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Vacuum Assumptions For RHIC

A. G. Ruggiero

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Collider Accelerator Department

Brookhaven National Laboratory

U.S. Department of Energy

USDOE Office of Science (SC)

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RHIC-PG-51

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for
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Vacuum Assumptions

Two Sections:

(a) **Warm** – 25% of Circumference.

Equivalent Nitrogen Pressure : 10^{-9} torr

Gas Composition :

CO: 50% and H_2 : 50%

Room Temperature : 300 °K

(b) **Cold** – 75% of Circumference.

Equivalent Nitrogen Pressure : 10^{-11} torr

Gas Composition :

He : 50% and H_2 : 50%

Liquid Helium : 4.2 °K

The vacuum pressure is measured with a gauge with the following efficiency factors

1.0 for CO
0.5 for H_2
0.5 for He

Therefore : in the <u>warm</u> section

$$(0.5)\, n_{H_2} + (1.0)\, n_{CO} = n_{N_2}$$

$$n_{H_2} = n_{CO}$$

and in the <u>cold</u> section

$$(0.5)\, n_{H_2} + (0.5)\, n_{He} = n_{N_2}$$

$$n_{H_2} = n_{He}$$

By definition

$$n_{N_2} = 2.687 \times 10^{19} \frac{P_{torr}}{760} \times \frac{273.16}{T_{oK}}$$

$$n_{N_2} = 3.22 \times 10^{16}\ P_{torr}/cc$$

$$= 3.22 \times 10^{7}\ /cc \qquad \underline{\text{warm}}\ \text{section}$$

$$n_{N_2} = 2.30 \times 10^{18}\ P_{torr}/cc$$

$$= 2.30 \times 10^{7}\ /cc \qquad \underline{\text{cold}}\ \text{section}$$

and

	warm	cold
densities, n	25%	75%
H_2	2.1×10^7 /cc	2.3×10^7 /cc
He	–	2.3×10^7 /cc
CO	2.1×10^7 /cc	–

with

	Z	A
H_2	2	2
He	2	4
CO	14	28

or

	warm	cold
	25%	75%
n_H	4.2×10^7 /cc	4.6×10^7 /cc
n_{He}	–	2.3
n_C	2.1	–
n_O	2.1	–

with

	Z	A
H	1	1
He	2	4
C	6	12
O	8	16