Quality Control Update of the Cleanroom for Superconducting Multi-Cell Cavities at DESY

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The acceleration gradients for Superconducting accelerator resonators are improved continuously. The surface electric-...and drying, particulates and bacteria introduced by ultra pure water during rinsing and cleaning procedures, and particle contamination resulting from the auxiliary infrastructure like vacuum pump units.

INTRODUCTION

During the last decade cavity acceleration gradient improved from 5 to 39 MV/m acceleration gradients in multi-cell resonators. To ensure the reproducibility and to reduce field emission loading of superconducting surface for assembly and drying, particulates and bacteria introduced by ultra pure water during rinsing and cleaning procedures, and particle contamination resulting from the auxiliary infrastructure like vacuum pump units.

QUALITY CONTROL OF THE TTF CLEANROOM AIR

Four times a year and on demand a general quality check of the cleanroom air is done. All filters are controlled for proper installation on the filter junctions, and leakage of particles on the entire filter membranes.

For laminar flow conditions, the standard value of air velocity should be set to 0.45 m/s with a tolerance of ± 20 %.

Since 2002 a gradual increase of particles was measured.

- Air velocity distribution (lips broken/local turbulence)
- Since summer 2004 class 10 had to be closed for cavity assembly
- Returning filter units class 10/ 100 in December 2004

Since summer 2004 class 10 had to be closed for cavity assembly.

Air particle concentration

For laminar flow conditions, the standard value of air velocity should be set to 0.45 m/s with a tolerance of ± 20 %.

Typical reduction of particle concentration measured.

- 2.50 µm: 99.95% filtered
- 1.00 µm: 99.90% filtered
- 0.54 µm: 99.80% filtered
- 0.21 µm: 98.63% filtered

The online liquid particle counter is connected to one of the HP rinse outlets to the HPR stand, total sampling time 16 hours

Particle concentration of the HPR filter after 72 h of rinsing.

Filter analysis after HPR

Results from filter analysis

- Particles are found and analyzed
- No significant reduction of particles washed out by the HP rinse found after four HP rinse sequences

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QUALITY CONTROL OF THE ULTRA PURE WATER SYSTEM

Bacteria in UPW

A MILLI-EXPTM 100 test system is in use for bacteria control. Sample size 0.5 ltr UPW, filter 0.45µm pore size. Bacteria growth conditions: Filter immersed in culture medium; sample autoclaved at 40°C for 72 hours.

Bacteria colonies appear as darkened area.

Filter analysis after HPR

Rinsing water is collected in a funnel below cavity huan tub. Drawing water of cavity is filtered by a 2.0 µm filter. Typical volumes of up to 100 litres are analyzed. A scanning light microscope allows to determine size and numbers of particles. Rinsing water analysis is done after assembly of cavity in situ.

Results from filter analysis

- Particles are found and analyzed
- Origins of particles found
- No significant reduction of particles washed out by the HP rinse found after four HP rinse sequences

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QUALITY CONTROL OF THE CAVITY VENTING UNITS

The DESY ventilation unit is connected to the UHV (Ultra High Vacuum) pumping unit. The 0.2 µm filter is not vacuum equivalent. A CF 16 whole metal valve is installed between venting unit and pump line.

Filter quality control for the CF 16 valve

- Calibration of valve by class 10 clean room air
- Particles measurement in the continuous flow of argon (minimum venting speed)
- Shock waves produced by shut open and close of CF16 valve (particles blown off by shock waves)

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Example for quality control of the UHV All-Metal Valve on particle contamination

Improvement with a new designed UHV All-Metal Valve