

DESY Cavities Inspection, Processing, Testing and Plan

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Results of Recent 9-Cell Cavities

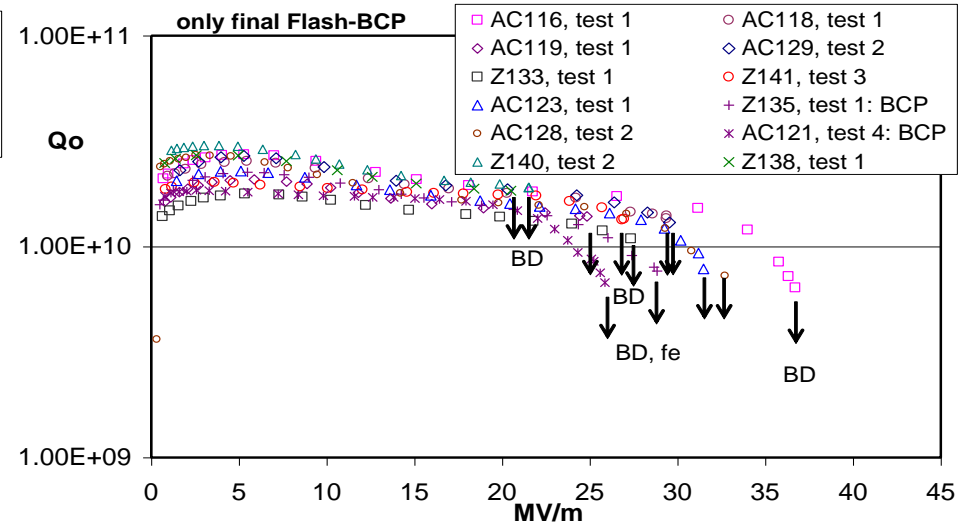
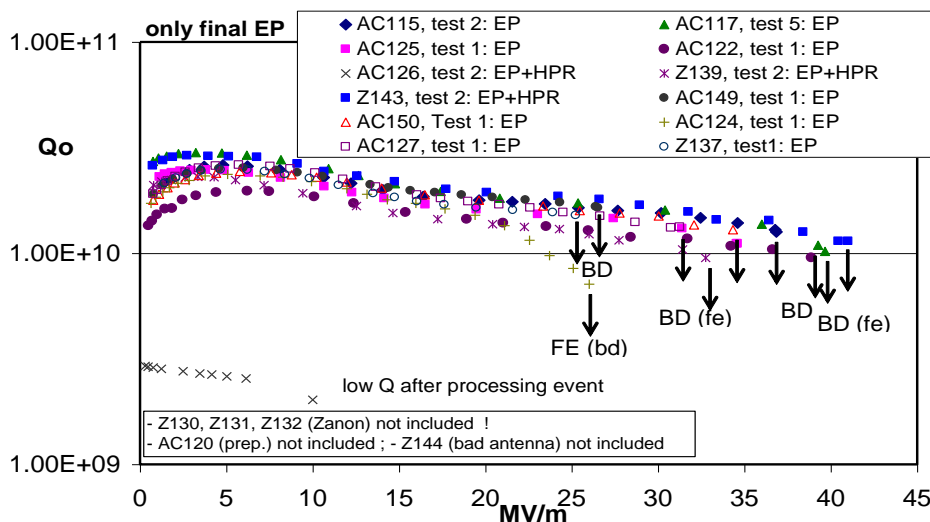
Detlef Reschke, SRF09

Typical Q(E)-performances

- => final EP: + gradients > 36 MV/m possible
- => final Flash BCP: - Q-slope w/o field emission not fully cured

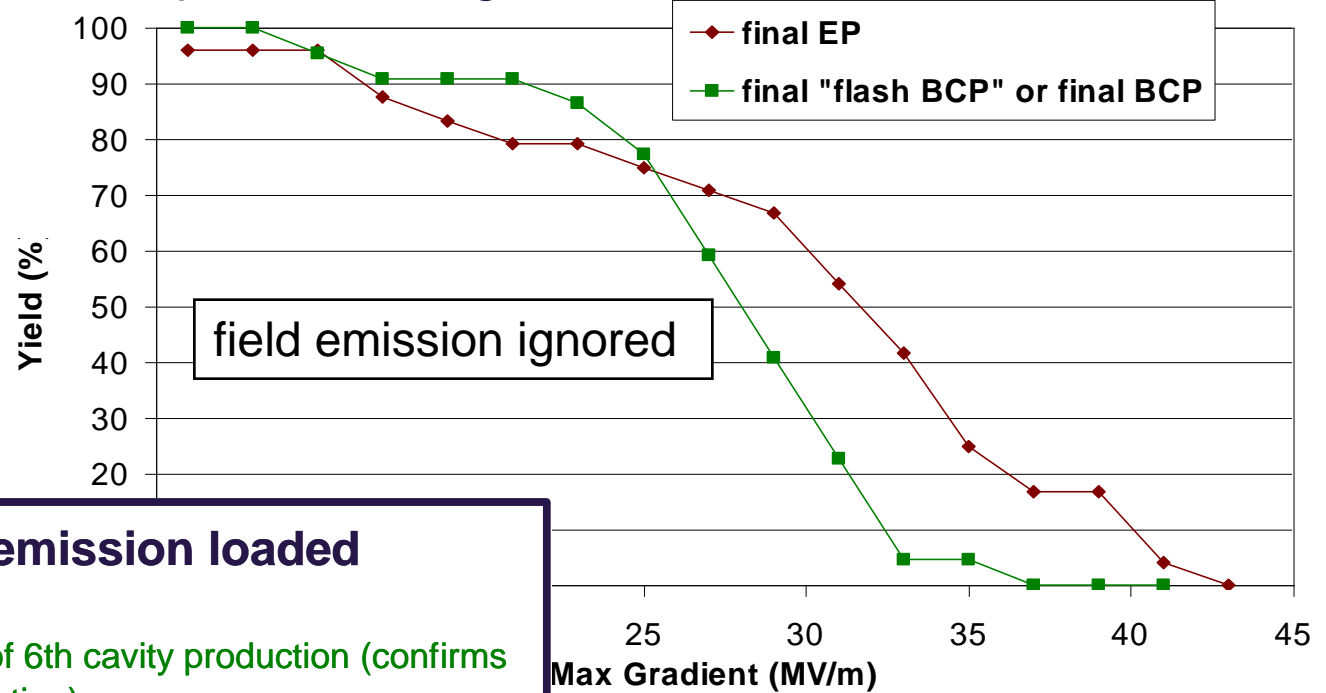
Preparation with final EP:

Preparation with final Flash BCP:



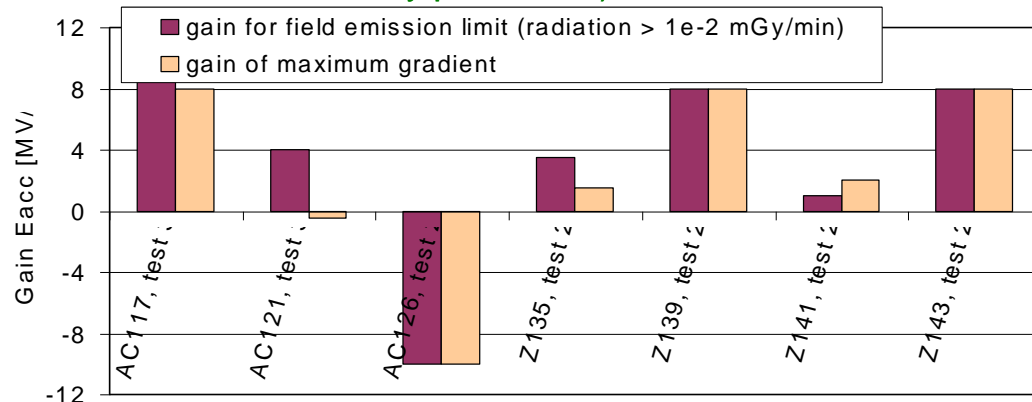
Results of Recent 9-Cell Cavities

Yield plot for **max** gradient of **last** vertical rf test:



Re-processing of field emission loaded cavities by HPR

=> successful for 6 of 7 cavities of 6th cavity production (confirms earlier results of 4th cavity production)



Detlef Reschke, SRF09

9-Cell Cavity Tests at DESY in 2009-2010

- ≥ 10 reprocessed cavities
- 8 large grain cavities, ordered, not yet processed
- 3 fine grain cavities ordered
- 2 hydroformed cavities ordered



Goals of HiGrade WP6

- Improve over XFEL performance
 - XFEL will make a choice on the cavity preparation cycle soon
 - Ongoing R&D might show improved methods for cavity preparation
 - HiGrade will implement these steps on a subset of XFEL cavities
- Therefore maximum synergy is achieved between the projects
 - HiGrade can jump onto XFEL production
 - Quality control on a regular basis by
 - Support optical inspection of all cavities
 - Thermal mapping of cavities
 - XFEL can profit from HiGrade Cavities
 - Soon to finance pre-series (tbd)
 - in the long run as Spares or for higher energy
- Deliver ~30 cavities after a well-defined fabrication and preparation
 - First test should rely on XFEL preparation cycle
 - QC of the XFEL process
 - Second test is to be decided
 - Demonstrate yield acceptable for ILC mass production in low-power tests
 - Further steps to be decided
 - Final step is tank welding
 - Could add on horizontal high-power test
 - Results on this will be very late for HiGrade

starting in 2011

XFEL Cavity Preparation Cycles

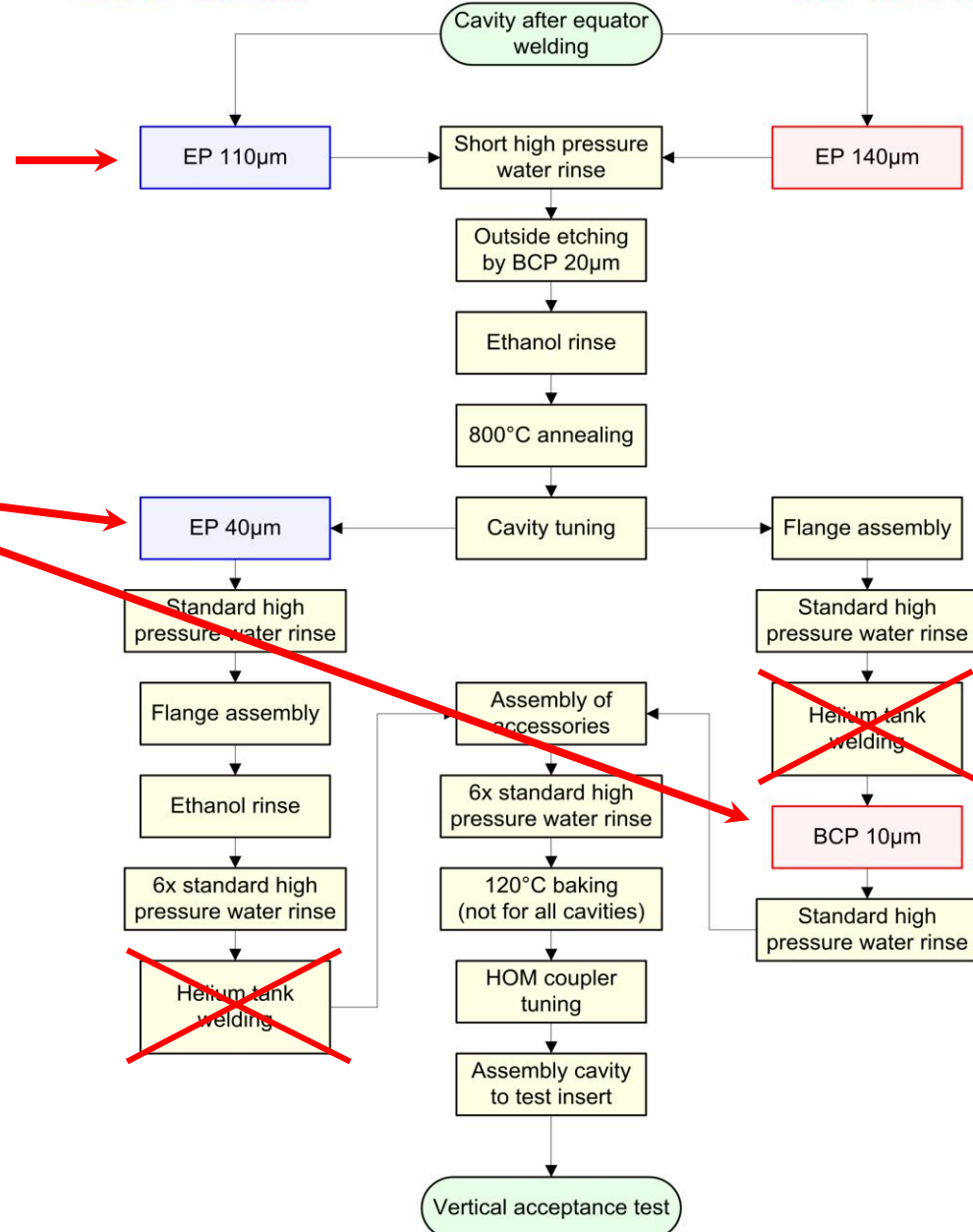
Final EP Scheme

BCP Flash Scheme

both cycles with rough EP →

final acid treatment will be decided this year →

for high grade program no He tank will be attached



Tools to be used

- XFEL cavities will be a well advanced standard
 - **E.g. HOM Design is well proven**
- Advanced high-resolution optical inspection
 - **Will be included into the XFEL production cycle**
 - **Will improve performance of manufacturers online**
- T-mapping on all HiGrade cavities
 - **Essential tool to pin down high-gradient hot spots**
 - **Need bare cavities**

 - **One system is in use**
 - **a second one is under construction**

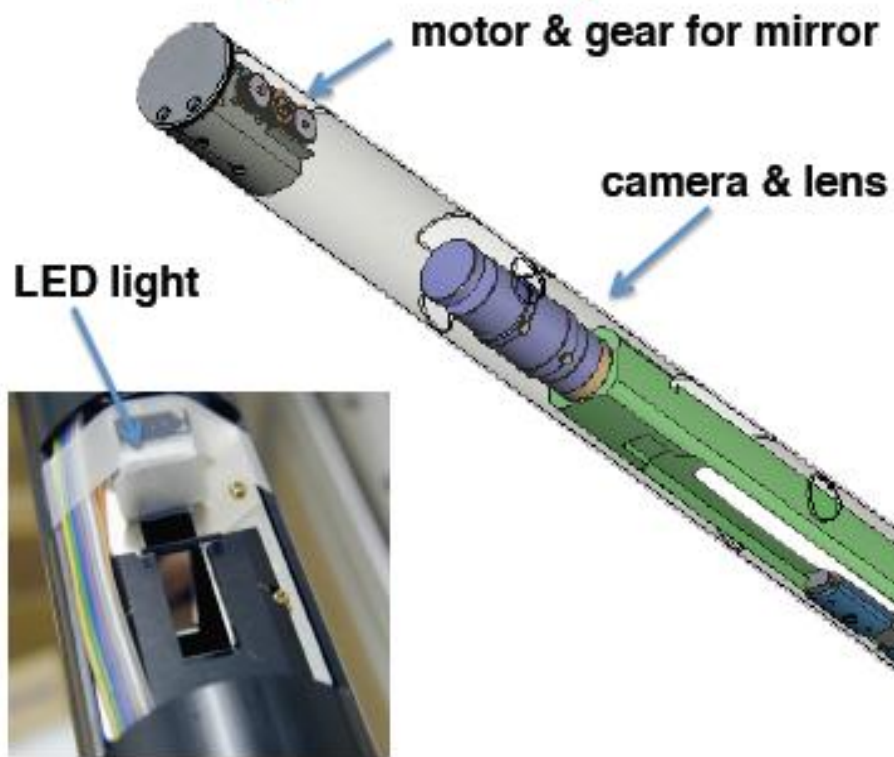


Kyoto/KEK High Resolution Camera

For visual inspection of cavity inner surface.



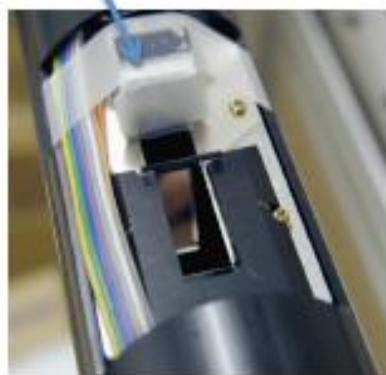
Camera system ($7\mu\text{m}/\text{pix}$) in 50mm diameter pipe.



LED light

motor & gear for mirror

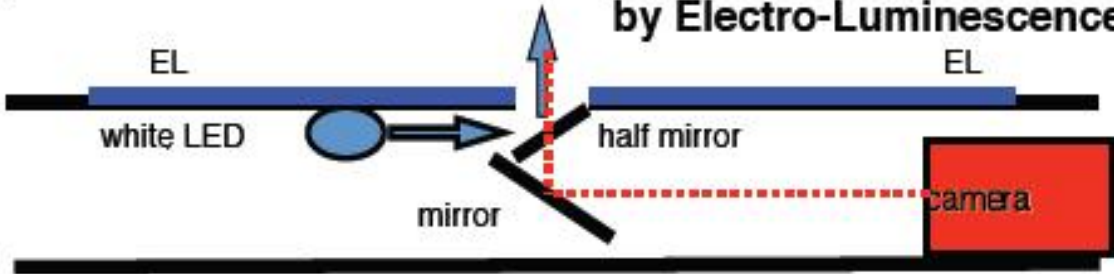
camera & lens



sliding mechanism of camera

perpendicular illumination by LED & half mirror

tilted sheet illumination by Electro-Luminescence



EL

white LED



mirror

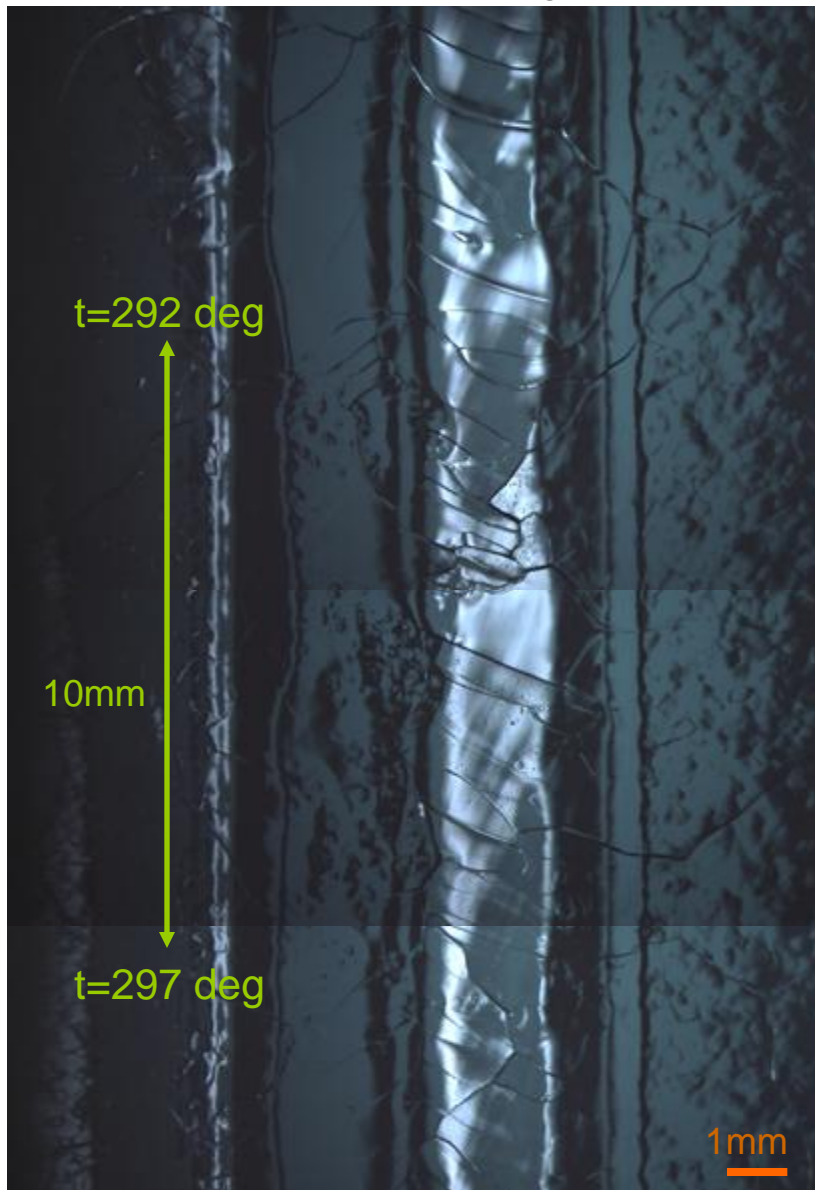
half mirror

EL

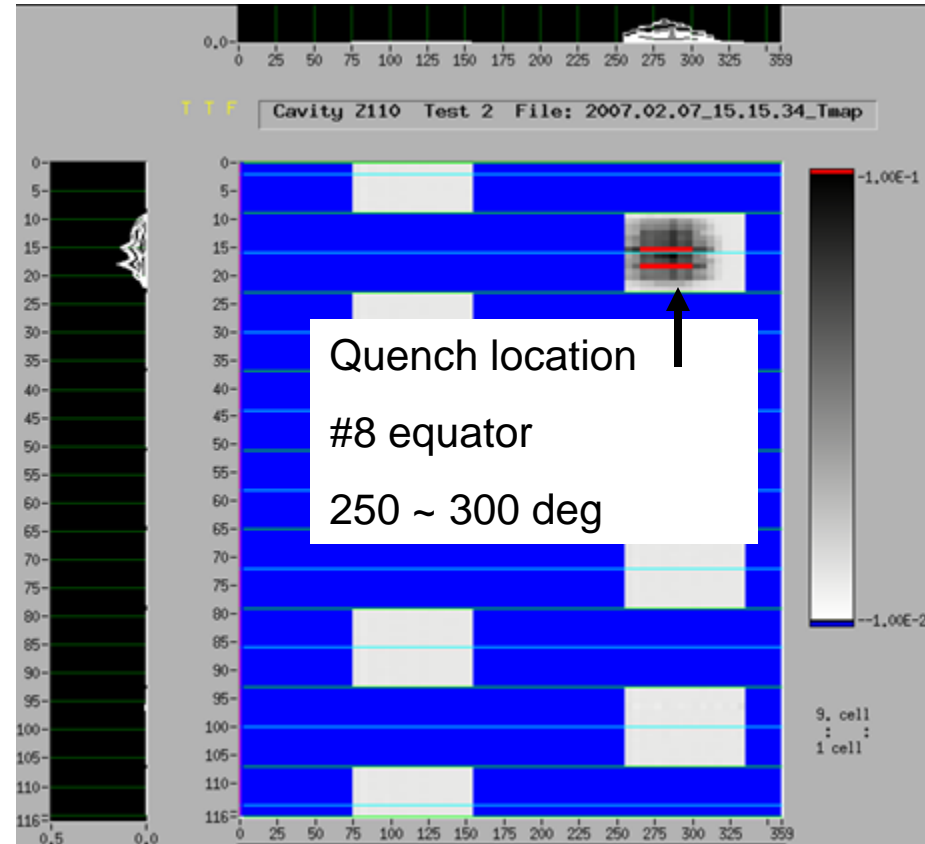
camera

TESLA cavity Z110: #8 cell equator

#8 equator, $t=288 \sim 299$ deg



T-map data in test 2, 14.2 MV/m



Group of defects with 10mm wide were observed.
Similar beads group were also observed in several places.



Model for ILC-HiGrade Cavity Production and Preparation

	Technical Choices	Location	Remark
Fabrication	XFEL-like	Company	Include optical inspection
Rough Surface Preparation	XFEL-like	Company	
Optical Inspection I	XFEL-like	Company	
Furnace	XFEL-like	Company	
Final Surface Preparation	XFEL	Company	QC Argument
Test I	T-map mandatory	DESY	DESY Manpower? Second sound?
Optical Inspection II	Compare with T-map	DESY	Guided repair option?
Final Surface Preparation	ILC recipe	DESY, CEA, Company	DESY capabilities? Which Company? Horizontal vs. Vertical EP
Test II (or more)	T-map (or second sound) mandatory	DESY, CEA	Second sound at DESY or CEA
Tank welding	Bladetuner with Piezos	Company, DESY	Compatible XFEL Cav. ! Tuner from INFN
Coupler assembly and Final rinse	High-pressure water rinse after assy	DESY, CEA	Coupler from LAL
High-power test		DESY, CEA	CHECHIA, CryHoLab