Replacement of the VIRGO MC payload
Comments by Paolo La Penna

General comment:

The motivation to replace the existing MC mirror with a larger one is surely to be shared because:

1. the too high losses of present MC,
2. the differences in the centering position (depending on the position of the beam losses are different), therefore the increase in the high quality coated area are useful
3. radiation pressure problems: mostly in connection with the increase in power in Virgo+

Further comments

It's not obvious that the whole displacement range has to be performed using a motor on the Marionette: it could be possible to move, at least partly, the suspension point of the chain. This could reduce the requirements on the motors to be placed on the marionette.

If major modification of the marionette should be necessary, it should be taken into account the possibility to replace the present marionette with a standard one: the use of a disk marionette is standard in the short towers because the normally accommodate benches (this was also the case in the past with the MC mirror). Since now the MC is a standard mirror, a standard marionette could be used (but this would imply modification also to the filter 7). The possible advantages of using a standard marionette could be analysed.

It could be taken into account the possibility to use a smaller mirror, instead of a 350 mm (about 20 kg) one: a mirror like a BS (about 5 kg) mirror could be sufficient. Simulations concerning the radiation pressure effects with 50 W should be performed (partly already done: with 5 kg the resonance frequencies, ty being the most critical, does not move and stays in the range of 1 Hz). The use of a smaller mirror could be advantageous if no major modification to the mechanics is desirable. Moreover, the cost and delivery time of a smaller mirror are more convenient (to be known).

In the optical specifications: in Table 1 (small mirror specifications) the scratch and dig of side B is not specified: it could be specified as in Table 2 as 5/5, but this is a quite strict requirement. I guess that 10/5, commercially available, is enough.

Neither in Table 1 nor Table 2 is specified the density of defect/cm^2 : I think this number should be specified. This number should be decided in some way, some simulation should be made. I guess that a definition like: no defect larger than 1 μm, < 1/cm^2 for defects globally smaller than 1 μm should be written. This parameter, i.e. the quantity of defects, is important as the S/D.

Minor comments:

Abstract and motivations: a further motivation is that the scattering inside the MC is causing frequency noise, thus requiring the presence of a Faraday isolator on the IB bench.

p.4

first line, Taking in account --> Taking into account

third line, This so --> Such a

p.5

line 14: don't correspond --> doesn't correspond

line 15: revealing --> thus revealing

last line: Is well clear --> it's clear

p.6:

fourth line: behaves --> behave

p.8

Table 1: Side A <15 nm on diameter 60 mm

Side B <8 nm on diameter 60 mm

p.9:

Task 2.1 a, first line: on in peek --> one in peek

p.11

Scenario B: for Virgo + a larger mirror will be mandatory

The MC is a short tower, hence the standard marionette shows a disk shape: the disk shape is standard where there are suspended benches, otherwise it is not necessary.

Second line after Eq.1: writer for the power --> written for the power

p.21

Task 2.1b: could be mentioned why it shouldn't be used the chain suspension point for displacing the mirror

p.3.1b

Could be explained why a standard marionette couldn't be used?

p.17

Table 3, fourth line: Variation of the power transmitted by the ISYS and backscattered light

p.18

Planning: actions should already been started. It's true? Shouldn't the planning be shifted?

p.21

Table 8, line 1: I've asked a quote to SESO, I've just got it, it should be considered