ABSORBER / SCRAPER

Vacuum pressure estimation and profile

LIU-PSB section 8L4
Period 8

TE/VSC
Triplet period 8 PSB

Position of old scrapers inside manifold (8L2)

Position of new scrapers (8L4)

Beam direction

Courtesy EN/MME and EN/STI
Vacuum profile in period 8 PSB (today)

- Ion pump $S(N_2)$ 410 l/s
- Sublimation pump $S(N_2)$ 1290 l/s
- Pressure: $5.8 \times 10^{-9}$ mbar
- Pressure: $1.4 \times 10^{-9}$ mbar
- Pressure: $1.4 \times 10^{-8}$ mbar

Pressure profile 23rd September 2016. (Ion pump current / pressure)

- Ion pump $S(N_2)$ 410 l/s
- Sublimation pump $S(N_2)$ 1290 l/s
- Pumping fitted directly on scraper

Sublimation pumps are used $< 5 \times 10^{-8}$ mbar and pumping speed is decreasing between two sublimations

Ion pumps has maximum pumping speed at $1 \times 10^{-4}$ mbar and 50% at $1 \times 10^{-10}$ mbar
Total surface of Absorber / Scraper

Surface mobile scraper seen by the vacuum: 1519 cm²
Surface fixed scraper seen by the vacuum: 1543 cm²
Total Surface of 8 scrapers seen by the vacuum: 12246 cm²
Material outgassing

- Outgassing of Titanium is better or equal to Stainless steel and can work as a pump when heated.
  • Outgassing measurements done for TA6V: < 1x10^-12mbar l/s *cm2 at room temperature.
  • Stainless steel: < 2x10^-11mbar l/s *cm2 at room temperature.

- New outgassing results for Graphite will be ready soon, as a new test stand has been built to make these measurements. (None vacuum fired, room temperature, heating up to 300 degrees).

- Below is the outgassing results we have for the Graphite used in the main L4 dumps and test samples.
  • Graphite vacuum fired twice: 2x10^-9mbar l/s *cm2 (room temp, 24 hours of pumping, Samples)
  • Graphite vacuum fired twice: 5.9x10^-9mbar l/s *cm2 (room temp, 24 hours of pumping, L4)
  • Graphite vacuum fired twice: 7x10^-9mbar l/s *cm2 (100 degrees)
  • Graphite vacuum fired twice: 1x10^-8mbar l/s *cm2 (200 degrees)

- Total outgassing of Absorbers in section 8L4:
  • Graphite at room temperature: (5.9x10^-9 mbar l/s*cm2 x 12246 cm2) = 7.2 x 10^-5mbar l/s
  • Titanium at room temperature (1x10^-12 mbar l/s*cm2 x 12246 cm2) = 1.2 x 10^-8mbar l/s
For the installation of the new FWS scanners (similar to the new scraper installation) a vacuum Molflow simulation were performed.
Pumping speed and pressure (8L4)

Old scraper

New scraper

Pressure: 1.4x10^{-9} \text{ mbar (> 4 weeks)}
Total outgassing: 6x10^{-7} \text{ mbar l/s}
(Little or no activation of VPS)

Pressure: 8x10^{-8} \text{ mbar (Graphite)}
Pressure: <2x10^{-8} \text{ mbar (Ti)}
(after 24 hours with scraper, scaled from FWS)

Expected pressure at scraper will be
2 \times 10^{-7} \text{ mbar after 24 hours of}
pumping at room temperature, if
graphite is used.

No pump down or limit pressure
change will be observed if Titanium is
used as scraper material.

Pressure: 1.4x10^{-8} \text{ mbar (> 4 weeks)}
Total outgassing: 4x10^{-6} \text{ mbar l/s}
(Little or no activation of VPS)

Pressure: 9x10^{-8} \text{ mbar (Graphite)}
Pressure: <4x10^{-8} \text{ mbar (Ti)}
(after 24 hours with scraper, scaled from FWS)
• Expected pressure at scraper will be $2 \times 10^{-7}$ mbar after 24 hours of pumping at room temperature, if graphite is used.

• No change in pump down time or limit pressure will be observed if Titanium is used as scraper material.

• The pressure will recuperate with time, but it might also be higher if the scrapers are used during the first days after an intervention due to temperature increase, as no cooling is foreseen.

• TE/VSC would recommend to use Ti, as we cannot make a bakeout of this sector and difficult to add extra pumping to compensated for increased outgassing from the Graphite.
In the existing installation the vacuum chamber is free. In the new install it will be fixed so the installation must be design with a bellows each side (see functional design report).
Pressure profile BR30 (pump down in 2014)