

## TEST WAFER – NE TOWER

The NE payload was put in vacuum on 23th March 2016.

In order to check if any chemical residues could affect the monolithic suspension, one silicon wafer was put in vacuum in the tower for one week after its characterization. Another one was available but broken during the characterization phase. During that week the payload mirror was unloaded as a precaution. Below the logbook report and some picture related:

**Carbognani, Ciardelli, Majorana, Vacuum team** - 11:24, Thursday 31 March 2016 (33484)

The sequence followed before this first evacuation attempt was as follow:

- Positioning of the IR lamp
- Measurements via the Infrared Camera of the background (tower walls) temperature and of the mirror temperature. A difference of few degrees (~25 C respect to ~21 C) could be reached in less than half an hour and considered sufficient.
- Insertion of the sampling wafer to monitor dust deposition (Fig. 1-3)
- Bottom flange approach
- Clean air flux stopping
- Bottom flange closure

During all phases in tower the particle contamination was checked with the ParticleScan (and Flucke particle counter for cross-check) and level of all particle sizes were always almost zero



Figure 1: Wafer box with the plastic protection

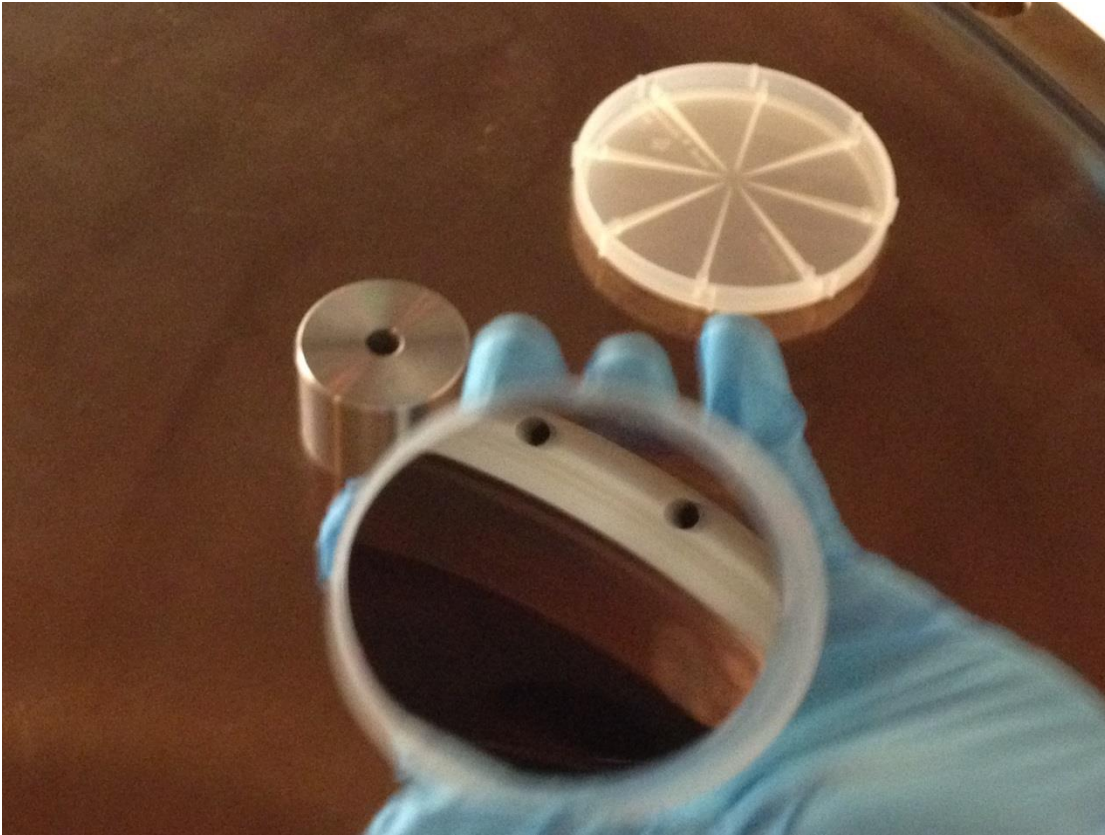


Figure 2: Wafer box open in the NE tower



Figure 3: Wafer position in NE tower

## The wafer

The wafer was an old wafer used to test the cleanness inside the tower for Virgo+ or initial Virgo. It was cleaned with alcohol isopropanol and rinsed with ultra-pure water. After that phase few pictures were taken and the wafer was analyzed using a FE-SEM with the EDX analysis in order to see the chemical elements present on the wafer surface.

## Pictures of the surface

In March 2016, the collaboration didn't have any chance to perform an optical map of the whole wafer surface because the only instrument available at that time was in Lyon and it didn't work. The decision was to take few pictures of the surface using a traditional camera. It is clear that the pictures before and after the tower insertion could give only a rough idea about what could be the pollution inside the tower. Below, two pictures to compare the surface of the wafer before and after the week in vacuum. The surface was washed few times but a residual pollution was always visible. The attention in this test was focused on the differential chemical analysis (before and after the placement inside the tower), which is not affected by the dust.

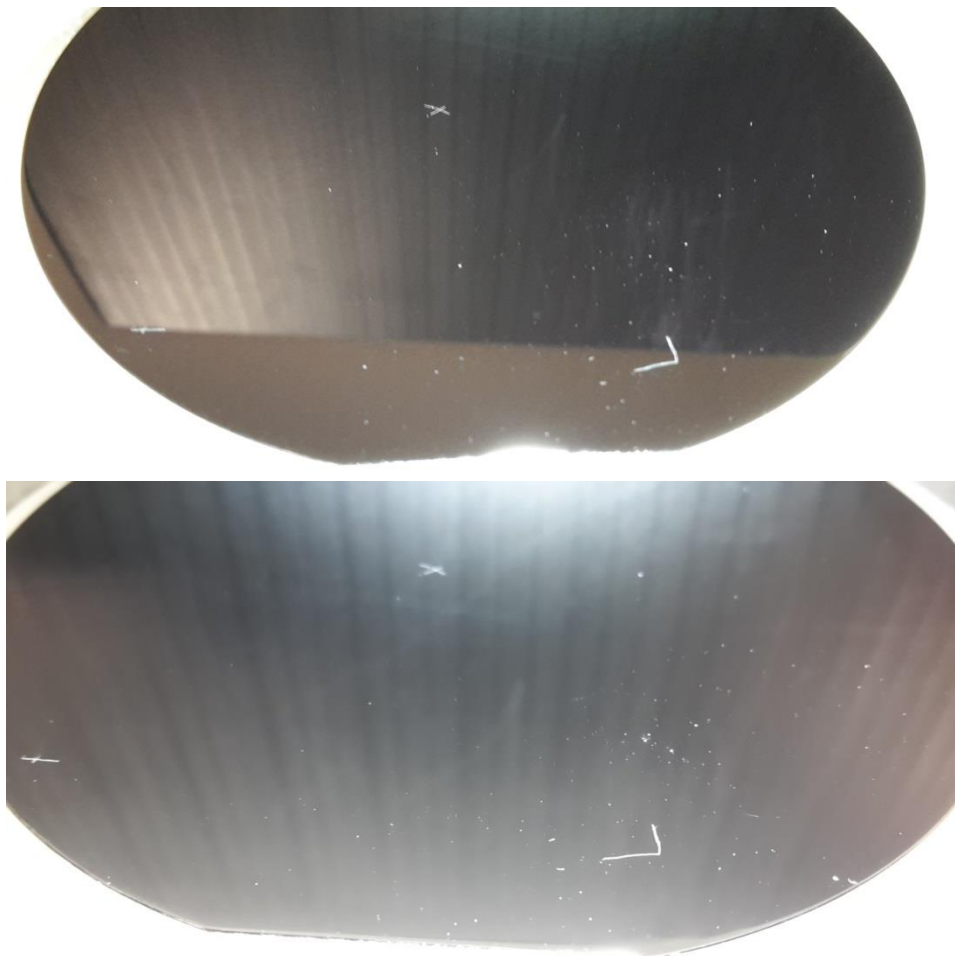


Figure 4: Wafer before (up) and after (down) the week in vacuum.

### FE-SEM: EDX analysis

The chemical analysis of five areas (identified by some scratches made on the surface) of few mm<sup>2</sup> has been analyzed using the FE-SEM EDX sensor. The following images present the chemical composition on the surface of the wafer before and after the insertion in the tower.

The result is that there is no particular evidence for chemical residues deposited on the surface.

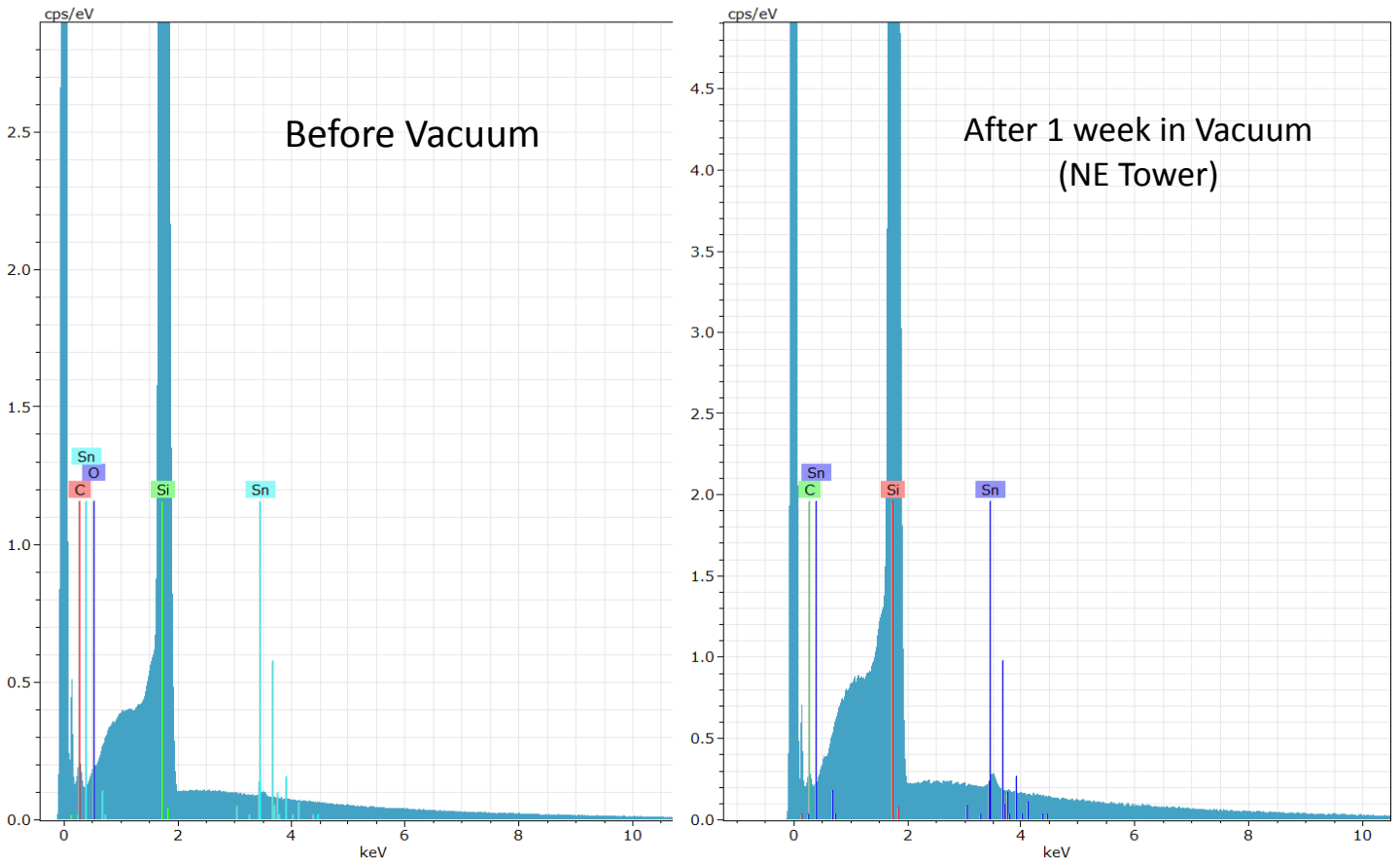


Figure 5: SEM analysis before (left) and after (right) one week in vacuum