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Subject: Port issues

Posted by [Wayne Parham](#) on Wed, 06 Aug 2003 21:46:17 GMT

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What I've found is that the Helmholtz formulas are most accurate when the size of the box is large enough that the port can be placed where airflow is not disturbed. That's really all we're concerned about here, setting aside turbulence for a moment. Having the port placed near a cabinet wall doesn't change the fact that the system forms a Helmholtz resonator - It just makes the tuned frequency indicated by the formulas less reliable. But it is still a resonator, and it is still tuned to some frequency. And as long as the system is tuned to the frequency desired, the configuration, shape and location of the port is of little importance. But there are a couple other things to consider. In addition to forming a Helmholtz resonator, a port can form a waveguide if its dimensions are right. The cabinet can also act in a similar fashion, forming a transmission line. Either case can make standing wave phenomenon that add unexpected resonances. But these are usually only a problem is one dimension of the cabinet or the port is long in comparison to the others. A very tall cabinet or a very long port are examples of things that might develop audible standing waves in the passband. Another thing to avoid is excessive turbulence in the port or interface. If velocity is high through the port, then audible "chuffing" sounds can be produced. This can be caused by too small a port used in a high-pressure system having a high-excursion woofer. It can also be caused by interference in port airflow from a boundary or an object. Turbulence can even be introduced from objects outside the cabinet, by placing the speaker where the port is very near a wall, for example. Airflow restriction also modify filter damping, so the Helmholtz resonator's Q can be changed or even made to be asymmetric, like a partial rectification. So I've found it easiest to design systems that have a nice, large cabinet where port airflow is unimpeded. But I've built many systems where the cabinet dimensions were pretty tight. And as long as the Helmholtz frequency is right and the airflow in the port isn't so great as to create its own sounds, the port configuration is appropriate and you can expect performance to be good.