

# IPB Reactor Observation Note

Jin Liu

February 17, 2017

Definition

$H_{pdrop}$  : heater power drop after power deposit to the core in watts

$V_1$  : voltage RMS measured at the core entrance when  $Q$ -pulse

$V_2$  : voltage RMS measured at the core exit when  $Q$ -pulse

$V_3$  : voltage RMS measured across the RF termination resistor at the end of the transmission line. The termination resistors are mounted in a copper block that is water cooled . It has constant RF impedance in the freq range we are operating in. With this method we can measure the pulse current directly by measuring  $V_3$  and knowing the  $R_{term}$  resistance,  $I = V_3/R_{term}$

$P$  : power deposit to the core either by  $DC$  or  $Q$ -pulse in watts in  $Q$ -pulse

$$P = \frac{(V_1 - V_2) * V_3}{R_{term}} \quad (1)$$

$V^2 = (V_1 - V_2)^2$  when  $Q$ -pulse or voltage drop when  $DC$

Observation

$$R = \frac{V^2}{P} \text{ [volts}^2\text{/watts]}, \text{ [volts}^2\text{/watts]} = \text{[ohms]} \quad (2)$$

Where  $R$  is constant at any given core temperature for power  $DC$  or  $Q$ -pulse, gas helium or hydrogen.

$$M = \frac{H_{pdrop}}{P} \quad (3)$$

Where  $M$  is constant at any given core temperature for power  $DC$  or  $Q$ -pulse, gas helium or hydrogen.