Initial Study of Type-B Payload

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O Two kinds of design

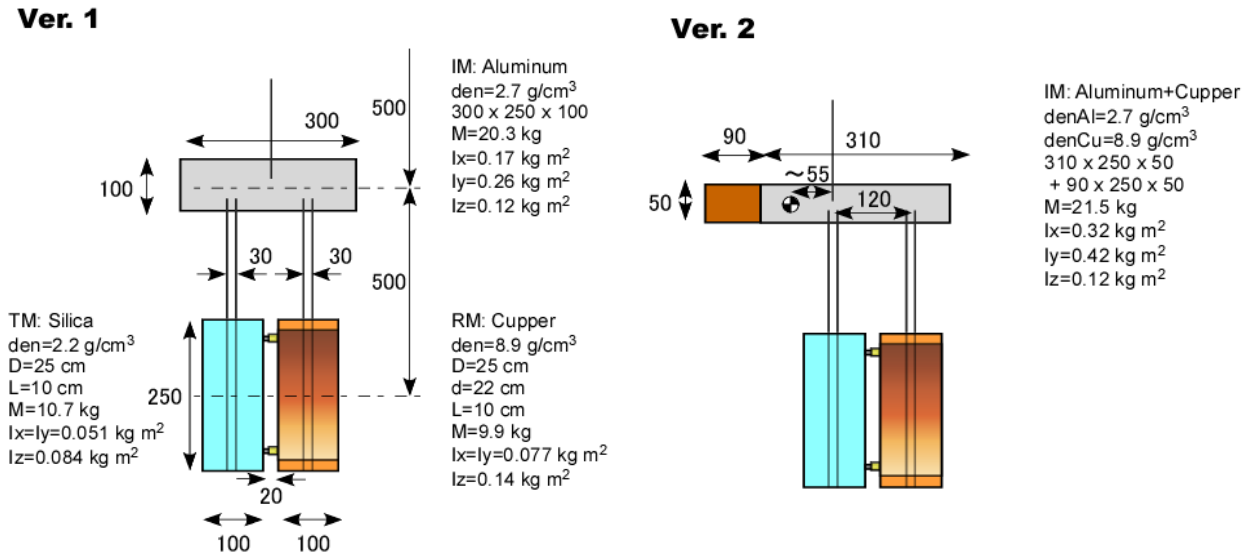

Fig.1: Preliminary design of the type B payload

Because of the folding the concentric geometry cannot be used for the recycling mirrors and their recoil masses (as the folded beam passes just next to the mirror side edge). Therefore we use coaxial in-line geometry, using copper pipe to allow for the transmitted beam collection.

The simplest design of the type-B payload would be the left hand side of the Fig. 1 (**ver. 1**). The TM and RM are balanced by making them in the same masses (10 kg). In this configuration, however, the pitch motion of the IM and the vertical motion of the TM may be largely coupled. To reduce such a coupling, configuration shown in the right hand side of the Fig. 1 (**ver. 2**) is designed. The IM is balanced by a counter weight (made by copper).

The simulation result (Fig. 3) shows that horizontal and vertical modes are coupled more largely in ver. 1.

O Mathematica Models

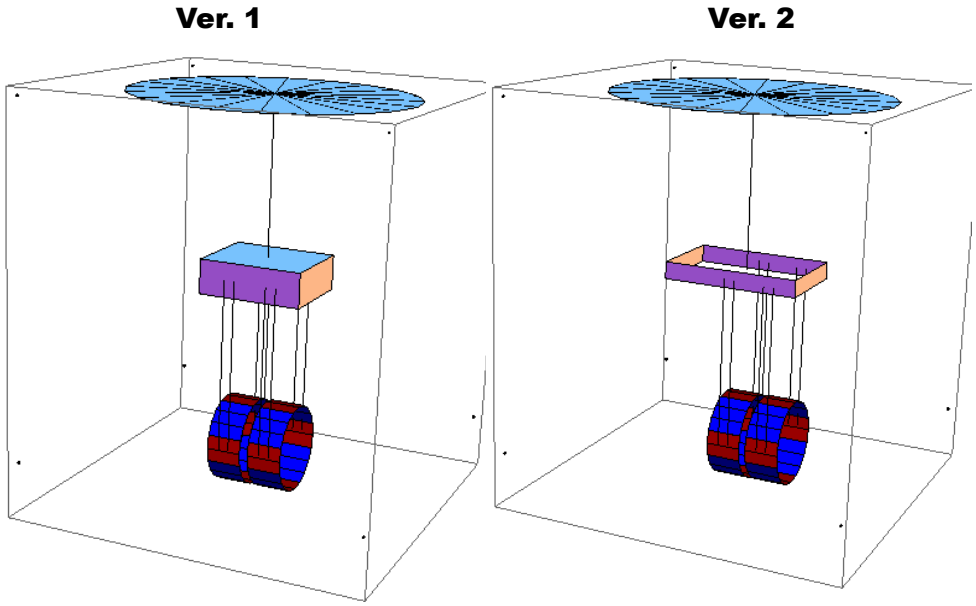

Fig. 2: Mathematica Models

O Transfer Function

* Ground (horizontal) → TM (vertical)

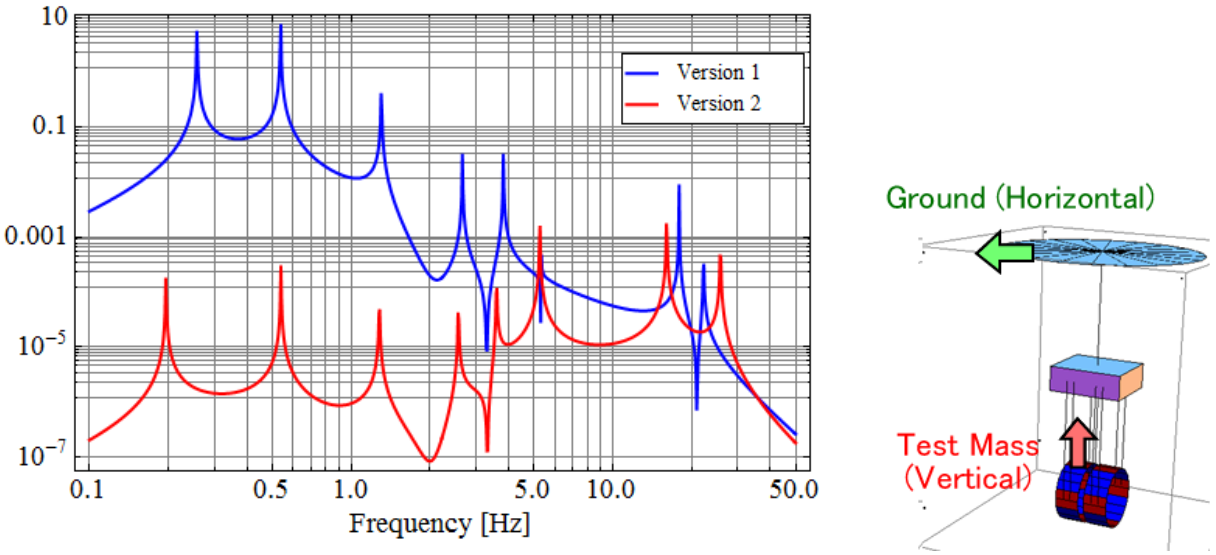

Fig. 3: Transfer function [ground motion (horizontal) → TM motion (vertical)]

O Parameters

Ver. 1

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(*          IM,   TM,   RM     *)
mass = {20.3, 10.7, 9.90} kg;
moix = {0.17, .051, .077} kg meter^2;
moiy = {0.26, .051, .077} kg meter^2;
moiz = {0.12, .084, 0.14} kg meter^2;,
matw={"MS","W","C70"};(*wire material*)
lNw={{50.0},{50.0,50.0,50.0,50.0},{50.0,50.0,50.0,50.0}}cm;(*wire natural length*)
dw={{0.40},{0.20,0.20,0.20,0.20},{0.25,0.25,0.25,0.25}}mm;(*wire diameter*)
dyu={{0.00},{0.00,0.00,0.00,0.00},{0.00,0.00,0.00,0.00}}mm;(*break-off of COM & upper suspension point*)
dyl={{0.00},{1.00,1.00,1.00,1.00},{1.00,1.00,1.00,1.00}}mm; (*break-off of COM & lower suspension point*)
dxu={0.00,12.5,12.5}cm;(*x-separation of wires*)
dzu={0.00,1.50,1.50}cm;(*z-separation of wires*)
dxl=dxu;dzl=dzu;(*vertical suspension*)
nw={1,4,4};(*number of wires*)
dzTM = +6 cm; (*z-separation between COM of TM & COM of IM*)
dzRM = -6.485 cm; (*z-separation between COM of RM & COM of IM*)
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Ver. 2

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(*          IM,   TM,   RM     *)
mass = {21.5, 10.7, 9.90} kg;
moix = {0.32, .051, .077} kg meter^2;
moiy = {0.42, .051, .077} kg meter^2;
moiz = {0.12, .084, 0.14} kg meter^2;
matw={"MS","W","C70"};
lNw={{50.0},{50.0,50.0,50.0,50.0},{50.0,50.0,50.0,50.0}}cm;
dw={{0.40},{0.20,0.20,0.20,0.20},{0.25,0.25,0.25,0.25}}mm;
dyu={{0.00},{0.00,0.00,0.00,0.00},{0.00,0.00,0.00,0.00}}mm;
dyl={{0.00},{1.00,1.00,1.00,1.00},{1.00,1.00,1.00,1.00}}mm;
dxu={0.00,12.5,12.5}cm;
dzu={0.00,1.50,1.50}cm;
dxl=dxu;dzl=dzu;(*vertical suspension*)
nw={1,4,4};
dzTM = -5.526 cm;
dzRM = -17.526 cm;
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