

## Vacuum Assumptions For RHIC

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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 :  $300^\circ K$

(b) Cold - 75% of Circumference

Equivalent Nitrogen Pressure :  $10^{-11}$  torr

Gas Composition :

He : 50% and  $H_2$  : 50%

Liquid Helium :  $4.2^\circ K$

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

- 1.0 for CO
- 0.5 for H<sub>2</sub>
- 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

$$n_{N_2} = 2.687 \times 10^{19} \frac{P_{\text{torr}}}{760} \times \frac{273.15}{T_{\text{OK}}}$$

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

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

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

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

and

	<u>warm</u>	<u>cold</u>
densities, $n$	25%	75%
H <sub>2</sub>	$2.1 \times 10^7 / \text{cc}$	$2.3 \times 10^7 / \text{cc}$
He	-	$2.3 \times 10^7 / \text{cc}$
CO	$2.1 \times 10^7 / \text{cc}$	-

with

	<u>Z</u>	<u>A</u>
H <sub>2</sub>	2	2
He	2	4
CO	14	28

or

warm

cold

25%

75%

$n_H$

$4.2 \times 10^7 / \text{cc}$

$4.6 \times 10^7 / \text{cc}$

$n_{He}$

-

2.3

$n_e$

2.1

-

$n_O$

2.1

-

with

Z

A

H

1

1

He

2

4

C

6

12

O

8

16