



Clean policy discussion

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Why we care about cleanliness?

- Contamination melts IBS coating

Onset occurs at $92\text{W}/\text{mm}^2$ on average

TMs $\sim 100\text{W}/\text{mm}^2$, MCs \sim higher

No spare mirrors

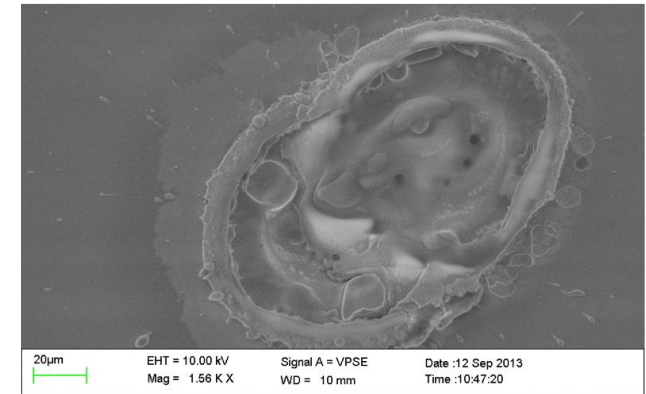
- Loss will go up (Hasegawa is leading the investigation)

We do not have much margin in the loss budget (100ppm/R.T. in total)

LIGO observed a higher loss than designed (expected)

- Contamination only gets worse (optics are never cleaned naturally)

We must keep vacuum chambers as clean as possible and also install stuff (optics, vibration isolation systems, suspension,..) as clean as possible



(LIGO-G1400209-v2)

basics

- Contamination (dust, metal, fiber, ..) is never created inside the vacuum chambers but is introduced from outside the chamber
- So, if we have zero contamination inside the chambers and bring zero contamination from outside, we will be good in principle
- The reality is never perfect, but it is very important for everyone to keep that principle in mind: [We should try minimizing contamination from outside](#)
- So, keep yourself clean (wear clean suits), keep your stuff clean (no residual particles, no outgassing), and keep your environment clean (inside/outside clean booths)

clean suit

- It is important to wear [ISO class 3 compatible or better suits and special inner shirts/pants](#) when you work inside the vacuum chambers or work on stuff that is going into the vacuum chambers
- You should NOT wear suits that don't meet the spec. However, it will be okay to wear something else when you work on less critical components and do not have a chance to add contaminant to critical components
- Many suits have been purchased and people who need them should contact [Miyoki-san @ ICRR](#) first

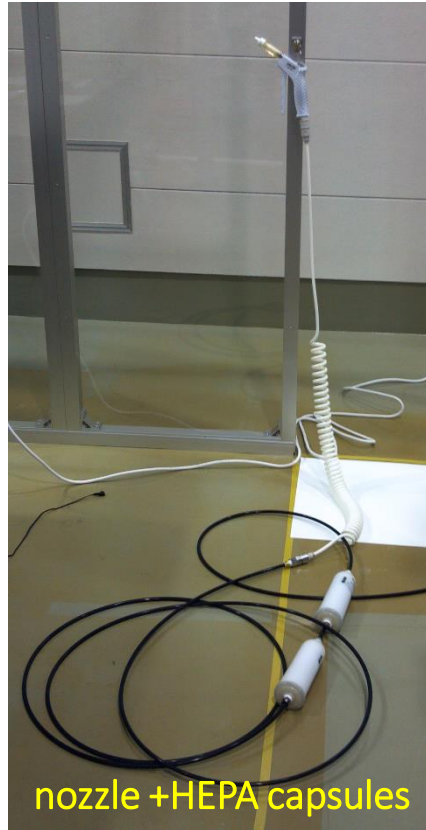


<http://www.guardner.co.jp>

cleaning equipment so far..



Lint-free wiper + ethanol



nozzle + HEPA capsules



korokoro



Cotton pre-wetted wiper (NOT lint-free)



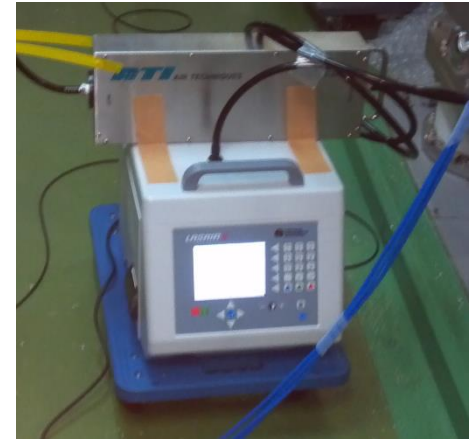
clean air filter unit (table type)



~~IPA pre-wetted wiper~~



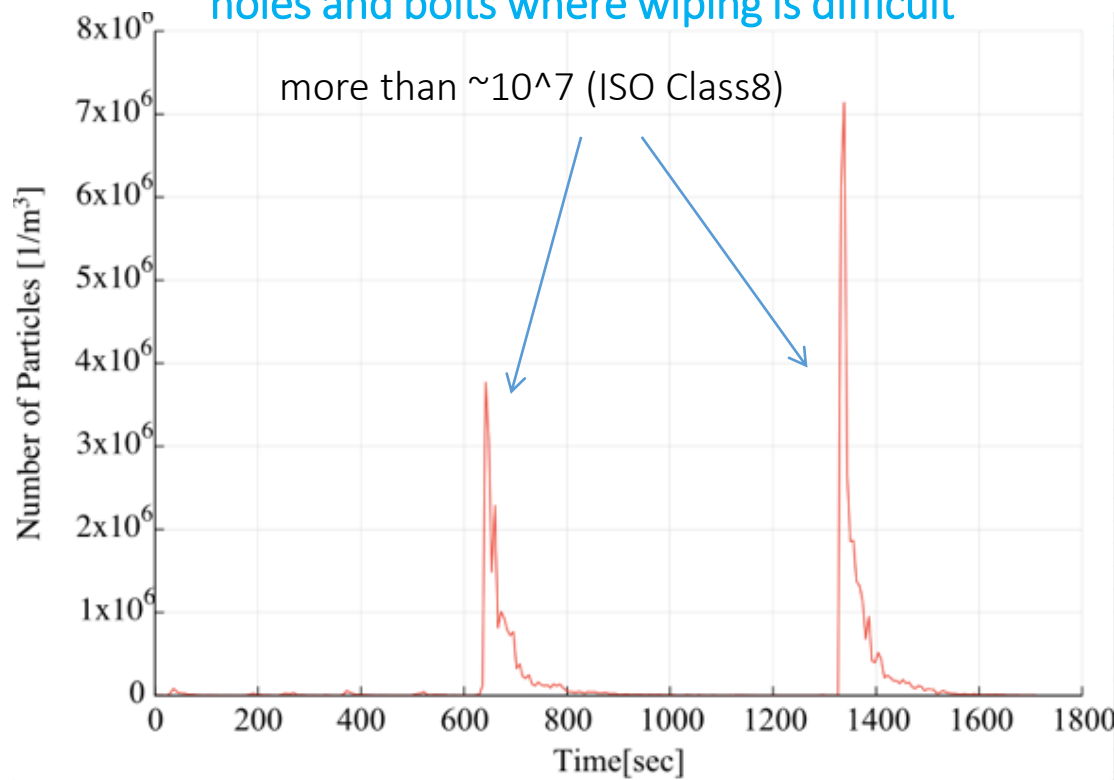
clean air filter unit



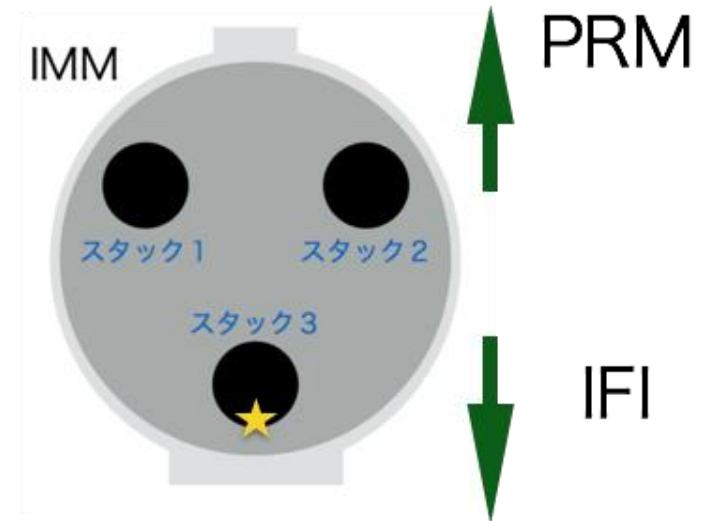
particle counter

Lots of residual dust counted during blowing chambers

Dust gets everywhere and tends to stay in holes and bolts where wiping is difficult



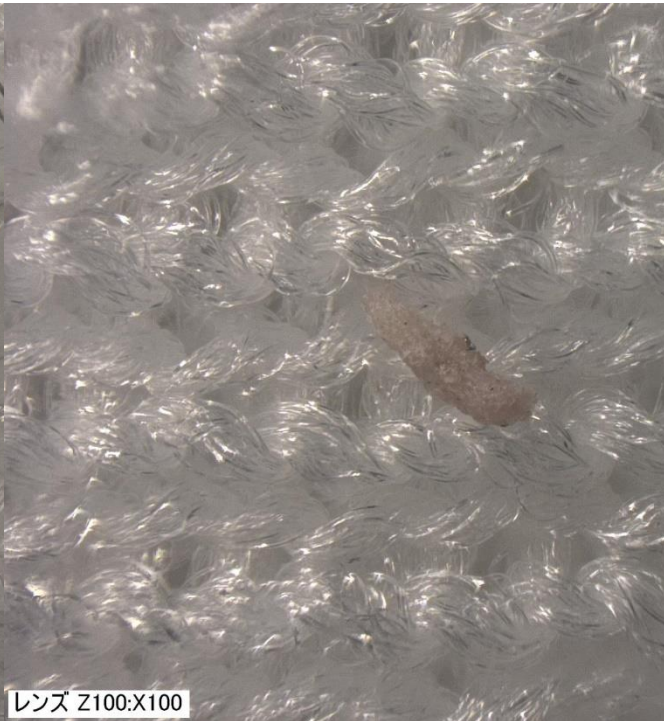
Date:2016/1/20
Time:19:00~19:30
@ IMM Chamber



Findings on wipers



metal



fiber?



mites

- They must have been introduced after vacuum chamber fabrication
- A company is analyzing samples
- We will investigate the route of these stuff or contamination control

discussion

- First of all, we are doing this since we think this is very important not only for optics performance but also for the project
- We propose we have at least one '*contamination control officer*' at the site, who is responsible for contamination control
- If you have an issue, please consult us. We may not be able to solve it completely, but we will be happy to help you!

Acknowledgment

Calum Torre, GariLynn Billingsley @ the LIGO lab

Please ask questions and request for discussion