

Vacuum Assumptions For RHIC

A. G. Ruggiero

April 1984

Collider Accelerator Department
Brookhaven National Laboratory

U.S. Department of Energy

USDOE Office of Science (SC)

Notice: This technical note has been authored by employees of Brookhaven Science Associates, LLC under Contract No. DE-AC02-76CH00016 with the U.S. Department of Energy. The publisher by accepting the technical note for publication acknowledges that the United States Government retains a non-exclusive, paid-up, irrevocable, world-wide license to publish or reproduce the published form of this technical note, or allow others to do so, for United States Government purposes.

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, nor any of their contractors, subcontractors, or their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or any third party's use or the results of such use of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof or its contractors or subcontractors. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

Vacuum Assumptions

for

RHIC

A. G. Ruggiero

BNL, April 27, 1984

①

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 H₂
- 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 ₂	$2.1 \times 10^7 / \text{cc}$	$2.3 \times 10^7 / \text{cc}$
He	-	$2.3 \times 10^7 / \text{cc}$
CO	$2.1 \times 10^7 / \text{cc}$	-

with

	<u>Z</u>	<u>A</u>
H ₂	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