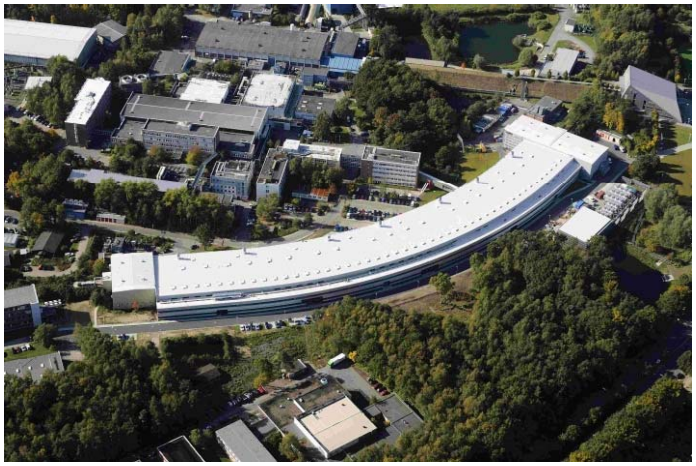
PETRA III.

- **PETRA III**
- **Availability**
- **Cavities and HOMs**



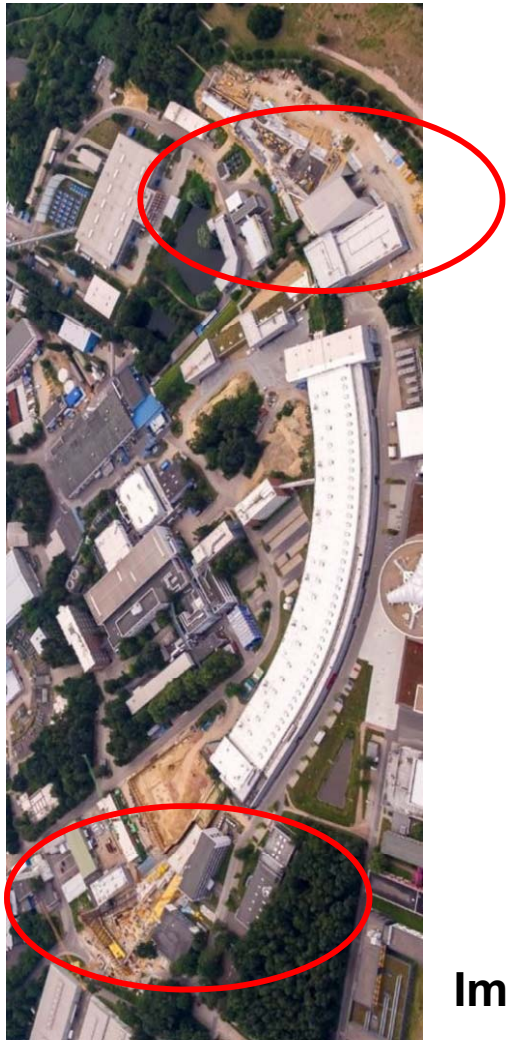
Rainer Wanzenberg
DESY - MPE -

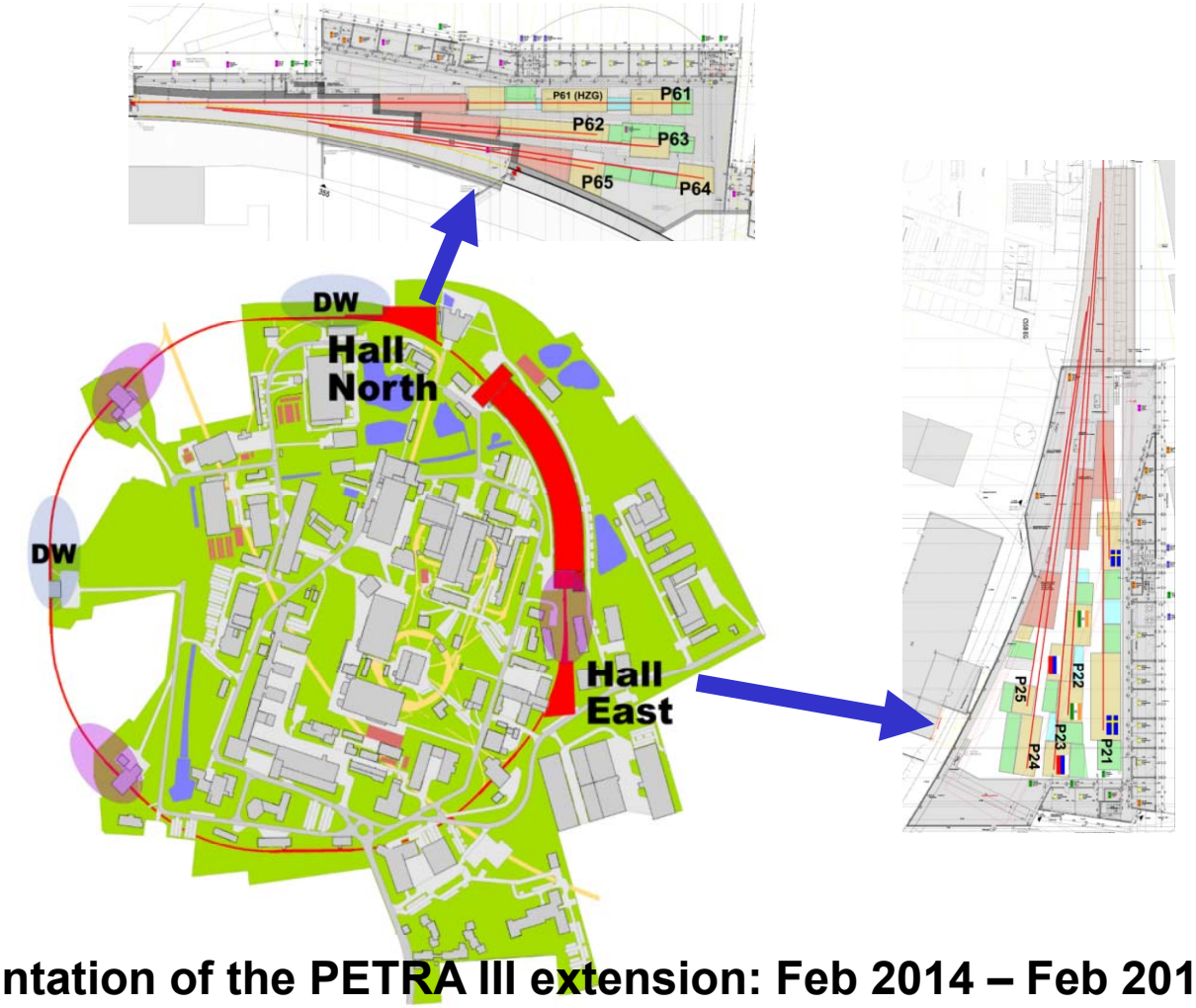
TUD – DESY collaboration meeting
June 24, 2016

HELMHOLTZ ASSOCIATION

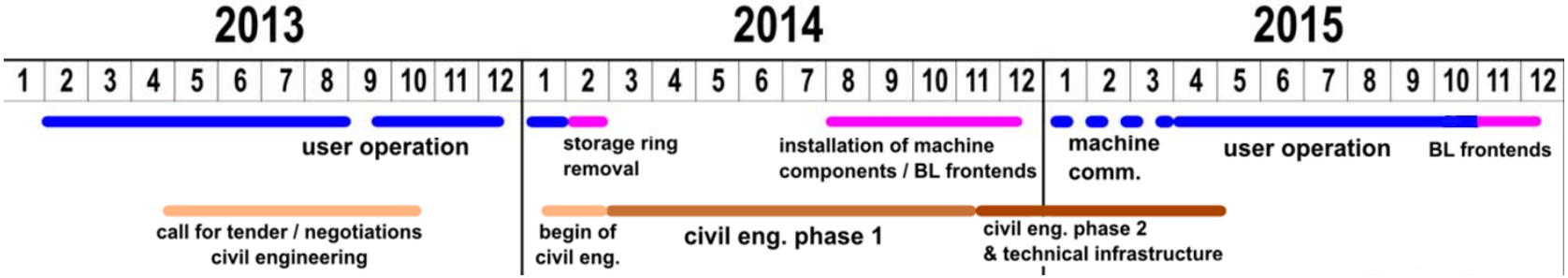
DESY

PETRA III in 2014: Extension Project, two new halls





Implementation of the PETRA III extension: Feb 2014 – Feb 2015

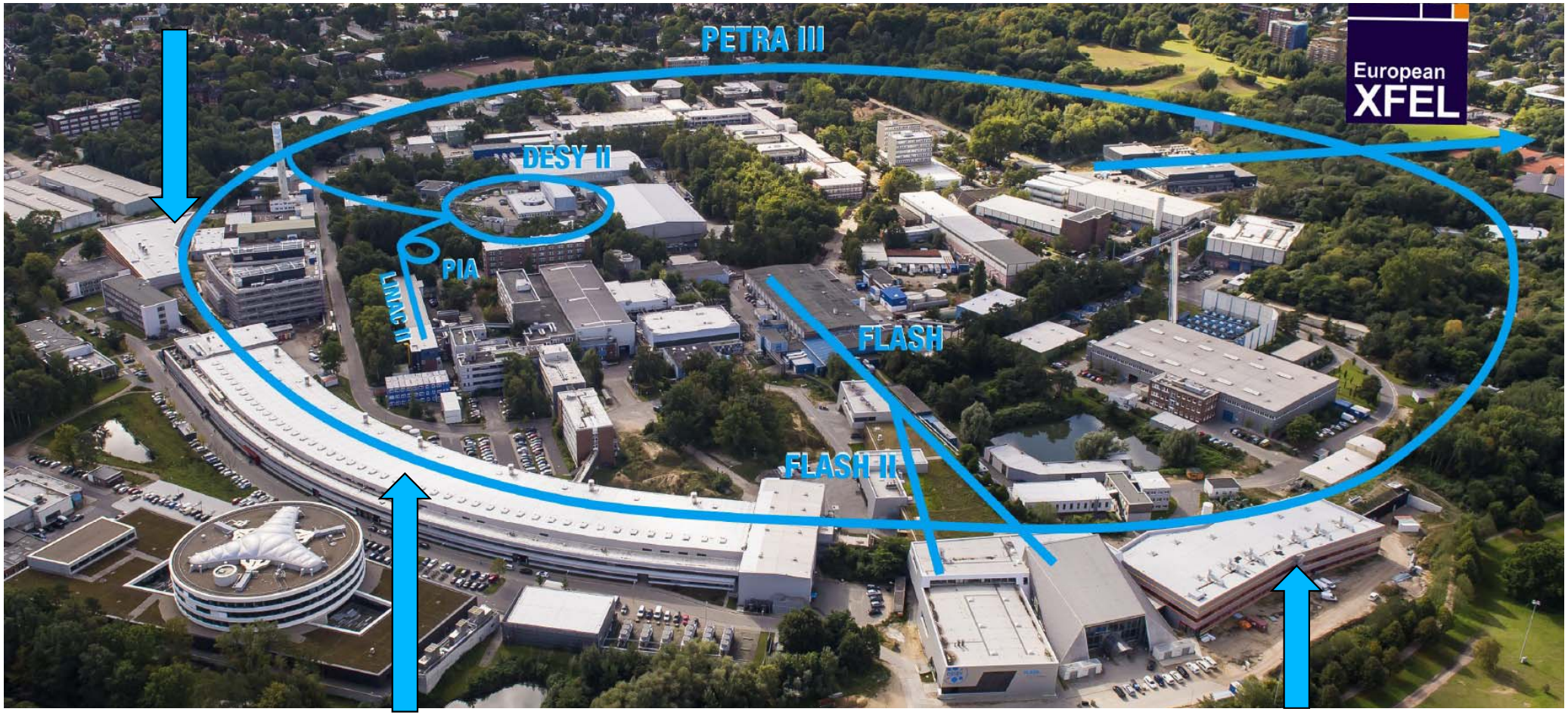


The DESY site in 2016

LINAC II → PIA → DESY II → PETRA III

C = 29 m, E =450 MeV C = 293 m, E = 6 GeV C = 2304 m, E = 6 GeV

Extension Hall East



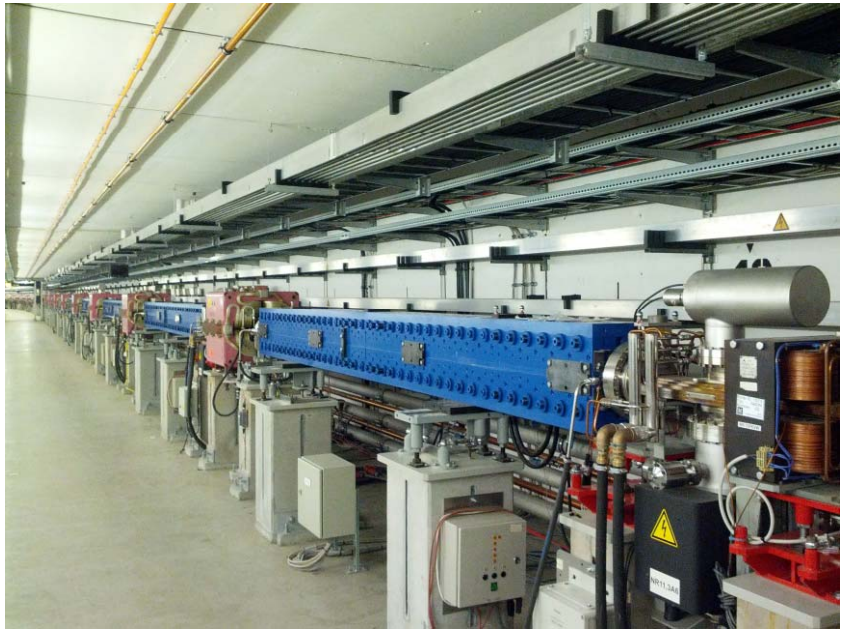
Max von Laue Hall

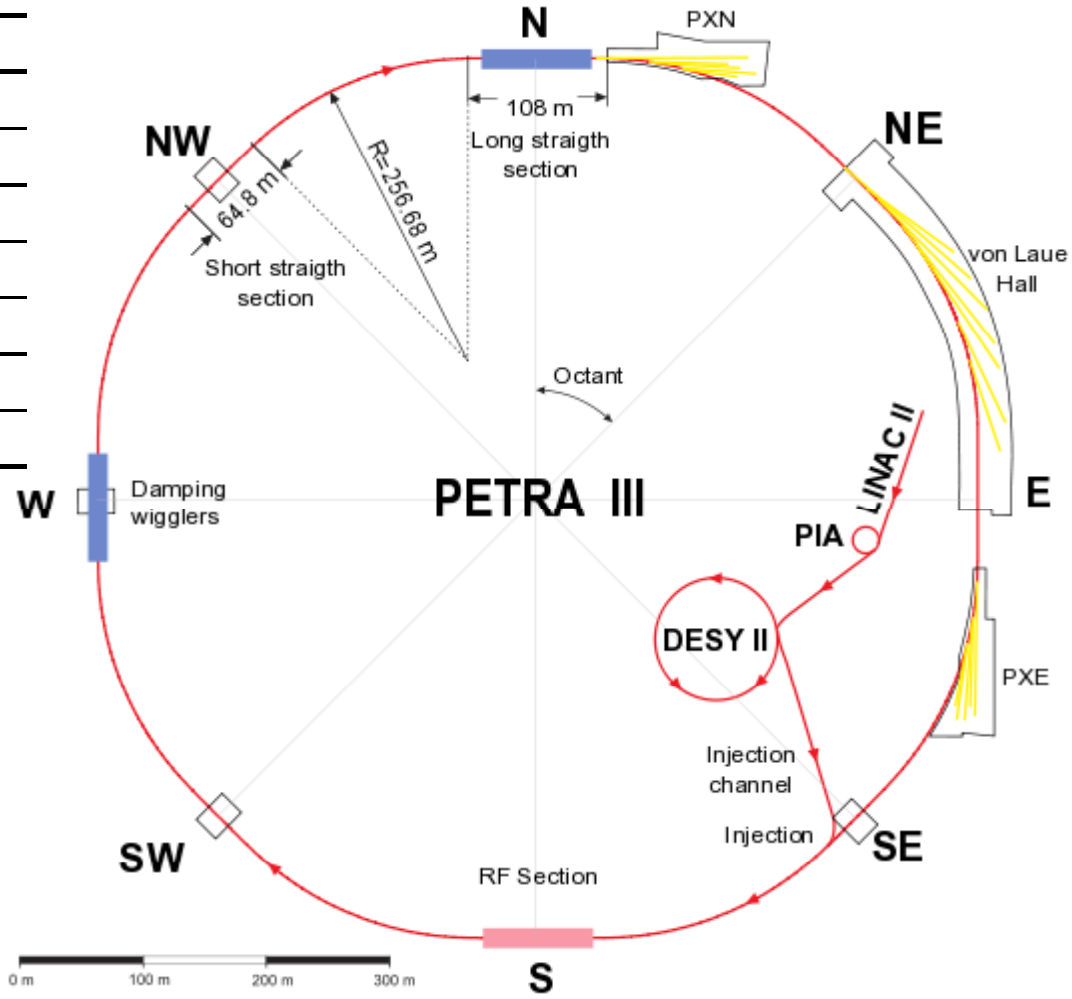
Extension Hall North

PETRA III

Parameter	PETRA III	
Energy / GeV	6	
Circumference /m	2304	
Emittance (horz. / vert.) /nm	1.2 / 0.012	
Total current / mA	100	
Number of bunches	960	40
Bunch population / 10^{10}	0.5	12
Bunch separation / ns	8	192

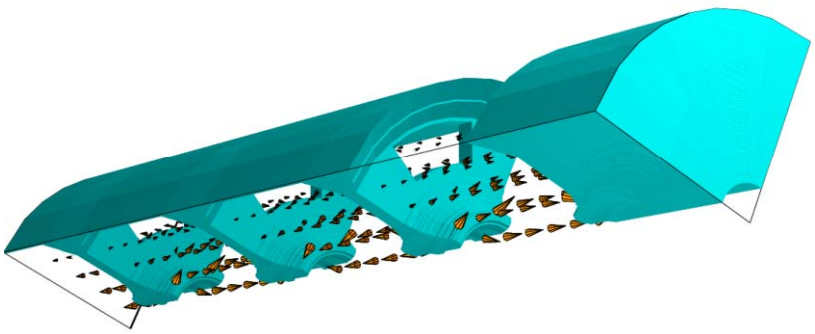
Damping Wigglers: B ~ 1.5 T, λ = 0.2 m
2 x 10 x 4 m = 80 m
ε_x: 5 nm → 1.2 nm



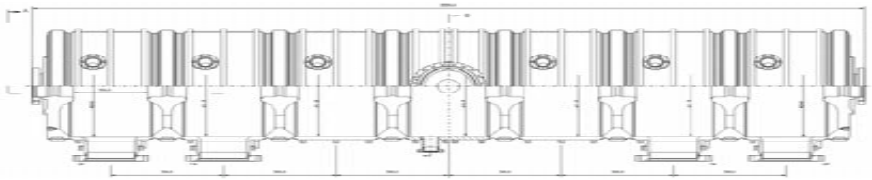


Dispersion correction in the wiggler sections:
D_x < 18 mm, D_y < 5 mm

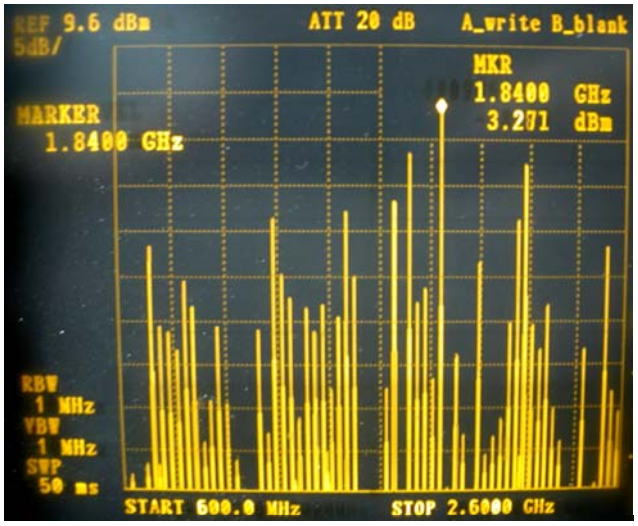
PETRA III – RF



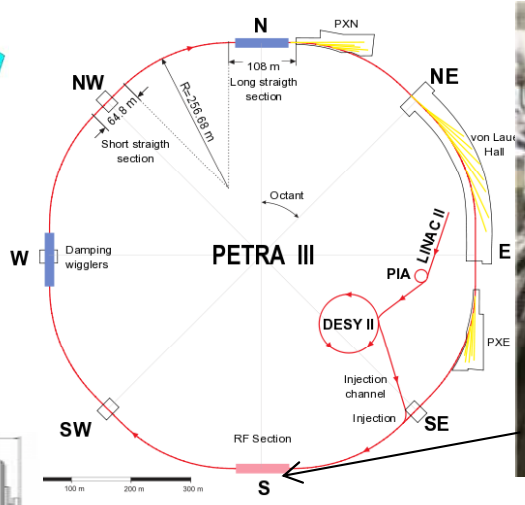
π-Mode, 500 MHz, R/Q = 800 Ohm, Q_0 ~ 35000

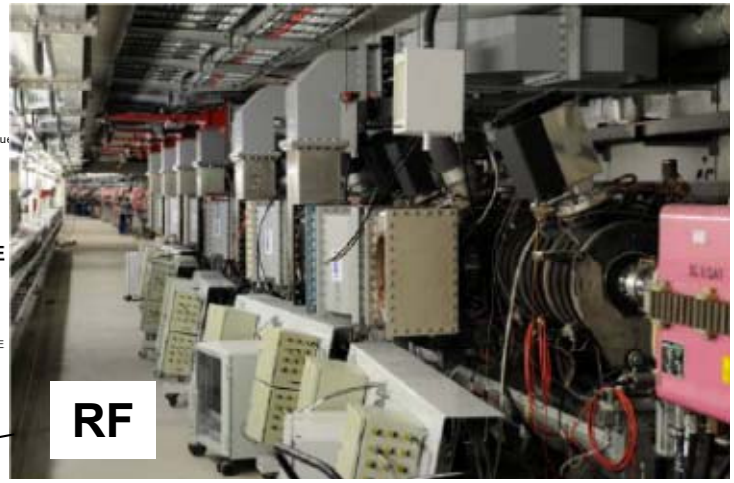


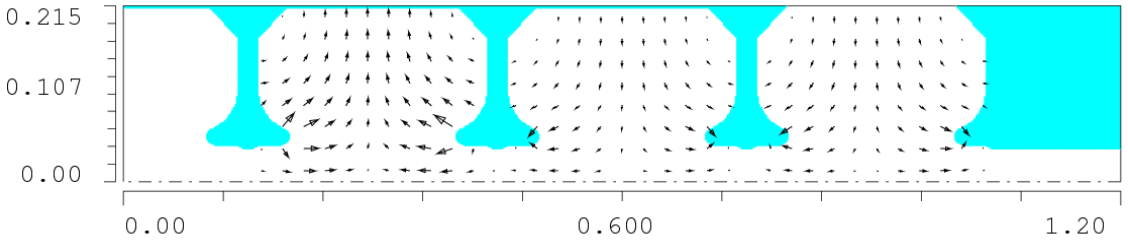
Technical drawing (MHF-e)



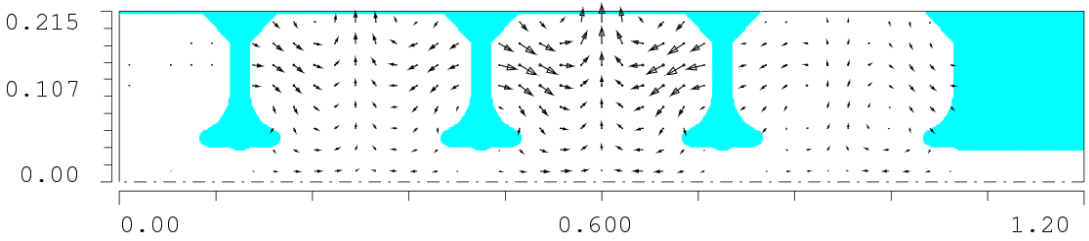
Measured HOM spectrum
(M. Ebert et al. April 7,2010)





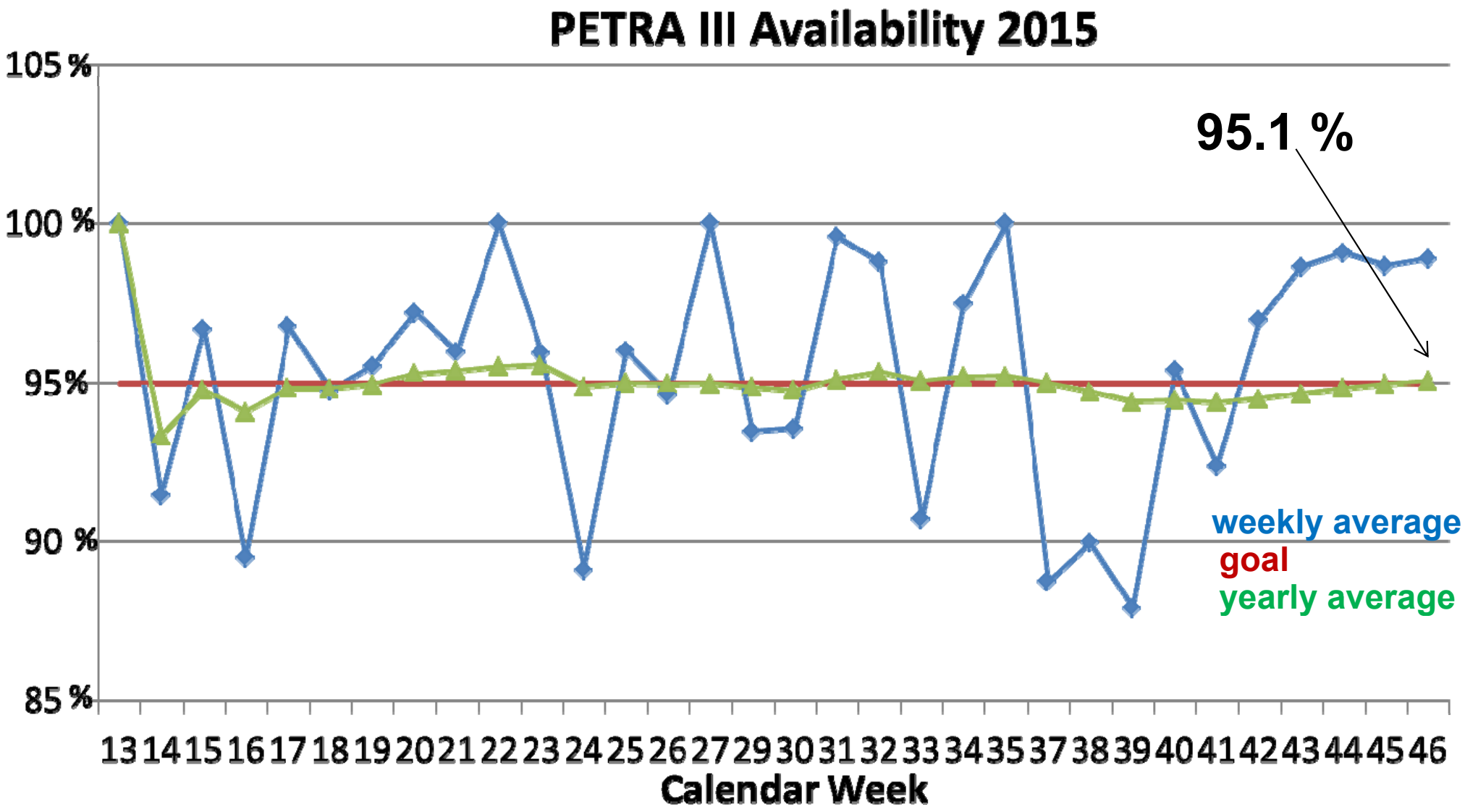


Mode EE-6, 727 MHz

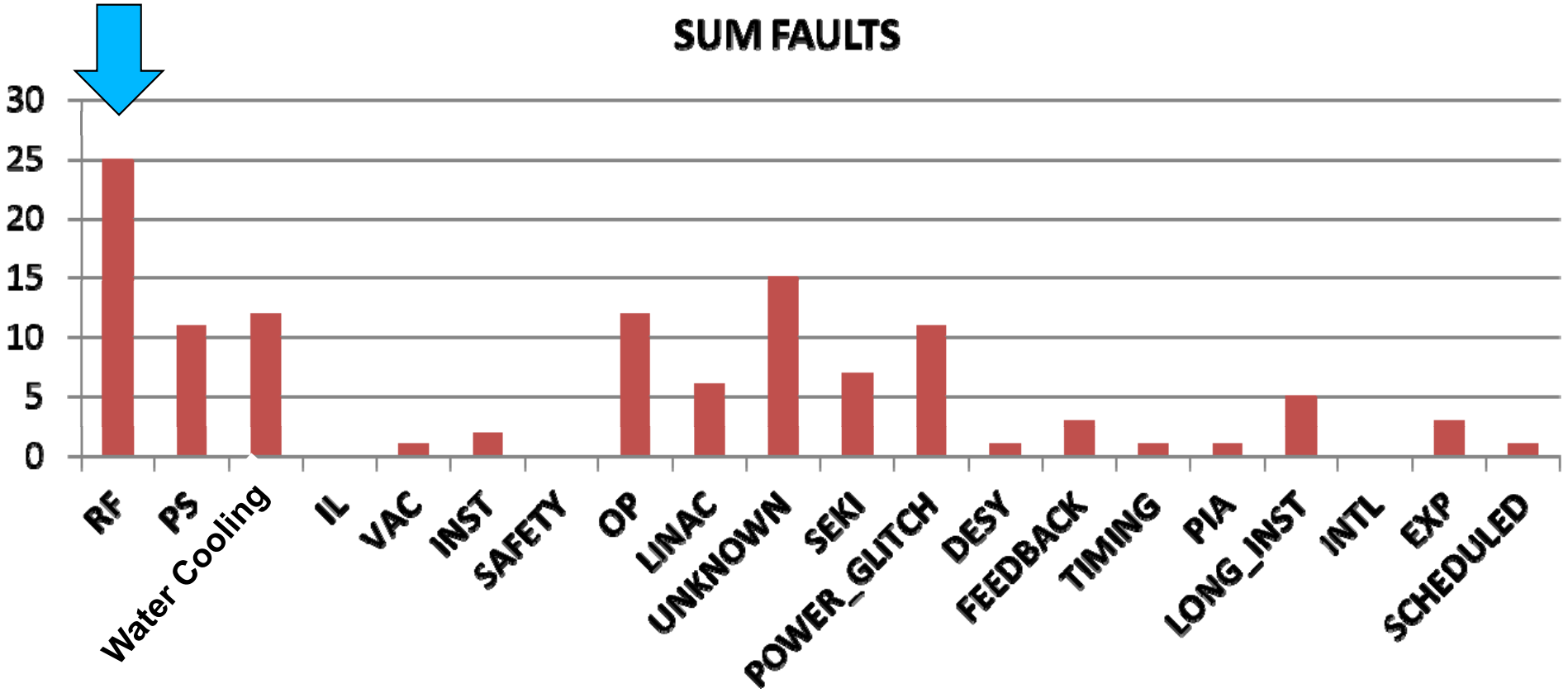


Mode EE-67, 1833 MHz

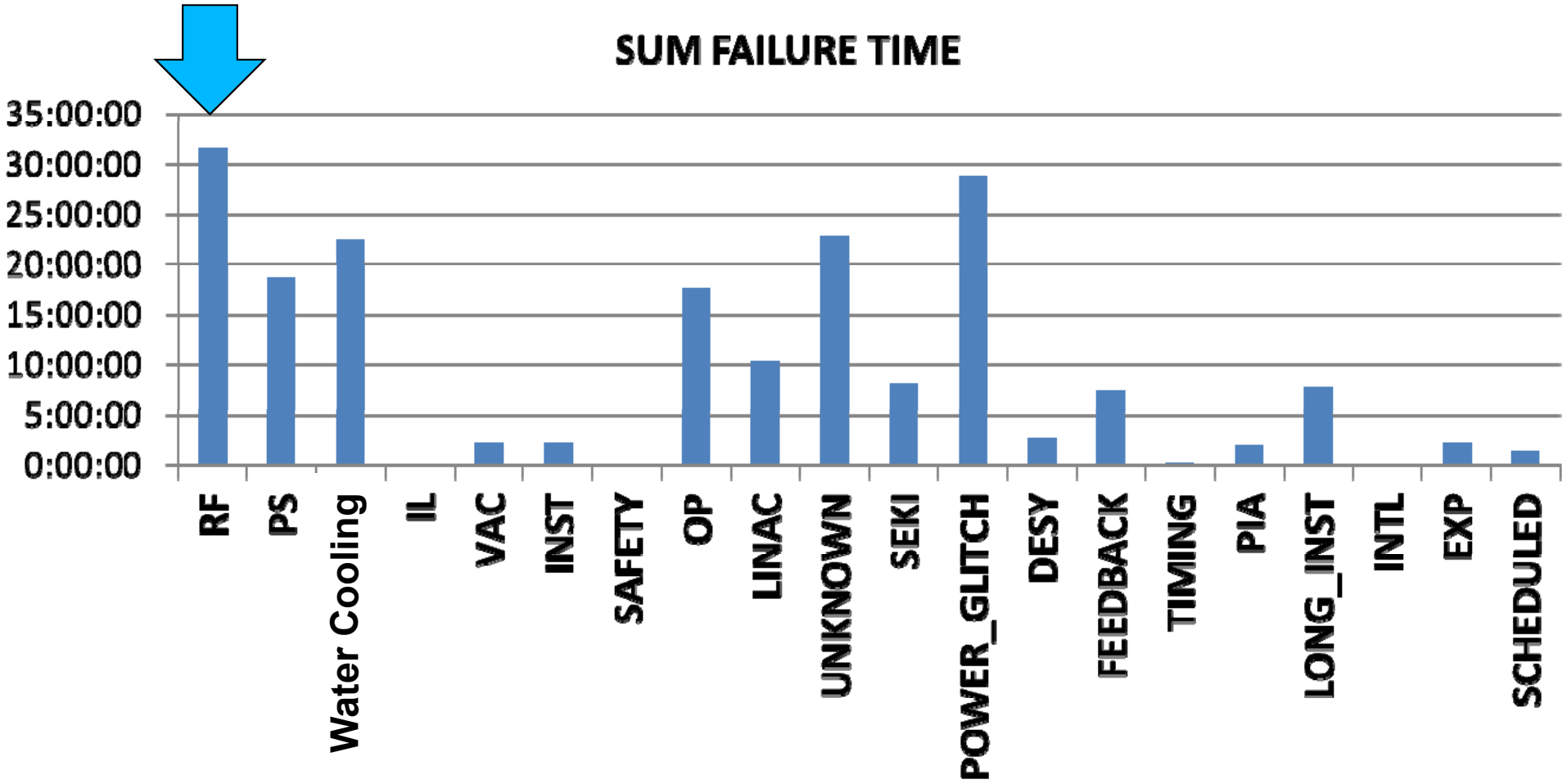
Availability 2015



Availability 2015 – number of faults

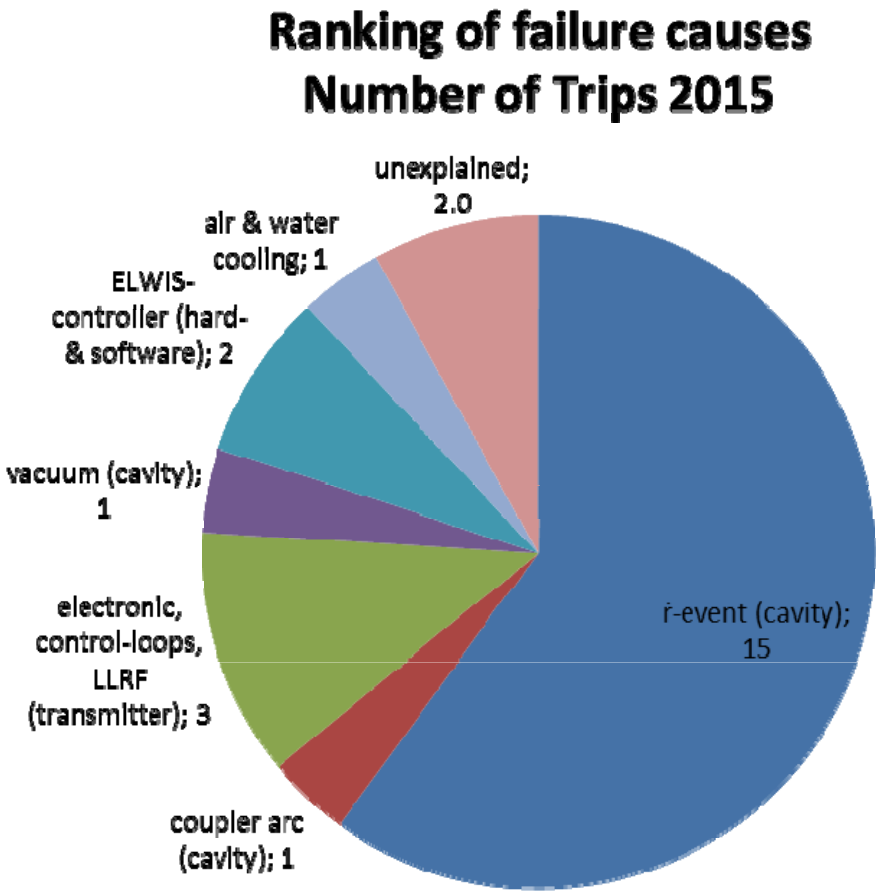


Availability 2015 – failure time



Measures needed to decrease the number of rf-trips

Overcome the ṙ-problem !!!!



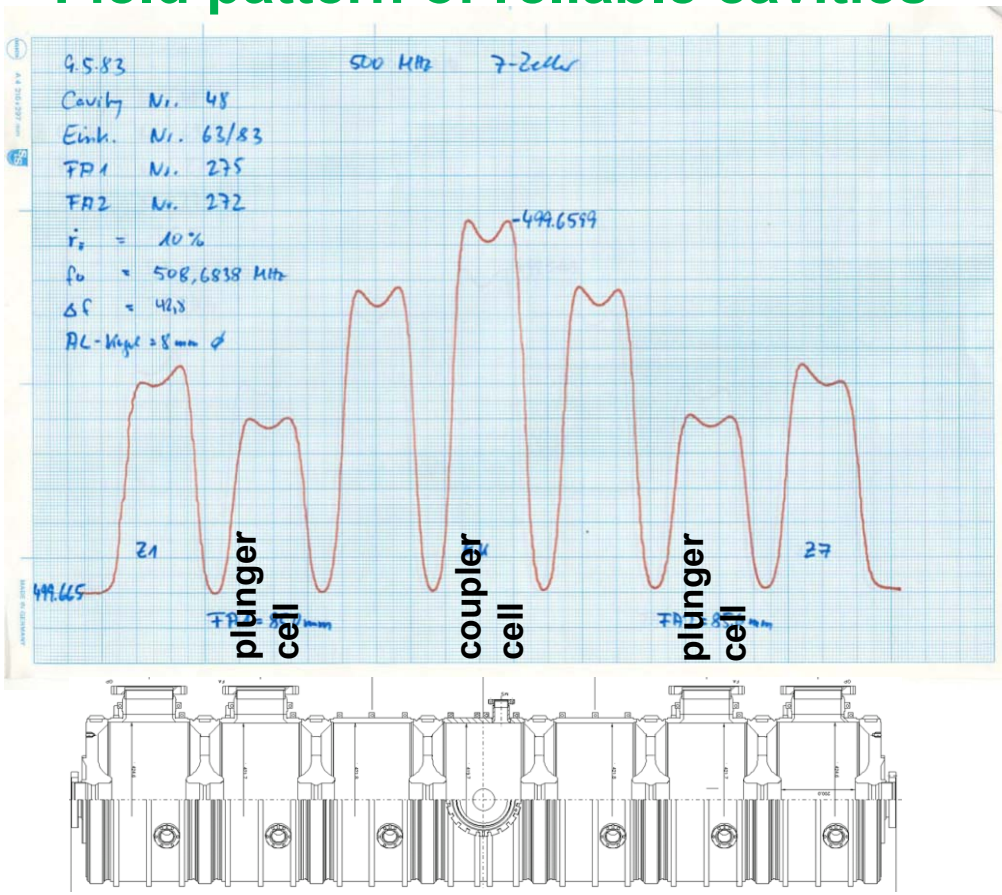
- ṙ-problem seems to be quite persistent
- A precise CST-MWS modeling of the cavity and Eigenmode analysis provided an useful overview of all modes,
- but we have not yet understood the ṙ-problem

- **Currently, we suspect a HOM in 3.8GHz range.**
- **CST-MWS Eigenmode analysis should be extended to this range.**

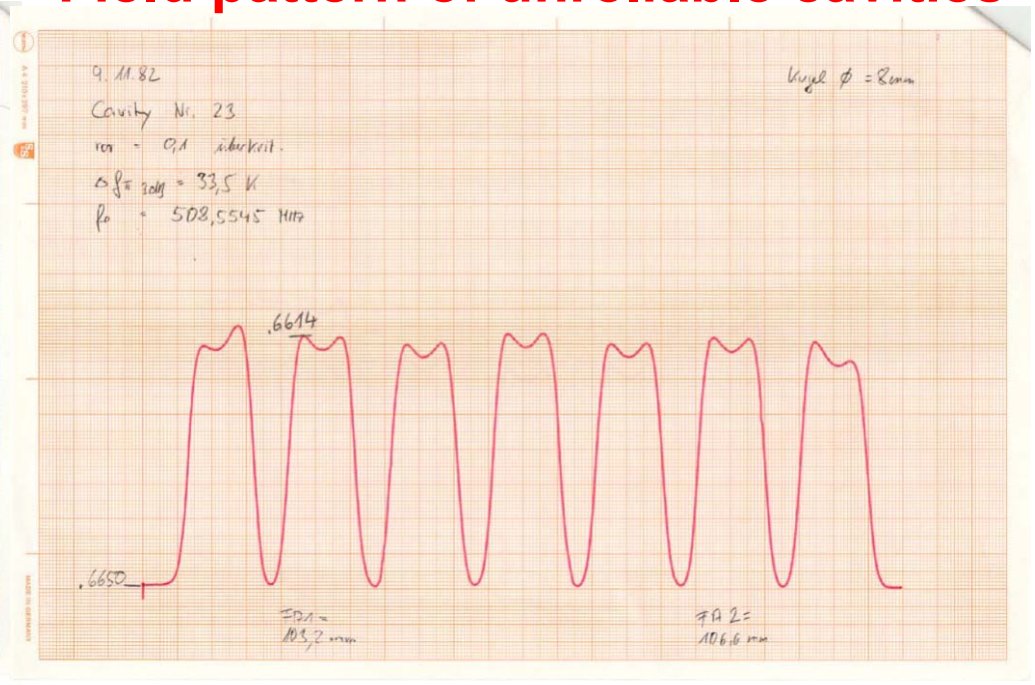
Cavities: field patterns and ṙ- events

Results from bead pull measurements

Field pattern of reliable cavities



Field pattern of unreliable cavities



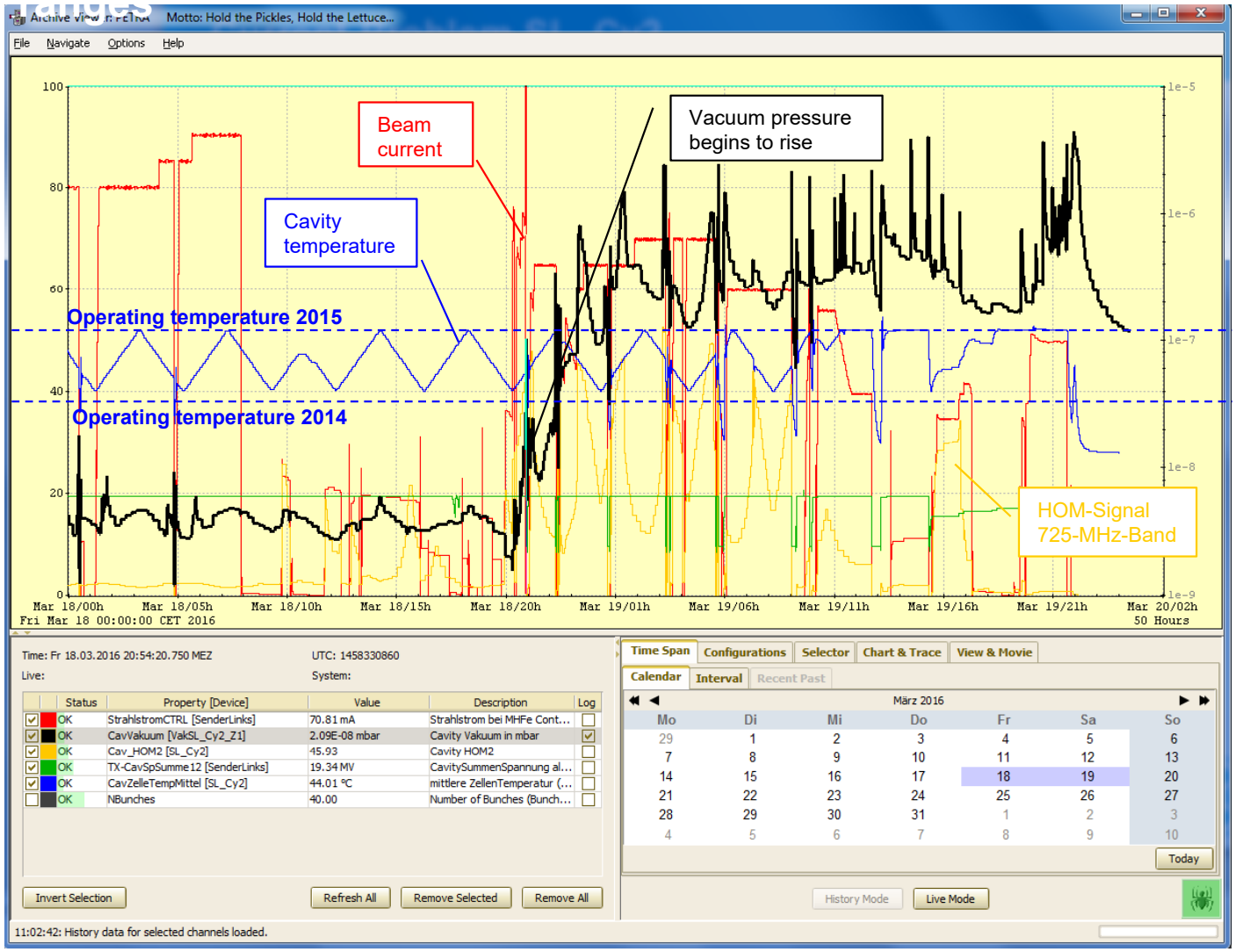
The cavities with highest ṙ-event rate are characterized by harmonious field pattern!

The problem could be related to the plungers somehow.

Problems with cavity SL_Cy2 in 2016

A vacuum problem occurs 18 days before start of user operation

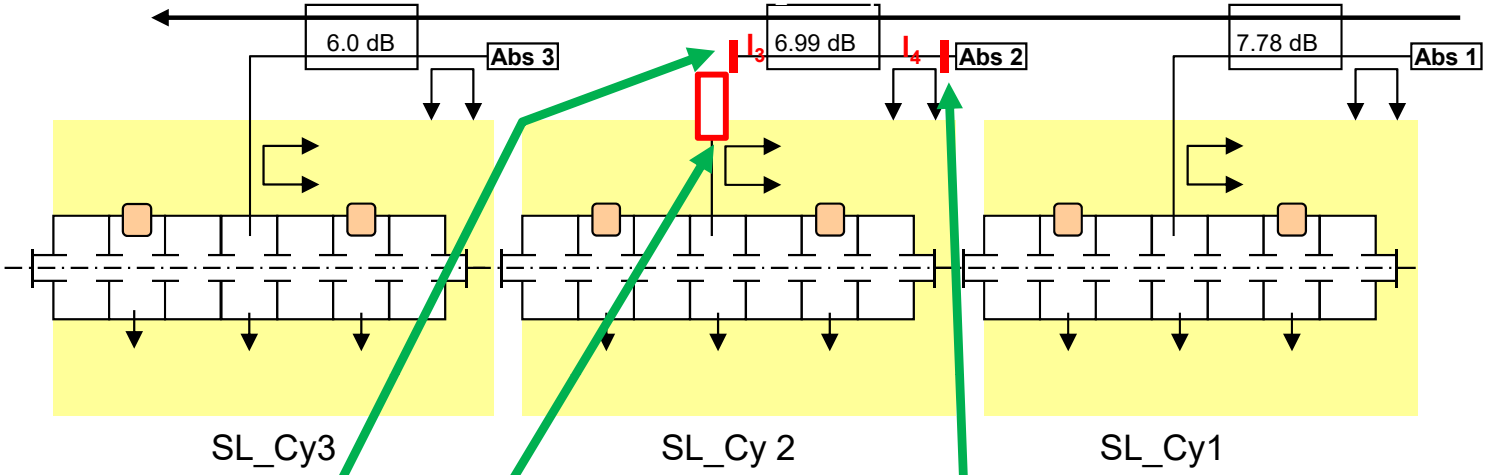
Actually the goal was to scan cavity temperatures for sensitive ṙ-event

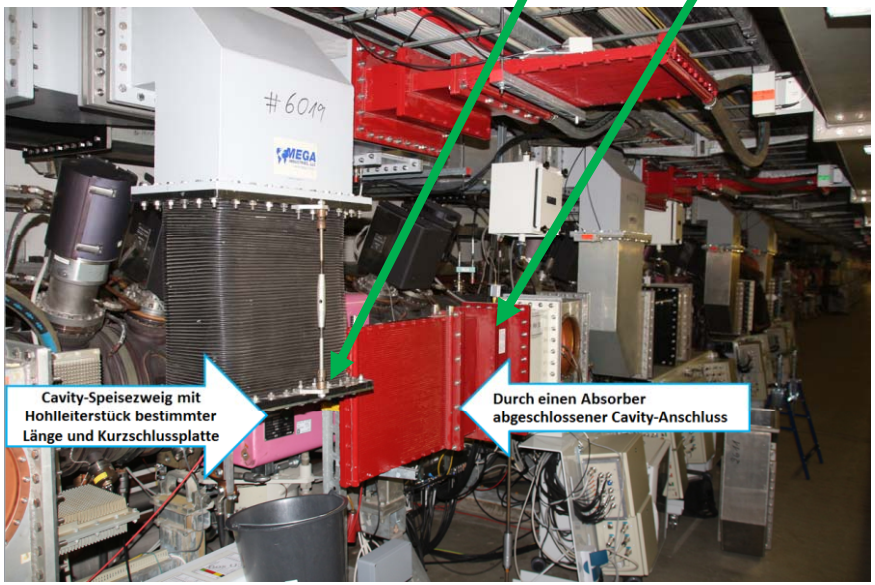


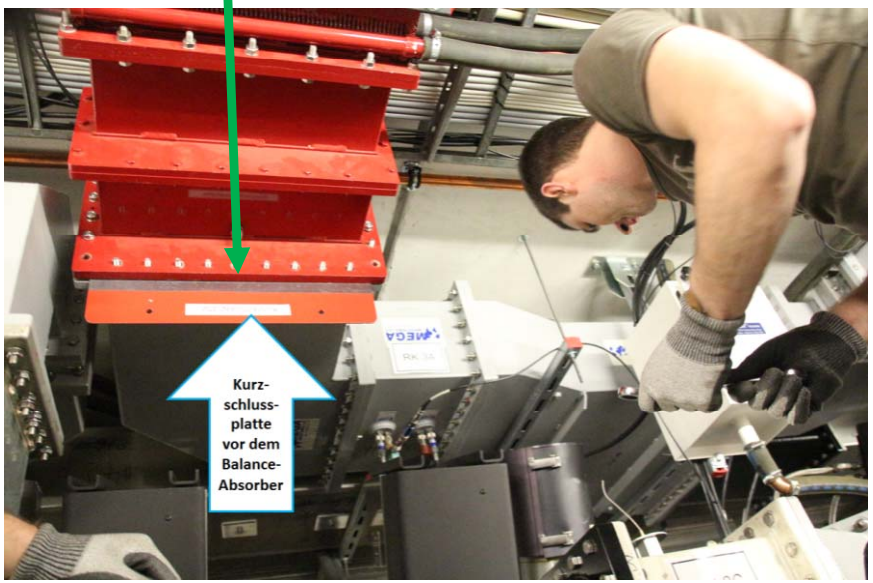
- **Instead of the expected ṙ- events we got plunger temperature and vacuum events.**
- **The vacuum behavior looked like a leakage. But no leakage could be found!**
- **A similar event has occurred at this Cavity already in 2012!**
- **In order to avoid venting the vacuum system the cavity was disconnected from rf system.**

Recent Problem with cavity SL_Cy2

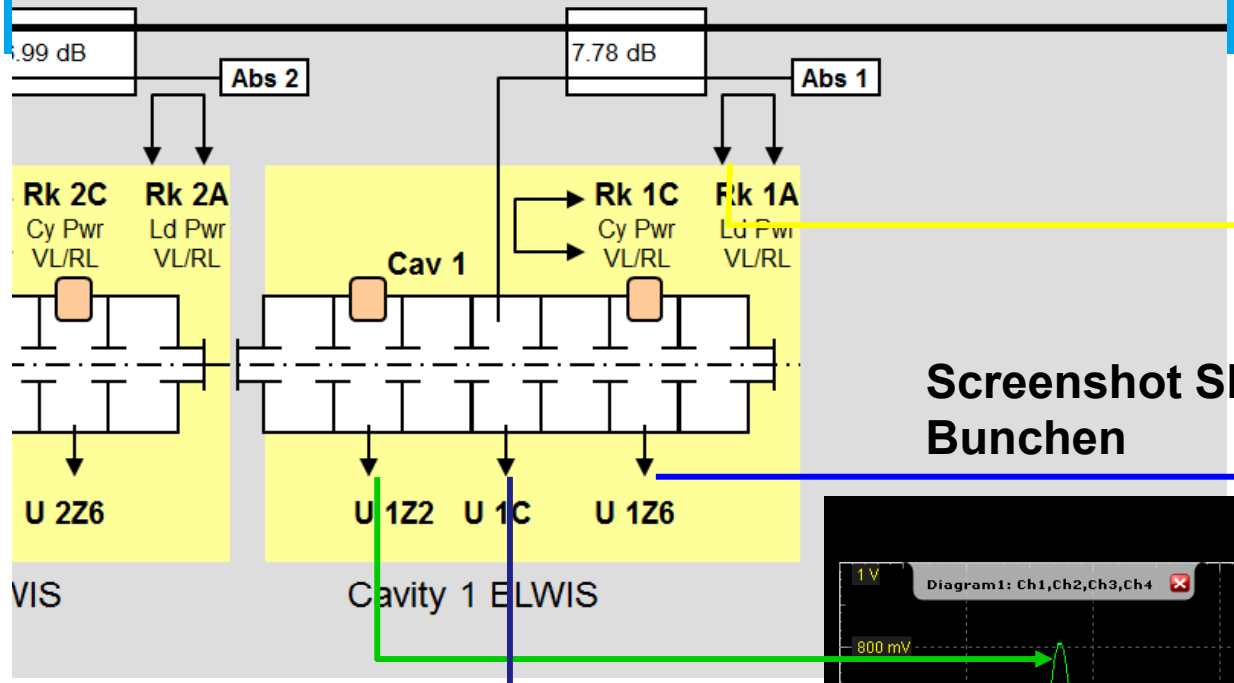
Disconnecting SL_Cy2 from RF system



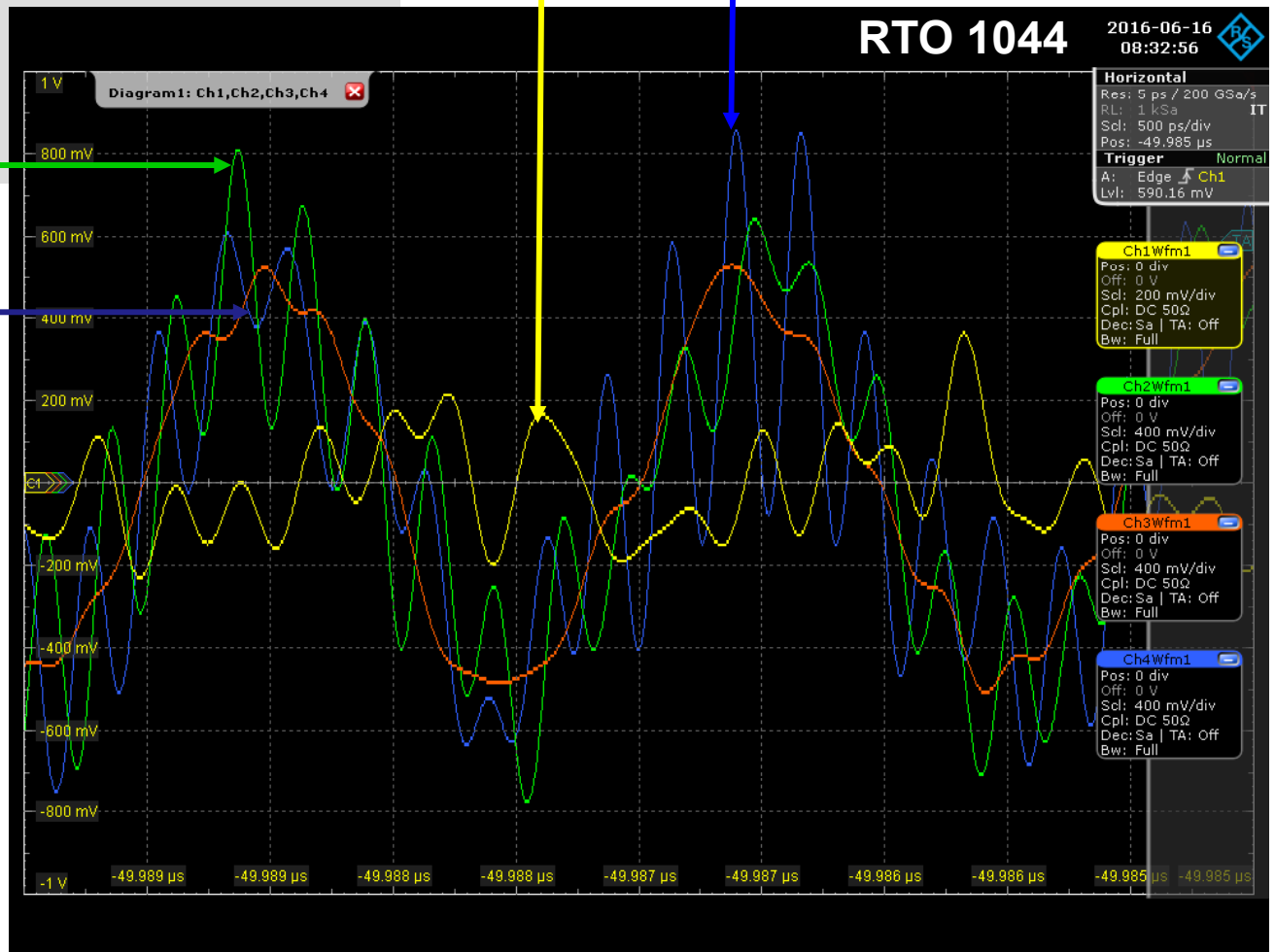




Recent Measurements



Screenshot SL_Cy1 bei 99,4 mA in 40 Bunchen



PETRA III Schedule: User Run, April 7 – Dec 22, 2016

Typical week: 168 h user run, Monday … Wednesday 7 h, Thursday 7 h … Sunday
Wednesday: maintenance or short study period + Test run starting at ~ 20 h … 23 h

2016	Jan	Feb	March	April	May	June		July	Aug.	Sep.	Okt.	Nov.	Dez.
1			Interlock	Line		MDT	1	MDT					
2			Test	Set-up			2					MDT	
3							3		MDT				
4	Shut			MDT/Test	MDT		4				Service		
5	Down			MDT/Run			5				Week		
6				MDT			6	MDT			MDT		
7			Technical	USER			7			MDT	MDT		MDT
8			start up	RUN		MDT	8		Service				
9							9		Week			MDT	
10							10						
11					MDT		11						
12							12				MDT		
13				MDT			13	MDT					
14							14			MDT		Service	MDT
15			MDT			MDT	15		MDT /			Week	
16			MDT				16		Test				
17			MDT		Service		17		Runs				
18			MDT		Week		18						
19			MDT				19				MDT		
20				MDT	MDT		20	MDT					
21			MDT				21			MDT			MDT
22			MDT			MDT	22		MDT /				
23			MDT				23		Test			MDT	Shut
24			Beam				24		Runs				Down
25			Line		MDT		25						
26			Set-Up				26				MDT		
27				MDT		Service	27	MDT					
28						Week	28			MDT			
29			MDT				29						
30			MDT			MDT	30					MDT	
31			Beam				31		MDT				

Inspection of the plungers of cavity SL_Cy 2

Study period in Aug. 2016

Thank you for your attention !