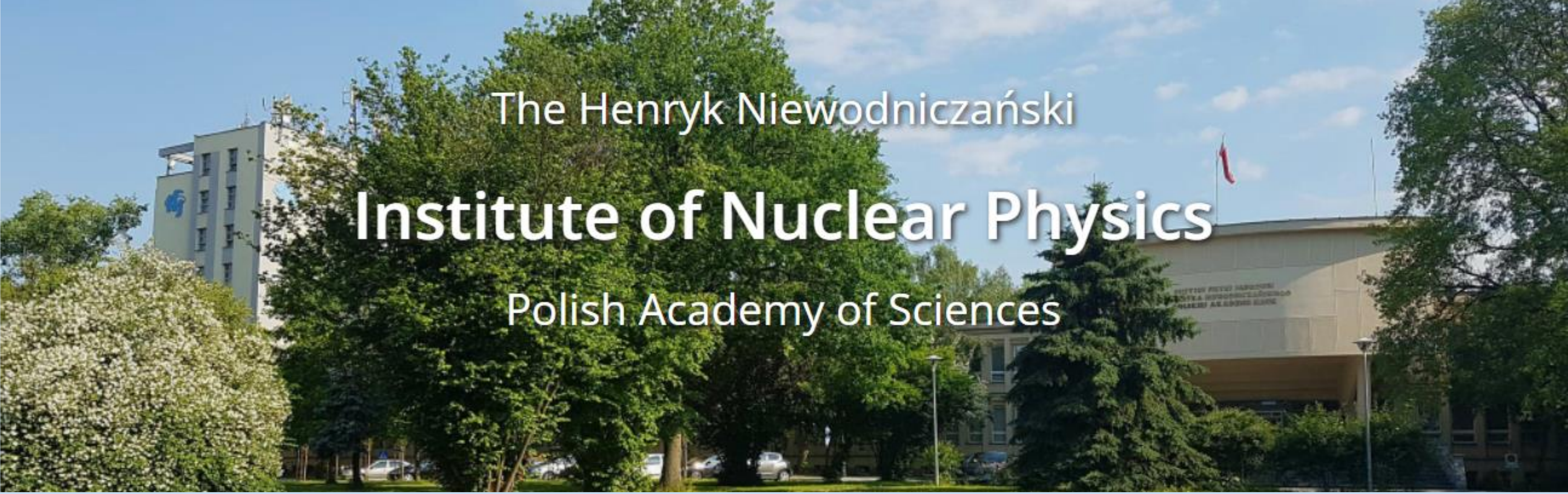
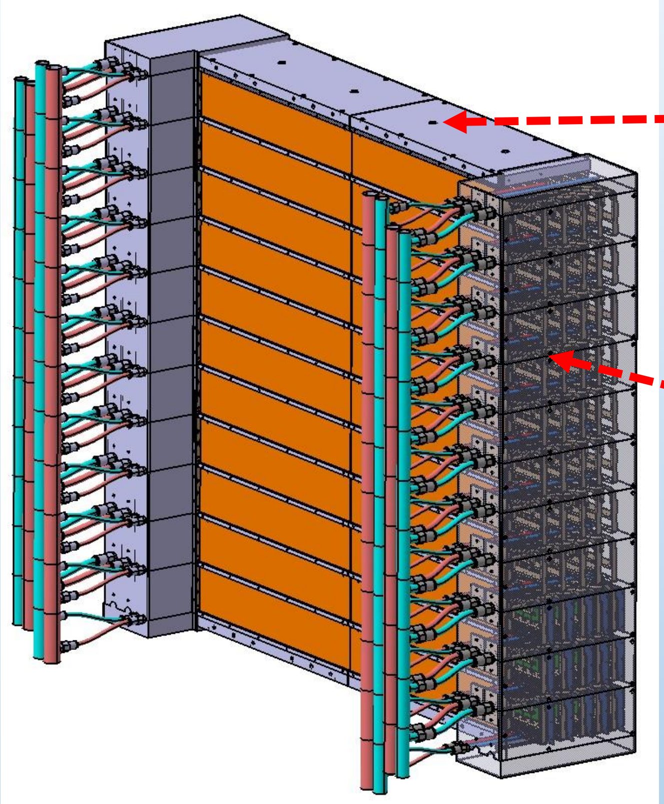


IFJ PAN in-kind contribution to the FoCal-E cooling system with respect to the quality assurance based on IFJ PAN projects experience

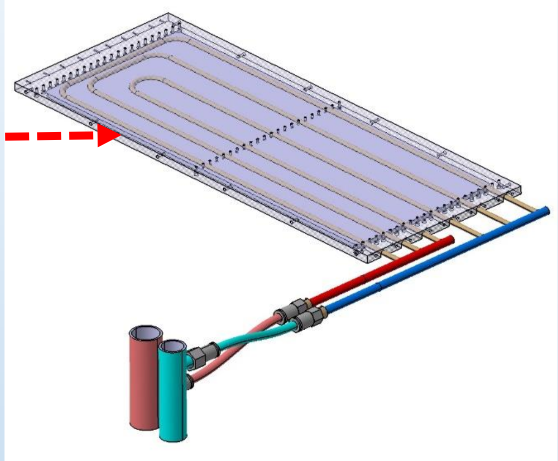
The Division of Scientific Equipment and Infrastructure Construction (DAI)

IFJ PAN – in-kind contribution to FOCAL

COOLING SYSTEM RESPONSIBILITY AND SCOPE OF WORK

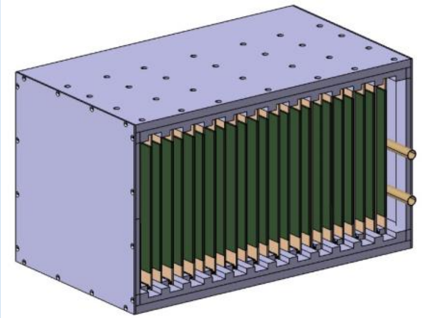


FOCAL model with cooling system

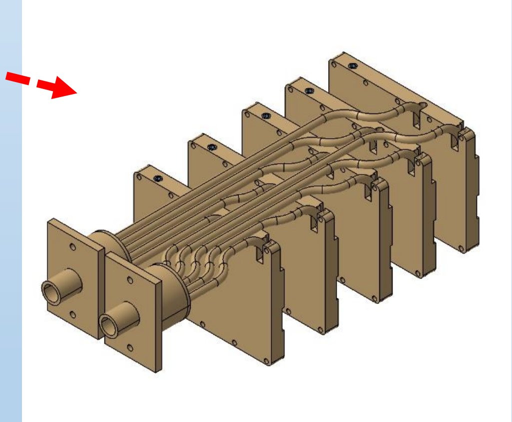


FOCAL-E heat exchanger

- ***DESIGN***
- ***PRODUCTION***
- ***TEST***
- ***DELIVERY***

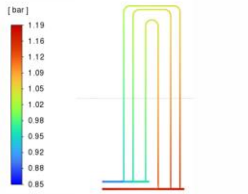


READOUT UNIT heat exchangers

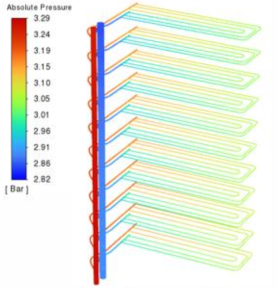


EXTERNAL ELECTRONICS heat exchangers

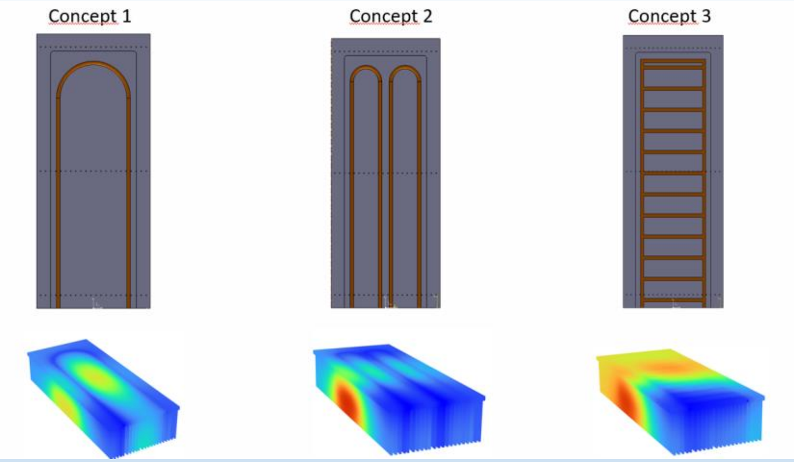
FOCAL-E CONCEPTUAL WORK

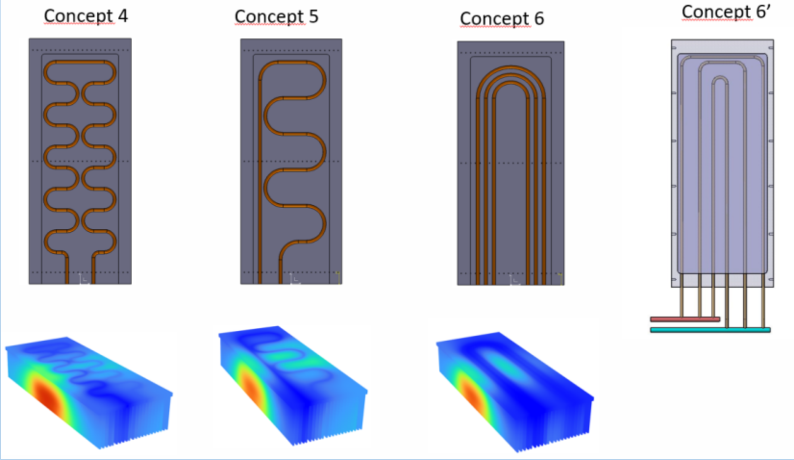


According to the ANSYS preliminary simulation the pressure drop for one heat exchanger is about **0,34 bar.**



According to the ANSYS preliminary simulation the pressure drop for 11 heat exchanger is about **0,47 bar.**





For each manufactured heat exchanger the pressure drop will be checked at the flow of 4 liters per minute. We did following calculations.

Flow: $Q = 4\frac{l}{min} = 6,66 * 10^{-5}\frac{m^3}{s}$

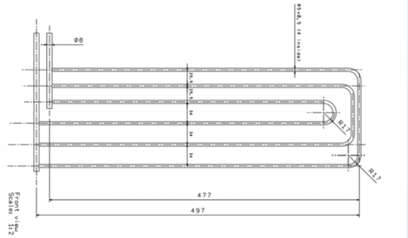
Flow surface: $S = \frac{D^2 * \pi}{4} = \frac{0,004^2 * \pi}{4} = 0,000013m^2$

Velocity: $w = \frac{Q}{S} = \frac{\frac{(6,66 * 10^{-5}\frac{m^3}{s})}{3}}{0,000013m^2} = 1,769\frac{m}{s}$

Reynolds number: $R = \frac{wD\rho}{\mu} = \frac{5,3\frac{m}{s} * 0,004m * 999,5\frac{kg}{m^3}}{0,001234\frac{Pa}{s}} = 5732,76$

Relative Roughness $\varepsilon = \frac{k}{D} = \frac{0,005 * 10^{-3}m}{0,004m} = 0,00125$

Cooling water						
Parameters	10°C		11°C		12°C	
Density	999,7	kg/m³	999,6	kg/m³	**999,5**	**kg/m³**
Viscosity	0,001306	Pa*s	0,0013	Pa*s	**0,001234**	**Pa*s**



Flow coefficienty: $\frac{1}{\sqrt{\lambda}} = -2\lg\left(\frac{6,1}{Re^{0,915}} + 0,268 * \varepsilon\right) \rightarrow \lambda = \left(\frac{1}{-2\lg\left(\frac{6,1}{Re^{0,915}} + 0,268 * \varepsilon\right)}\right)^2$

$\lambda = \left(\frac{1}{-2\lg\left(\frac{6,1}{Re^{0,915}} + 0,268 * \varepsilon\right)}\right)^2 = \frac{1}{-2\lg\left(\frac{6,1}{5732,76^{0,915}} + 0,268 * 0,00125\right)} = 0,03719$

Pressure drop over lenght $(L) = 1m$ **(Darcy-Weisbach equation)**

$\Delta p_{HE} = \lambda\frac{L * \rho * w^2}{D * 2} = 0,03719 * \frac{1 * 999,5\frac{kg}{m^3} * \left(1,769\frac{m}{s}\right)^2}{0,004m * 2} = 14547,43Pa = 0,15Bar$

Pressure drop for bend with $r = 0,017m$

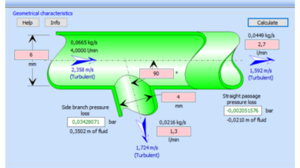
$\Delta p_{bend} = \varepsilon_{bend}\frac{\rho w^2}{2}$

$\Delta p_{bend} = \left[2,97 + 1,847 * \left(\frac{r_{pipe}}{R_{bend}}\right)^{3,5}\right] * 999,5\frac{1,769^2}{2}$

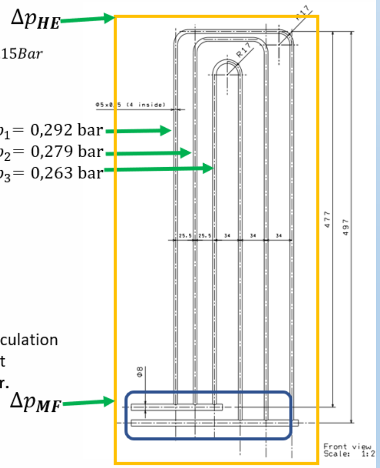
$= \left[2,97 + 1,857 * \left(\frac{\frac{0,004}{2}}{0,017}\right)^{3,5}\right] * 999,5\frac{1,769^2}{2} = 4647Pa\ (for\ one\ bend) = 0,046$

1:L=1,37m, Δp_1= 0,292 bar
2:L=1,28m, Δp_2= 0,279 bar
3:L=1,17m, Δp_3= 0,263 bar

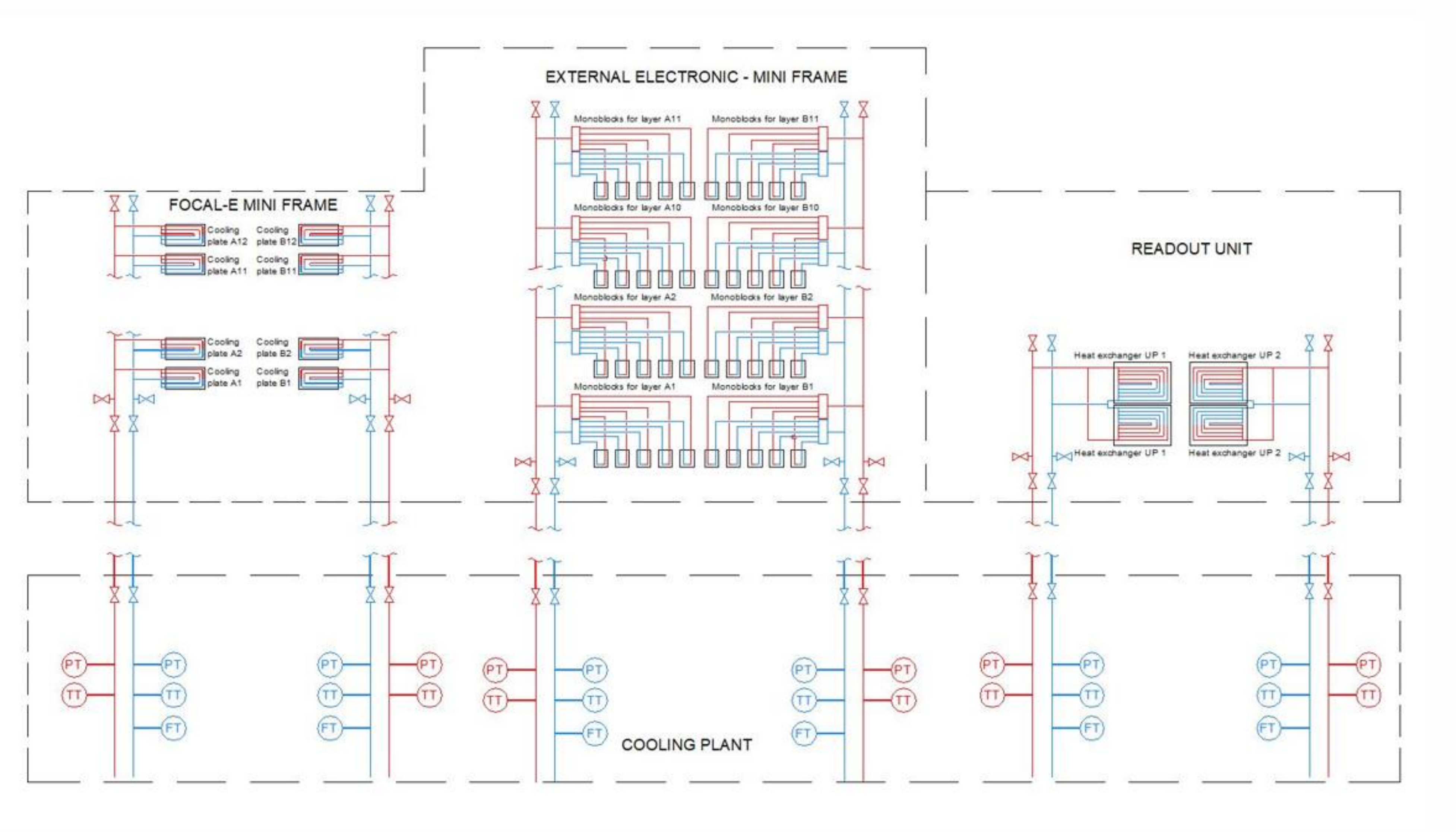
According to the dedicated software for manifold calculating pressure drops $\Delta p_{MF} = 0,035$ ***bar***



According to the analytical calculation the pressure drop for one heat exchanger is Δp_{HE}=**0,327 bar.**



PRELIMINARY P&ID DIAGRAM FOR FOCAL



PRELIMINARY RISK Analysis DIAGRAM FOR FOCAL

Risk Number	Risk Name	Description of the threat	Potential impact of the threat	S value	P value	Risk level	actions	S value	P value	Risk level	Comments
1	Production	Incorrect production of aluminium plates	Ineffective cooling process and problems during assembly	5	3	15	Control of the aluminum plate manufacturing process at every stage of production	5	1	5	
2	Production	Incorrect production of tungsten plates	Ineffective cooling process and problems during assembly	5	3	15	Control of the tungsten plate manufacturing process at every stage of production	5	1	5	
3	Assumptions/Design	Insufficient system pressure	Ineffective cooling process	5	3	15	Comparison of empirical calculations with simulation data and confirmation of assumptions	5	1	5	
4	Production/Assembly	Insufficient system pressure	Ineffective cooling process	4	2	8	Control of the exchanger manufacturing process (dimensions of copper pipes) and control during assembly	4	1	4	
5	Assumptions/Design	Insufficient flow (stream)	Ineffective cooling process	5	3	15	Comparison of empirical calculations with simulation data and confirmation of assumptions	5	1	5	
6	Assembly	No surface contact between the aluminum plate and the tungsten plate	Ineffective cooling process	4	3	12	Control during assembly aluminium and tungsten plates	4	1	4	
7	Transport	Damage to elements during transport	No assembly possible	5	2	10	Securing all components during transport	5	1	5	
8	Assembly	Leak	Ineffective cooling process and damage to adjacent installations	5	3	15	Control of the exchanger assembly process	5	1	5	
9	Design/Production/Assembly	No validation electronics	Extension of the design and production time and problems in the assembly process	4	2	8	Confirmation from the manufacturer of final dimensions	4	1	4	
10	Design/Assembly	Overloaded supporting structure of the exchangers	Possibility of damage elements	5	2	10	Performing mechanical calculations	5	1	5	
11	Production/Assembly	Mechanical damage to copper pipes and clogging	Ineffective cooling process	5	2	10	Control of the production and assembly process	5	1	5	
12	Assembly	Insufficient number of elements during assembly	No assembly possible	5	2	10	Test assembly to verify the presence of the necessary elements. Spare parts	3	1	3	
13	Assembly	Incorrect assembly of elements	Damage to the structure, incorrect operation of the exchanger	4	2	8	Installation according to a previously prepared procedure	4	1	4	
14	Design/Use	Water temperature in the cooling system too low	Water condensation on the installation	4	2	8	Design of the installation according to the indicated water temperature (above the condensing temperature)	4	1	4	
15	Assembly/ Design	Structural instability	Damage to the installation structure	4	3	12	Performing mechanical calculations	4	1	4	
16	Design/Use	Water temperature in the cooling system too high	Ineffective cooling process	4	3	12	Design of the installation according to the indicated water temperature	4	1	4	
17	Design	Incomplete or wrong assumptions made as input data	Preparation of technical documentation that does not meet the requirements	5	2	10	documentation based on full, complete and consistent data	5	1	5	

Legend

	"S" value	"P" value
1	minimal effect	nearly impossible
2	low effect	low probably
3	medium effect	moderately possible
4	serious effect	probable
5	catastrophic effect	almost certain

RISK LEVEL

EFECT						
	4	8	12	16	very high	13-16
	3	6	9	12	high	9-12
	2	4	6	8	medium	5-8
	1	2	3	4	low	1-4
	Probability					

IFJ PAN in-kind contribution to ESS – Technical Annexes

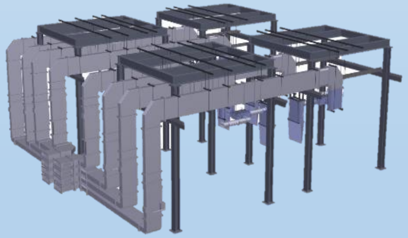
SCHEDULE AIK 10.1-Cryomodule test

- Reception of Cryomodule units
- Preparation of Cryomodule units for the test bench
- Installation on the test bench
- Initial testing
- Cool down
- Heat load measurements
- Warm up
- Disconnection
- Preparation for the tunnel
- Participation in site activity coordination
- Final review

2017 - 2026

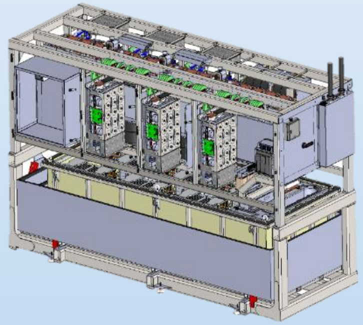
SCHEDULE AIK 8.6 -RF Installation

- Stub installation
- LLRF installation
- LPS installation
- Distribution system installation
- High Power Amplifier installation



SCHEDULE AIK 17.3 -PC Installation

- Klystrons Modulators for RFQ and DTL
- Klystron Modulators for Medium / High Beta
- Magnet Power Converters



SCHEDULE AIK 8.8

CONTRIBUTION TO THE LOW AND HIGH-POWER TESTS OF RF EQUIPMENT AND TESTING AND INSTALLATION OF RFPS'S IN TS3 AND IN G02.

2022 - 2023

IFJ PAN (DAI) at ESS

permanently at ESS site 14 persons in total

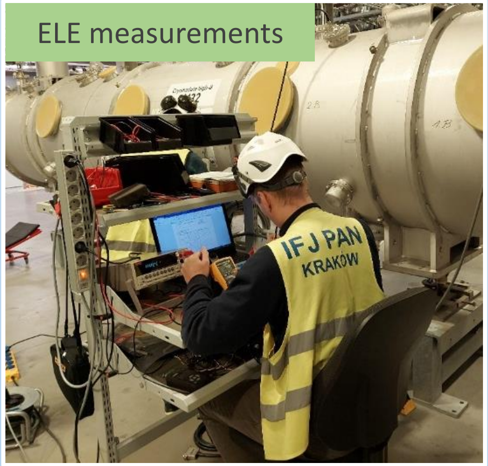
THE HENRYK NIEWODNICZAŃSKI INSTITUTE OF NUCLEAR PHYSICS POLISH ACADEMY OF SCIENCES
EUROPEAN SPALLATION SOURCE

- Cryogenic experts,
- Mechanical and electrical specialists,
- RF engineers,
- Vacuum specialists,
- Skilled technicians,


MECH inspection

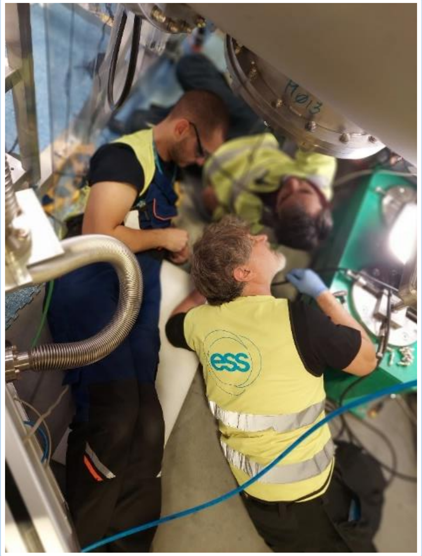
CRYO operations


VAC activities



ELE measurements


TECH work



IFJ PAN (DAI) at ESS

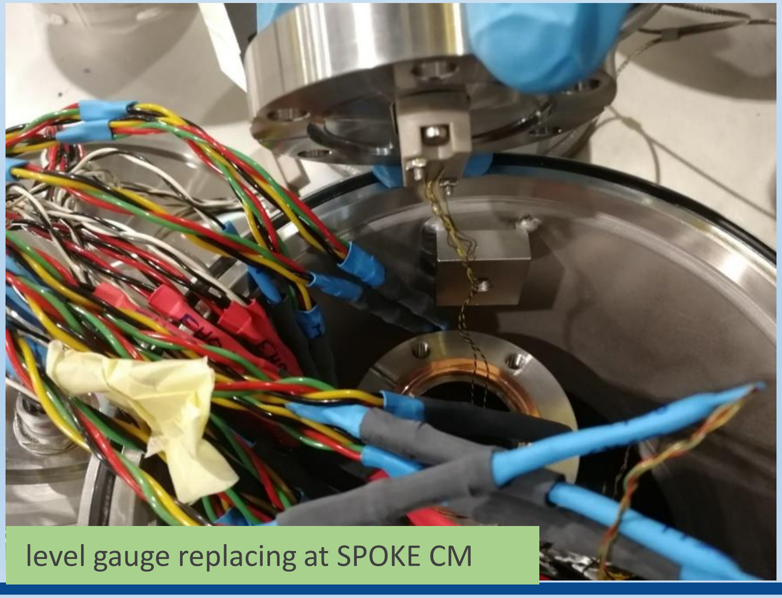
Supported activities at ESS side

- Support with installation trial of elliptical CM05 & spoke CM02 in the tunel,
- Support with SPOKE CM10 CTS motor replacing,
- Replacing of the LG at all SPOKE CM's,
- Various leak tests for choosen SPOKE CM's,
- Support with MLI installation for ACCP-CTL interconnections,
- And …


CM05 waveguides connection in the tunnel


CM05 Jumper connection in the tunel

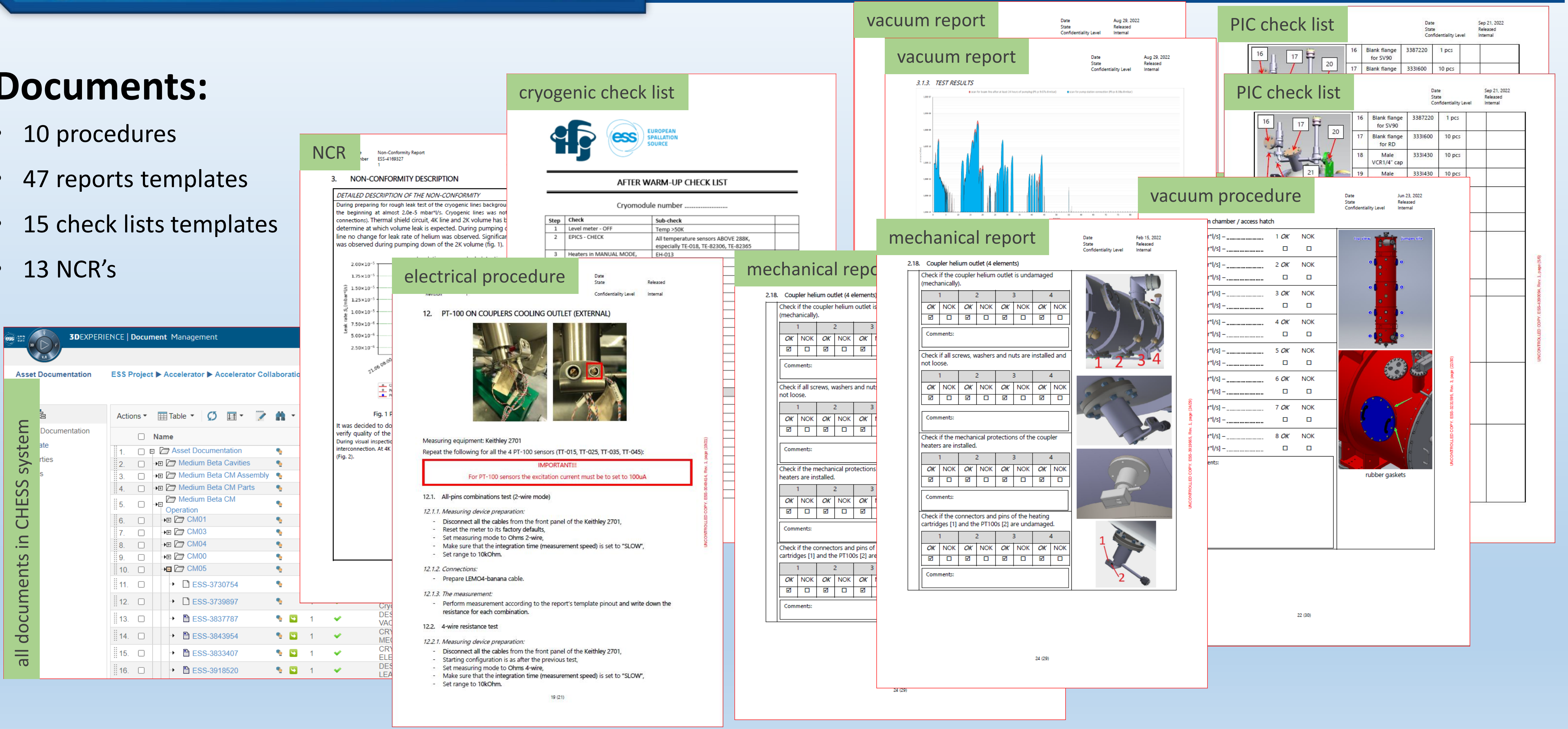

CTS motor repairing at SPOKE CM


level gauge replacing at SPOKE CM

IFJ PAN (DAI) at ESS

Documents:

- 10 procedures
- 47 reports templates
- 15 check lists templates
- 13 NCR's



IFJ PAN (DAI) at LHC

LHC - construction, commissioning, consolidation

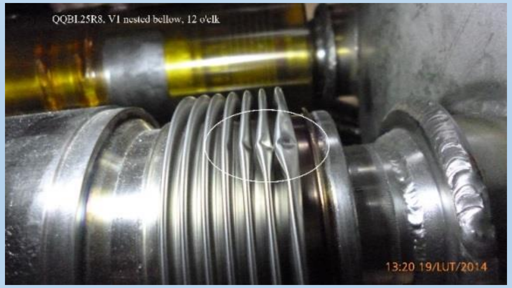
Sining of the agreement in 2005-2010 between IFJ PAN Director – prof. Marek Jeżabek and LHC Project Coordinator – dr. Lyndon Evans

- ✓ Design and implementation of automatic measurement systems for testing superconducting LHC circuits
- ✓ Quality Control of superconducting electrical circuits
- ✓ Inspection of LHC superconducting magnet connections

Quality Control of superconducting electrical circuits
ELQA TEAM

LHC during Long Shutdown

New measurement systems



Damage disclosed during QC– ICIT TEAM

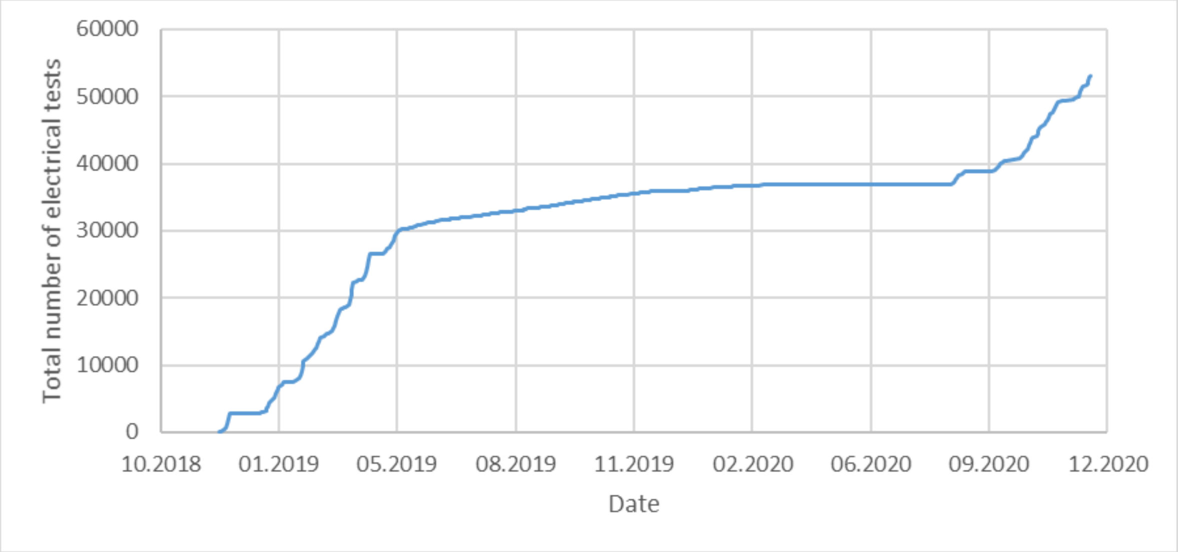
- ✓ The work managing of the multinational team "Alpha-Omega"

Measurements in the LHC during Long Shutdown 2


Standard ELQA measurements in the LHC during Long Shutdown 2.

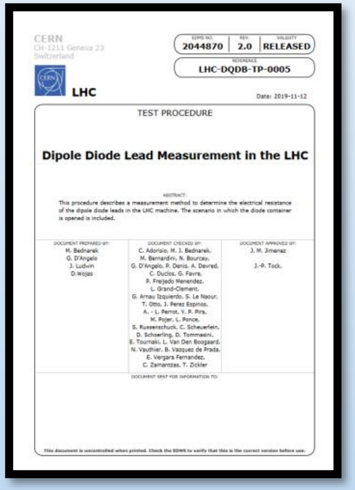
- Standard measurements on more than 1600 LHC superconducting circuits and their instrumentation before and after warm-up of the LHC.
- Software development, design and fabrication of four dedicated diode lead measurement systems.

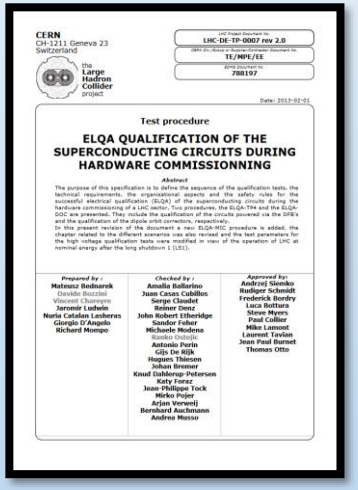
Up to 25 engineers and technicians from IFJ PAN on CERN site

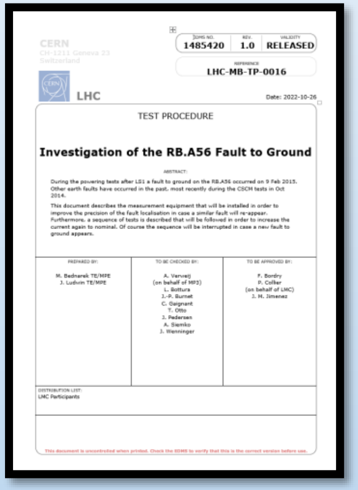


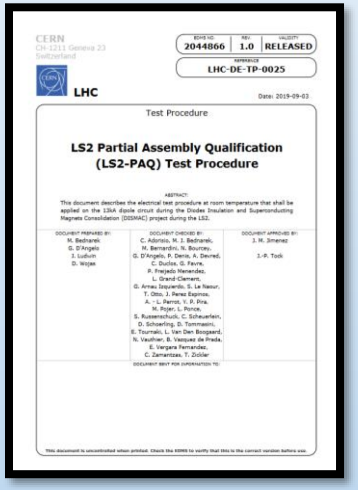
Number of ELQA measurements performed by IFJ PAN personnel during LS2 until the end of 2020.

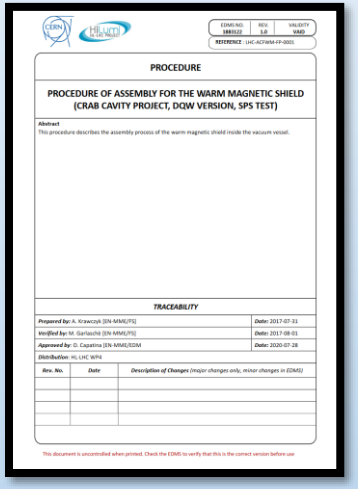
Procedures at CERN


CERN
2044870 2.0 RELEASED
LHC-DQDB-TP-0005
LHC
TEST PROCEDURE
Dipole Diode Lead Measurement in the LHC


CERN
LHC-DE-TP-0007 rev 2.0
TE/MPE/EE
788197
Test procedure
ELQA QUALIFICATION OF THE SUPERCONDUCTING CIRCUITS DURING HARDWARE COMMISSIONING


1485420 1.0 RELEASED
LHC-MB-TP-0016
LHC
TEST PROCEDURE
Investigation of the RB.A56 Fault to Ground


CERN
2044866 1.0 RELEASED
LHC-DE-TP-0025
LHC
Test Procedure
LS2 Partial Assembly Qualification (LS2-PAQ) Test Procedure


PROCEDURE
PROCEDURE OF ASSEMBLY FOR THE WARM MAGNETIC SHIELD (CRAB CAVITY PROJECT, DQW VERSION, SPS TEST)
TRACEABILITY

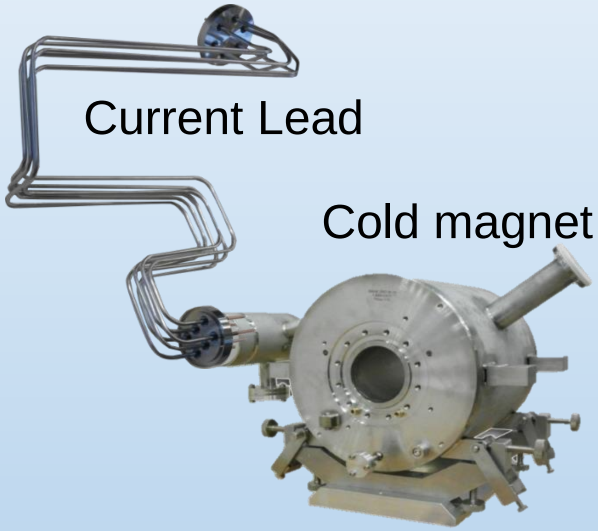
- Co-authorship of 10 procedures related to electrical quality assurance of LHC and HL-LHC superconducting circuits
- Prototype crab cavity assembly procedure

IFJ PAN (DAI) at XFEL

Acceptance tests of superconducting components of the XFEL accelerator

IFJ PAN in-kind contribution to the XFEL 2010 – 2016

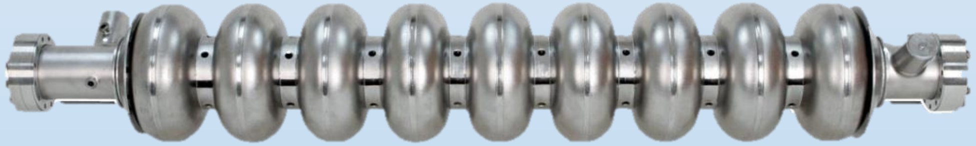
103 x



Current Lead

Cold magnet

840 x



Cavity

103 x

Cryomodule

European XFEL

DESY

Location: DESY campus at Hamburg

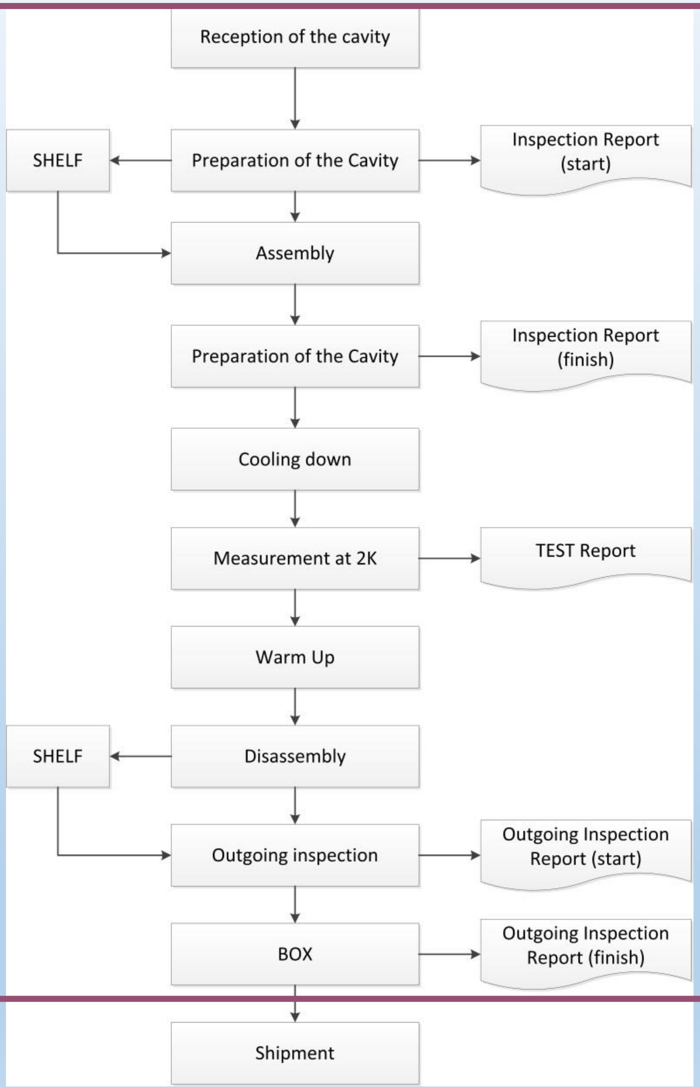
IFJ PAN Team met the logistic challenge in facility operating (equipped with) :

- Two cryostats
- Preparation area for cavities (6 Inserts)
- Three test stands for cryomodules
- Preparation areas for cryomodules(3x special support for survey check + additional 5 place for further incoming check.
- Limited Storage areas for cavities and cryomodules
- 2 cryo operation(2 slots) available at the same time

TEST - What does it mean ?

European XFEL

DESY

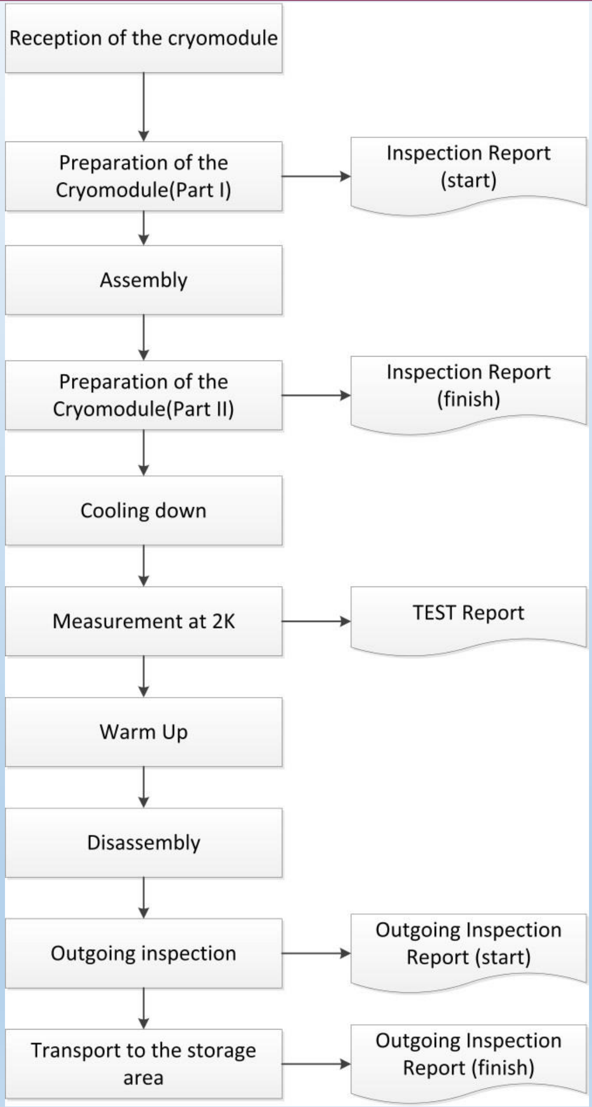


Cavity test main flow diagram

Cryomodule test main flow diagram

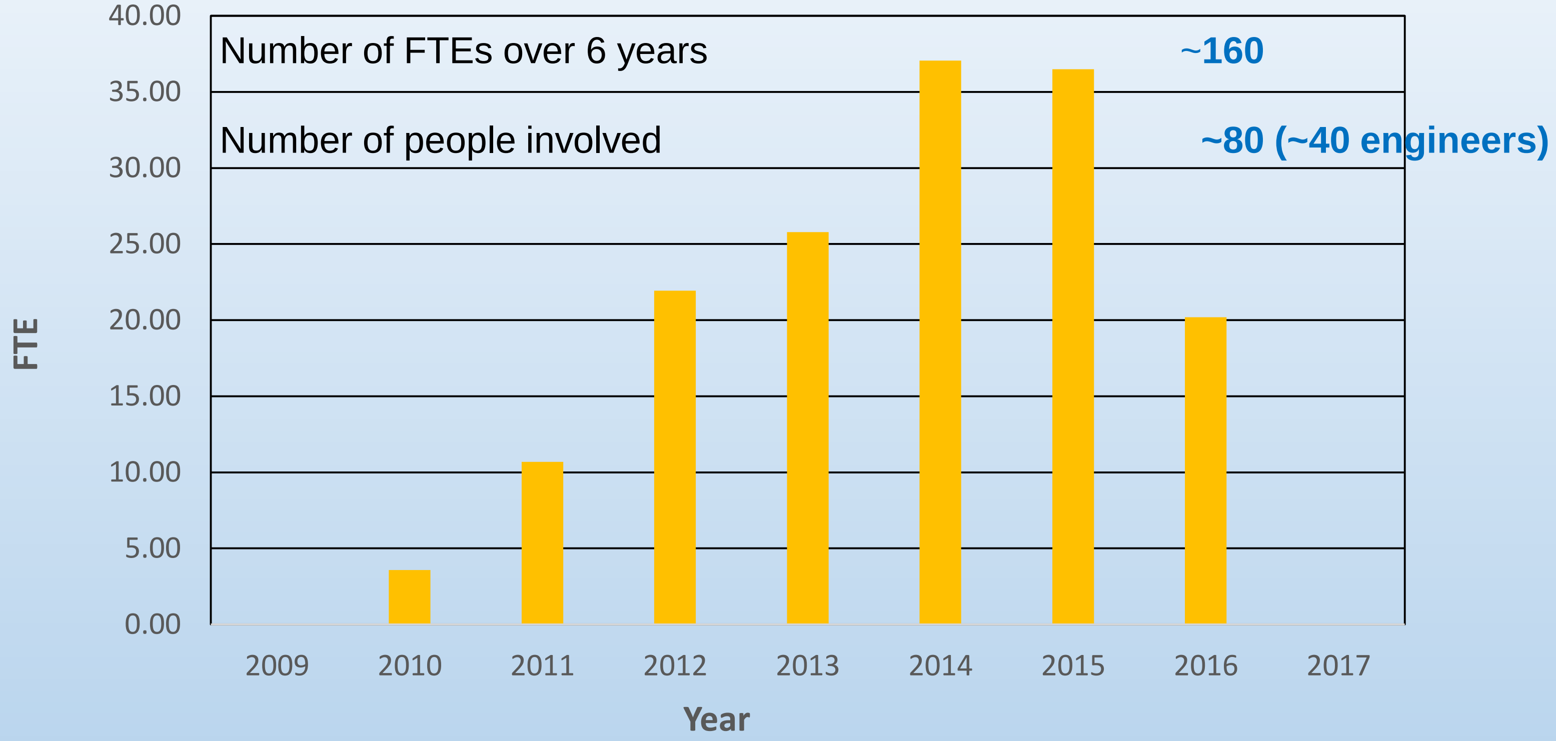
TEST

The test program is realized according to the written procedures



TEST - What does it mean ?

Very time consuming and laborious



In total were performed:

1214 tests for **813** series cavities performed

108 tests performed of **101** series cold magnets and current leads

107 tests for **100** series cryomodules

AMTF Hall - Cryomodule

European XFEL

DESY

Unloading of the cryomodule after transport

Cryomodule preparation area

Cryomodule test stand

Cryomodule test stand – module inside

Cryomodule test stand – front view

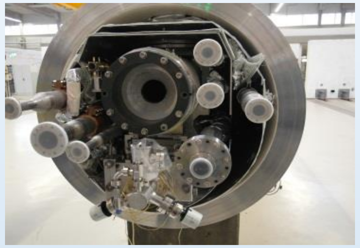
The Henryk Niewodniczański Institute of Nuclear Physics
Polish Academy of Sciences

Preparation and assembling of cryomodules at AMTF hall

European XFEL

DESY





Main tasks:

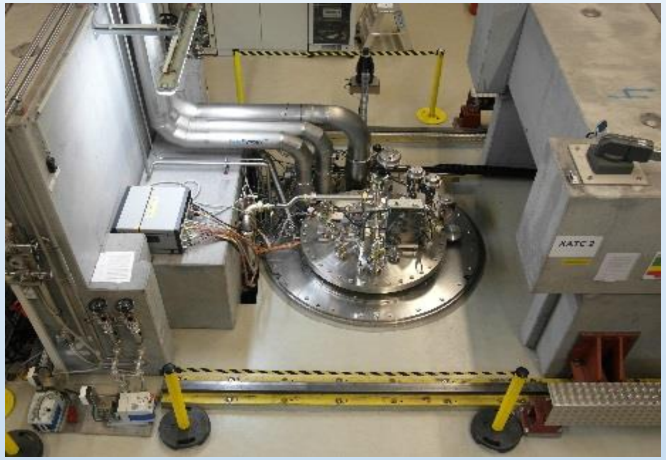
- Unload the cryomodule from the truck
- Incoming checks
- Load the cryomodule to the movable support
- Assembling Cryomodule at the test stand
- Connecting Cryomodule beam line to the test stand under clean room conditions
- Leak check of beam line interconnections and mass spectroscopy of the beam line
- Connecting of the waveguides
- Connecting of all electrical cables
- Connect of all cryomodule process pipes to the test stands
- Leak check of cryomodule vessel (ISO-VAC)
- Leak check of cryomodule cryogenic lines
- Assembly and isolating thermal shields
- Pumping down of isolation vacuum



AMTF Hall - Cavity

European XFEL

DESY



Vertical Cryostat

Radiation protection shielding

Cavity preparation area

Cavity storage area

Cavity incoming check area

Clean room

Preparation and assembling of cavities at AMTF hall

European XFEL

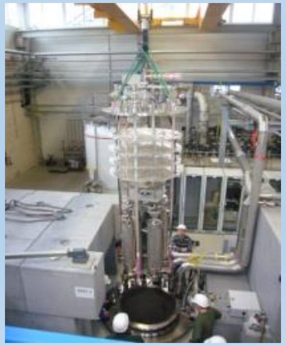
DESY




Main tasks:

- Incoming checks
- Assembling Cavity to the Insert
- Connecting Cavity to the vacuum line (in cleanroom conditions)
- Tuning of Fundamental Mode Rejection Filters of both HOM couplers + Cables connection
- Leak check of the Cavity
- Transport of the Insert to the cryostat + vacuum connection

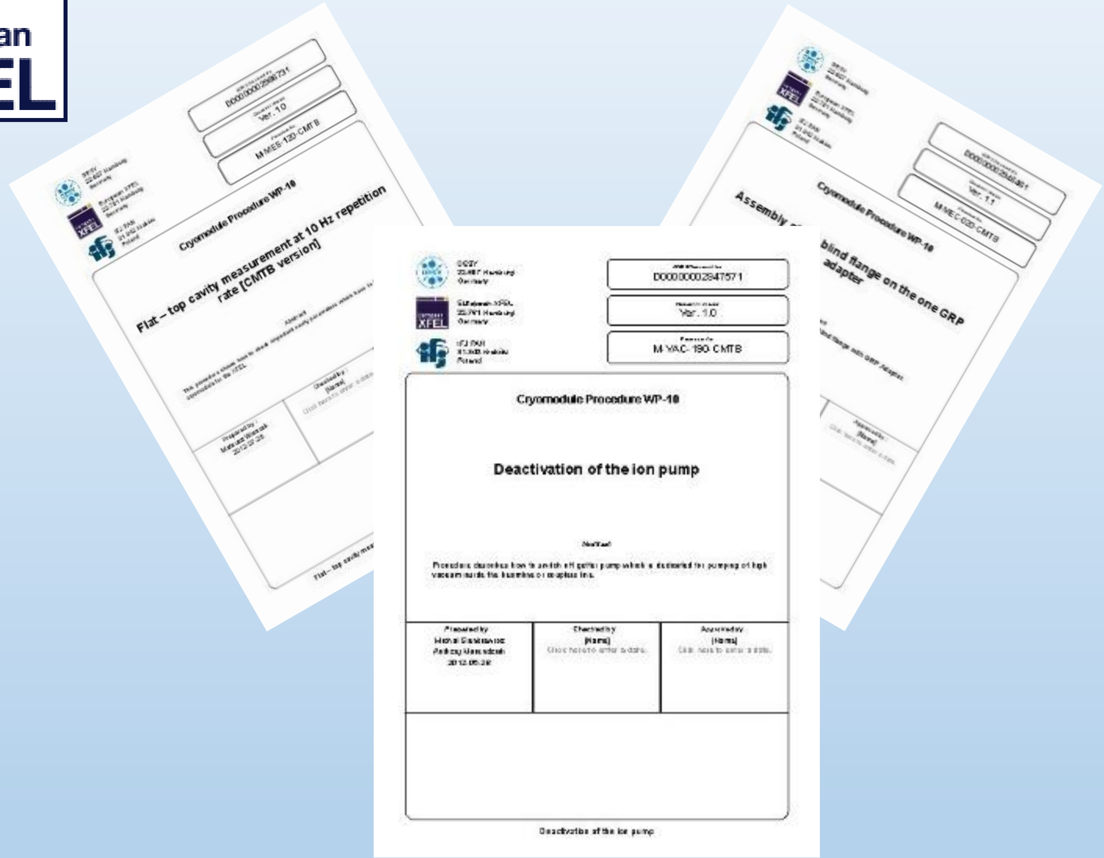


XFEL Procedures

European XFEL

DESY



Activation and deactivation of Ion Pump	D00000006689411	09.02.2016
Activation of Titanium Sublimation Pump (TSP)	D00000006689491	09.02.2016
Alignment_of_the_crymodule	D00000006678751	26.01.2016
Assembly final tightening and connection of GRP adapter	D00000006651881	26.01.2016
Cavities fine tuning and module calibration	D00000006630821	11.12.2015
Closing of the sliding muff	D00000006650681	20.01.2016
Connection of all process pipes	D00000006651941	26.01.2016
Connection of the beamline	D00000006790331	24.03.2016
Connection_of_the_waveguides	D00000006853821	25.04.2016
COOL DOWN_XATB	D00000006563271	08.01.2016
COOL DOWN_XATB_checklist	D00000006552401	09.01.2016
Coupler tuner bellow check at warm	D00000006637781	18.12.2015
Cryomodule Heat Loads measurements	D00000006710641	23.03.2016
Detune all cavities after cold test	D00000006632411	14.12.2015
Disconnection of all process pipes	D00000006652001	21.01.2016
Disconnection of the beamline	D00000006790571	24.03.2016
Disconnection_of_the_waveguides	D00000006853921	25.04.2016
Dismounting of GRP adapter	D00000006652061	26.01.2016
Flat - top measurement	D00000006638681	18.12.2015
Heat Loads Measurements at 2K RF	D00000006637201	18.12.2015
Installation of the 80K thermal shield at End-cap and Feed-cap sides	D00000006678511	26.01.2016
Installation of the 8K thermal shield at End-Cap and Feed-cap sides	D00000006678461	26.01.2016
Integral leak check of the cryomodule	D00000006633341	15.01.2016
Isolating of all process pipes	D00000006652431	20.01.2016
Isolation of the 80K thermal shield using MLI at End-cap and Feed-cap sides	D00000006678631	26.01.2016
Isolation of the 8K thermal shield using MLI at End-cap and Feed-cap sides	D00000006678571	26.01.2016
Leak check of the cryomodule	D00000006711021	15.02.2016
LLRF measurements at AMTF	D00000006637721	05.01.2016
Low power RF measurement at 2K	D00000006630761	11.12.2015
Magnet test at 2K	D00000006632351	21.12.2015
Opening and closing of the cold valve	D00000006710831	15.02.2016
Opening of the sliding muff	D00000006651091	20.01.2016
Post caps installation	D00000006651331	20.01.2016
Pumping down of the cryomodule insulation vacuum	D00000006789801	24.03.2016
Removal of Post caps	D00000006651391	20.01.2016
Removal of the transport-cap at downstream side	D00000006651451	21.01.2016
Removal of the transport-cap at upstream side	D00000006651501	21.01.2016
Unloading of the XFEL cryomodule from the trailer and transfer to the preparation area	D00000006678691	26.01.2016
Vacuum incoming inspection for crymodule	D00000006632481	15.01.2016
Warm coupler conditioning	D00000006637261	18.12.2015

Number of created procedures:

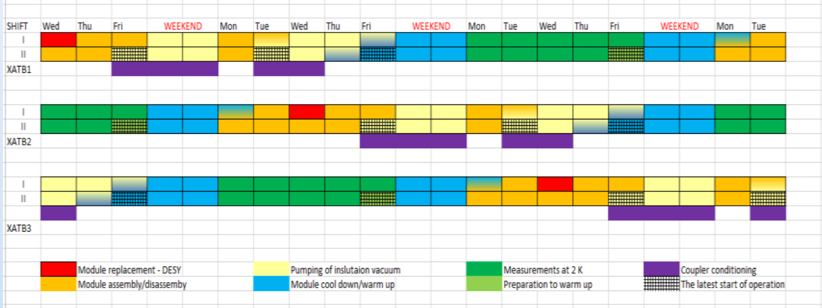
~50 for Cryomodule (AMTF)
~19 for Cavity (AMTF)

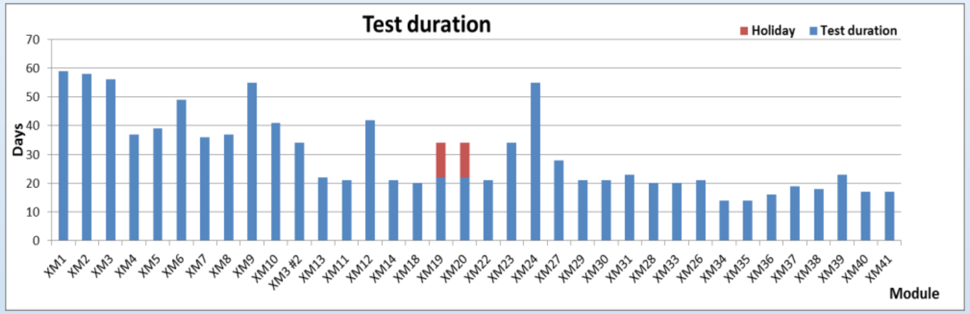
~146 for Cryomodule (CMTB)
~21 for Cavity (HALL 3)

European XFEL

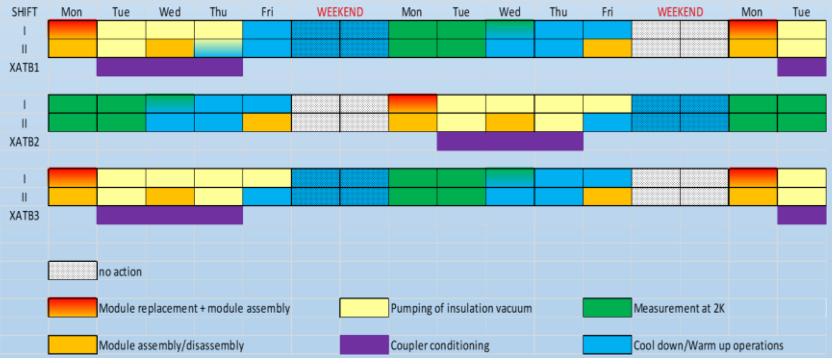
DESY

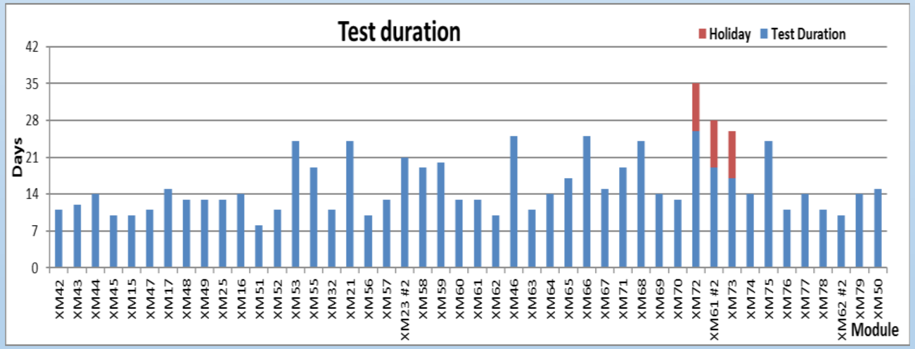
In November 2014 the major plan how to perform the test of the cryomodule with rate 1 per week (21 days test program) have been created





Test rate 1 module per week

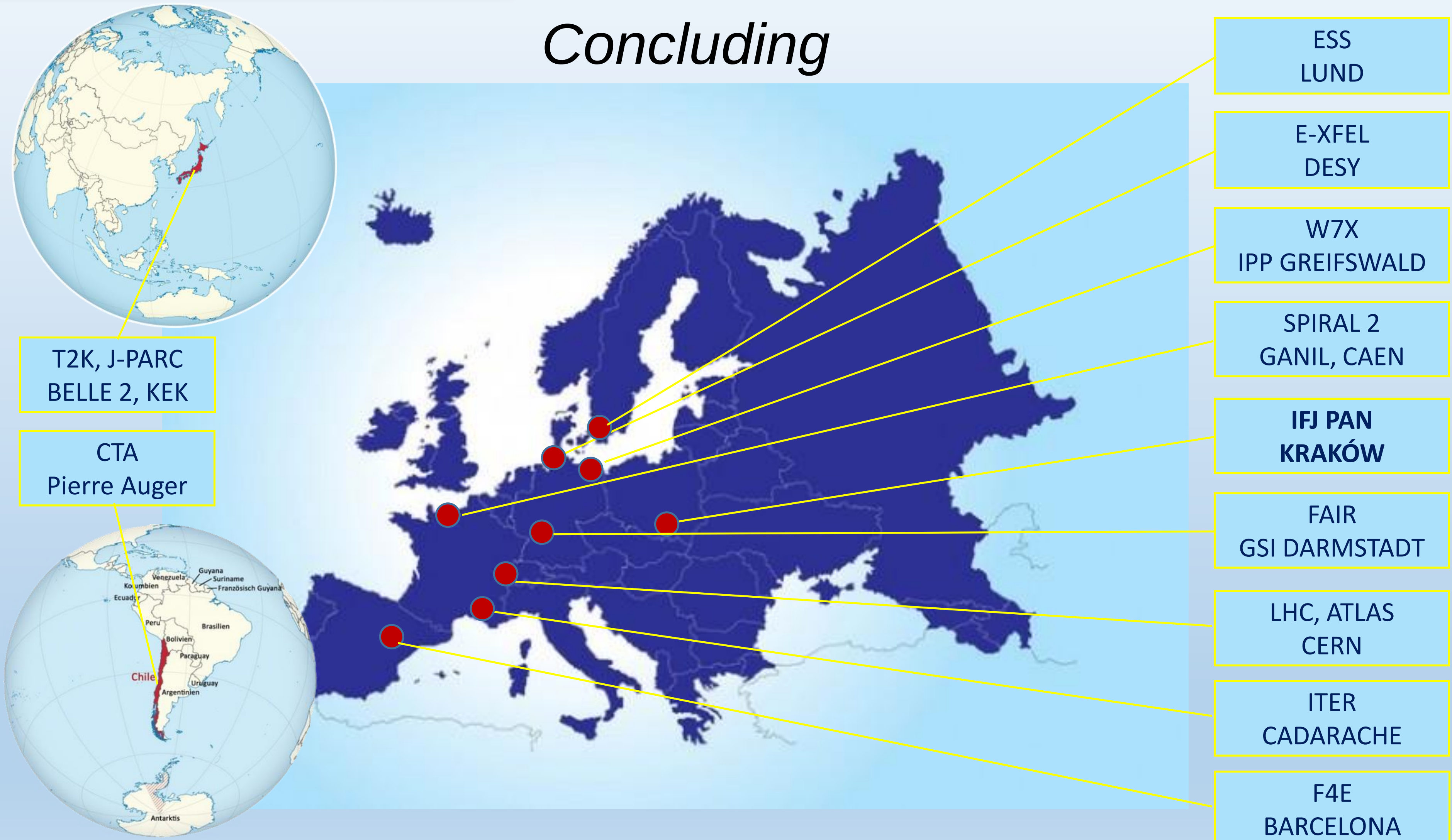




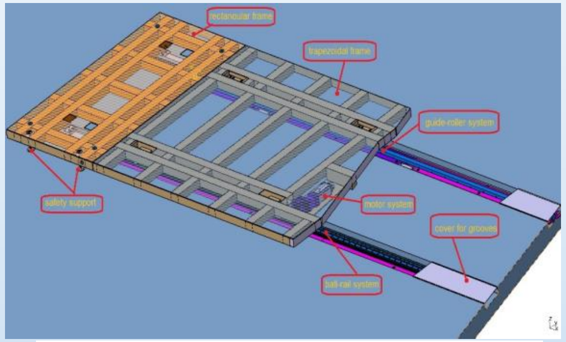
Test rate 1.5 module per week

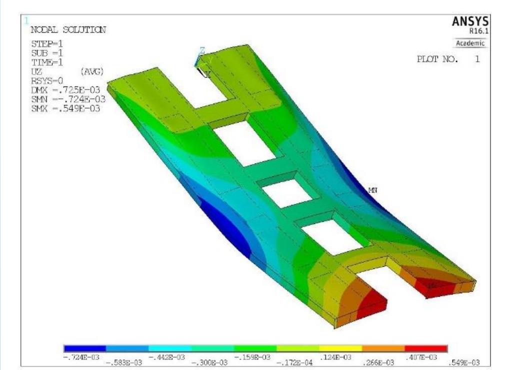
A small drop of our experience

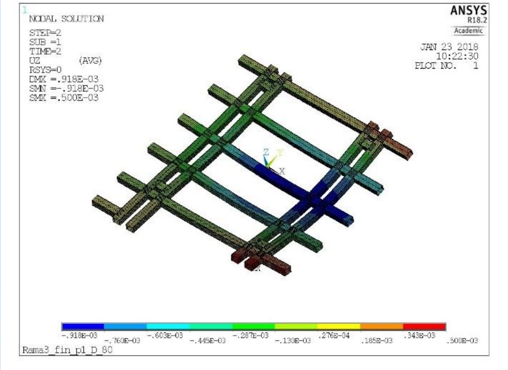
Concluding



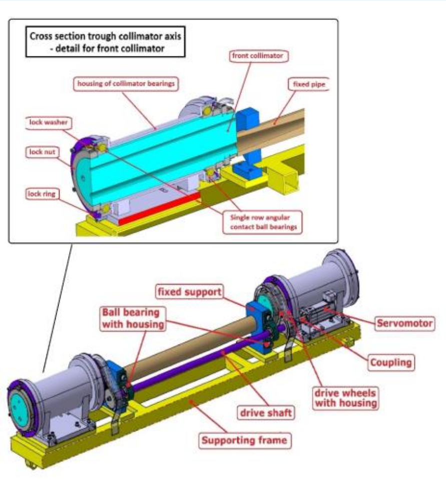
GSI – Detector Motion System

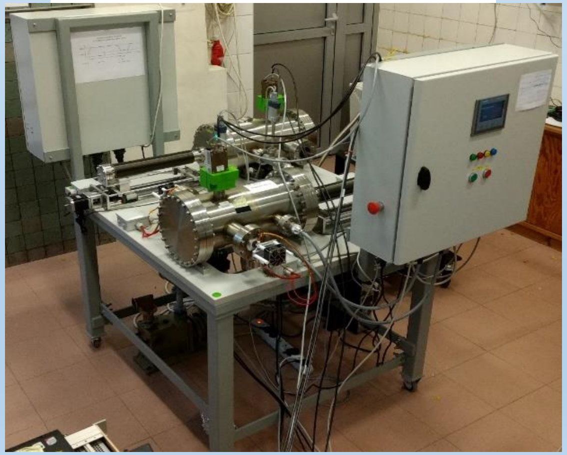




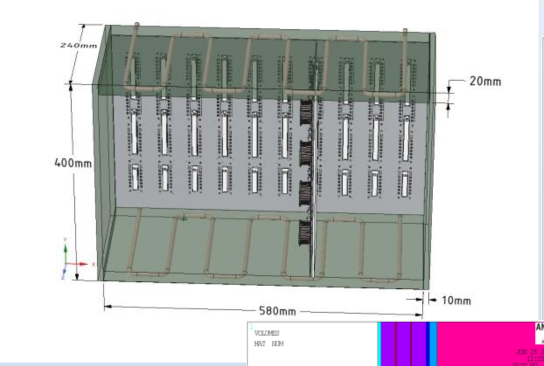


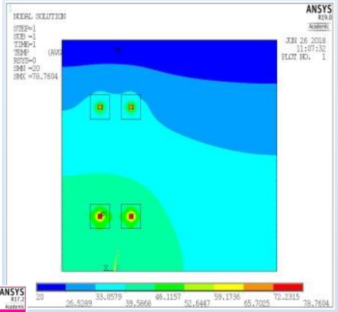
ITER RNC

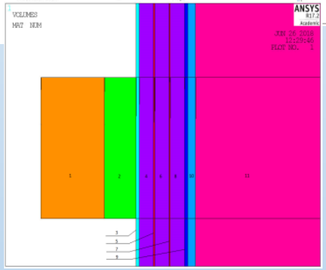




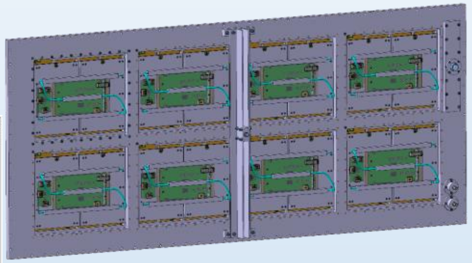
ITK – ATLAS experiment







T2K (ND280 detector upgrade)



PIERRE AUGER – Surface Scintillator Detector (SSD)

Lack of structures, lack of quality

European XFEL

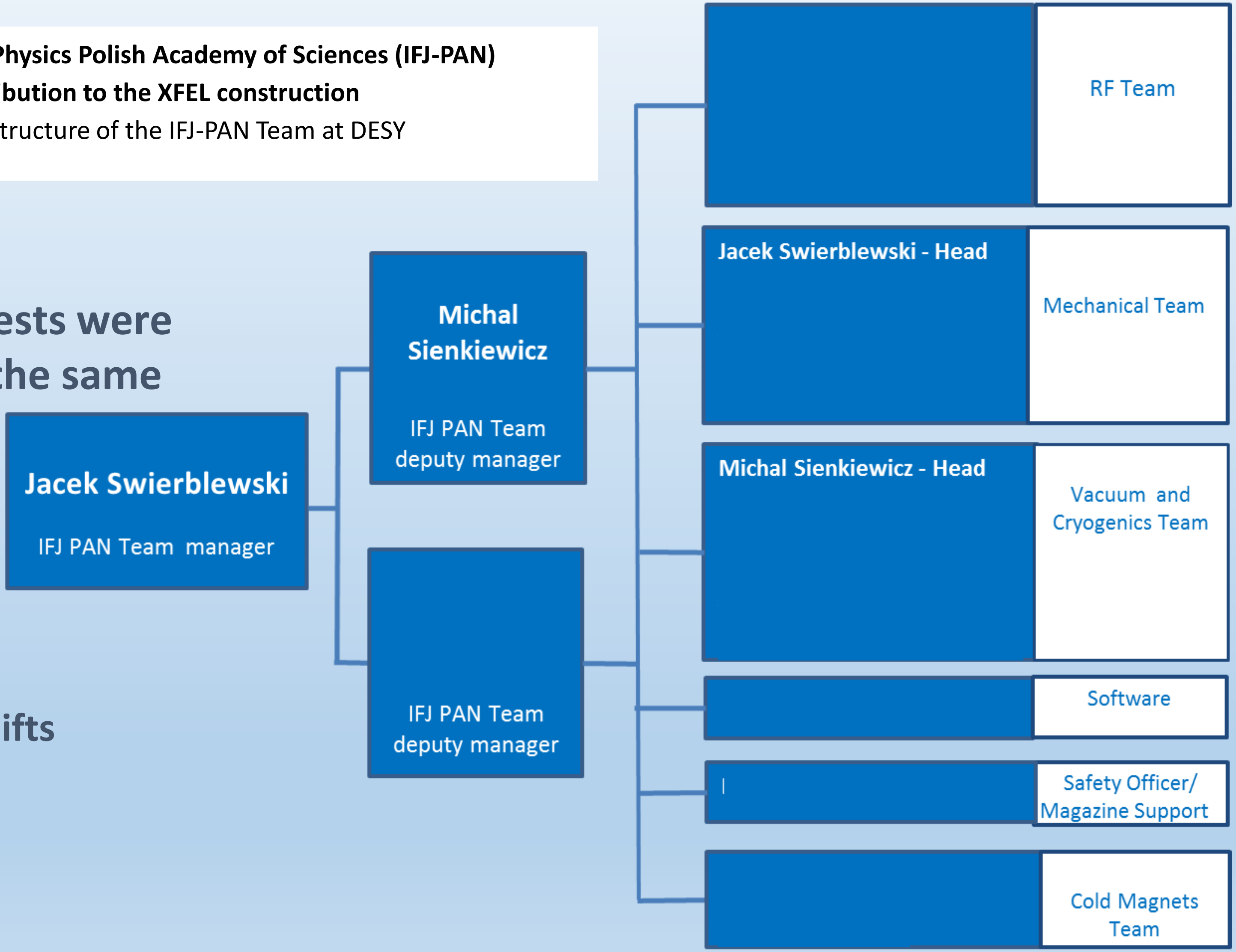
DESY

Institute of Nuclear Physics Polish Academy of Sciences (IFJ-PAN)
in-kind contribution to the XFEL construction
Organizational structure of the IFJ-PAN Team at DESY

For Cavities and Cryomodules tests were involved around 50 persons at the same time:

- AMTF Technical Coordinator
- 25 engineers
- 24 technicians

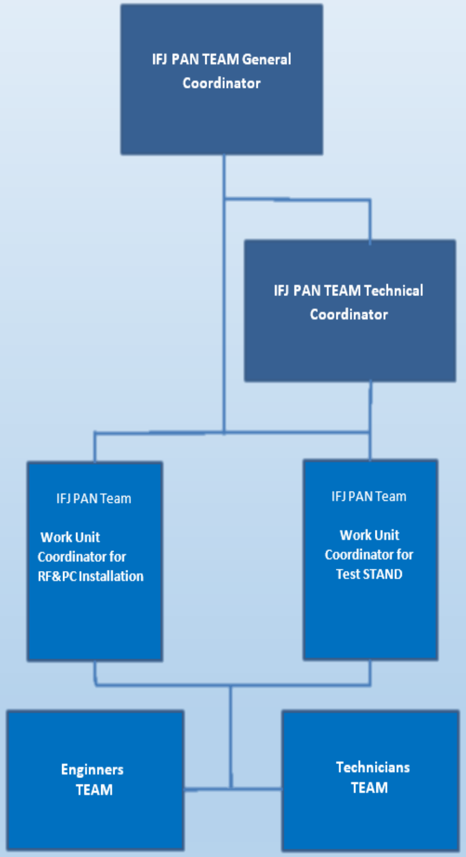
The work was organized on two shifts



Lack of structures, lack of quality

IFJ PAN Team at Lund (ESS)

Institute of Nuclear Physics Polish Academy of Sciences (IFJ PAN)
in-kind contribution to the ESS construction
Organizational structure of the IFJ-PAN Team at ESS



18 People involved
The work is organized on one shift

PERSONNEL:

GENERAL Coordinator: ……………………….
Technical Coordinator – ………………………
Work Unit Coordinator for Test Stand – …………………….
Work Unit Coordinator for RF&PC Installation - ……………….

Understanding of the Quality

Quality Assurance

Quality assurance can be defined as "part of quality management focused on providing confidence that quality requirements will be fulfilled." The confidence provided by quality assurance is twofold—internally to management and externally to customers, government agencies, regulators, certifiers, and third parties.

Quality Control

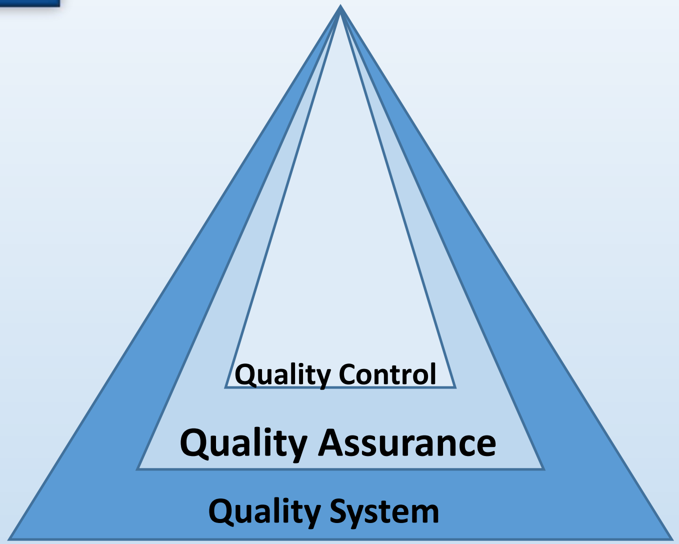
Quality control can be defined as "part of quality management focused on fulfilling quality requirements." While quality assurance relates to how a process is performed or how a product is made, quality control is more the inspection aspect of quality management.

QC focuses on the results of the work performed, whereas QA is concerned with the adequacy of the underlying processes, methodology, and standards in place to create the output.

Project Management Theory and Practice, Third Edition,2019

https://asq.org/quality-resources/quality-assurance-vs-control

Quality Relationships. ISO 9000 definitions from ISO 9000:2015: Quality management systems



This standard describes the fundamental concepts and principles of quality management which are universally applicable to the following:

- organizations seeking sustained success through the implementation of a quality management system;
- customers seeking confidence in an organization's ability to consistently provide products and services conforming to their requirements;
- organizations seeking confidence in their supply chain that product and service requirements will be met;
- organizations and interested parties seeking to improve communication through a common understanding of the vocabulary used in quality management;
- organizations performing conformity assessments against the requirements of ISO 9001;
- providers of training, assessment or advice in quality management;
- developers of related standards.

E.W. Deming defines quality as the anticipated degree of homogeneity and reliability of a product at the lowest possible cost and adjusting it to the market requirements.

Quality means conformance to requirements. *(Crosby, 1979)*
Project Management Theory and Practice, Third Edition,2019

7 Principals of Quality

- Customer focus
- Leadership
- Engagement of people
- Process approach
- Improvement
- Evidence-based decision making
- Relationship management

One American computer manufacturer was dissatisfied with one of its American suppliers. So he decided to try to cooperate with the Japanese. In the order, he wrote that he expected for every 10 000 no more than 4 defective products on average, which was in line with the US military standard 105D at that time. The Japanese took the order. Some time later the delivery of the equipment came, along with a letter that read: "We Japanese have a hard time for understanding the North American way of doing business. Four defective parts per 10 000 are delivered separately. We hope you are satisfied with this. "

Andrzej Blikle, Doktryna jakości (wydanie II turkusowe) — rzecz o turkusowej samoorganizacji (16 września 2016)

QUALITY – fundamental Sensei

W. Shewhart

J. Bank

E. Skrzypek

J. Oakland

Ph. Crosby

G. Taguchi

J.M. Juran

W.E. Deming

K. Ishikawa

A.V. Feigenbaum

A.V. Feigenbaum

Quality in eight dimensions according to D.A. Garvina

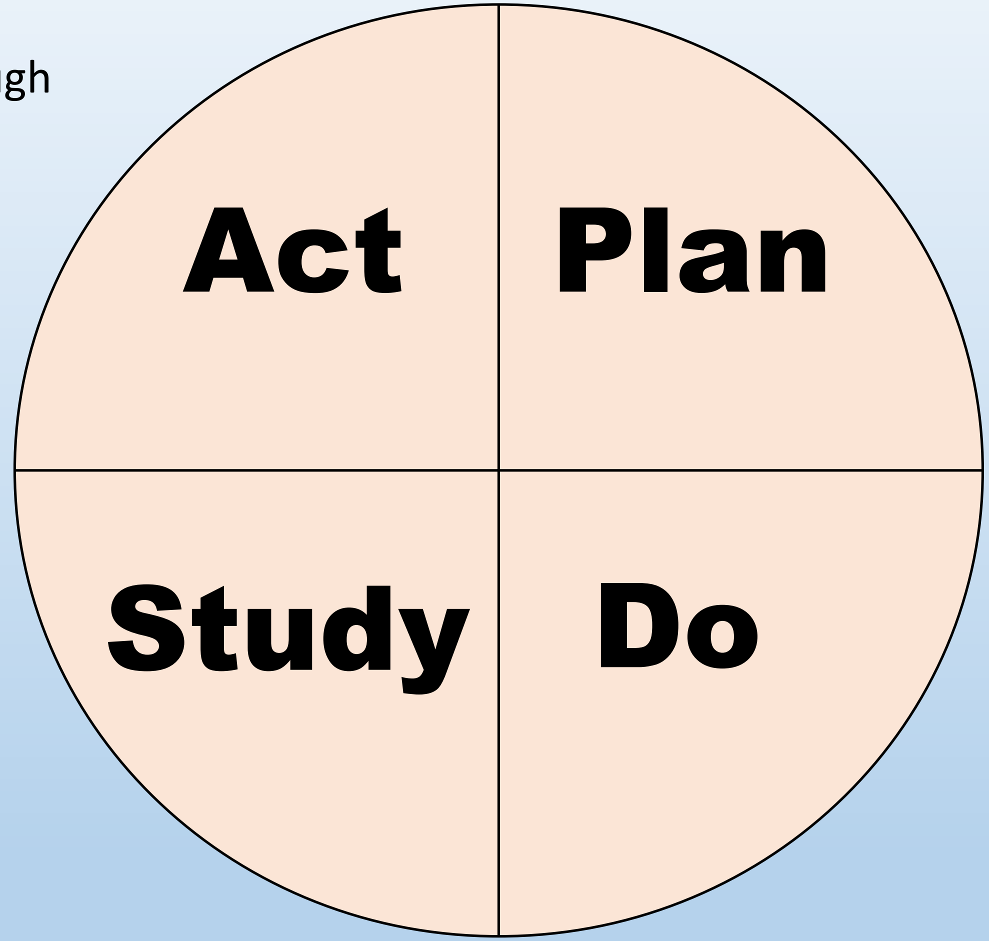
- practicality
- singularity
- utility
- durability
- compliance with the requirements
- aesthetic
- reliability
- quality perception

G.F. Smith, The quality meaning, „Total Quality Management” 2003, Vol.3,

PDSA – Deming’s cycle

Adopt the change, abandon it or run through the cycle again.

Plan a change or test aimed at improvement.



Examine the results. What did we learn? What went wrong?

Carry out the change or test (preferably on a small scale).

Deming modified Shewhart cycle and called new one → the Shewhart Cycle for Learning and Improvement

Deming described it as a flow diagram for learning and improvement of a **product** or a **process**.

Classification of quality management methods

ENGINEERING

- Failure mode and effects Analysis (FMEA)
– Quality function deployment (QFD)
– Projektowanie eksperymentów
– Metoda Taguchiego
– Single minute exchange of die
– Poka yoke
– Total productive maintenance
– Just in time
– Kanban
– 5xS

STATISTICAL

- Control card
- Pareto diagram
- Scatter correlation diagram
- Histogram
- Data analysis matrix
- Analytical sheet
- Statistical quality control
- Statistical controls process
- Process capability analysis

MANAGEMENT

- Kaizen
- Continuous improvement cycle(PDCA)
- Quality cost analysis
- Ishikawa diagram
- Relationship diagram
- Matrix diagram
- Decision tree
- Programming chart the decision process
- Benchmarking
- Quality planning
- Graphical presentation processes
- Flag method
- Process improvement cycle (DMAIC)
- SERVQUAL
- Quality wheels
- Quality audit meeting
- Empowerment
- Hoshin kanri
- Catchball
- Criteria quality awards (incl. W. E. Deming, M. Baldridge)
- EFQM excellence
- ISO 9004
- Management review
- Internal audit

ISSN 1898-6447, Zesz. Nauk. UEK, 2013; 910: 37–49

Quality Management Programs

- TQM
- Zero Defect
- Six Sigma
- ISO 9000
- Lean methodology

Total Quality Management — TQM

The heart of the TQM philosophy is the prevention of problems and an emphasis on quality in the design and development of products and processes. A formal quality planning process is integral to the TQM philosophy.

Way to TQM

- Six Sigma
- Lean management

Project Management Theory and Practice, Third Edition,2019

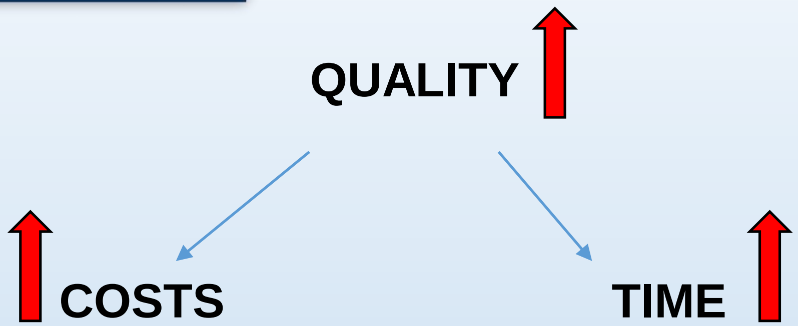
Deming's 14 Points for the Transformation of Management First presented in Dr. Deming's seminal book, *Out of the Crisis*

85% of quality problems are due to system errors and only 15% can be attributed to employees.

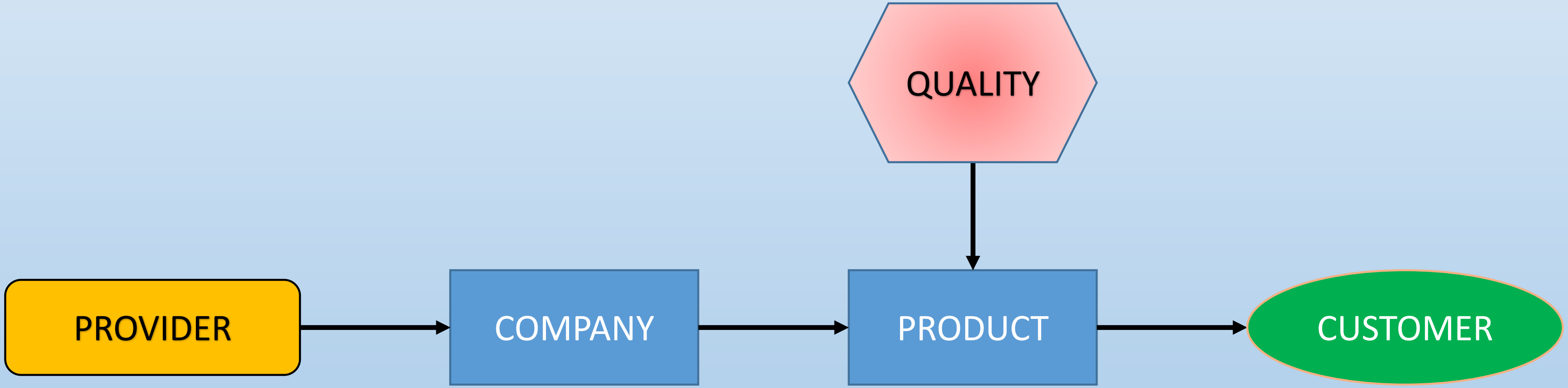
- ✓ *Create constancy of purpose for improving products and services*
- ✓ *Adopt the new philosophy*
- ✓ *Cease dependence on inspection to achieve quality*
- ✓ *End the practice of awarding business on price alone; instead, minimize total cost by working with a single supplier*
- ✓ *Improve constantly and forever every process for planning, production, and service*
- ✓ *Institute training on the job*
- ✓ *Adopt and institute leadership*
- ✓ *Drive out fear*
- ✓ *Break down barriers between staff areas*
- ✓ *Eliminate slogans, exhortations, and targets for the workforce*
- ✓ *Eliminate numerical quotas for the workforce and numerical goals for management*
- ✓ *Remove barriers that rob people of pride of workmanship, and eliminate the annual rating or merit system*
- ✓ *Institute a vigorous program of education and self-improvement for everyone*
- ✓ *Put everybody in the company to work accomplishing the transformation*

https://deming.org/explore/fourteen-points/

Traditional quality assurance model

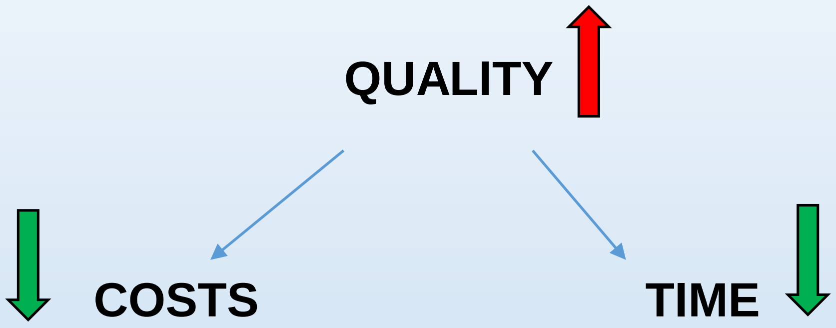


The traditional relationship between quality and production time and cost

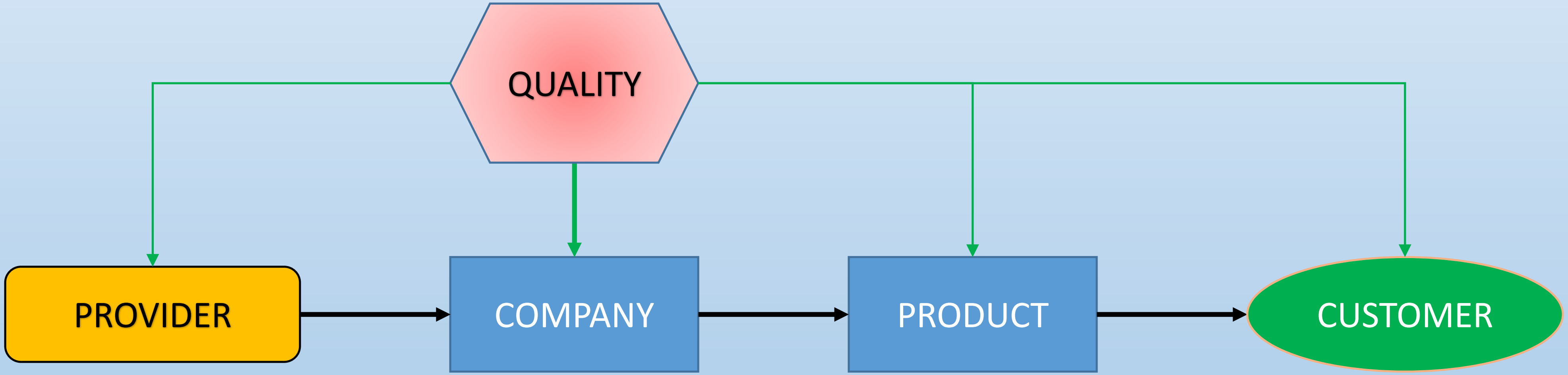


Andrzej Blikle, Doktryna jakości (wydanie II turkusowe) — rzecz o turkusowej samoorganizacji (16 września 2016)

TQM quality assurance model



The TQM's relationship between quality and production time and cost



Andrzej Blikle, Doktryna jakości (wydanie II turkusowe) — rzecz o turkusowej samoorganizacji (16 września 2016)

SEVEN DEADLY DISEASES OF MANAGEMENT

1. ***Lack of constancy of purpose*** to plan product and service that will have a market and keep the company in business and provide jobs. *Lack of a set course of action is not like a runny nose or the flu. It is not a mild disease. It is a fatal disease and leads to the collapse of the company*

2. ***Emphasis on short-term profits***: short-term thinking (just the opposite from constancy of purpose to stay in business), fed by fear of unfriendly takeover, and by push from bankers and owners for dividends.

3. ***Evaluation of performance, merit rating, or annual review***.

4. ***Mobility of management***; job hopping.

5. ***Management by use only of visible figures***, with little or no consideration of figures that are unknown or unknowable.

6. ***Excessive medical costs***. As reported by Dr. Deming in Out of the Crisis (pages 97-98), executives shared with him that the cost of medical care for their employees was amongst their largest overall expenses, not to mention the cost of medical care embedded in the purchase price of what they purchased from their suppliers.

7. ***Excessive costs of liability***, swelled by lawyers that work on contingency fees.

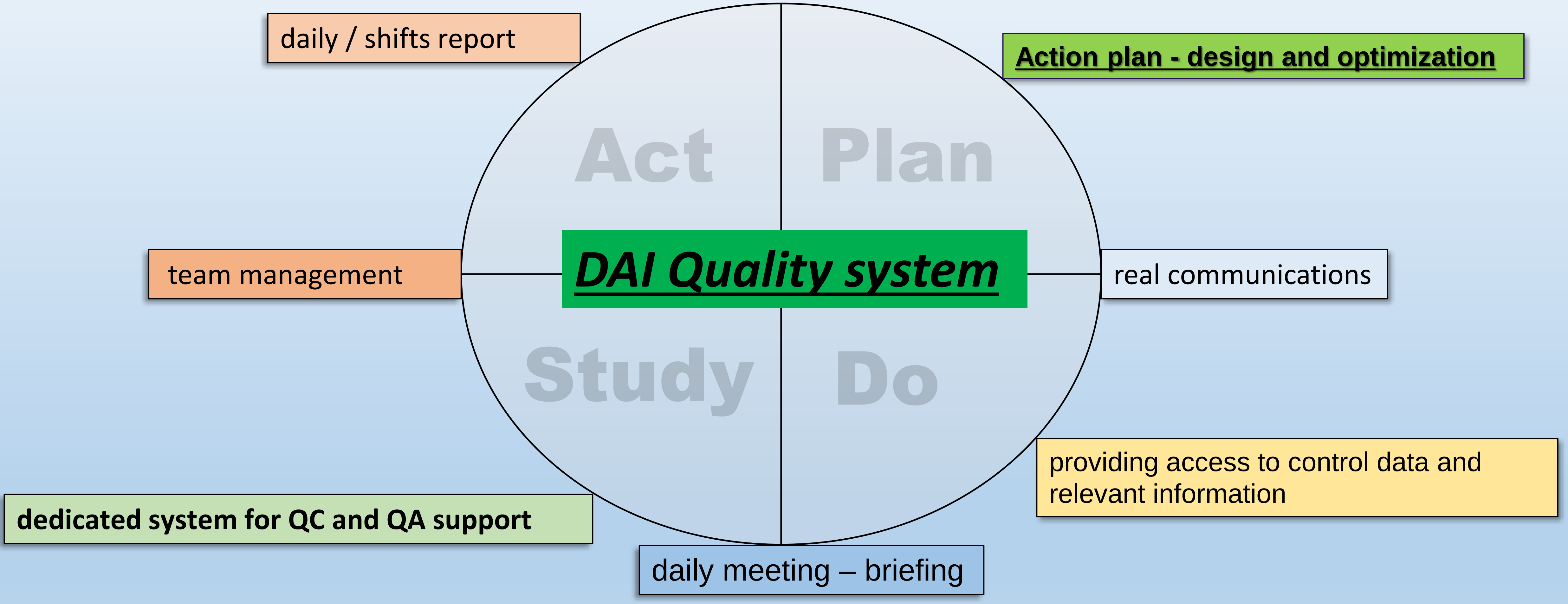
https://deming.org/explore/seven-deadly-diseases/

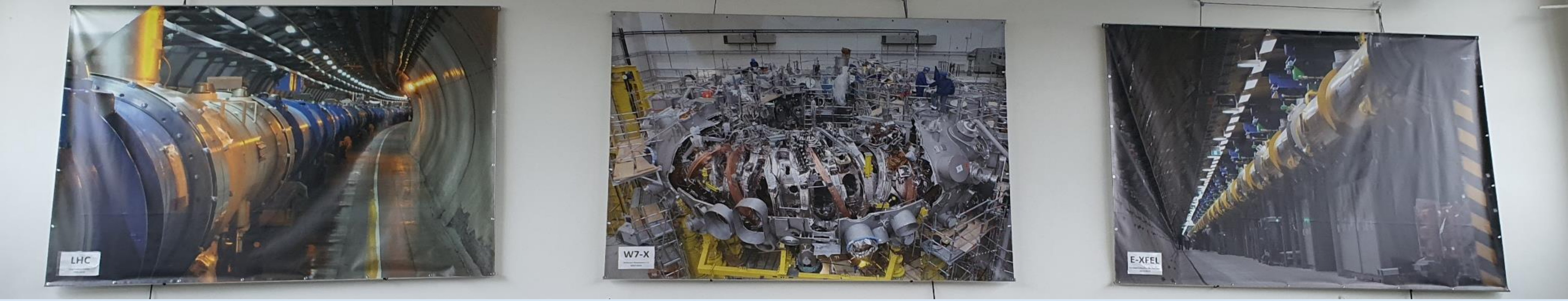
EFQM Model - European Foundation for Quality Management

„The EFQM Model not only remains relevant but continues to set the management agenda for any organisation wanting a long term, sustainable future.” - EFQM Model Change Management Framework | EFQM

https://www.efqm.org/efqm-model

IFJ PAN *in-kind contribution* to……





Division of Scientific Equipment and Infrastructure Construction (DAI)

ON BEHALF of the TEAM:
Jacek Świerblewski

Jacek.Swierblewski@ifj.edu.pl

So that customers come back to you, not products! Quality is something that satisfies and even delights customers.

William Edwards Deming