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# Electron Cooling Instrumentation

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DoE review

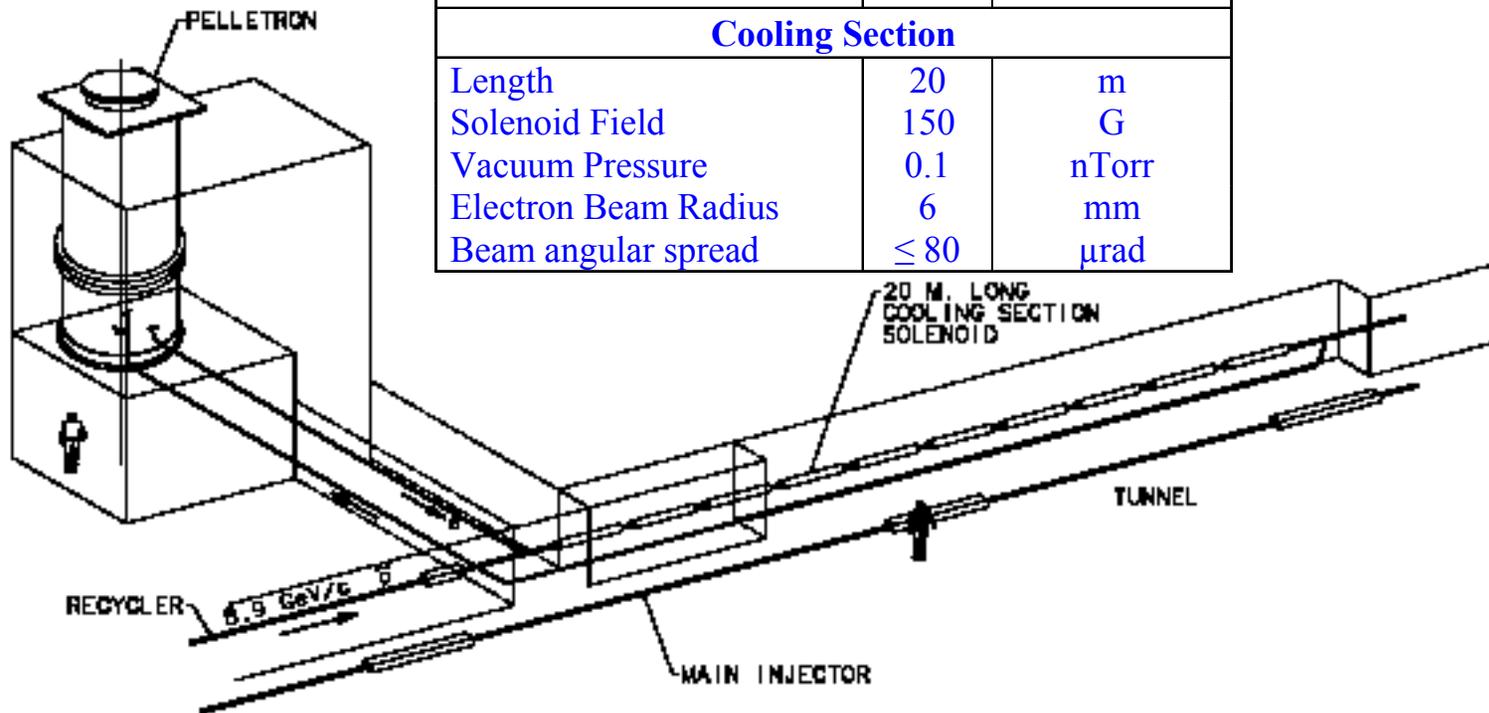
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# Schematic Layout of the Recycler Electron Cooling

## Electron Cooling System Parameters

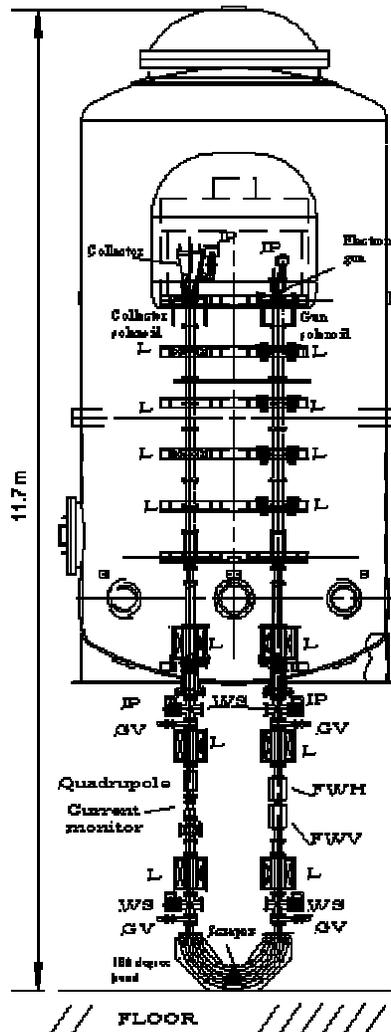
Parameter	Value	Units
<b>Electrostatic Accelerator</b>		
Terminal Voltage	4.3	MV
Electron Beam Current	0.5	A
Terminal Voltage Ripple	500	V (FWHM)
Cathode Radius	2.5	mm
Gun Solenoid Field	600	G
<b>Cooling Section</b>		
Length	20	m
Solenoid Field	150	G
Vacuum Pressure	0.1	nTorr
Electron Beam Radius	6	mm
Beam angular spread	$\leq 80$	$\mu\text{rad}$



# Recirculation experiment at WideBand

Operation with beam: Mar 01- Nov 02

## Instrumentation used in experiment



Type	Comments
Controls of DC voltages and currents of all PSS in Pelletron	Reliable operation; no changes for full length set-up
$\mu$ s-scale measurements of cathode current and terminal voltage	Same
Wire scanners	Same
BPMs	50 $\mu$ m resolution for DC beam; need to add pulsed mode
Scrapers	Need improvements
Flying wire	Operational. Need to switch to ACNET

# Diagnosics in the ECOOL beamline

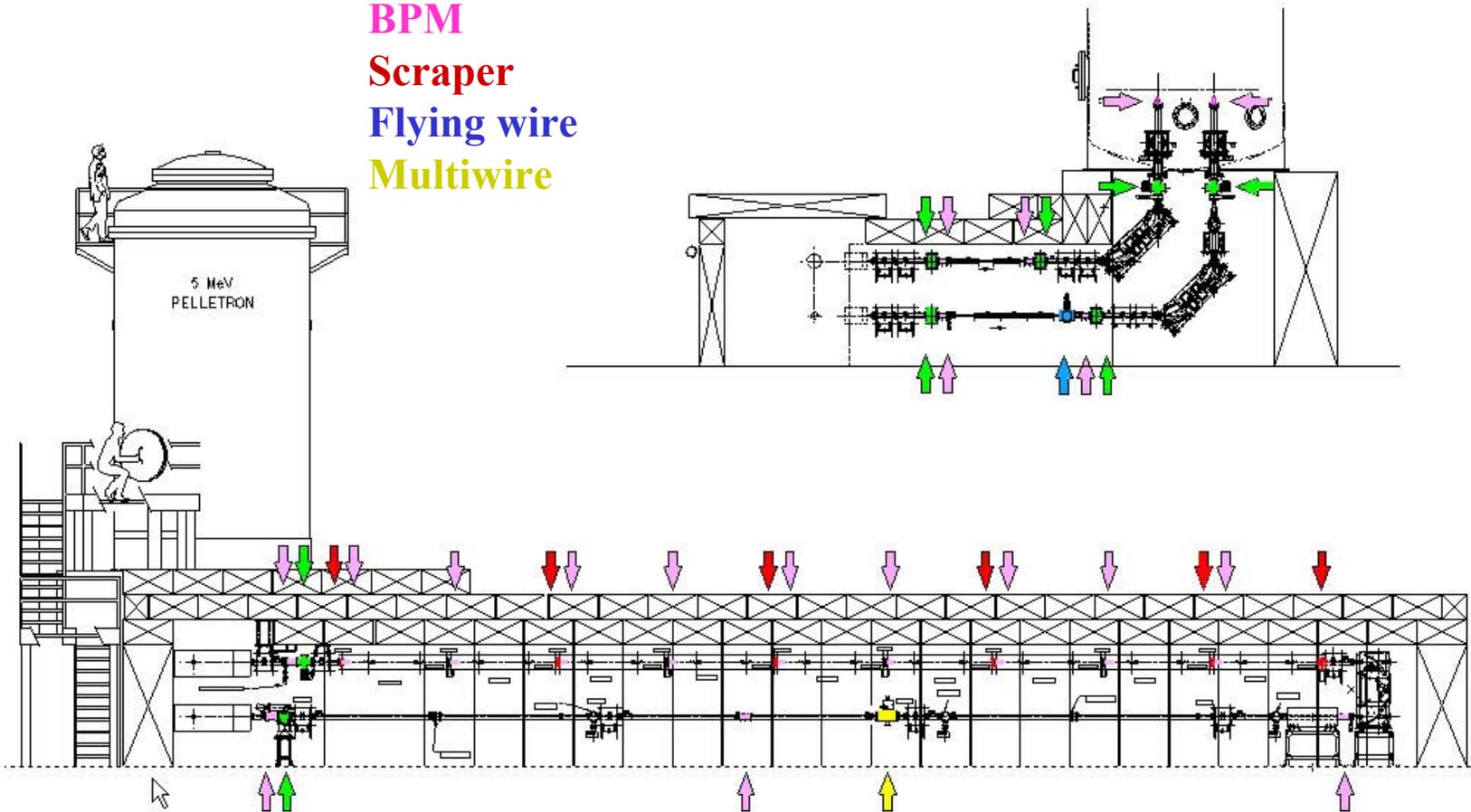
Wire scanner

BPM

Scraper

Flying wire

Multiwire



## List of beam diagnostics tools

Type, quantity	Description	Operating mode	Used for
Wire scanner 8	Rotating 1 mm wire	DC, 0.1- 3 $\mu$ A	Initial alignment; quick tests of beam line status
BPM 19	Capacitive pickups	DC with current modulation; 2 $\mu$ s, 1 Hz pulse	Electron beam position measurements; in MI31 used for pbars as well
Scraper 5	Copper plate with 15 mm round opening	DC, full current	Measurements of beam size at the level of $10^{-5}$ of the total current
Flying wire 1	25 $\mu$ m carbon wire flying at 5 m/s	DC, full current	Beam size and density distribution measurements
Multiwire harp 1	tungsten, 25 $\mu$ m wires over 0.5 mm; 50 each plane	2 $\mu$ s , 1 Hz pulse	Beam size and density distribution measurements

## List of beam diagnostics tools (cont.)

Type	Resolution	Control	Status
Wire scanner	1 mm	Analog	Fully operational
BPM	50 $\mu\text{m}$ in all modes	ACNET	Tested in pulsed mode Tested with pbars
Scraper	50 $\mu\text{m}$	ACNET	Under commissioning
Flying wire	50 $\mu\text{m}$	ACNET	Tested (with a PC control)
Multiwire harp	0.5 mm	ACNET	Under commissioning

# Conclusion

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- All instrumentation necessary for commissioning of the full length beam line is installed
- All tools have been tested, and most of them are operational
- Instrumentation intended for routine operation is controlled by ACNET
- All these elements of diagnostics will be used in Recycler. A small addition will be made to take into account longer cooling section and longer beam lines