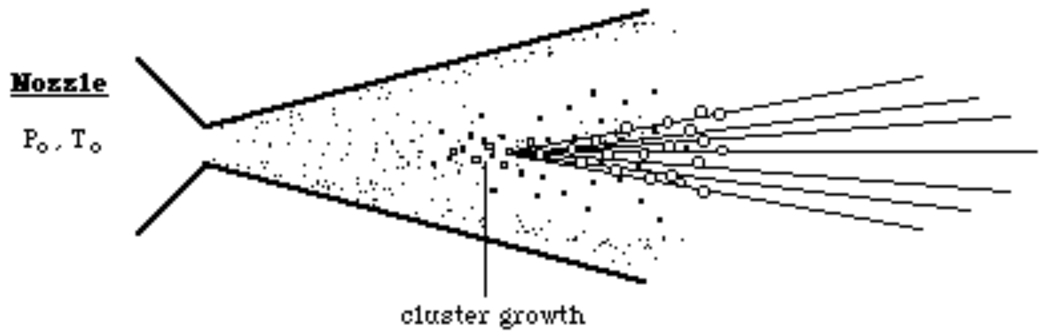
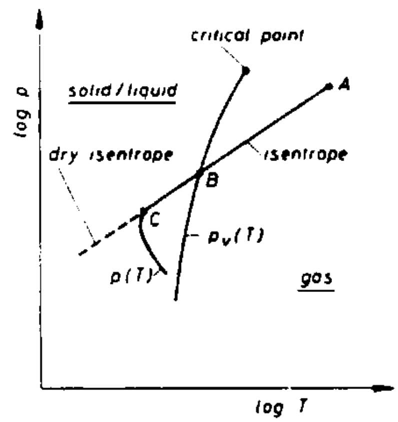


FIG. 1



critical point
A
solid / liquid
log p
dry isentrope
isentrope
B
C
$p_v(T)$
$p(T)$
gas
log T

FIG. 2

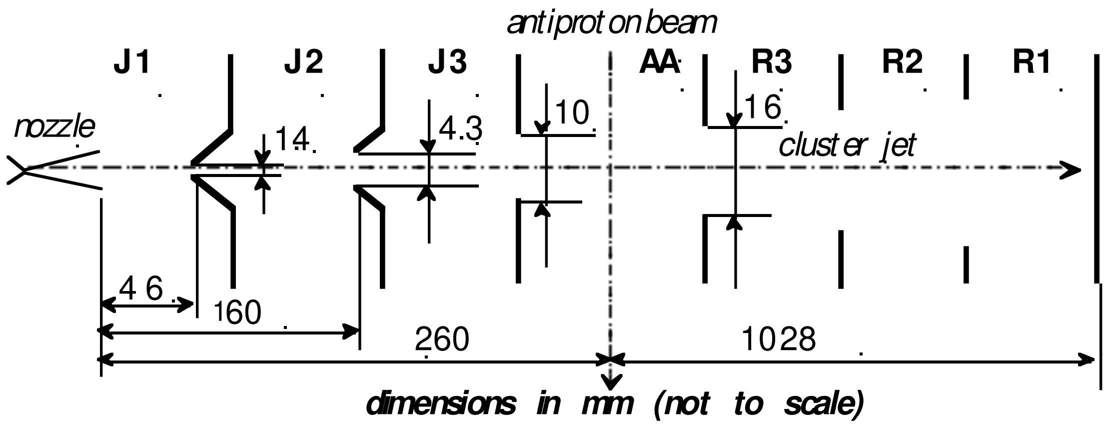

antiproton beam
J1
J2
J3
AA
R3
R2
R1
nozzle
14
4.3
10
16
cluster jet
46
160
260
1028
dimensions in mm (not to scale)

FIG 3

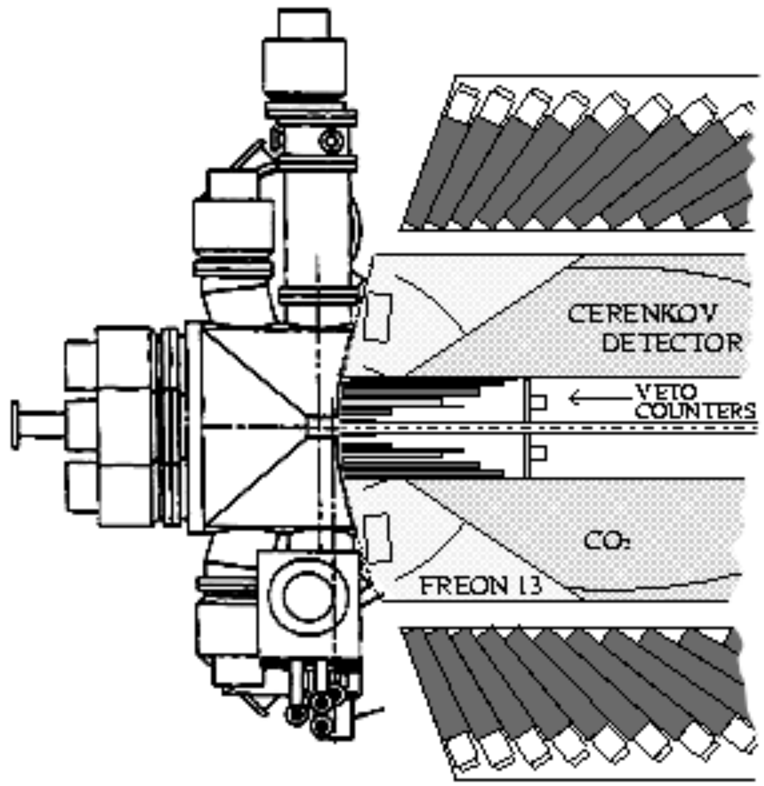


FIG $

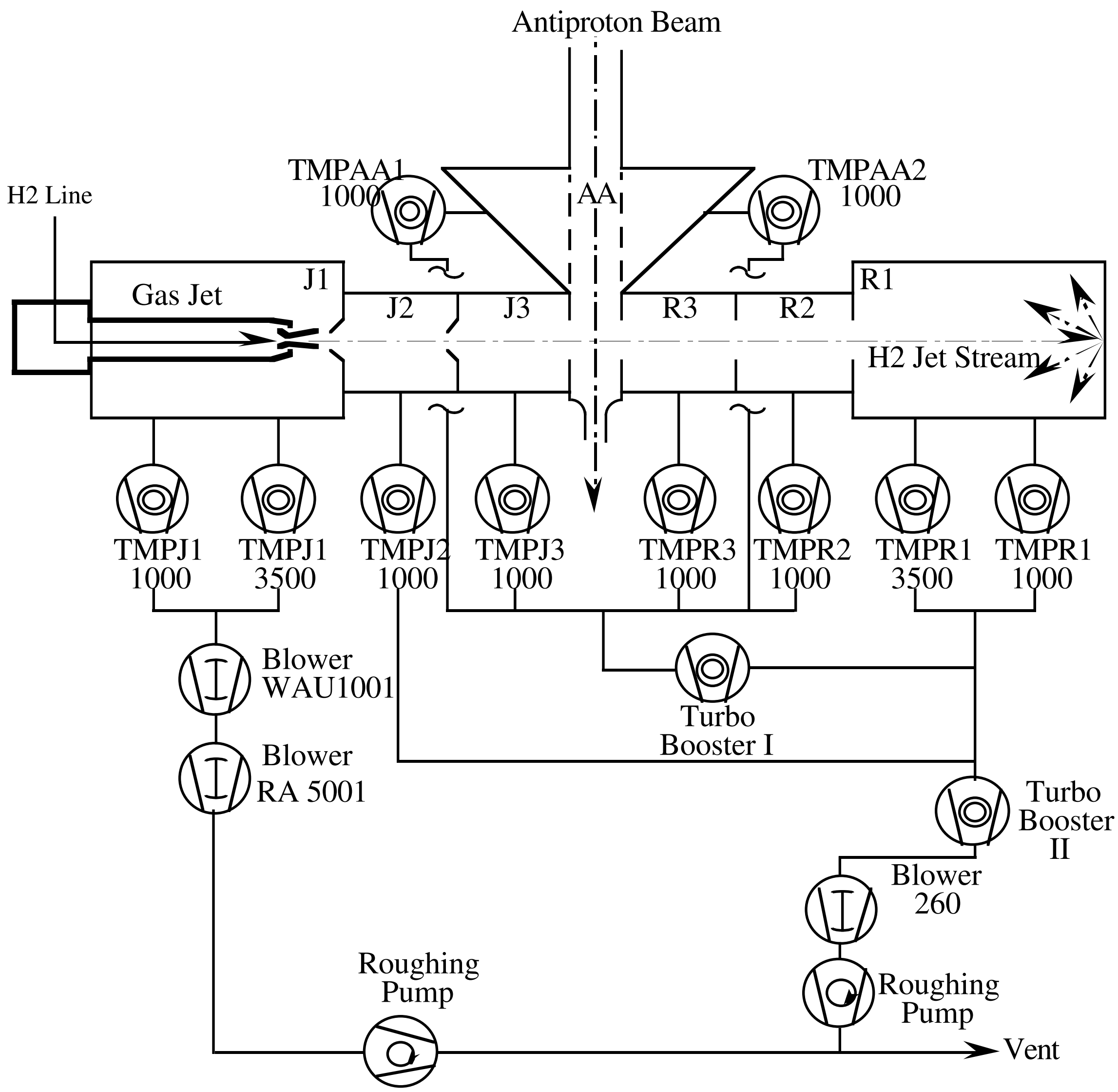

Antiproton Beam
H2 Line
TMPAA1
1000
AA
TMPAA2
1000
Gas Jet
J1
J2
J3
R3
R2
R1
H2 Jet Stream
TMPJ1
1000
TMPJ1
3500
TMPJ2
1000
TMPJ3
1000
TMPR3
1000
TMPR2
1000
TMPR1
3500
TMPR1
1000
Blower
WAU1001
Turbo
Booster I
Blower
RA 5001
Turbo
Booster
II
Blower
260
Roughing
Pump
Roughing
Pump
Vent

FIG 5

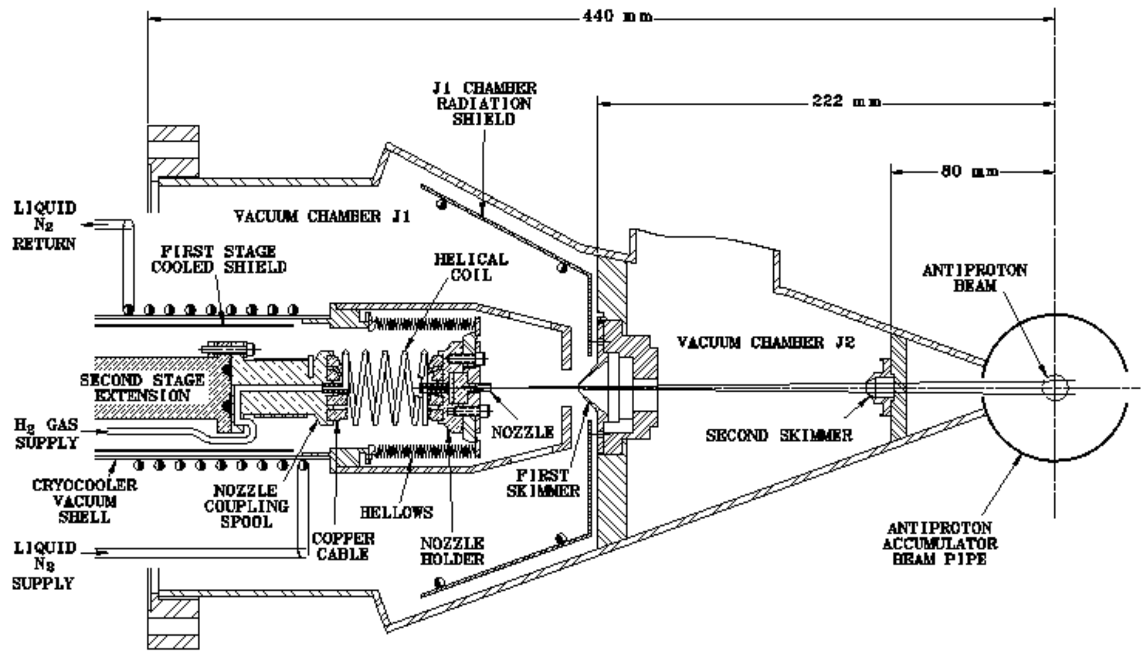
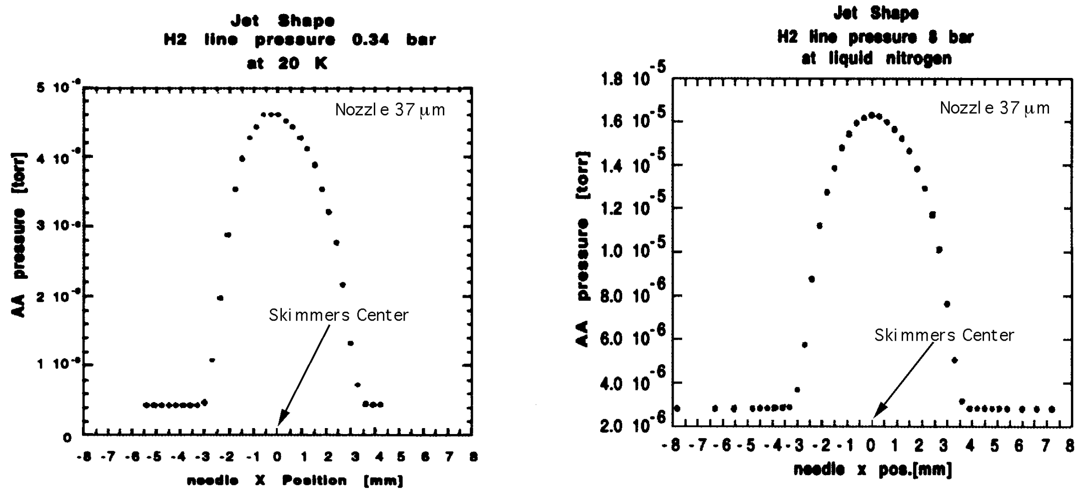
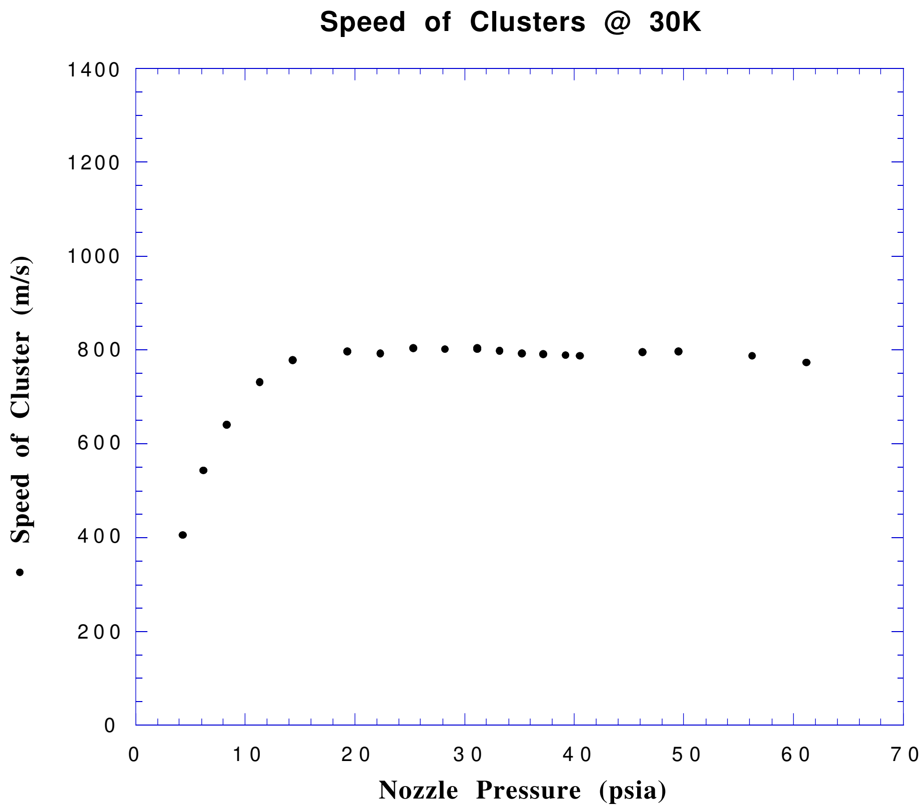

440 mm
222 mm
80 mm
J1 CHAMBER
RADIATION
SHIELD
LIQUID
N2
RETURN
VACUUM CHAMBER J1
FIRST STAGE
COOLED SHIELD
HELICAL
COIL
ANTIPROTON
BEAM
VACUUM CHAMBER J2
SECOND STAGE
EXTENSION
H2 GAS
SUPPLY
NOZZLE
SECOND SKIMMER
FIRST
SKIMMER
CRYOCOOLER
VACUUM
SHELL
NOZZLE
COUPLING
SPOOL
BELLOWS
COPPER
CABLE
NOZZLE
HOLDER
LIQUID
N2
SUPPLY
ANTIPROTON
ACCUMULATOR
BEAM PIPE

FIG 6


Jet Shape
H2 line pressure 0.34 bar
at 20 K
Nozzle 37 μm
Skimmers Center
AA pressure [torr]
needle X Position [mm]
Jet Shape
H2 line pressure 8 bar
at liquid nitrogen
Nozzle 37 μm
Skimmers Center
AA pressure [torr]
needle x pos.[mm]

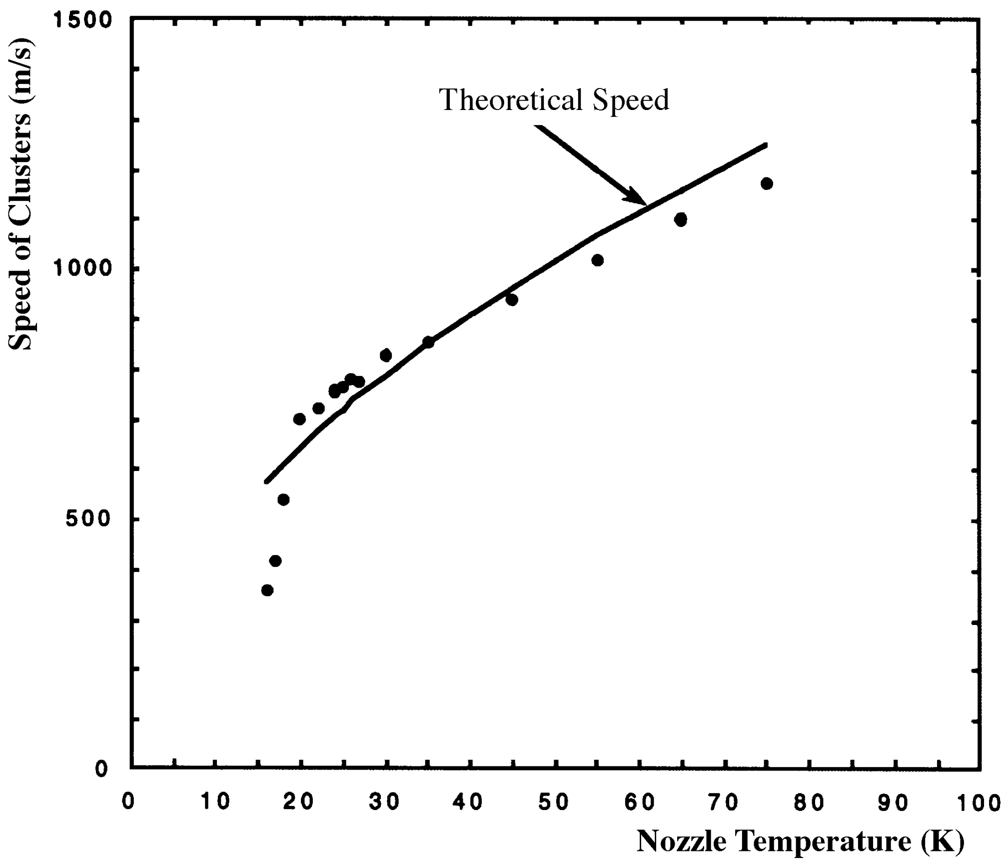
(*a*) (*b*)

FIG 7



Speed of Clusters @ 30K
Speed of Cluster (m/s)
0
200
400
600
800
1000
1200
1400
0
10
20
30
40
50
60
70
Nozzle Pressure (psia)

FIG 8



1500
1000
500
0
Speed of Clusters (m/s)
Theoretical Speed
0
10
20
30
40
50
60
70
80
90
100
Nozzle Temperature (K)

FIG 9

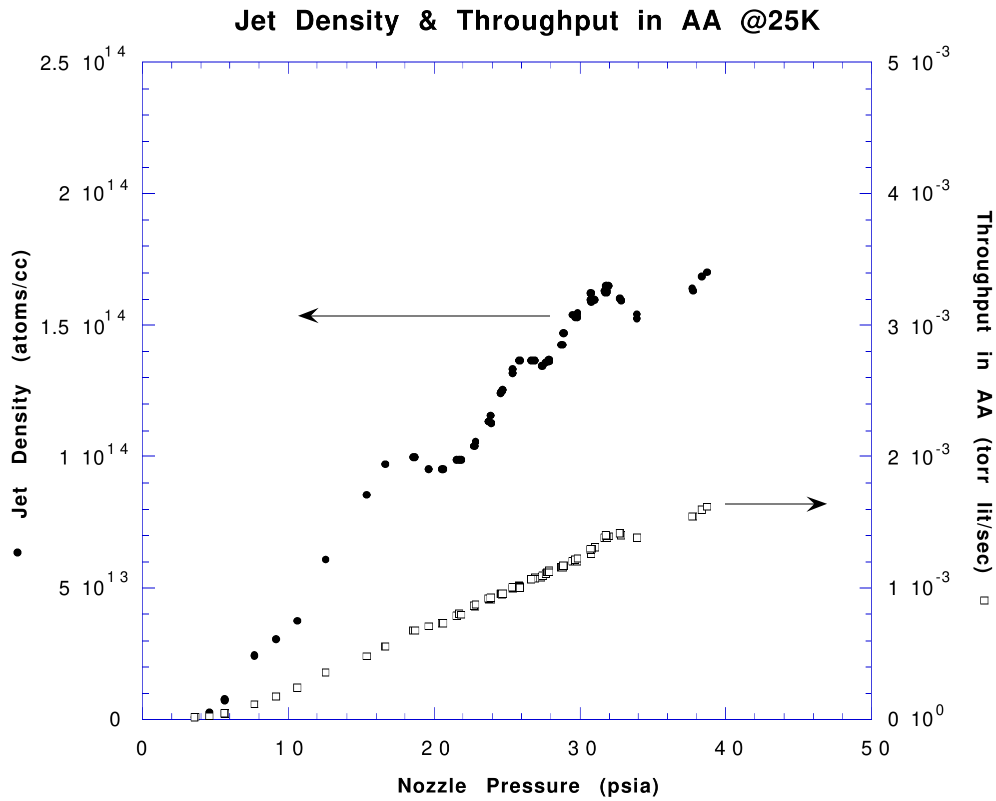

Jet Density & Throughput in AA @25K
2.5 10^14
2 10^14
1.5 10^14
1 10^14
5 10^13
0
5 10^-3
4 10^-3
3 10^-3
2 10^-3
1 10^-3
0 10^0
0
10
20
30
40
50
Nozzle Pressure (psia)
Jet Density (atoms/cc)
Throughput in AA (torr lit/sec)

FIG 10

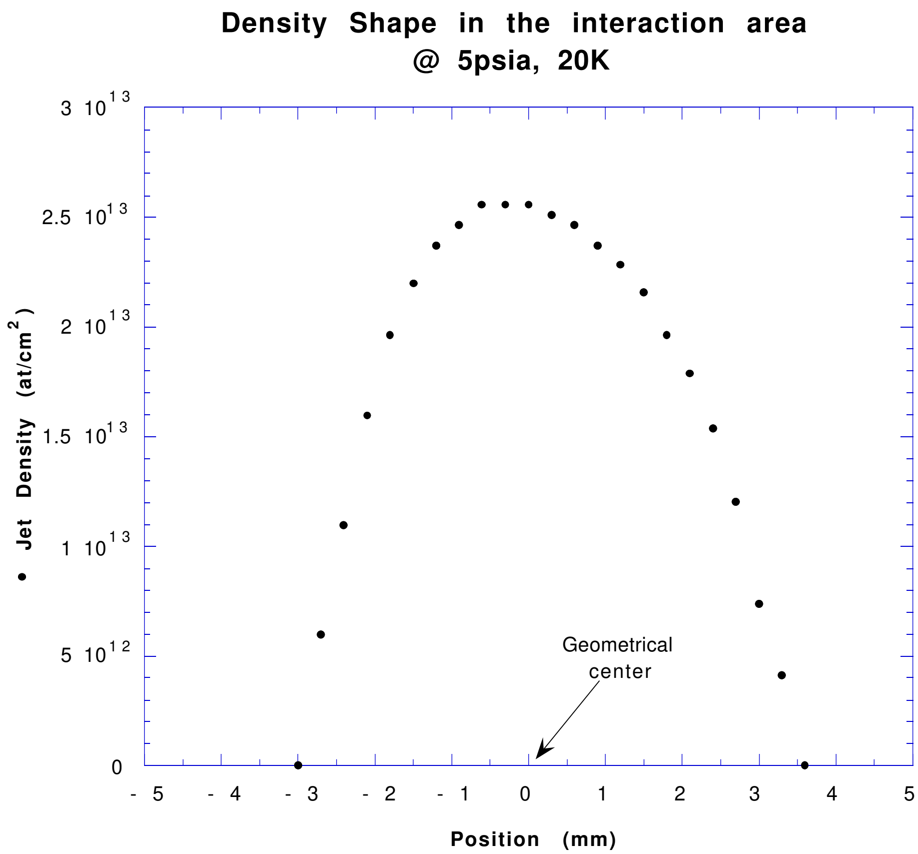
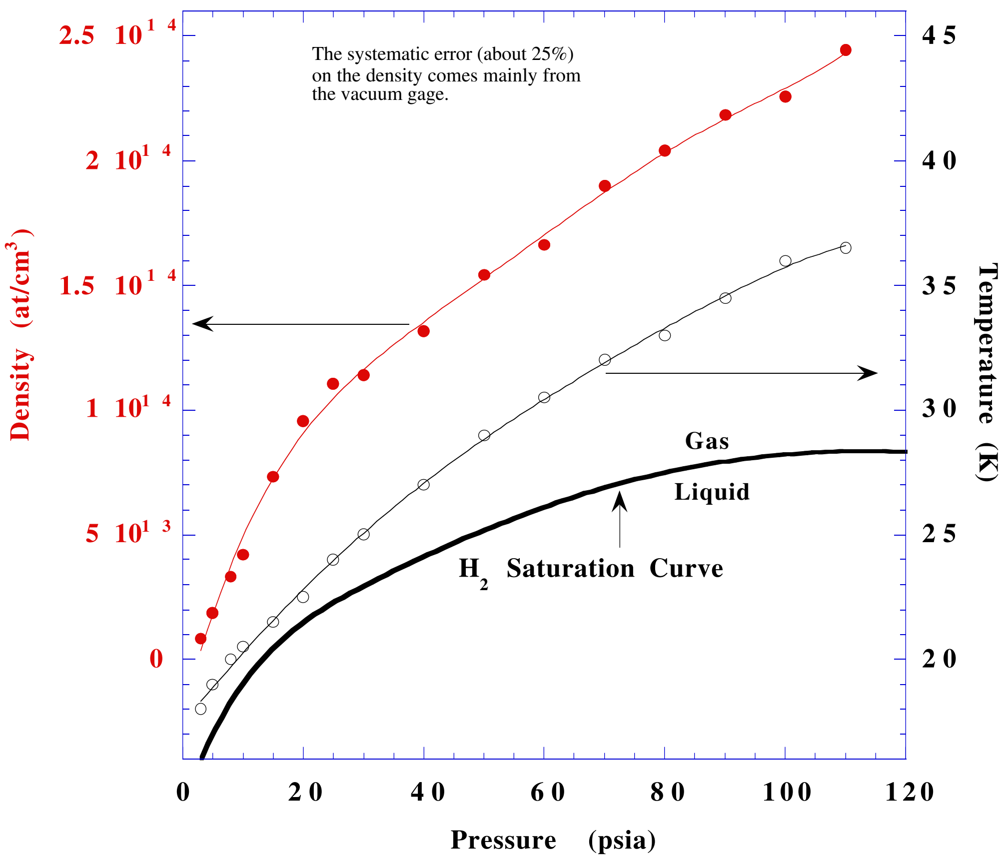

Density Shape in the interaction area
@ 5psia, 20K
Jet Density (at/cm²)
3 10¹³
2.5 10¹³
2 10¹³
1.5 10¹³
1 10¹³
5 10¹²
0
- 5
- 4
- 3
- 2
- 1
0
1
2
3
4
5
Position (mm)
Geometrical
center

FIG 11



The systematic error (about 25%) on the density comes mainly from the vacuum gage.
2.5 10^14
2 10^14
1.5 10^14
1 10^14
5 10^13
0
Density (at/cm^3)
45
40
35
30
25
20
Temperature (K)
Gas
Liquid
H2 Saturation Curve
0
20
40
60
80
100
120
Pressure (psia)

FIG 12

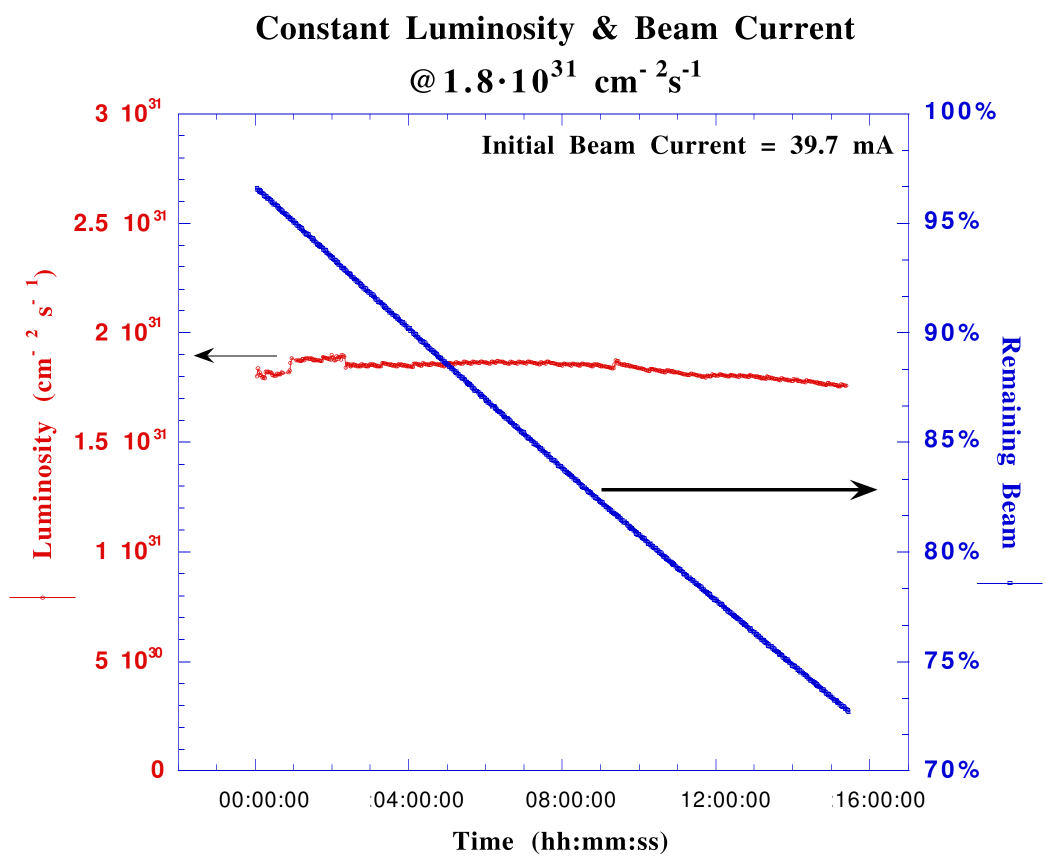

Constant Luminosity & Beam Current
@1.8·10^31 cm^-2 s^-1
Initial Beam Current = 39.7 mA
3 10^31
2.5 10^31
2 10^31
1.5 10^31
1 10^31
5 10^30
0
100%
95%
90%
85%
80%
75%
70%
Luminosity (cm^-2 s^-1)
Remaining Beam
00:00:00
04:00:00
08:00:00
12:00:00
16:00:00
Time (hh:mm:ss)

FIG 13