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Vacuum Assumptions For RHIC

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RHIC-PG-51

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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 warm section

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

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

and in the cold section

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

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

By definition

$$n_{N_2} = 2.687 \times 10^{19} \frac{P_{torr}}{760} \times \frac{273.16}{T_{0K}}$$

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

$= 3.22 \times 10^{7} \, /cc$ warm section

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

$= 2.30 \times 10^{7} \, /cc$ cold section

and:

densities, n

	warm 25%	cold 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