

## ID31 microstation. September 2017 - M. Lesourd

### 1. Introduction

Vibration measurements were performed on ID31 microstation mounted in technical room, i.e: outside golden slab. Results show a relatively low frequency, global horizontal (X) mode in the 25Hz region closely followed by a 32Hz contribution (Y). This is due to the fact that the base structure is not glued to the concrete slab. These low frequency modes complicate the interpretation of local modes linked to sub-structures. However it seems that no local mode appears below 90Hz on the hexapod.

### 2. Procedure

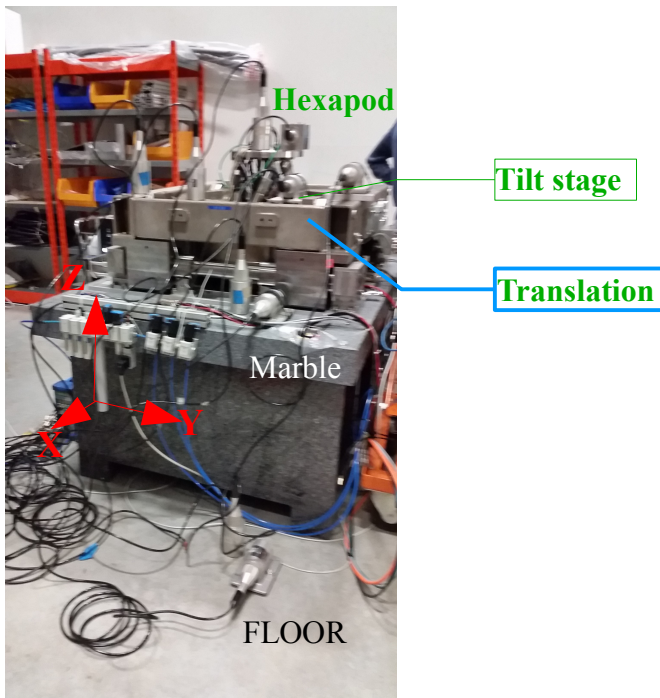


Fig.1 – ID31 Microstation mounted in ID31 technical room.

Tests performed with structure not glued to floor.

Vertical and horizontal L4-C geophones placed on floor, marble, translation stage, tilt stage and top of hexapod.

Natural response of the structure and tests with hammer impacts on hexapod.

Bandwidth 1-->100Hz

### 3. Results

Position	Floor	Base marble	Translation stage	Tilt Stage	Hexapod
Vertical Z	0.75	0.77	0.72	0.70	0.73
Horizontal X	0.36	0.40	0.40	0.45	0.40
Horizontal Y	0.39	0.43	0.47	0.44	0.61

Table 1. Peak to peak displacement in  $\mu\text{m}$  in 3 directions at the different locations.

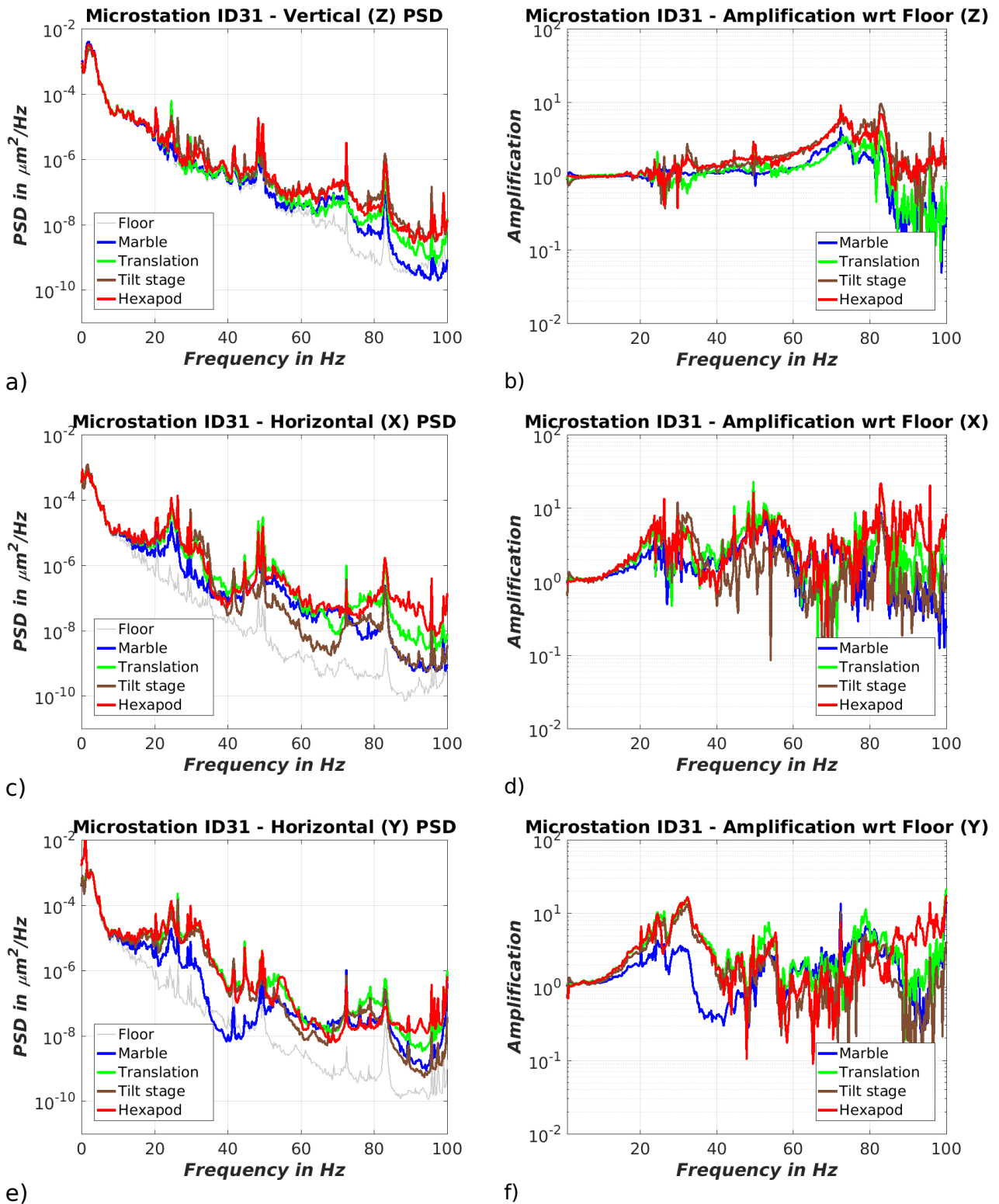
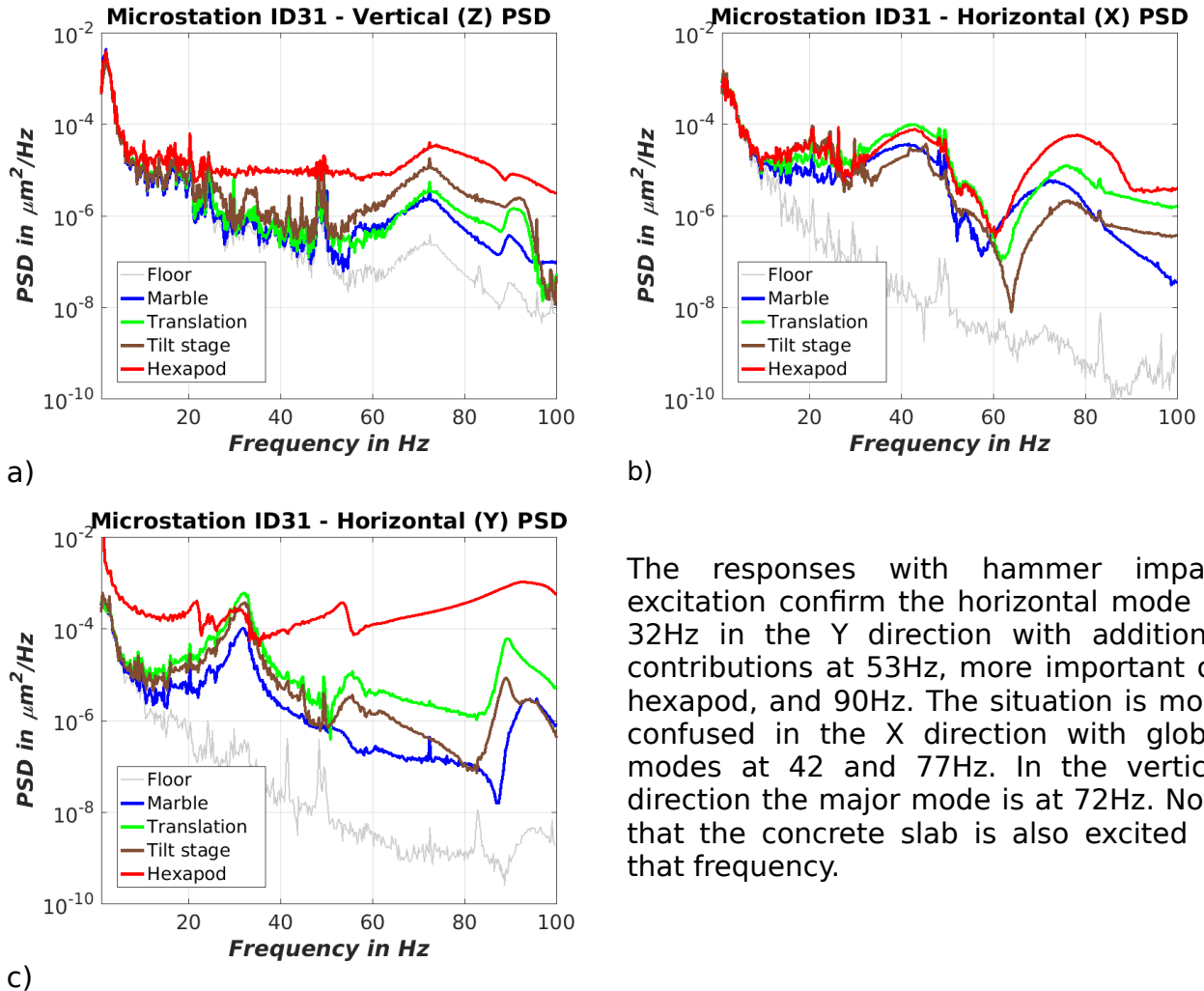


Fig.2. Power Spectral Density and Frequency Response Function plots for vertical (a,b), X(c,d) and Y(e,f) directions.

The structure's response show a global horizontal mode at about 25Hz mainly in the X direction, followed by another global mode at about 32Hz in the Y direction. In the vertical direction the 1<sup>st</sup> mode is at 72Hz with a 2<sup>nd</sup> one near 83Hz.

Below 90Hz there is no clearly visible local mode of a sub-structure. Above that, it seems that there is some amplification taking place on the hexapod only.



The responses with hammer impact excitation confirm the horizontal mode at 32Hz in the Y direction with additional contributions at 53Hz, more important on hexapod, and 90Hz. The situation is more confused in the X direction with global modes at 42 and 77Hz. In the vertical direction the major mode is at 72Hz. Note that the concrete slab is also excited at that frequency.

Fig.3. Response with hammer impact - PSD in the Z (a) X (b) and Y (c) directions.

The effect of TiltY control loop is not significant as shown in Fig.4 below.

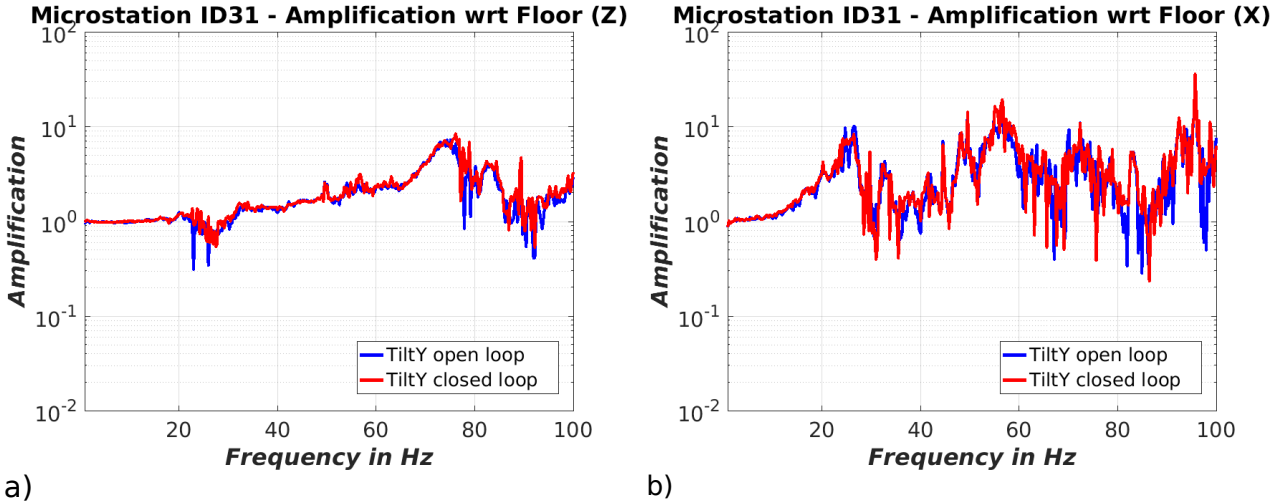


Fig.4. Effect of TiltY at hexapod location – FRF in Z(a) and X (b) directions in open and closed loop.

The effect of the air spindle control loop is also not significant although there seems to be a slight increase in the vibration levels in closed loop in the Y direction.

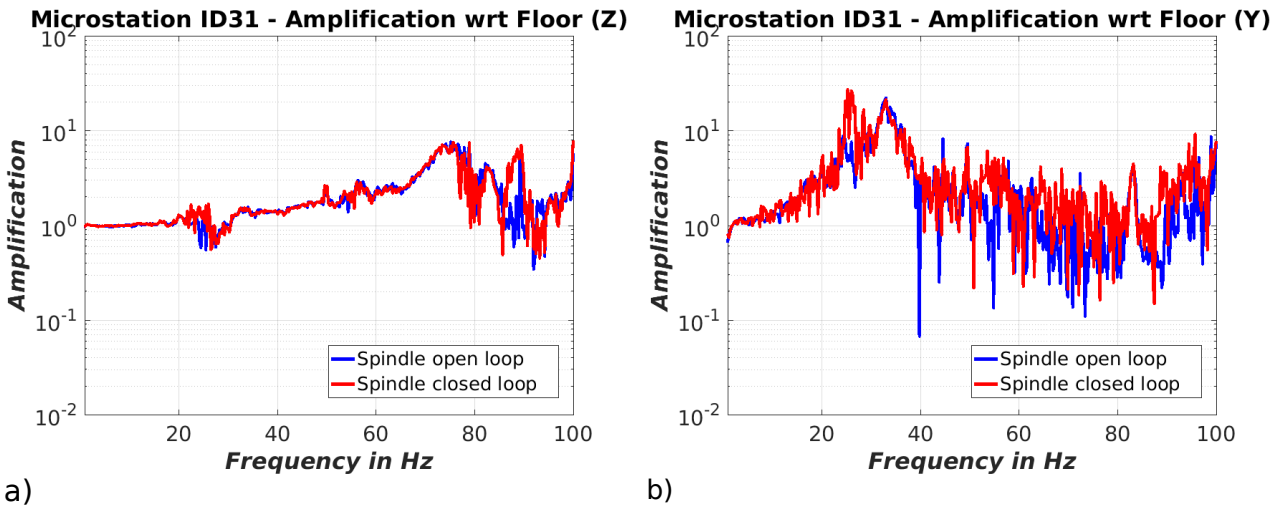


Fig.5. Effect of Spindle at hexapod location - FRF in Z (a) and Y (b) directions in open and closed loop.