

WP5 (Surface Preparation, SP)

- There are two different topics:
 - Electro-polishing will produce smoother surfaces as compared to the widely used chemical polishing method.
 - There are very encouraging results on single-cell and nine-cell cavities (in collaboration with KEK, Japan), which can be excited to considerable higher RF fields.
 - In this work package, the optimum EP parameters will be investigated first with single cells.
 - As a next step, this technology will be adapted to the geometry of multi-cell cavities.
 - In parallel, a new method of EP with self-stabilising parameters will be further developed for single cell and multicell cavities.
 - Dry ice (CO₂) cleaning is expected to clean surfaces from dust or residual contaminations much more effectively than the presently used technique of high pressure water. It is under use in the semiconductor industry but was never applied to SRF cavities.

Planning for WP5

- C. Antoine

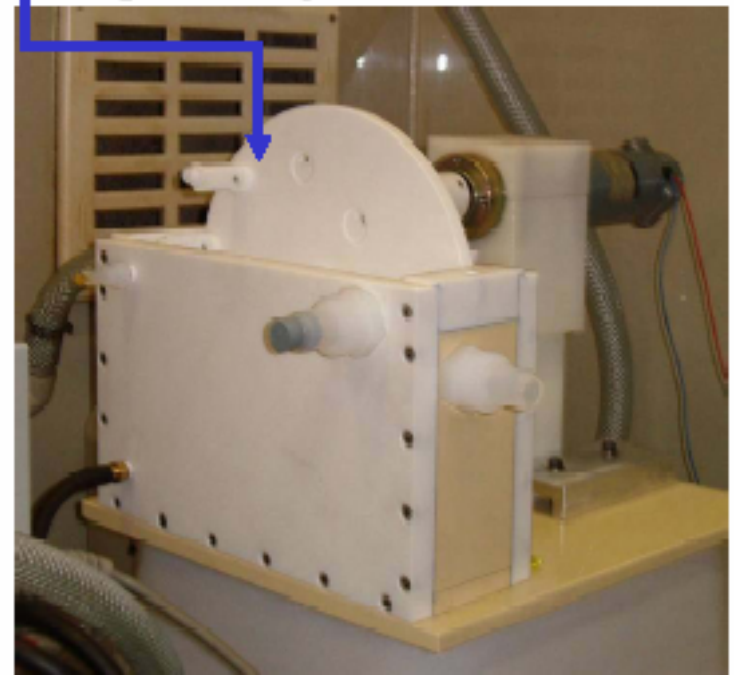
Task Name	Milestones	Deliverables	2004												2005											
			12	01	02	03	04	05	06	07	08	09	10	11	12	01	02	03	04	05	06	07	08	09		
WP5 Surface preparation																										
5.1 EP on single cells																										
5.1.1 EP on samples																										
5.1.1.1 Establishing method of surface characterization (roughness, reflectometry)																										
5.1.1.2 Surface characterization fixed	Report																									
5.1.1.3 Series of EP with samples for surface investigations																										
5.1.1.4 Best EP parameters		Report																								
5.1.2 Single cell cavities																										
5.1.2.1 Order Nb and fabricate 3 cavities																										
5.1.2.2 3 cavities fabricated	Test cavities																									
5.1.3 EP chemistry on single cells																										
5.1.3.1 Design of EP set-up																										
5.1.3.2 Fabrication of EP set-up																										
5.1.3.3 Commissioning of EP set up																										
5.1.3.4 First operation of EP set up	EP set up operational																									
5.1.3.5 Operation of EP set-up																										

Optimisation of EP Process

- Improvement of EP parameters
 - Optimization of electric parameters *(in progress)*
 - Anode/cathode surface ratio *(influences working voltage)*
 - Anode/cathode distance
 - Bath composition *(close from present composition)*
- Protection against hydrogen
 - identification of contaminating steps *(confirmed)*
 - Pt sample protection *(failed)*

Samples set-ups :

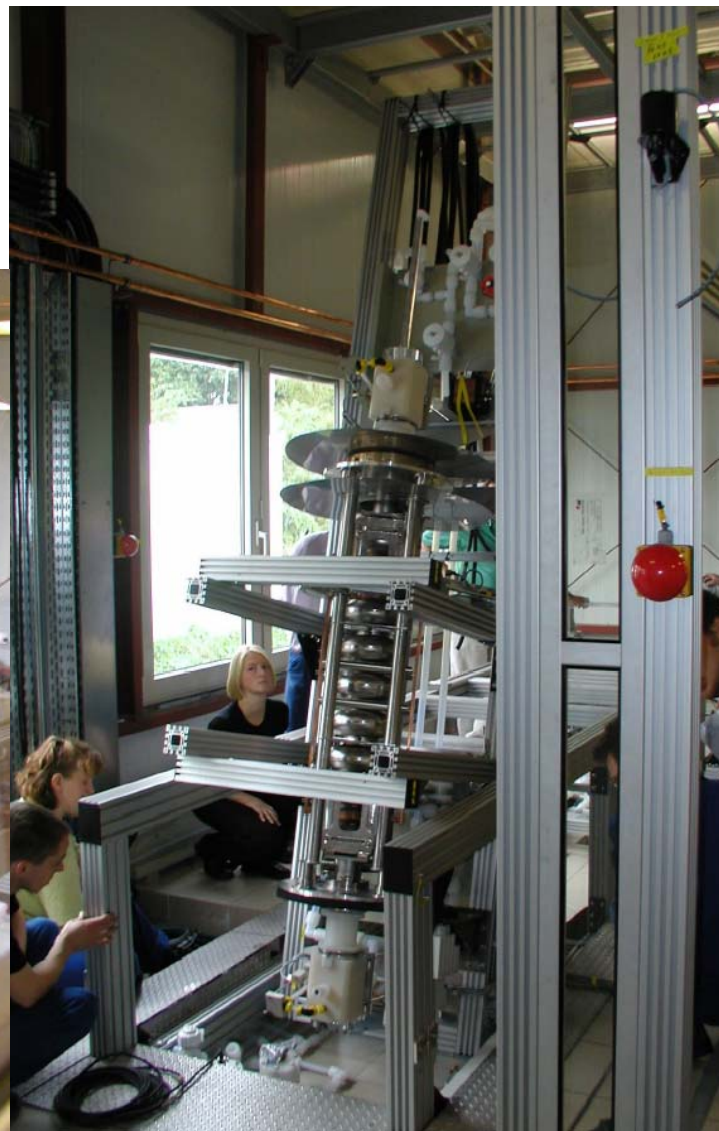
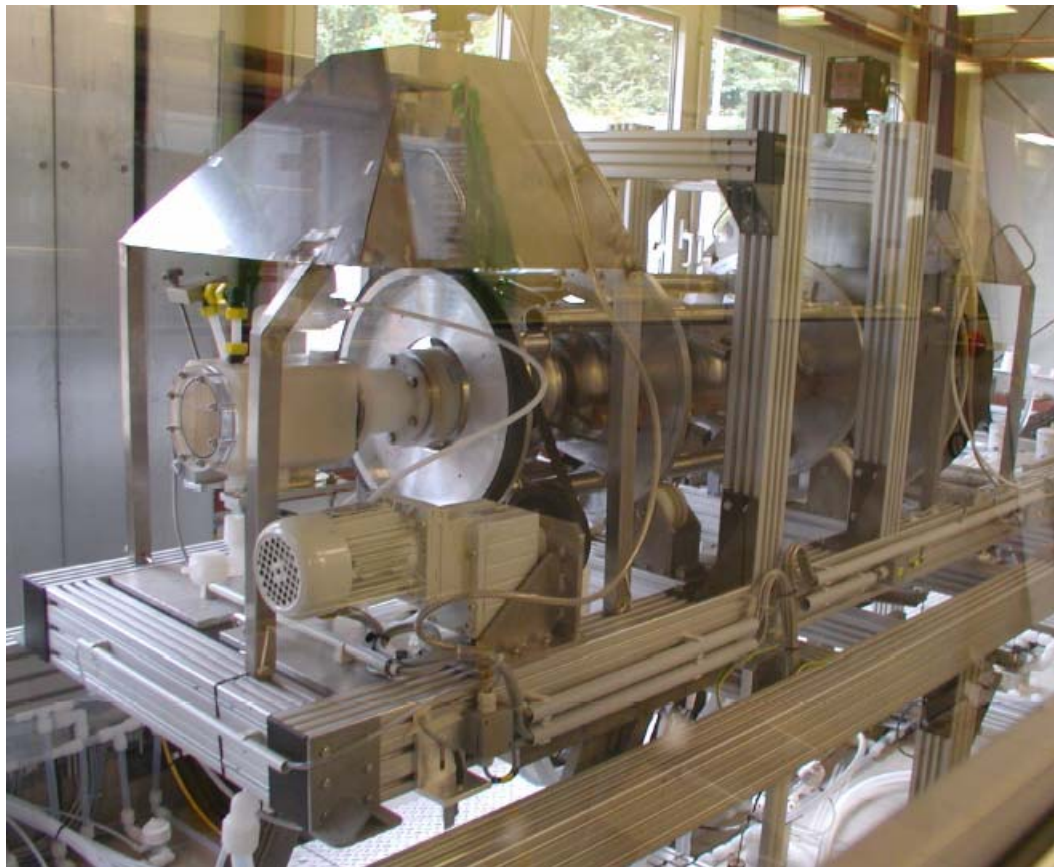
1. *standard EP reactor*
2. *rotating sample holder =>*
 - *same anode cathode distance*
 - *reproduces cavity rotation and sequential immersion in the polishing bath*



- A. Matheisen

Task Name	Milestones	Deliverables	2004												2005											
			12	01	02	03	04	05	06	07	08	09	10	11	12	01	02	03	04	05	06	07	08	09		
5.2 EP on multi-cells																										
5.2.1 Transfer of parameters from single cell to multi cell equipment																										
5.2.1.1 Finish EP setup nine-cells at DESY																										
5.2.1.1.1 Improved gas cleaning system																										
5.2.1.1.2 Design for hot water rinsing																										
5.2.1.1.3 Proof-of-Principle experiment hot water rinse	Report																									
5.2.1.2 Optimize electrode shape																										
5.2.1.2.1 Develop computer model/ Evaluate software																										
5.2.1.2.2 Design improved electrode																										
5.2.1.3 Fix process parameters/ Quality control																										
5.2.1.3 .1 Setup chemical lab																										
5.2.1.3 .2 Bath aging																										
5.2.1.3 .3 Bath mixture																										
5.2.1.3 .4 Alternative (salt) mixtures																										
5.2.1.3.5 Process parameters fixed		Report																								
5.2.2 Laser roughness																										
5.2.2.1 Evaluate existing systems																										
5.2.2.2 Specify laser system																										
5.2.2.3 Build laser system																										
5.2.3 Oxipolishing as final chemical cleaning																										
5.2.3.1 Laboratory studies																										
5.2.3.2 Design of OP system																										
5.2.3.3 Setup one-cell system																										

EP setup at DESY



26.01.2004

L. Lilje DESY -MPY-

- E. Palmieri
- D. Reschke

Task Name	Milestones	Deliverables	2004												2005											
			12	01	02	03	04	05	06	07	08	09	10	11	12	01	02	03	04	05	06	07	08	09		
5.3 Automated EP (AEP)																										
5.3.1 prototype EP Installation																										
5.3.1.1 Design installation																										
5.3.1.2 Fabricate/ order components																										
5.3.1.3 Assemble EP Installation																										
5.3.1.4 EP installation ready	First operation																									
5.3.2 EP computer control																										
5.3.2.1 Design control architecture																										
5.3.2.2 develop software																										
5.3.2.3 Test of software																										
5.3.2.4 Software ready	Report																									
5.3.3 Operation of AEP prototype																										
5.3.3.1 Correlate surface finish/ conductance																										
5.3.3.2 Determine optimum conductance																										
5.3.3.3 Optimize automated operation																										
5.4 Dry Ice cleaning																										
5.4.1 Installation of full system for 1-3 cell cavities																										
5.4.1.1 installation of CO2 piping																										
5.4.1.2 installation of motion system																										
5.4.1.3 installation of control system																										
5.4.1.4 Commissioning																										
5.4.1.5 Installation finished	Start operation																									
5.4.2. Optimization of cleaning parameters																										
5.4.2.1 Sample cleaning																										
5.4.2.2 1-cell cavity cleaning																										
5.4.2.3 fix best cleaning parameters																										
5.4.2.4 Cleaning parameters fixed	Report																									
5.4.3 VT 9-cell cleaning apparatus																										
5.4.3.1 Design 9-cell apparatus VT																										
5.4.3.2 Fabricate 9-cell apparatus																										

WP 5	Surface Preparation
Task 5.1	EP on single cells
	Exploring the best parameter set for EP on single cells
	Deliverables: Reports about kinematics of EP with various conditions of chemical mixtures and temperature; influence of cathode geometry; definition of the best working parameter set; EP on a series of single cells
Task 5.2	EP on multicells
	Extrapolation of EP parameter from single cell to multicell cavities
	Deliverables: design, fabrication and operation of a multicell EP apparatus, EP on a series of multicell cavities
Task 5.3	Automated EP
	Development of a technology for self stabilising the best EP parameters under industrial operating conditions
	Deliverables: Report about stabilising chemical reactions during EP, design, fabrication and operation of an automated EP system, EP of a series of single and multicell resonators.
Task 5.4	Dry ice cleaning
	Development of an apparatus for CO ₂ cleaning of cavities
	Deliverables: Reports about principles of CO₂ cleaning of cavities, Design, fabrication and operation of a prototype CO₂ cleaning apparatus, CO₂ cleaning of a series of single-cell and multi-cell cavities