

MATERIALS AND STRUCTURES SYMPOSIUM (C2)
Interactive Presentations (IP)

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KA BAND METAL WIRE MESH DEVELOPMENT FOR DEPLOYABLE REFLECTOR

Abstract

Metal wire mesh is the key materials of deployable mesh reflectors. Ka band antenna can increase transmit ratio and bandwidth in communication satellite, so ka band metal wire mesh is developed for deployable reflector. Good mechanical and radio reflective performance is necessary for antenna metal wire mesh. The type of wire and the specification of plating player is very critical to mesh performance. Some existing wire and plating type is reviewed first. In fact, metal mesh have developed above forty years old. More than eighty satellites used some kinds of wire, such as fiber, tungsten, molybdenum, stainless steel, and so on. In the recent twenty years, gild molybdenum wire is the main selection. A good mesh should meet some special design requirements. The main characteristics include microwave reflection, mechanical tension, thermal transmit and absorption, light transmission. Microwave reflection ratio is required according to antenna frequency. In generally, more smaller mesh hole is necessary with antenna frequency increase. Mechanical tension-deformation curve should steady-going. In order to maintain mesh temperature, light transmission, thermal transmits and absorption have special requirement. There are many kinds of weave texture structure in the textile industry, but warp knitted fabric is applicable to antenna reflector metal mesh. Different texture is selected according to different antenna frequency, the size of hole and special mechanical requirement. So just few kinds of texture type is can be manufacture. Simulation of mesh is very difficult, some new methods will be introduced in this paper. For the reason that very thin wire modeling is difficult, equivalent strip radio analytic method is proposed, and near field and far field antenna radiation pattern is calculated, such as reflective loss, amplitude difference, phase difference, and so on. Simulation and calculation shows the designed weave structure is better. Based on weave radio loss leakage thesis, the diameter of mesh hole is calculated and determined. A kind of metal mesh has developed. After simulation and design, a kind of special weave metal mesh is manufactured, the diameter of gild molybdenum wire is 17m, and the hole of the mesh is 0.5mm. Two radio loss test method is proposed, and just one is selected to experiment after contrast. At last, radio reflective ratio and deformation-force curve is tested. The radio reflective ratio is tested at 23GHz and 29GHz, and radio loss is less than 0.2dB. The test result show the design is right.