanium	1000	3:30:00	3:20:24	10-200	10--100	100
N-177	Morgan, William	Iron	1000	3:00:00	2:00:18	5-200	10-100	67
N-178	Yu, Yongjia	Iron	1000	3:00:00	2:22:25	300	200	24
N-179	Grosovsky	Iron	1000	4:00:00	0:00:00			

Proposal Number	Principle Investigator	Ion	Energy	Beam Time Approved	Beam Time Used	Dose Range	Dose Rate	Number of Samples
N-180	Carson, William	Iron	1000	4:00:00	3:57:34	low	low	3
N-181	Obenaus, Andre	Iron	600	5:00:00	4:00:12	50-400	200	134
N-182	Dilmanian, Avraham	Iron	600	3:00:00	4:20:00	400-2000	1000	12
N-185	Sutherland,Betsy	Carbon	290	2:00:00	2:05:48	0-50	50-400	14
N-185	Sutherland, Betsy	Iron	1000	1:30:00	1:14:26	50-5000	50-500	6
N-188	Green, Lora	Carbon	290	9:00:00	6:26:12	10-200	50	120
N-189	Britt, Ann	Iron	1000	1:42:00	1:59:30	1250-10000	200	12
N-190	Ianzini, Fiorenza	Iron	1000	7:30:00	5:10:44	50-200	100	100
N-194	Kucik, Dennis	Iron	600	4:00:00	5:57:03	100	100	100
N-195	DiGiuseppe, Michael	Iron	1000	7:00:00	4:18:50	low	low	1
N-196	Azzam, Edouard	Iron	1000	6:00:00	4:27:06	10-200	25-100	75
N-200	Hlatky, Lynn	Iron	1000	1:24:00	2:23:14	20-100	100	120
N-200	Hlatky, Lynn	Protons	1000	1:42:00	1:48:09	50-200	50	108
N-202	Shi, Yufang	Iron	1000	2:45:00	1:23:33	10-400	10-100	60
E-4	Hassler, Donald	Iron	1000	5:00:00	6:07:13	low	low	1
E-4	Hassler, Donald	Protons	1000	5:00:00	4:54:12	low	low	1
E-4	Hassler, Donald	Silicon	300	2:00:00	0:00:00			
E-4	Hassler, Donald	Carbon	290	2:00:00	0:00:00			

[1] Running 250 and 500 MeV protons took the place of Solar Particle Event Simulation for which there was 12:30 hours allocated.

[2] Since energy changes are simple, 600 MeV/n Si was added in place of some 300 MeV/n Silicon running.

Entries in red indicate approved proposals there were not run during the 07A running period.

Total approved hours of science (not including those proposals that chose not to run in 07A is 298:36.

Total running hours of science is 277:35.