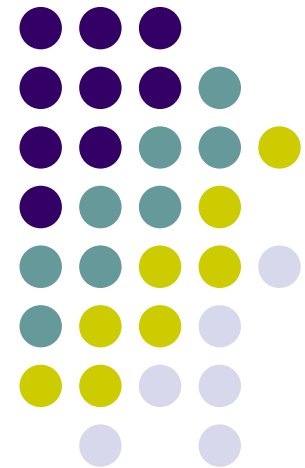


# Study of Mode Competition in Gyrotrons

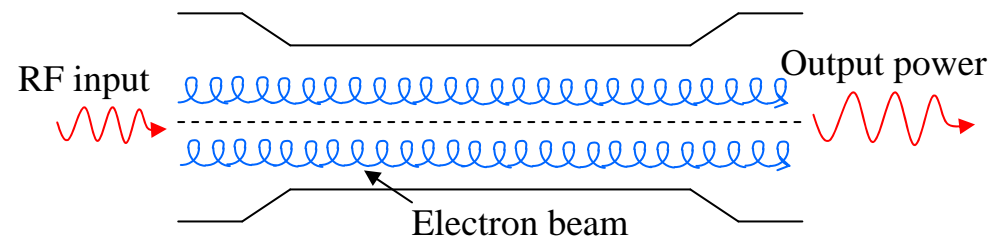
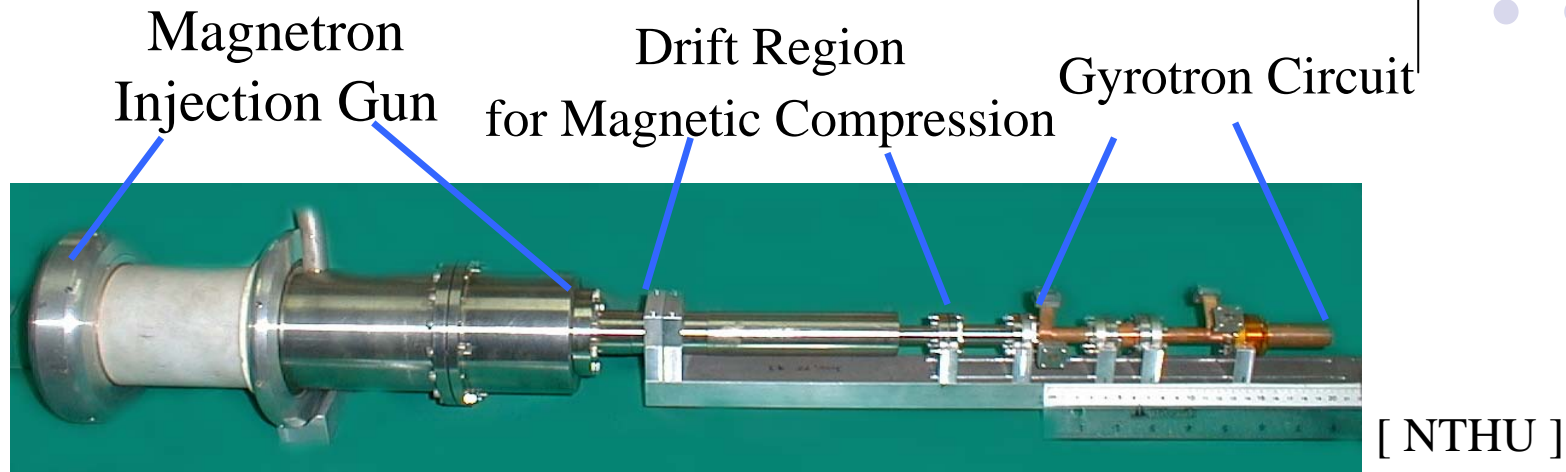
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**Student : Chih Te Huang**

**Advisor : Yi Sheng Yeh**

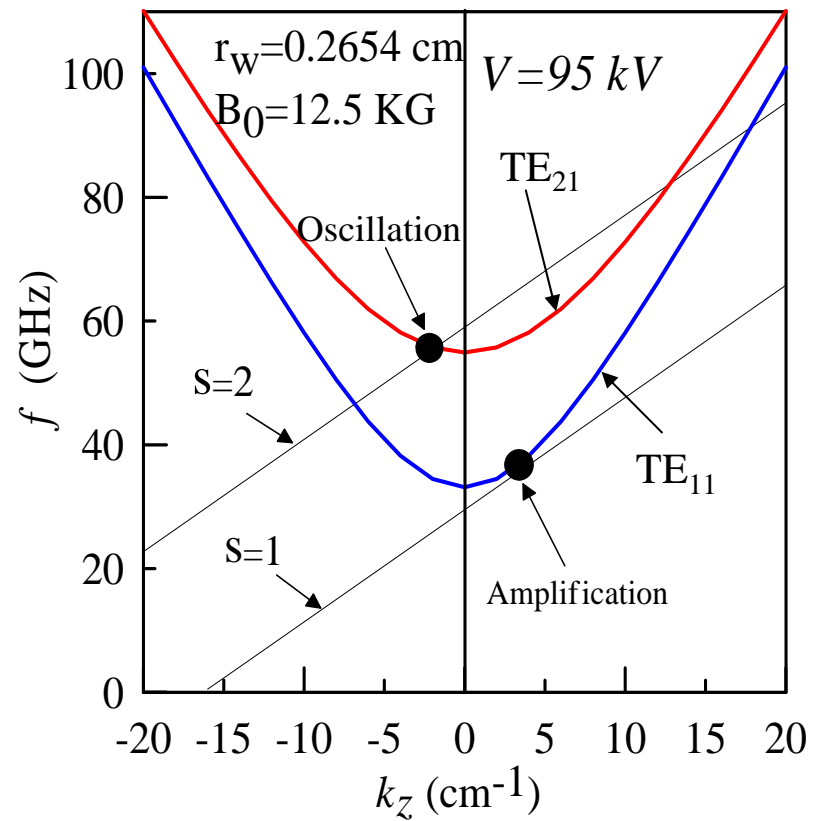
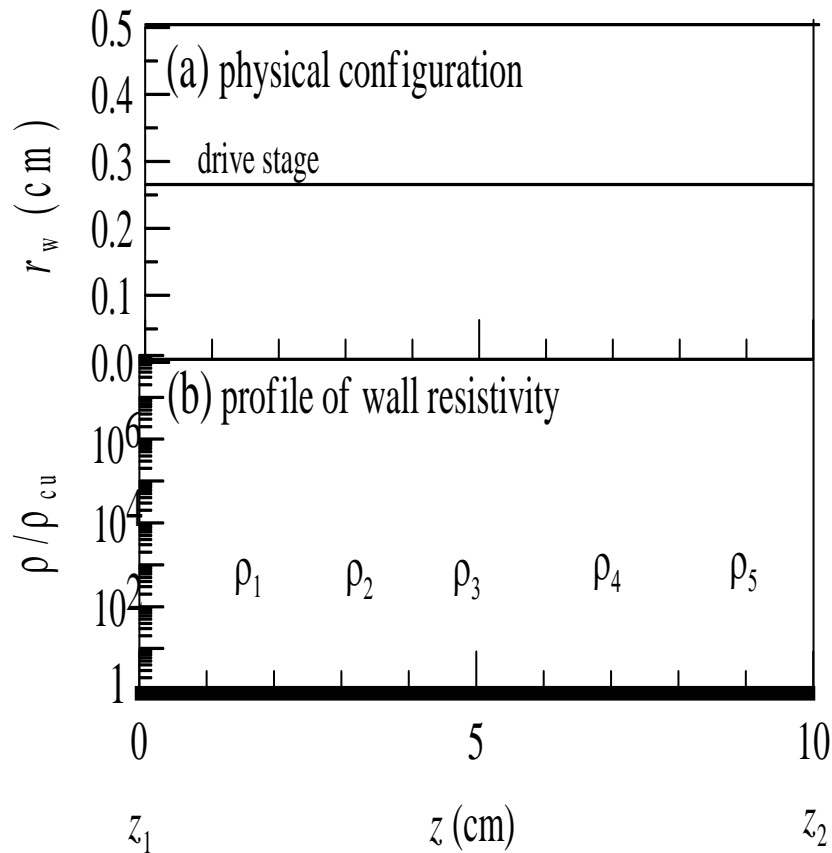


# Gyrotron Traveling Wave Amplifier

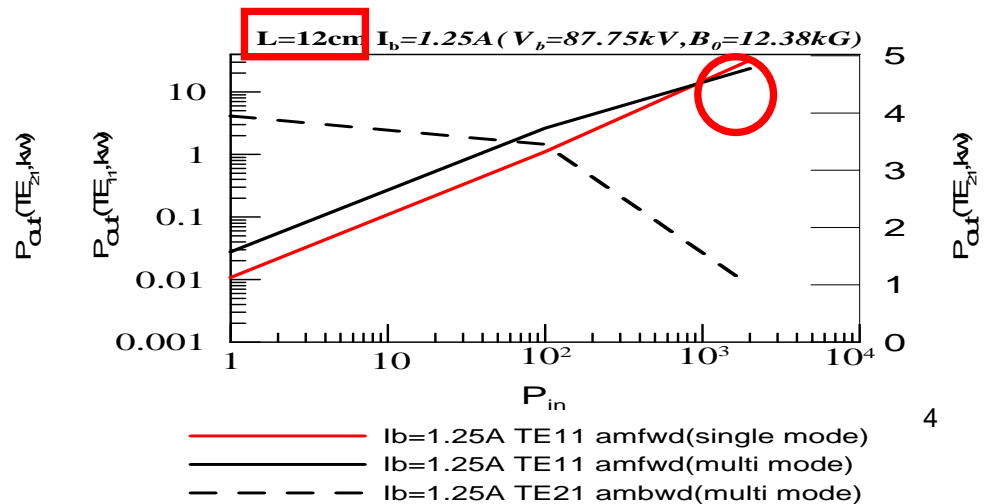
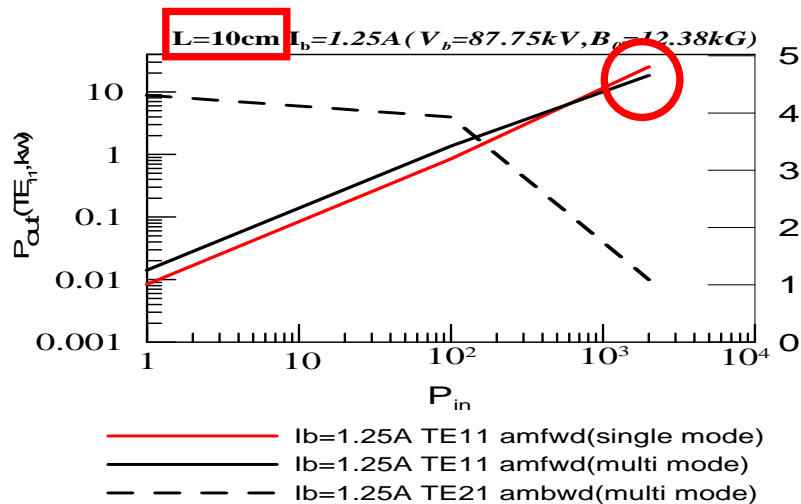
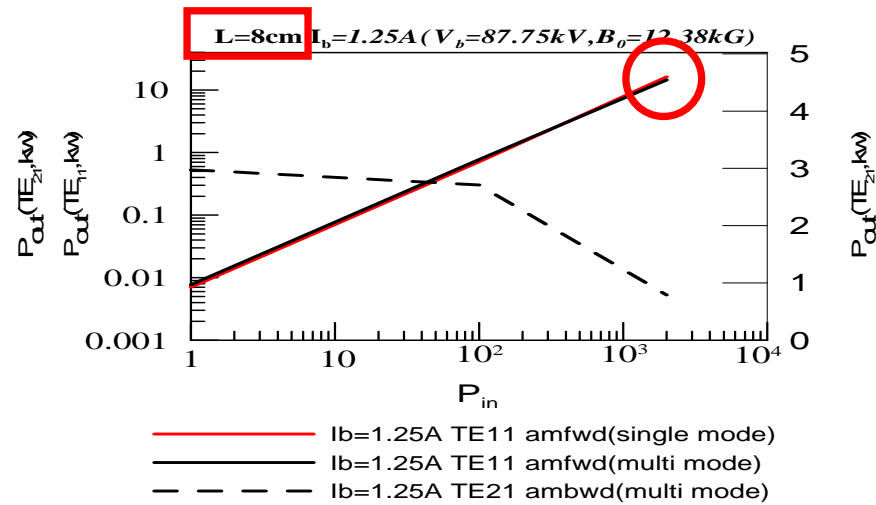
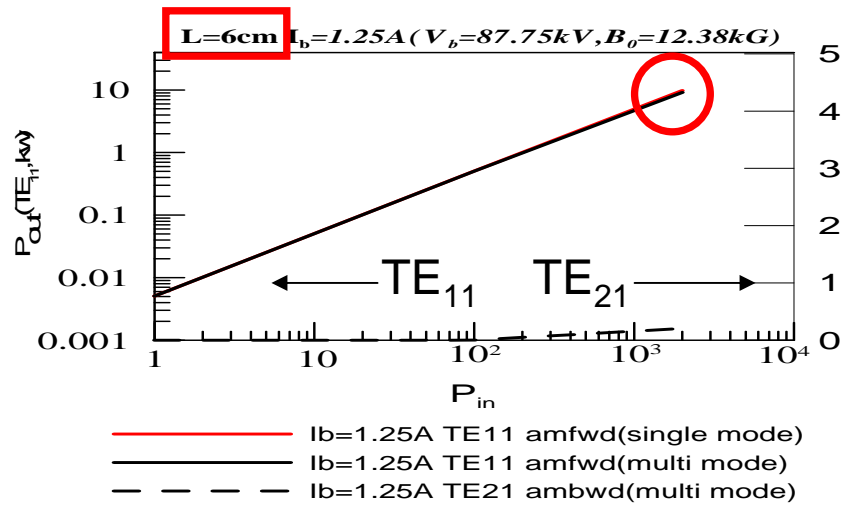


- ◆ The gyrotron traveling wave amplifier (gyro-TWA) is a high-power, broadband and millimeter-wave amplifier.
- ◆ A Ka-band distributed-loss gyro-TWT is experimentally to produce a 93 kW saturated peak power. A W-band gyro-TWT with distributed losses has a saturated peak power of 59 kW.

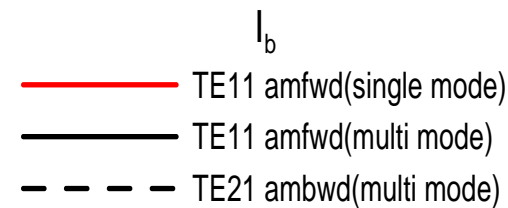
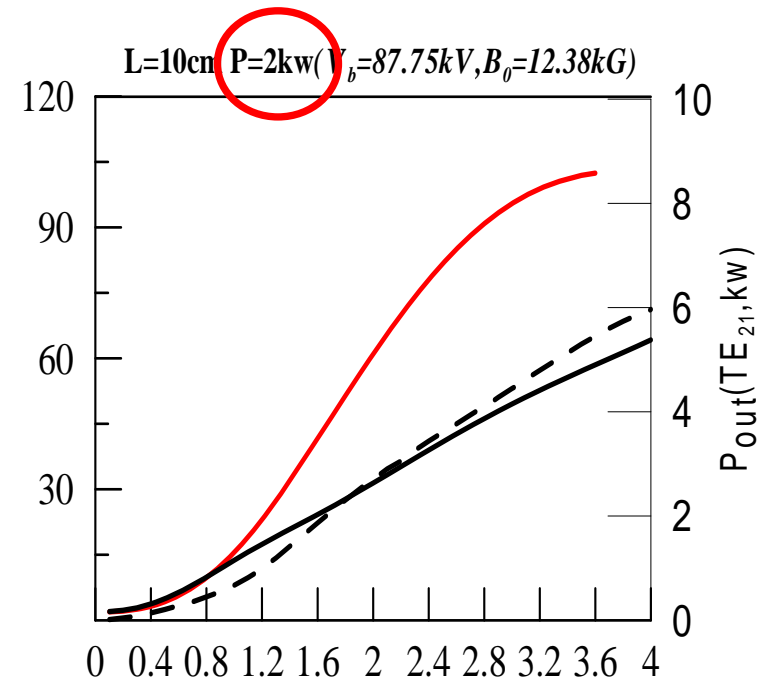
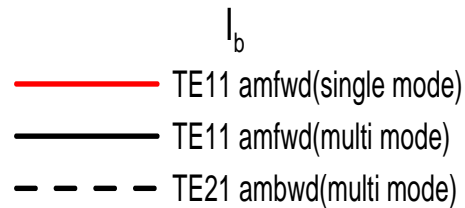
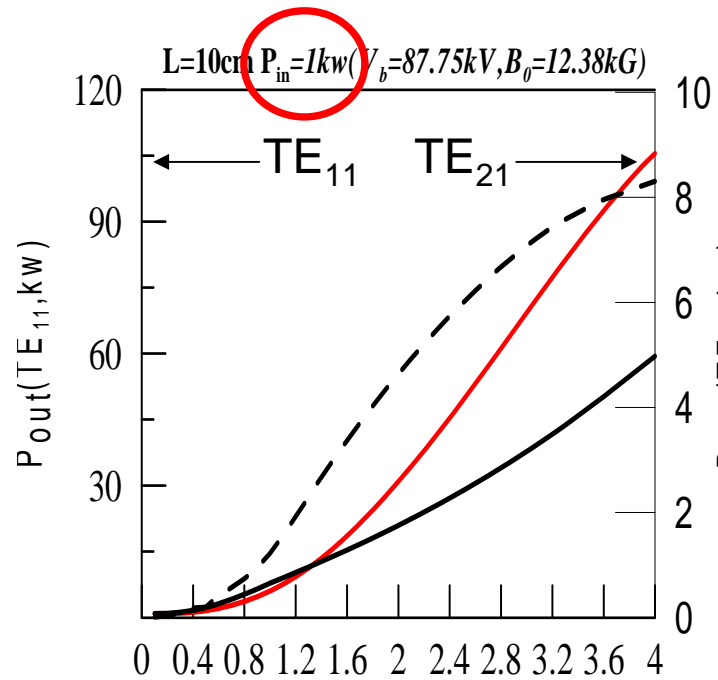
# 1. Gyro-TWA with uniform structure (I)



# 1. Gyro-TWA with uniform structure (II)

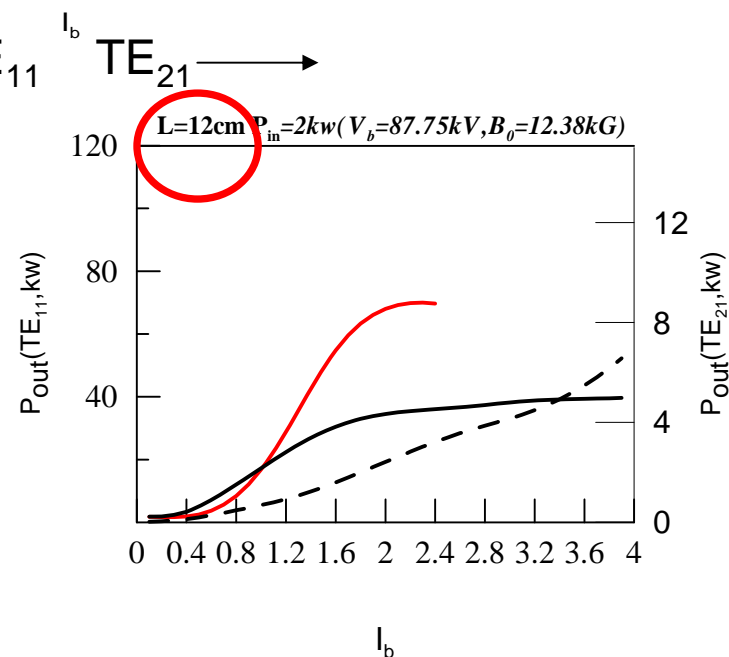
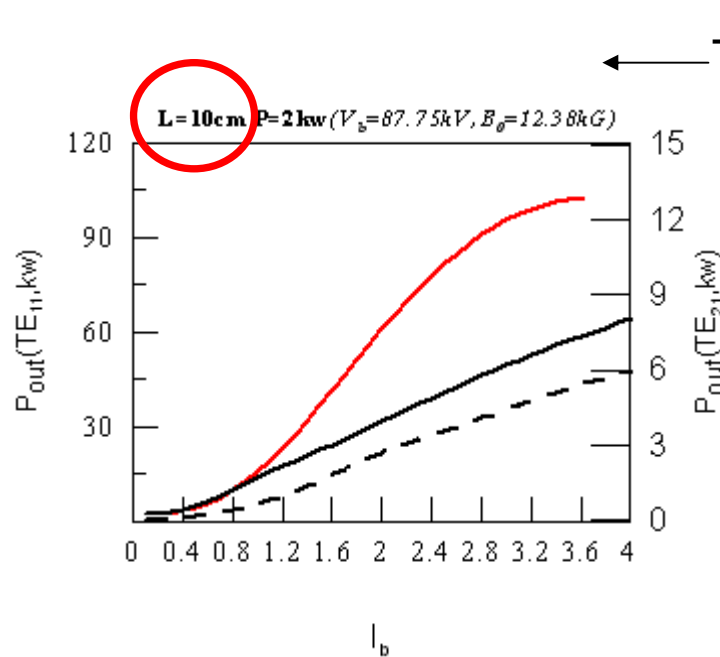
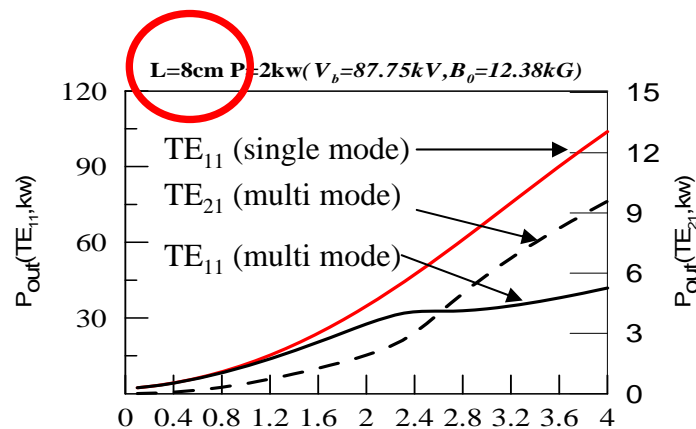


# 1. Gyro-TWA with uniform structure (III)

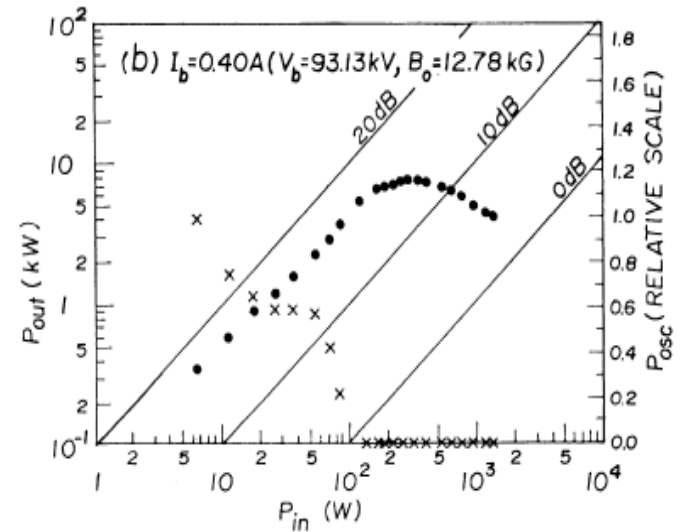
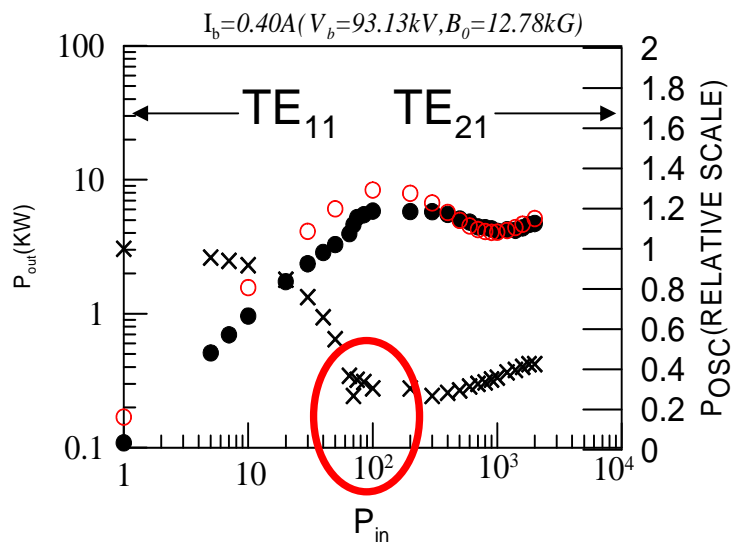
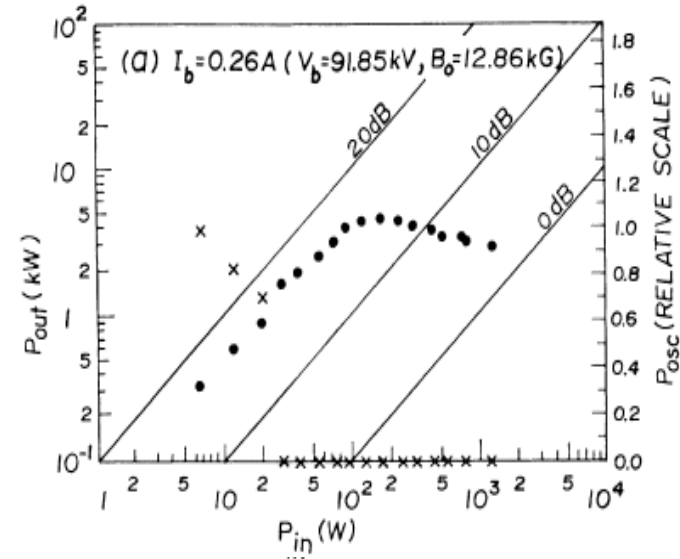
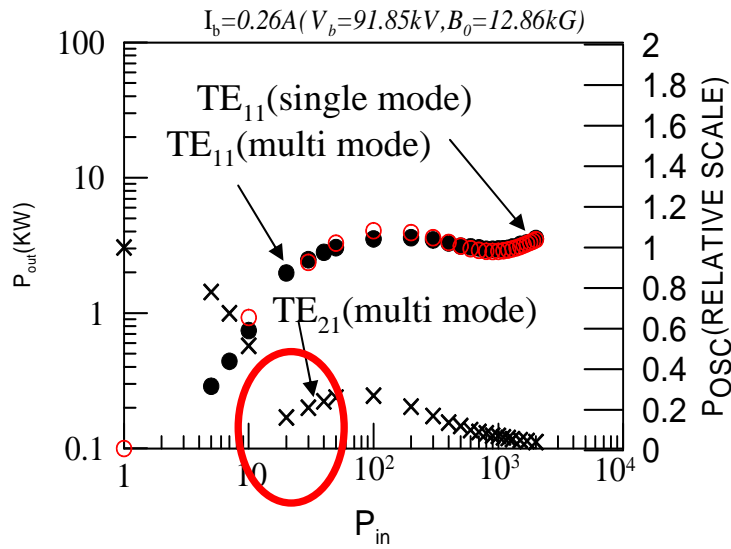




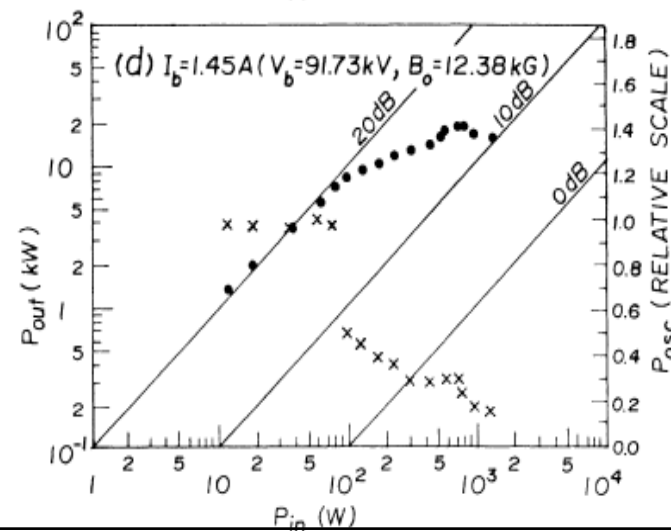
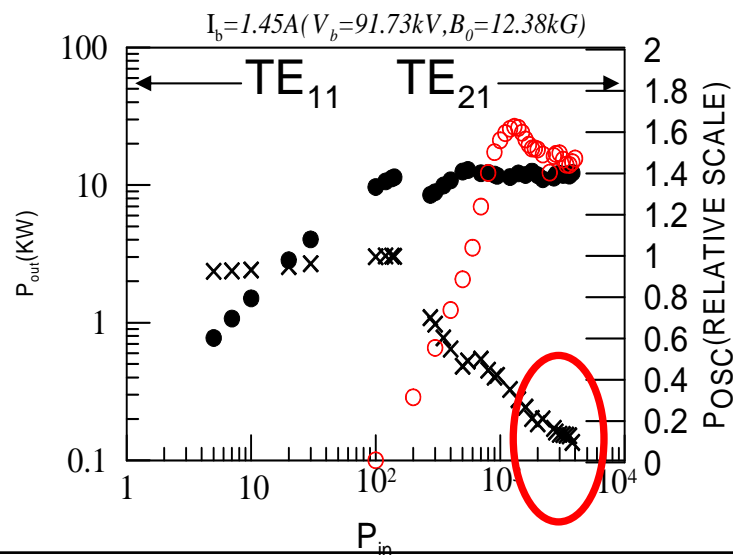
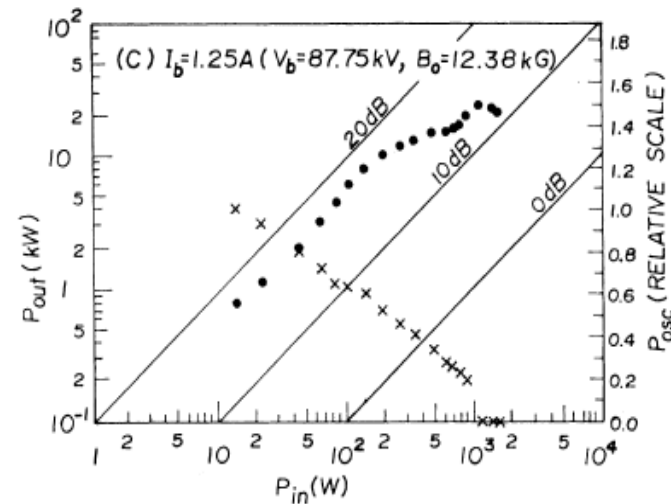
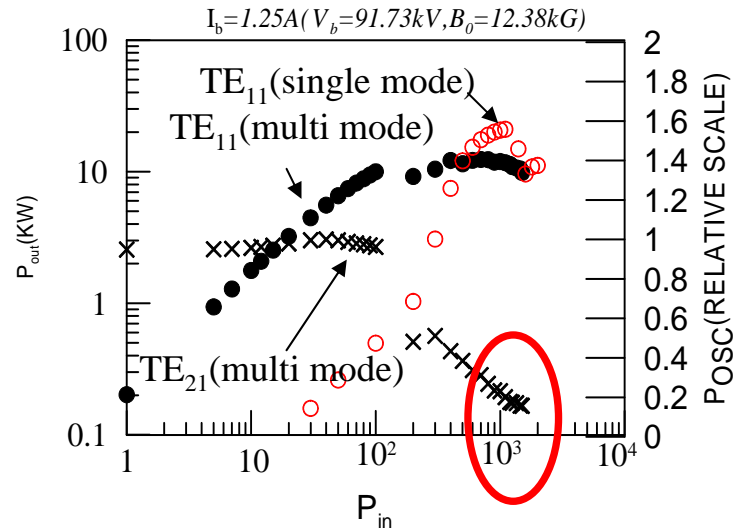
# 1. Gyro-TWA with uniform structure (IV)



## 2. Gyro-TWA with non-uniform structure (I)

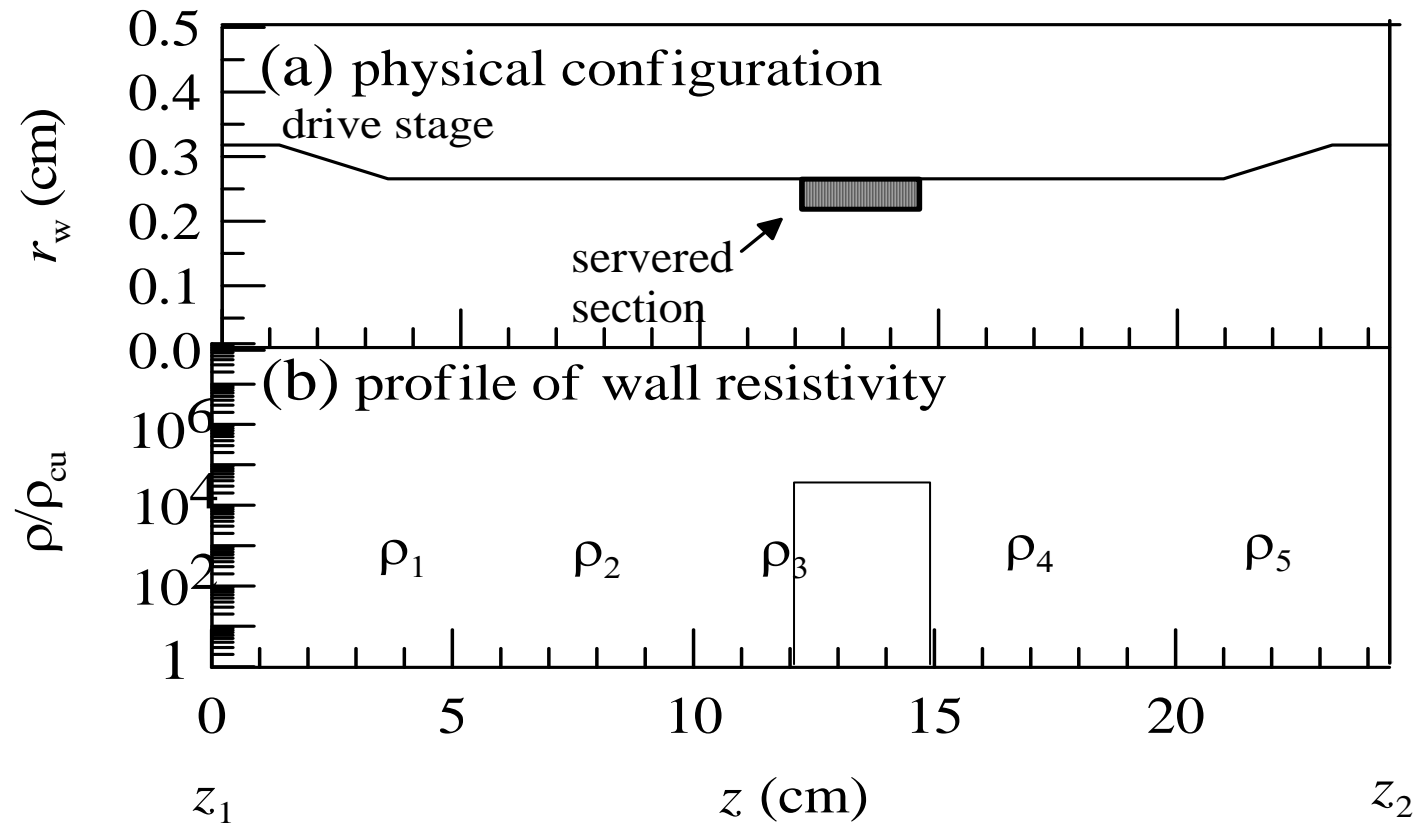


## 2. Gyro-TWA with non-uniform structure (II)



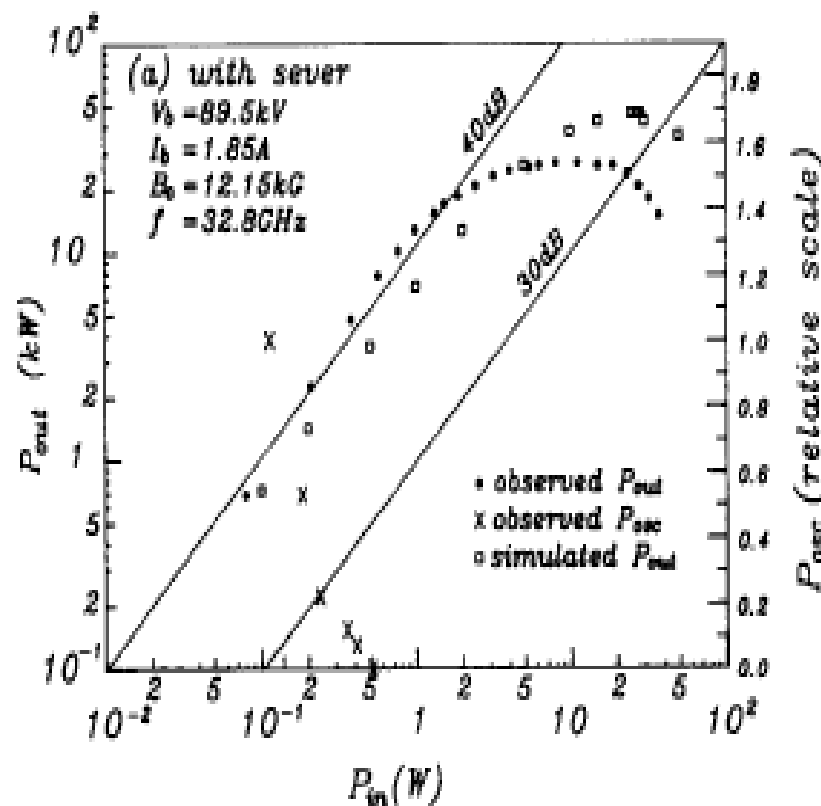
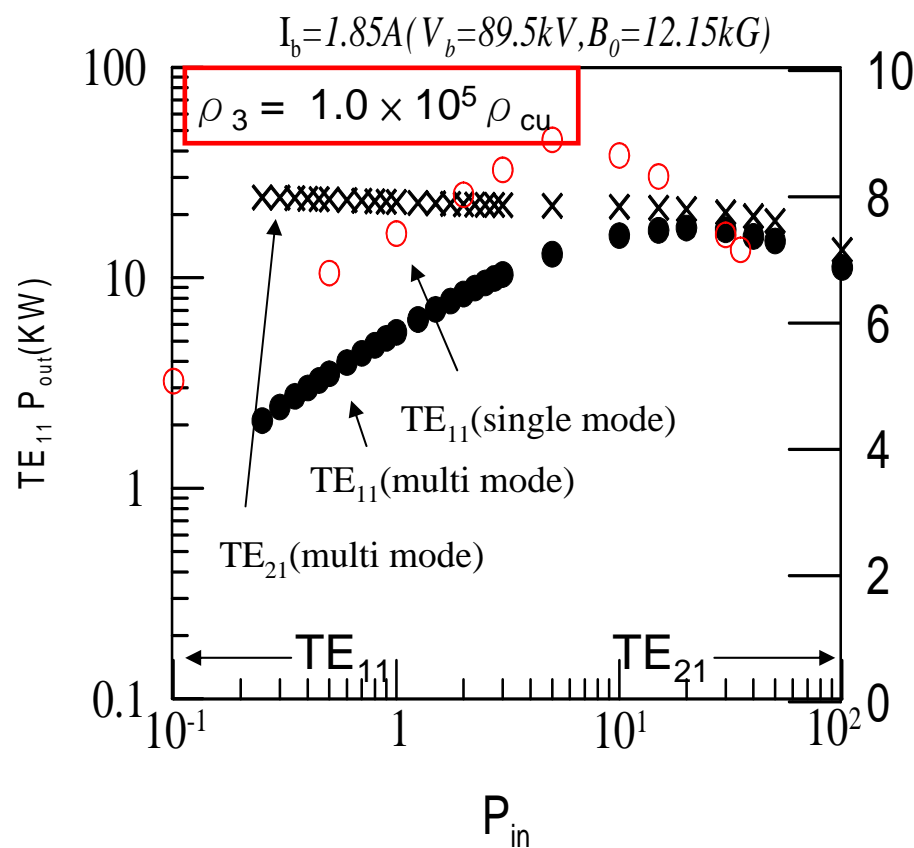


### 3. Gyro-TWA with sever (I)

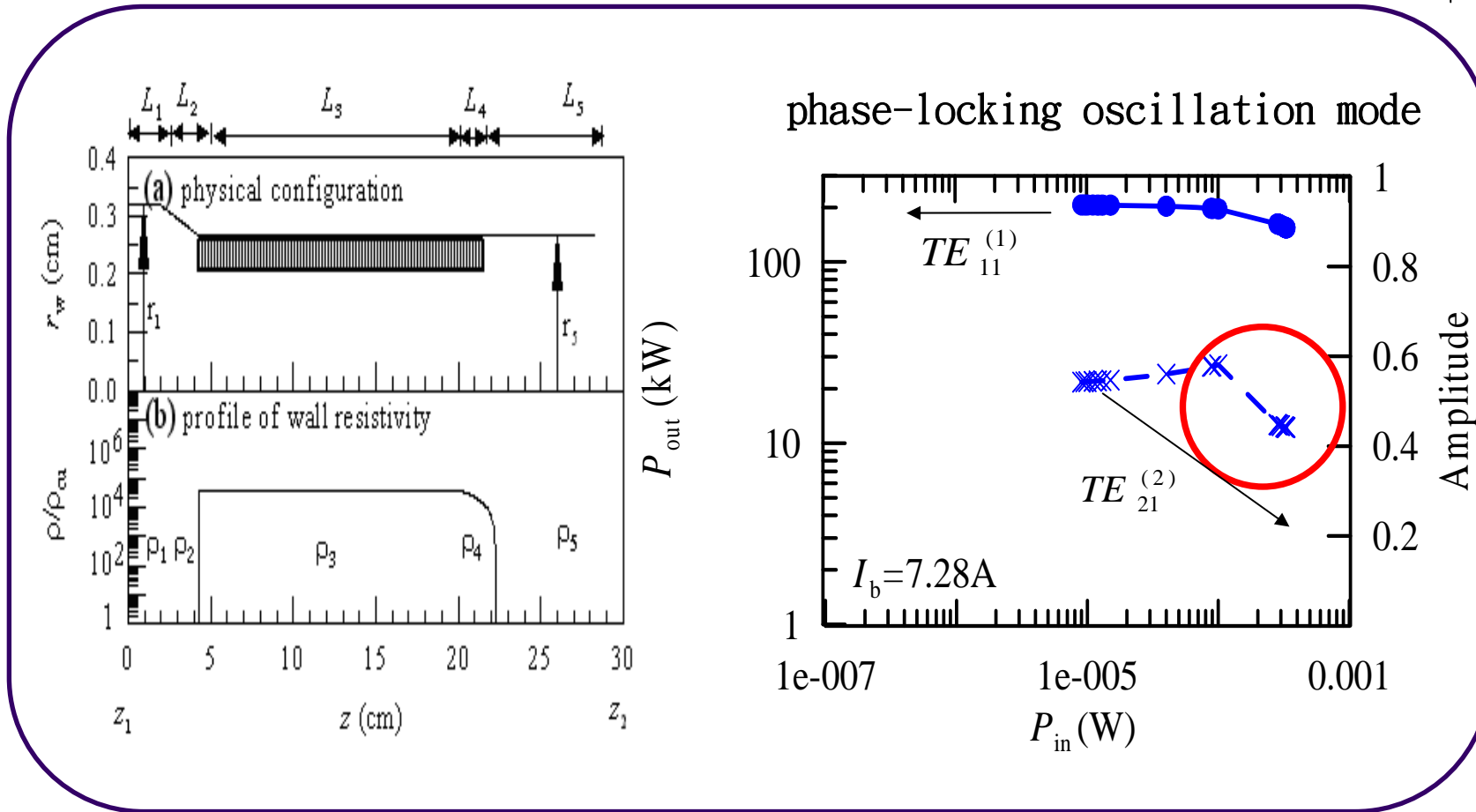




### 3. Gyro-TWA with sever (II)



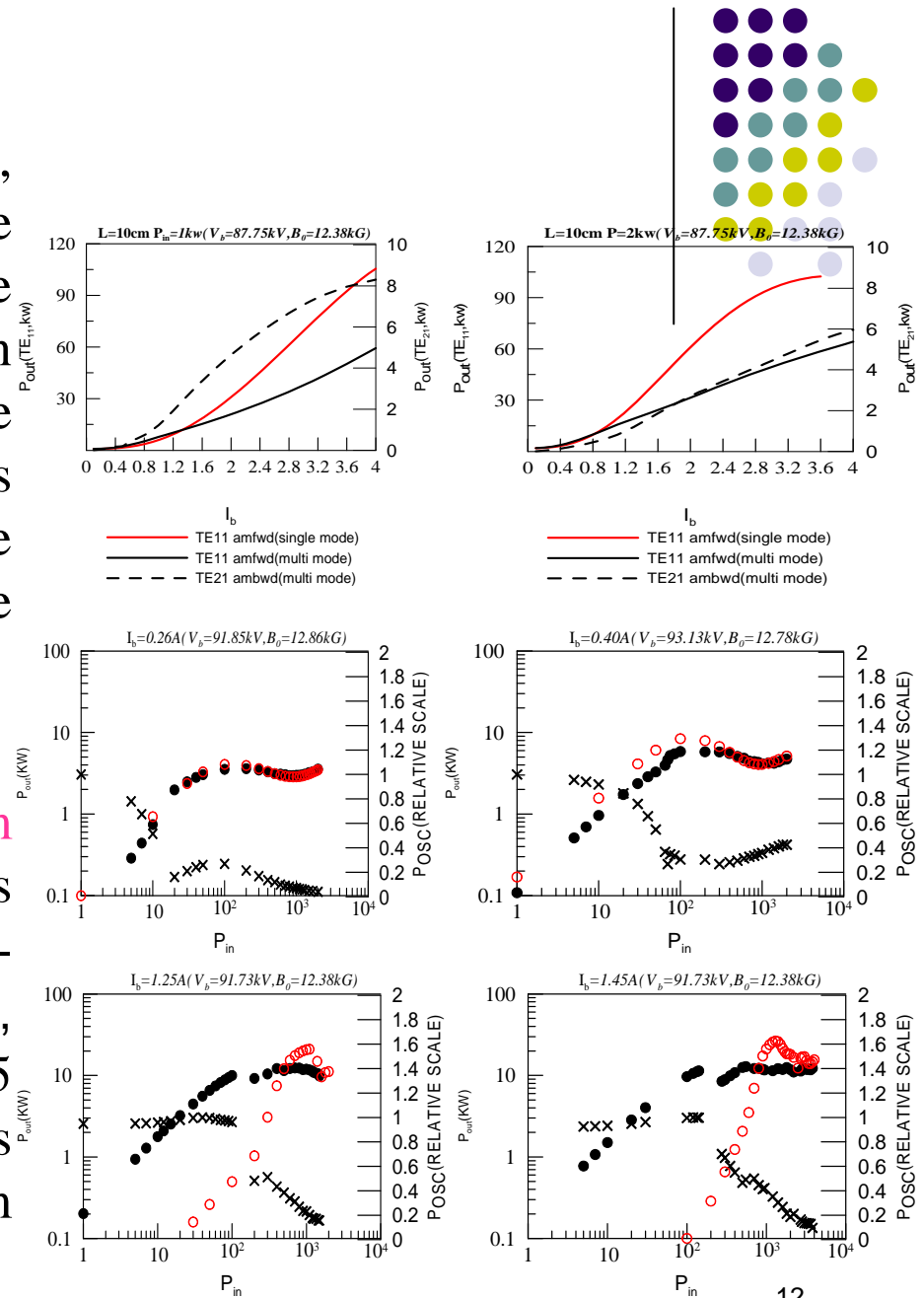
# 4. Gyro-TWA with distributed wall losses



# ● Conclusions (I)

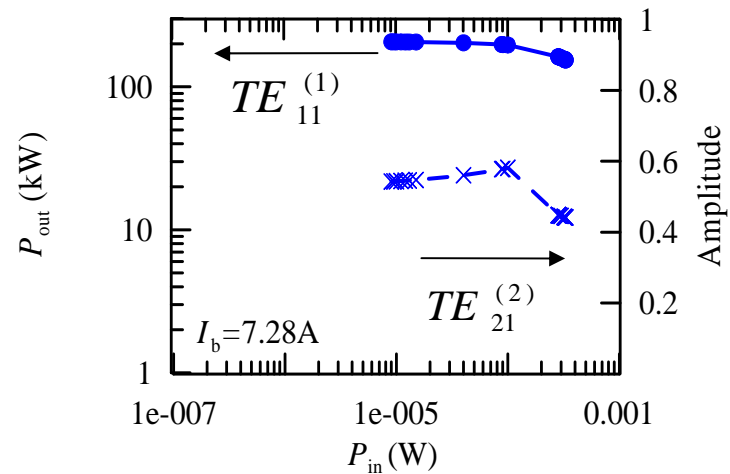
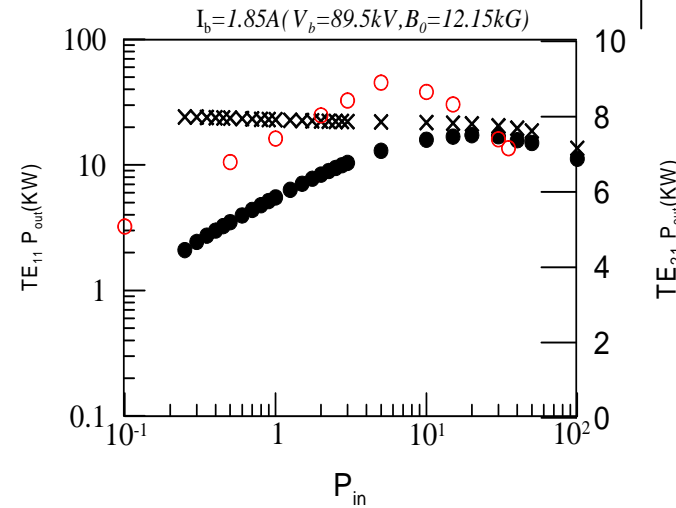
◆ In the Gyro-TWA with uniform structure, The simulation results show, the complete suppression of this instability by the application of the TE<sub>11</sub> drive has been observed. And has analyzed, Due to the TE<sub>21</sub> oscillation generate the power that is reduced the issue between the single mode gyro-TWAs and the multi mode gyro-TWAs.

◆ In the Gyro-TWA with non-uniform structure, The simulation results show, as the result of uniform structure of gyro-TWAs. In single-mode gyro-TWA, when the operation current reached 1.25 A, The TE<sub>11</sub> mode output power has become weak that is different from multi-mode gyro-TWAs.



# ● Conclusions (II)

- ◆ In the Gyro-TWA with **sever**, Increase the drive power can be effective suppression of  $TE_{21}^{(2)}$  mode oscillation.
- ◆ In the Gyro-TWA with **distributed wall losses**, when the traveling wave tube operating in the phase-locking oscillation mode can be effective suppression the oscillation of non-operating mode.



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