P951 AGS Impact Statement

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An R&D Program for Targetry and Capture at a Muon Collider Source

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Propose to study the effects of an intense FEB from the AGS on liquid and solid target materials.
A test was conducted in early FY 1999 in the FEB U-line, that showed a beam with an appropriate size
could be delivered if some modifications are made to the beam transport. Alternative locations
are being considered, in particular the A3 location on the present SEB floor.

The proposed R&D program into these targetry issues for a muon-collider source consists of eight parts:

1. Initial studies of liquid (and solid) target materials with a proton beam at the AGS.
2. Studies of a liquid-metal jet entering a 20-T magnet at the national High Magnetic Field Laboratory (NMFL) in Florida.
3. Studies of a full-scale liquid-metal jet in a beam of 100 TP protons per pulse, but without magnetic field.
4. Studies of a liquid-metal jet + proton beam + 20-T pulsed solenoid magnet.
5. Studies of a 70 MHz RF cavity downstream of the target in the proton beam but without a magnet around the cavity.
6. Continuation of topic 5, with the addition of a 1.25-T, 1.25-m-radius solenoid surrounding the RF cavity.
7. Characterization of the pion yields downstream of the target with RF cavity.
8. Simulation of the performance of liquid-metal targets: thermal shock, eddy current. Validation of the simulation by exploding-wire studies.

Topic 1 and 3-7 are planned activities that would use the AGS.

Topic	Beam					Remarks	Hours	Run Year	AGS Work
	GeV/c	Bunch structure	#Bunches	TP	Beam Size				
1	24	FEB	1	10	1mm		600	FY00	Remove E864 and prepare A3 for FEB
2									None
3	24	FEB	6	100	1mm		600	FY01	Upgrade AGS kicker for Single-turn extraction
4	24	FEB	6	100	1mm		600	FY02	Install pulsed magnet
5	≥7	FEB	1	100	2mm, 2ns		300	FY03	Install RF Cavity
6	≥7	FEB	1	100	2mm, 2ns		300	FY03	Install Solenoid (probably superconducting)
7	16-24	SEB		1	1mm	Secondary Beam	1200	FY04	Install secondary beam instrumentation
8									None

Conflicts with other experiments:

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Some Issues:

- **1** Initial Studies
  - Add quads in A3 line to deliver spot with sigma_x = sigma_y = 1mm @24 GeV.
  - Revise radiation safety monitors for FEB operation.
  - FEB running requires 1 Hz rate only for beam tuning; data taking is pulse-on-demand, about 1 per 10 min.
- **3** Single-turn Extraction
  - Muon-collider test goal is 10^14 protons in a sinlge pulse. 10^14 protons in 6 bunches + single-turn extraction is acceptable.
- **4** Pulsed magnet system
  - Bus MPS supply to A3 area.
  - Pulsed magnet is LN_2 cooled; 100 liter of LN_2 blown off each pulse (~ every 10 min); vent outside cave.
  - System includes conventional 'transition' magnets with ~ 1MW power.
  - Beam will strike the transition magnet, which must incorporate some features of a beam dump.
- **5** RF Cavity
  - The RF power supplies will arrive in FY00; establish RF test area adjacent to A3 line.
  - RF power transmitted into cave via 4 6"-coax lines => shielding penetrations and/or chicane.
  - RF power tubes may require magnetic shielding from stray fields of the E-951 magnets.
- **6** RF Solenoid
  - PEP-4 (TPC) solenoid to be transported to BNL in FY00 (without steel).
  - Use 100-W LHe refrigerator from E850
  - A3 cave must be high enough to clear magnet + cryo facilities.
- **7** Characterization of Pion Production
  - Bent solenoid spectrometer probably superconducting; add to refrigetator load.
  - Beam intensity < 10^6 Hz; long spill

The Plan:

- FY99-Begin removal of E864
- FY00- Remove, A2 front-end,Install additional shielding in A3,install beam instrumentation, install test target, begin Topic1
- FY01-
- FY02-

P951 Cost (FY99 dollars)

	Purchases			Labor(mandays)		
			Total			
AGS Capital:	Direct	Indirect	W/Indirect	techs	trades	EDIA
• Remove E864	$ -	$ -	$ -			
• Remove A2 front-end elements	$ -	$ -	$ -			
• A3 Beam Instrumentation	$ -	$ -	$ -			
• AGS Kicker Upgrade	$ -	$ -	$ -			
• Experiment installation, topic 1	$ -	$ -	$ -			
• Experiment installation, topic 3	$ -	$ -	$ -			
• Experiment installation, topic 4	$ -	$ -	$ -			
• Experiment installation, topic 5	$ -	$ -	$ -			
• Experiment installation, topic 6	$ -	$ -	$ -			
• Experiment installation, topic 7	$ -	$ -	$ -			
• Contingency	$ -	$ -	$ -			
AGS Total	**$ -**	**$ -**	**$ -**			

Experiment Detector Construction