

Abstract Submitted  
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**A simple analysis of inductively coupled discharge using transformer circuit model** YOUNG-DO KIM, HYO-CHANG LEE, CHIN-WOOK CHUNG, Hanyang University — Correlations between plasma parameters in an inductively coupled discharge were studied by an air-cored transformer model. By applying the transformer circuit model which is well-established by previous workers [1], for the maximum power transfer the optimal condition between external parameters (chamber dimension  $L$ , driving frequency  $\omega$ ) and internal parameters (skin depth  $\delta$ , electron-neutral collision frequency  $\nu_{en}$ ) was obtained. From this work, it was found that a maximum power transfer condition correspond to  $\delta \approx L$  when  $\nu_{en} / \omega \ll 1$ , while  $\delta / L \approx (2\omega / \nu_{en})^{1/2}$  when  $\nu_{en} / \omega \gg 1$ . This result of circuit analysis is consistent to the state of H to E mode transition which is existing results based on calculation of Maxwell's equation [2]. Our experimental results, as well as other researchers' results are also compared and agreed well with the theoretical value. This study will offers another view point of analyzing characteristics of inductively coupled plasma, and the theoretical predictions will play a very useful role in the system design or improving process efficiency.

[1] Piejak R B, Godyak V A and Alexandrovich B M, *Plasma Sources Sci. Technol.* **1** 179 (1992)

[2] Lee and Chung, *Physics. Plasmas*, **13** 063510 (2006).

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