Nsrl07c Schedule and Parameters

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Caution! The following schedule is subject to change. Please note release date above.

NSRL will begin taking beam on **Wed 5 Sept 2007**; the run will end on **Fri 26 Oct 2007**.

Tandem will be permitted to transport beams to the TTB beamstops beginning no later than **Wed 22 Aug**.

Setup of Booster and R line with beam will begin as early as **Tue 28 Aug** and no later than **Thur 30 Aug**.

Mon 3 Sept and **Tue 4 Sept** are Laboratory holidays.

Protons for NSRL will come from Tandem and will be set up on BU2. All other ions for NSRL will be set up on BU3.

1 Beam order and nominal extraction energy

1.1 Week 1

1. Silicon. 300 MeV per nucleon. Sept 5 (Wed).
2. Silicon. 600 MeV per nucleon. Sept 6 (Thur).
3. Silicon. 300 and 600 MeV per nucleon. Sept 7 (Fri).
4. Oxygen. 1000 and 190 MeV per nucleon. Sept 8 (Sat).

1.2 Week 2

1. Oxygen. 1000 and 600 MeV per nucleon. Sept 10 (Mon).

2. Iron. 600 MeV per nucleon. Sept 11 (Tue).
3. Iron. 300 and 1000 MeV per nucleon. Sept 12 (Wed).
4. Iron. 1000 MeV per nucleon. Sept 13 (Thur).
5. Iron. 1000 MeV per nucleon. Sept 14 (Fri).

1.3 Week 3

1. Iron. 1000 MeV per nucleon. Sept 17–21 (Mon–Fri).

1.4 Week 4

1. Iron and Protons 1000 MeV per nucleon. Sept 24–26 (Mon–Wed).
2. Iron. 1000 MeV per nucleon. Sept 27–29 (Thur–Sat).

1.5 Week 5

1. Iron. 1000 MeV per nucleon. Oct 1 (Mon).
2. Protons. 1000 MeV per nucleon. Oct 2 (Tue).
3. Iron. 1000 MeV per nucleon. Oct 3 (Wed).
4. Protons. 1000 MeV per nucleon. Oct 4 (Thur).
5. Iron. 1000 MeV per nucleon. Oct 5 (Fri).
6. Protons. 1000 MeV per nucleon. Oct 6 (Sat).

1.6 Week 6

1. Protons. 1000 MeV per nucleon. Oct 8–12 (Mon–Fri).

1.7 Week 7

1. Iron. 1000 MeV per nucleon. Oct 15–20 (Mon–Sat).

1.8 Week 8

1. Iron. 1000 MeV per nucleon. Oct 22–26 (Mon–Fri).

2 Injection and Extraction Parameters

Protons will be injected into Booster at a rigidity ($B\rho$) of 0.6073 Tm. All other ions will be injected at a rigidity of 0.6669 Tm. This is the nominal rigidity for injection of Fe^{20+}. During the Nsrl07b run we injected Si^{9+} at a rigidity of 0.8813444 Tm, the nominal rigidity for injection of Au^{31+}.

Table 1: Silicon and Oxygen Parameters at Booster Injection

Parameter	Si^{13+}	O^{7+}	Unit
Protons Nucleons	14 28	8 16	
mc^2	26.05369658	14.89559022	GeV
Archive Date	7 Apr 06 20 Oct 06	16 Nov 05 13 Jun 06	
11DH1 NMR Probe	4364.1	4364.1	Gauss
hf	442.455	416.9434	kHz
h	3	3	
$T = 1/f$	6.78035	7.19522	μs
Kinetic Energy W	129.3224	65.6018	MeV
$B\rho$	0.6669	0.6669	Tm
$B\rho/\rho$	480.974	480.974	Gauss
Booster Hall Probe			Gauss
Booster Gauss Clock			Gauss
Injection Field H	476.9	476.9	Gauss
Inflector Setpoint V_S	38.588	36.285	kV
Inflector Predicted V_I	38.598	36.372	kV

Table 2: Proton and Iron Parameters at Booster Injection

Parameter	Tandem Protons	Fe^{20+}	Unit
Protons Nucleons	1 1	26 56	
mc^2	0.938271998	52.0928437	GeV
Archive Date	21 Sept 06 27 Jun 07	June 2007	
11DH1 NMR Probe	3971.15	4364.1	Gauss
hf	566.033	341.131	kHz
h	2	3	
$T = 1/f$	3.53336	8.79427	μs
Kinetic Energy W	17.5008	153.2415	MeV
$B\rho$	0.6073	0.6669	Tm
$B\rho/\rho$	437.990	480.974	Gauss
Booster Hall Probe	418.2	453.4	Gauss
Booster Gauss Clock	14.3	23.5	Gauss
Injection Field H	432.5	476.9	Gauss
Inflector Setpoint V_S	67.367	29.605	kV
Inflector Predicted V_I	67.448	29.759	kV

Table 3: Proton Parameters at Booster Extraction

Parameter	Proton	Proton	Unit
mc^2	0.938271998	0.938271998	GeV
Archive Date	21 Sept 06 27 Jun 07	22 Jun 06	
hf	2.6001199	2.8586962	MHz
h	2	2	
$T = 1/f$	0.769195	0.699620	μs
Kinetic E per Nucleon	1000	2500	MeV
$B\rho$	5.65737292	11.03354195	Tm
$B\rho/\rho$	4080.15	7957.49	Gauss
Magnetic Field Setpoint	4159.68 4159	8112.60 8086.7085	Gauss
MM Current Setpoint	1710	3333.6537	Amps

Table 4: Proton Parameters at Booster Extraction

Parameter	Proton	Proton	Unit
mc^2	0.938271998	0.938271998	GeV
Archive Date	22 Sept 06 27 Jun 07	22 Sept 06 27 Jun 07	
hf	1.6823335	2.2521094	MHz
h	2	2	
$T = 1/f$	1.188825	0.888056	μs
Kinetic E per Nucleon	200	500	MeV
$B\rho$	2.14963569	3.63611180	Tm
$B\rho/\rho$	1550.337	2622.398	Gauss
Magnetic Field Setpoint	1580.557	2673.52	Gauss
MM Current Setpoint			Amps

Table 5: Silicon (Si^{13+}) Parameters at Booster Extraction

Parameter	Si^{13+}	Si^{13+}	Si^{13+}	Unit
mc^2	26.05369658	26.05369658	26.05369658	GeV
Archive Date	7 Apr 06 20 Oct 06	7 Apr 06 20 Oct 06	6 Apr 06 20 Oct 06	
hf	3.9052942	3.5388577	2.9165665	MHz
h	3	3	3	
$T = 1/f$	0.768188	0.8477312	1.028607	μs
Kinetic E per Nucleon	1000	600	300	MeV
$B\rho$	12.152097912	8.73018598	5.784686256	Tm
$B\rho/\rho$	8764.21	6296.29	4171.97	Gauss
Magnetic Field Setpoint	8935.05 8911	6419.02	4253.29 4252	Gauss
MM Current Setpoint	3680		1748	Amps

Table 6: Oxygen (O^{7+}) Parameters at Booster Extraction

Parameter	O^{7+}	O^{7+}	O^{7+}	Unit
mc^2	14.89559022	14.89559022	14.89559022	GeV
Archive Date	13 Jun 06	13 Jun 06	13 Jun 06	
hf	3.9049750	3.5384336	2.5308418	MHz
h	3	3	3	
$T = 1/f$	0.7682508	0.8478328	1.185376	μs
Kinetic E per Nucleon	1000	600	200	MeV
$B\rho$	12.8982909	9.2665137	4.8961552	Tm
$B\rho/\rho$	9302.37	6683.10	3531.15	Gauss
Magnetic Field Setpoint	9483.70	6813.37	3599.98	Gauss
MM Current Setpoint				Amps

Table 7: Iron Parameters at Booster Extraction

Parameter	Fe^{20+}	Fe^{20+}	Fe^{20+}	Unit
mc^2	52.0928437	52.0928437	52.0928437	GeV
Archive Date	23 Jun 07	1 May 07 25 May 07	26 Sept 06	
hf	3.9054651	3.5390849	2.9168317	MHz
h	3	3	3	
$T = 1/f$	0.768154	0.847677	1.028513	μs
Kinetic E per Nucleon	1000	600	300	MeV
$B\rho$	15.79629259	11.34804355	7.519187947	Tm
$B\rho/\rho$	11392.43	8184.31	5422.91	Gauss
Magnetic Field Setpoint	11614.50 11600	8343.84 8471	5528.62	Gauss
MM Current Setpoint	4934	3495		Amps

Table 8: Longitudinal Emittance and Bucket Area in Booster at Injection. Emit is the emittance of the beam in one bucket assuming $\Delta p/p = \pm 0.00025$. A_S is the stationary bucket area at the indicated gap voltage. The units are eV-s. Note that if the gap voltage is 30 kV and $dB/dt = 80$ G/ms, then the stable phase is 48.25 degrees and the bucket area is αA_S where $\alpha = 0.135$.

Ion	Emit	A_S 0.5 kV	A_S 30 kV
H^+	0.031	0.174	1.35
C^{5+}	0.148	0.719	5.57
O^{7+}	0.157	0.978	7.58
Si^{9+}	0.267	1.47	11.4
Si^{13+}	0.292	1.764	13.7
Ti^{18+}	0.404	2.71	21.0
Fe^{20+}	0.449	3.085	23.9