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出口宽高比对S形二元收敛喷管雷达散射截面的影响

Influence on radar cross-section of S-shaped two dimensional convergent nozzles with different outlet width-height ratios

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中文摘要:

在S形二元收敛喷管进出口面积、偏心距、面积变化规律及中心线变化规律不变的条件下，采用自适应超椭圆方法设计不同出口宽高比的S形二元收敛喷管.基于迭代物理光学法与等效边缘电磁流法自主开发计算腔体部件雷达散射截面（RCS）的程序；然后通过文献中的实验数据验证了计算程序的准确性和可靠性.通过计算程序分别分析了水平、垂直两种极化方式下不同S形二元收敛喷管的边缘绕射场与总散射场的电磁散射特性.结果表明：在水平、垂直两种极化方式下，喷管出口宽高比的变化对S形二元收敛喷管边缘绕射场的RCS影响较小，不同出口宽高比的S形二元收敛喷管边缘绕射场的RCS相差不超过4dB.喷管出口宽高比的变化对总散射场的RCS影响较大；正探测角时，宽高比为1.5时，在大部分探测角范围内总散射场有较低的RCS；负探测角时，宽高比为3.5时有较低的RCS.

英文摘要:

S-shaped two-dimensional(2-D) convergent nozzle with different width-height ratios were designed by the self-adaptive super-ellipse method when the inlet and outlet area,the eccentricity,area variation and the centerline variation of nozzles were kept constant.Combining iterative physical optic method with equivalent edge currents method,a code capable of calulating the edge diffraction and total scattering field was developed to simulate the radar scattering characteristics of cavities.The accuracy and reliability of the code was verified by comparing the experimental data from references with calculated data.Under horizontal and vertical polarization ways,radar cross-section(RCS) characteristics of S-shaped 2-D convergent nozzles were analyzed.The results show that the width-height ratio has little effect on the edge diffraction field of S-shaped 2-D convergent nozzle under horizontal and vertical polarization ways,and the difference of the outlet width-height ratio of the S-shaped 2-D convergent nozzles' RCS is less than 4dB.The nozzles' outlet width-height ratio has a large influence on total scattering field.At the positive detection angle within the large range of the detection angle the total scattering filed has lower RCS while the width- height ratio is 1.5,and at the negative detection angle,it has lower RCS while the ratio is 3.5.