

We study three cases,
 initial, with 10 kg test masses and 90 kg recoil masses
 LIGO-like test masses, 40 kg test masses, 60 kg recoil masses
 Heavy test masses, 90 kg test masses, 10 kg recoil masses.

test mass

$$m = 12.5 \cdot 2.2 \cdot r^2 \cdot \pi / 4 = 10000 \text{ g}$$

$$l = 12.5$$

$$d = 21.5$$

Test mass; $d=21.5$; $l=12.5$; densità 2.2 g/cm³; mass 9.984 Kg; $M_x=M_y=48843.911 \text{ Kgmm}^2$;

$M_z=57688.126 \text{ Kgmm}^2$ normale al piano

recoil mass $m = 90000$

$$d = 21.5 + 2 = 23.5$$

$$23 \cdot 2.2 \cdot (D^2 - 23.5^2) \pi / 4 = \text{mass}$$

$$23 \cdot 2.2 \cdot (D^2 - 23.5^2) \pi / 4 = 90000$$

$$50.6 \cdot (D^2 - 23.5^2) \pi / 4 = 90000$$

$$(D^2 - 23.5^2) = 2265$$

$$D^2 = 2265 + 552$$

$$D = 53$$

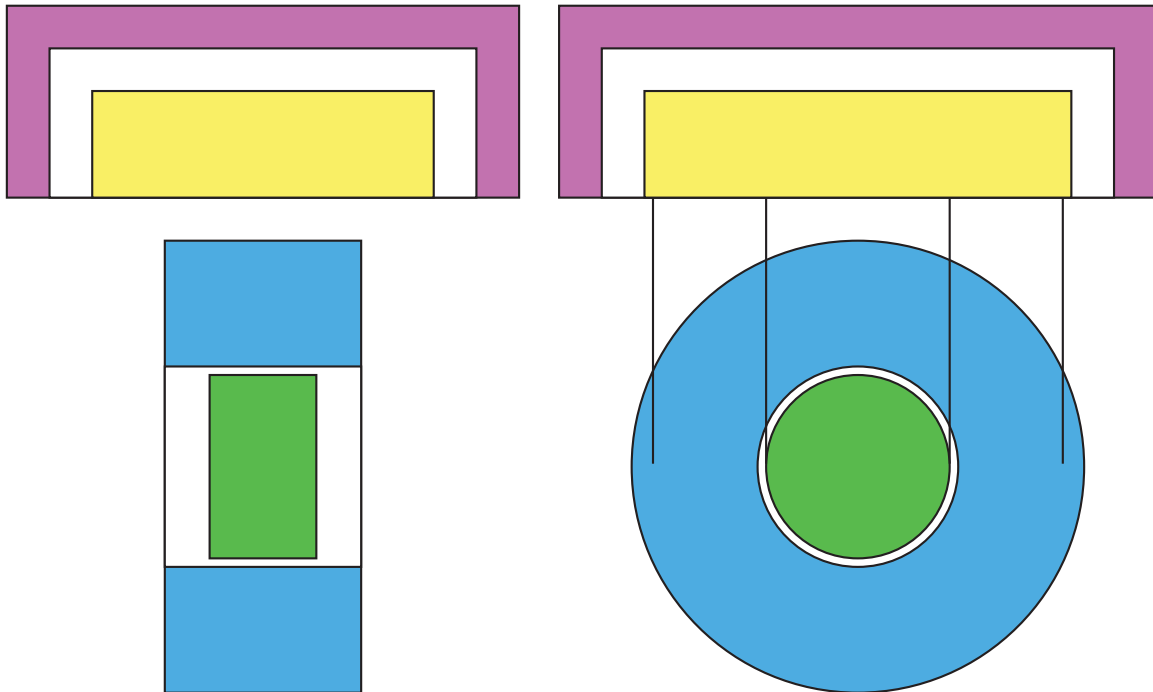
$$d = 23.5$$

$$L = 23$$

Recoil mass; $D=53$; $d=23.5$; $L=23$; densità 2.2; mass 89.686 Kg; $M_x=M_y=2279468.227$;

$M_z=3768206.354$ norm. al piano

$$Th = 14.75$$



test mass

$$m = 20 \cdot 2.2 \cdot r^2 \cdot \pi / 4 = 40000 \text{ g}$$

$$l = 20$$

$$d = 34$$

Test mass; d=34; l=20; densità 2.2; mass 39.948; x=y=421789.497; z=577255.

recoil mass m= 60000

$$d = 34 + 2 = 36$$

$$l \cdot 1.5 \cdot 2.2 \cdot (D^2 - 36^2) \pi / 4 = \text{mass}$$

$$20 \cdot 1.5 \cdot 2.2 \cdot (D^2 - 36^2) \pi / 4 = 60000$$

$$66 \cdot (D^2 - 36^2) \pi / 4 = 60000$$

$$(D^2 - 36^2) = 1157$$

$$D^2 = 1157 + 1296$$

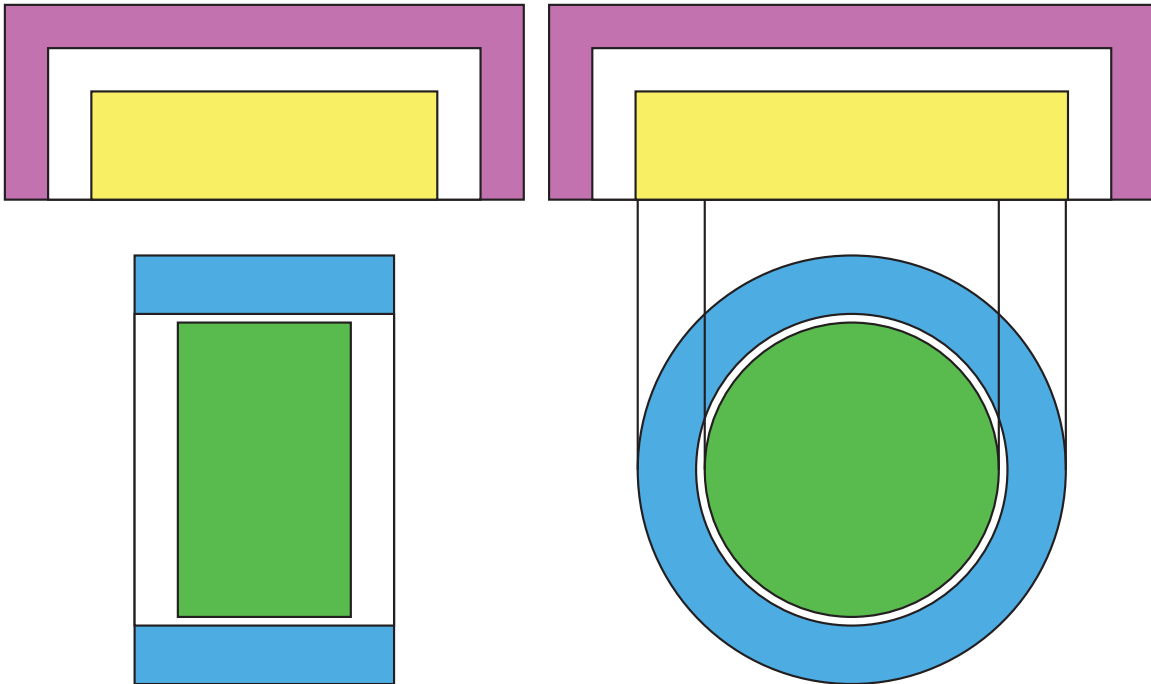
$$D = 49.5$$

$$d = 36$$

$$L = 30$$

recoil mass; dens. 2.2; mass 59.832; x=y=1849650.954; z=2801821.536

$$\text{Th} = 6.75$$



test mass

$$m = 25.2 * 2.2 * r^2 \pi / 4 = 80000 \text{ g}$$

$$l = 25.2$$

$$d = 42.8$$

Test mass; d=42.8; l=25.2; dens. 2.2; mass 79.763; x=y=1335309.803; z=1826409.645

recoil mass m= 20000

$$d = 42.8 + 2 = 44.8$$

$$l * 1.5 * 2.2 * (D^2 - 44.8^2) \pi / 4 = \text{mass}$$

$$25.2 * 1.5 * 2.2 * (D^2 - 44.8^2) \pi / 4 = 20000$$

$$83.16 * (D^2 - 44.8^2) \pi / 4 = 20000$$

$$(D^2 - 44.8^2) = 306$$

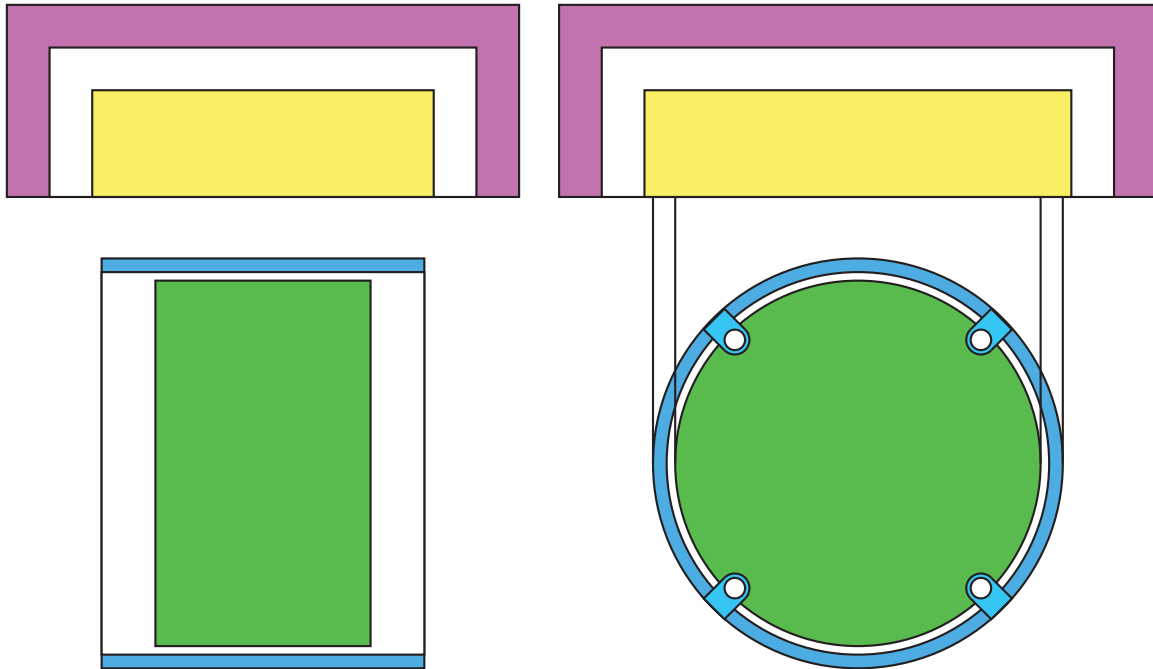
$$D^2 = 306 + 2007$$

$$D = 48$$

$$L = 37.8$$

Recoil mass; dens. 2.2; d=44.8; D=48; L=37.8; mass 19396; x=y=753536.89; z=1045187.921

Th = 2.6



test mass, fused silica

recoil mass, pyrex,

flaps for OSEMs attached with

low melting point glass

or UV curable epoxy

Intermediate mass

Material: fused silica plates bonded with UV curable epoxy or low melting point glass.

Central wire attachment: keyhole

Mirror fused silica fiber attachment: keyhole plus indium gasket RF point-like melting.

Pitch-roll balance: picomotors on fused silica mass internally suspended and spring loaded

Nominal Density = 2.2 g/cm³

M = 40000 g

V = 18200 cm³

W = 50 cm

L = 40 cm

H = 12.5 cm



fused silica parts:

50 x 125 x 400, 4p

300 x 400, 1 p

bonds, low melting point glass

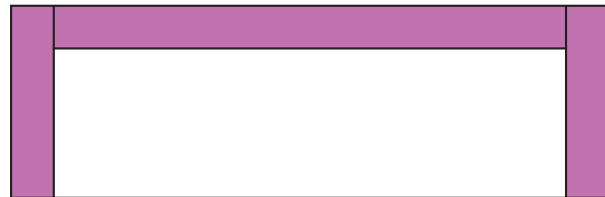
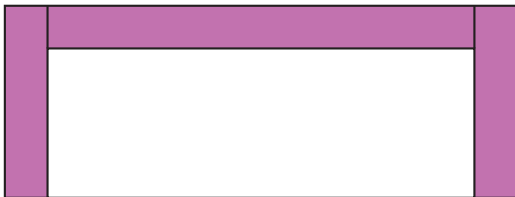
intermediate mass; dens. 2.2; W=50;L=40;H=12.5; mass 55; approximation single solid block

x=804947.917 norm. lato 40x12.5;

y=1879166.667 norm lato 40x50;

z=1217447.917 norm. lato 50x12.5

Intermediate recoil mass



Intermediate recoil mass

fused silica parts: 500 x 600 x 50

50 x 500 x 225, 4 p

bonding, low melting point glass

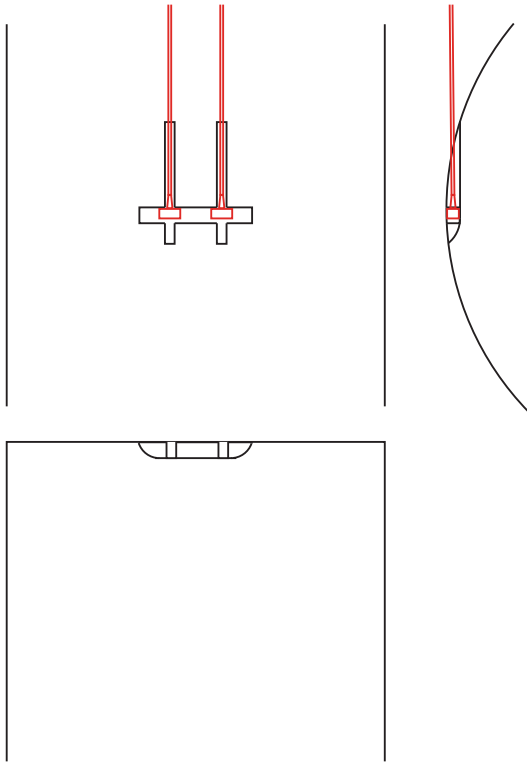
Intermediate recoil mass; dens. 2.2; 500x600x225 parete 50; mass 92.4;

x=4250640.625; norm. lato 600x225;

y=5444140.625 norm. lato 700x225;

z=8855000 norm. lato 600x700

wire attachment scheme on test mass, binding with Indium membrane melted by micro RF induction.



recycler mirrors

$$m=12.5*2.2*r^2 \pi/4 = 10000 \text{ g}$$

$$l=12.5$$

$$D=21.5$$

Recycler mirrors; des. 2.2; D=21.5; l=12.5; mass 9.984; x=y=41843.911; z=57688.126

recoil mass m= 90000

$$12.5*8.94 * (21.5^2 - d^2)\pi/4 =\text{mass}$$

$$12.5*8.94 * (21.5^2 - d^2)\pi/4 =10000$$

$$111.75 * (21.5^2 - d^2)\pi/4 =10000$$

$$(21.5^2 - d^2)=115.93$$

$$d^2 =506.25-115.93$$

$$d = 18.7$$

$$D=21.5$$

$$L = 12.5$$

Recoil mass; D=21.5; d=18.7; L=12.5; dens. 8.874; mass 9.806; x=y=62531.66; z=99526.184

intermediate mass

300 x 250 x 50 mm

material aluminum

$$m = 10000$$

1 picomotor for tilt

Intermediate mass; dens. 2.7; 300x250x50; mass 10.125;

x=54843.75 norm. 250x50;

y=128671.875 norm. 300x250;

z=78046.875 norm. 300x50

intermediate recoil mass

450 x 400 x 125 mm

material aluminum

$$m = 10000 \text{ g}$$

Intermediate recoil mass; dens. 2.7; 450x400x125x10 parete; mass 10.014;

x=214972.522 norm. 400x125;

y=258895.784 norm. 450x125;

z=442884.083 norm. 450x400

