the maximum value of m and n is 10, then most of the 100 modes can be excited.

From the results and analysis of Fig.2, the sound radiation power insertion loss are of significant difference , because the modes on different excitation points are various. Then, how to select the position of excitation points when using the plate model to evaluate the noise reduction performance of decoupling coating?

A simple solution is to select a sufficient number of excitation points , and all excitation forces are not relevant, then selecting the average radiated sound power value of multiple excitation points.Due to the symmetry of the plate, the position of excitation point can be selected in the quarter area of the plate. Supposed that a rectangular area which diagonal coordinates are (x'_0, y'_0) and $(a/2, b/2)$ is equally divided into N_1 sections in the direction of abscissa and ordinate, then the equal division points are selected as the excitation points.Take $x'_0 = a/8, y'_0 = b/8$, N_1=5. Fig.4 compares the two curves of the average radiation sound power insertion loss varied with frequency on 25 excitation points and 24 ones. The results show that two average radiation sound power insertion loss are basically the same.

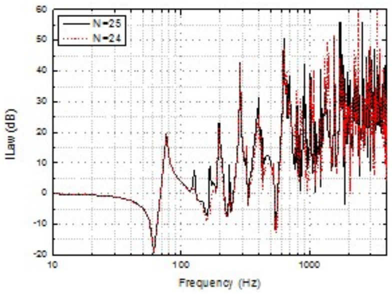

Fig.4 Average sound radiated power insertion loss; solid line: N=25; dash line: N=24

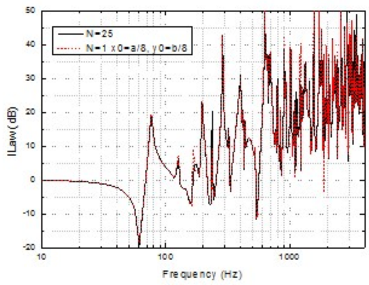

Fig.5 Average sound radiated power insertion loss; solid line: N=25; dash line: N=1 (x0=a/8,y0=b/8)

However, in the actual plate model test system, it's a huge work to test multiple excitation point. If we can find a point that consistent with the average radiation sound power insertion loss of multiple excitation point, the test will be easier. Received from formula (14), excitation point the more closer to the corner of the plate, the more modes number will be excited.

Fig.5 compares the radiation sound power insertion loss on the excitation point (x_0=*a*/8,y_0=*b*/8) and the average value of all 25 excitation points. The fig.5 concluded that the two results are unanimous. i.e. The corner of the plate is very suitable for the location of point excitation force.

IV. CONCLUSION

This thesis builds a vibration and sound radiation model of the simply supported rectangular plate which is water-loaded on one side and air backed on the other under the effect of point excitation force. The influence of the number and location of excitation points on the sound radiation power insertion loss is analyzed. The research shows that:

1) The location of point excitation force has great influence on the sound radiation power insertion loss.

2) the more number of point excitation forces, the results of the sound radiation power insertion loss more closer to convergence.

3) the radiation sound power insertion loss that the location of point excitation force is the corner of the plate is basically consistent with the average value of many excitation points

The excitation point selection is more appropriate to the corner of the plate, when using the plate model to evaluate the noise reduction performance of decoupling coating.

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