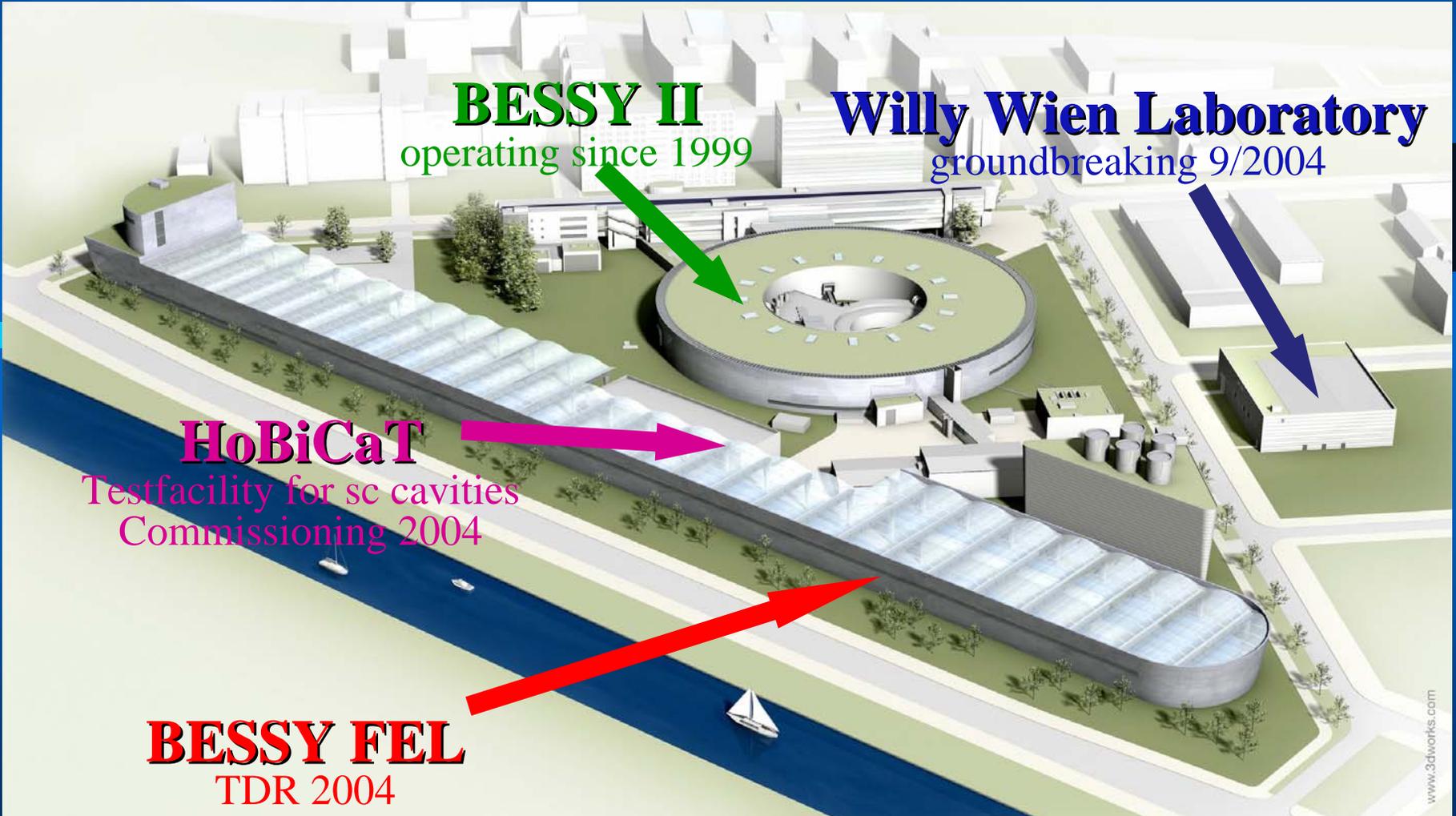


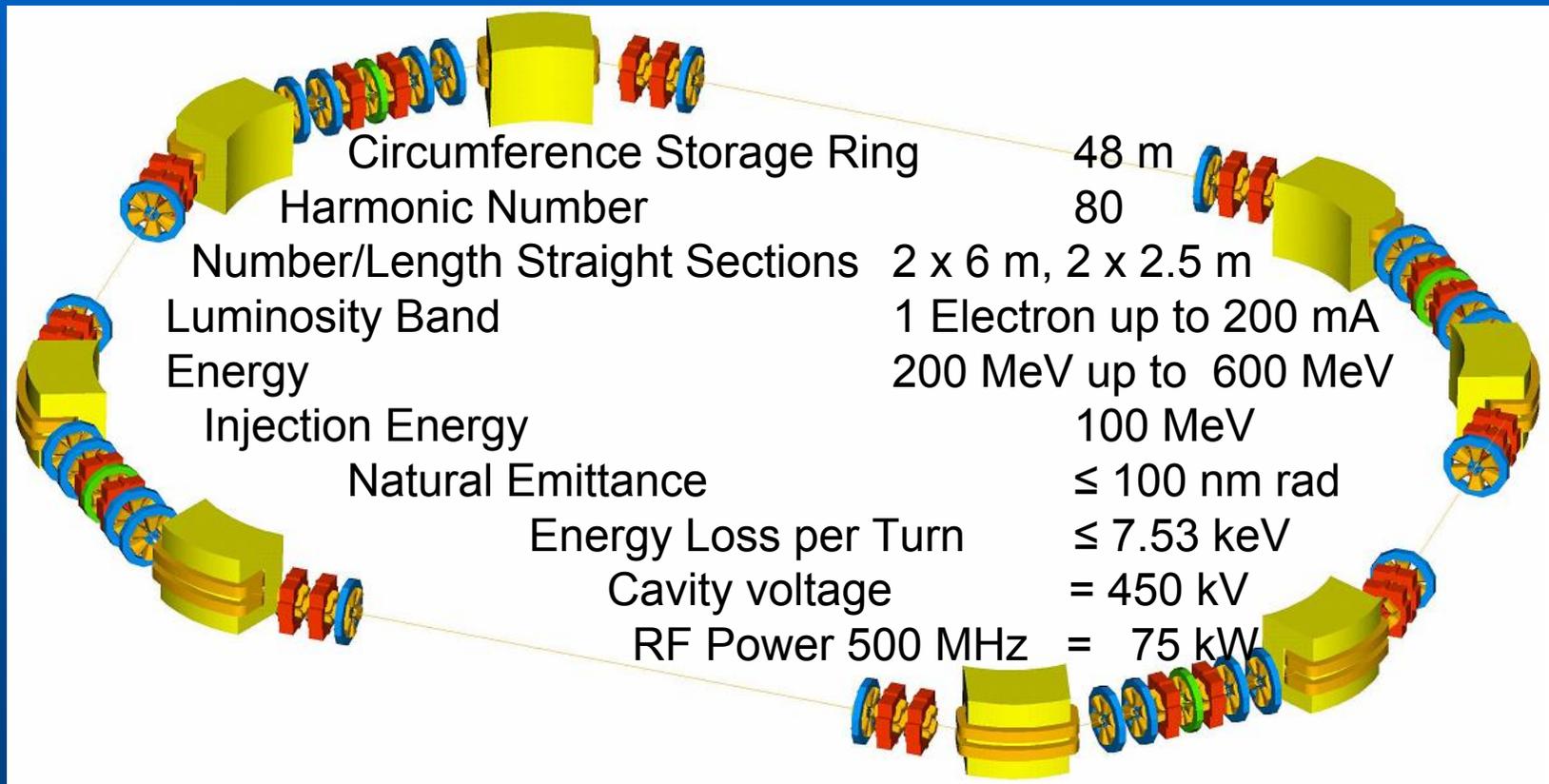
Status and Future of BESSY RF

8th ESLS RF Meeting 29.-30.9.2004 Daresbury
W. Anders, BESSY



Willy Wien Laboratory

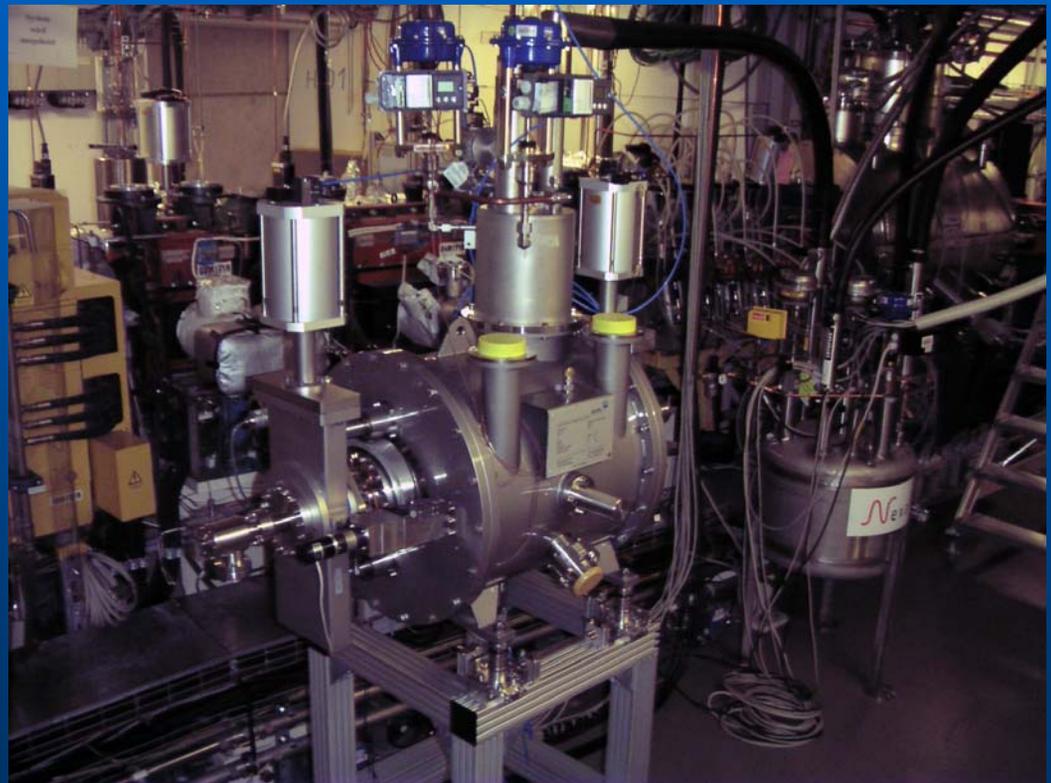
start 2004 → first beam 2008



SC 3rd Harmonic Cavity at BESSY II

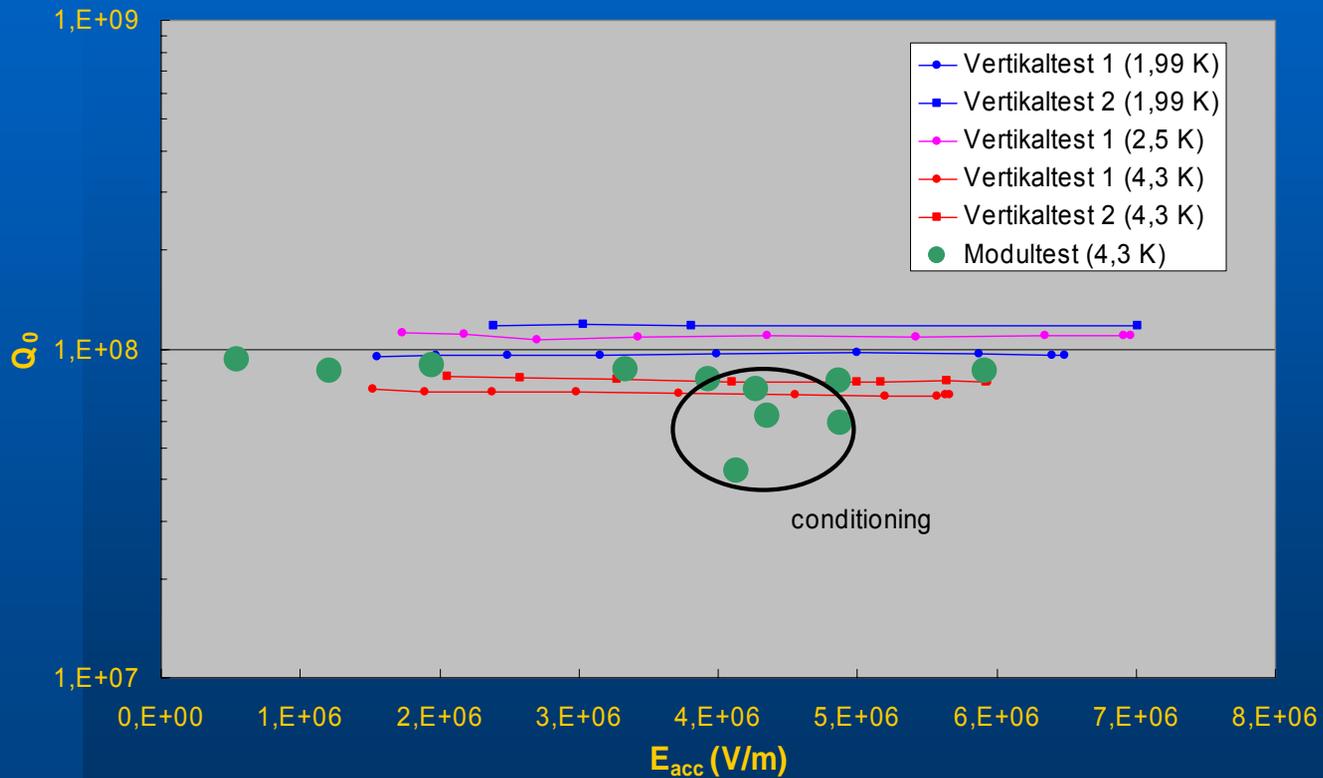
Harmonic cavity installed in the BESSY II storage ring tunnel due to radiation shielding

- direct connection to cryo plant
- use as test bench for microphonic compensation with piezo tuning
- installation in storage ring no time schedule



SC 3rd Harmonic Cavity at BESSY II

sc 3rd harmonic cavity tests



SC 3rd harmonic Cavity tests

vertical tests blue and red lines horizontal modul test green dots

Cavity Test Facility HoBiCaT

(Horizontal Bi Cavity Testfacility)

HoBiCaT is built as test bench to characterize the TESLA superconducting cavities in CW mode

- Gain practical experience to address the outstanding issues
- Gain operating experience of superconducting RF- technology
- Components should be operated under similar conditions as in the BESSY FEL

Parameters:

- Cryogenic power: 80 W@1.8 K
- Length of cryostat: 3.5 m good for two TESLA cavities
- 10 kW CW RF-transmitter

HoBiCaT Test program

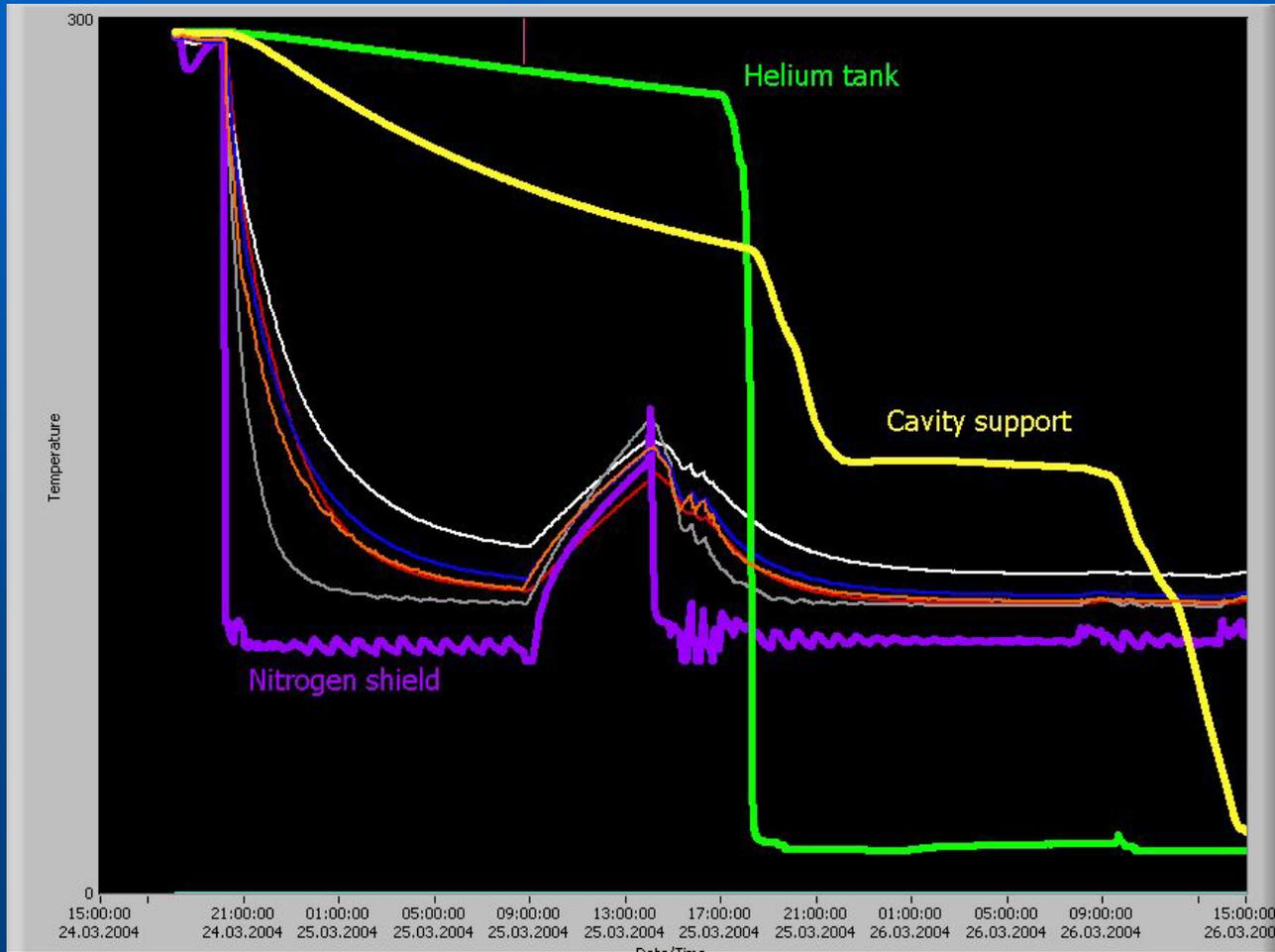
- **Gradient**
- **Bath temperature**
 - Optimize bath temperature to reduce refrigeration cost
- **Cryogenic load**
 - Cryostat design changes for CW operation
 - Demonstrate stable operation
- **Microphonics**
 - Level and sources of microphonic detuning
 - Compensation of microphonics
- **RF system**
 - Power requirements and distribution
 - Control system (digital/analog, IQ/Amp-Phase ...?)
 - How accurately can we control the cavity voltage?
- **Input coupler**
 - CW and standing wave power limit

HoBiCaT Testfacility for SC Cavities



Parameter	Value	Unit
Mechanical parameters		
Useable interior length	3,50	m
Number of TESLA cavities	2	
Useable interior diameter	1,10	m
Total height	3,2	m
Main cooling loop		
Temperature	1,8	K
Cooling capacity	80	W
Mass flow	4	g/s
Temperatures of the secondary loops		
Table cooling loop	4,5	K
Cavity fill loop	4,5	K
Coupler cooling	20	K
Heat shield LN2	77	K
Vacuum pumps		
Suction pressure	14	mbar
Pumping speed	6400	m ³ /h
Mains power	110	kW
RF Power Source		
Frequency	1300	MHz
Power	10	kW
Operating mode	cw	

HoBiCaT first cooldown (3/2004)



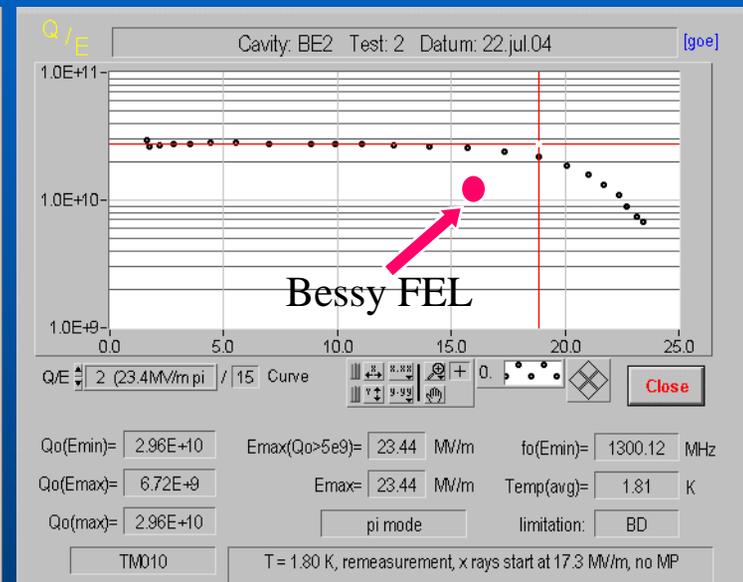
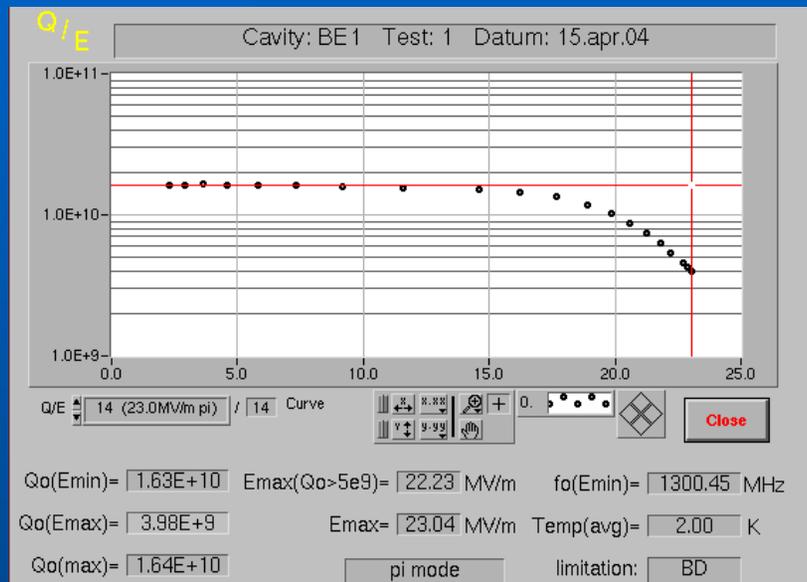
HoBiCaT Transmitter

HoBiCaT Transmitter:

- 1.3 GHz
- 10 kW cw klystron commissioning now
- ribble (design):
 - $1\text{E-}4$ voltage
 - 0.1 deg phase
- test of IOT prototype 2005



Vertical Tests of 9-cell Cavities



Two TESLA type cavities have been ordered by industry (ACCEL) including chemical treatment. The results of the vertical tests of both cavities is plotted. The Q-value is recorded in respect to the accelerating field. Left figure show the results of cavity BE1 at a helium bath temperature of 2 K. In the right plot the curve of cavity BE2 is shown at a temperature of 1.8 K. The high Q-value of $Q > 3E10$ at the planned operating field of the BESSY FEL of about 16 MV/m has to be mentioned.

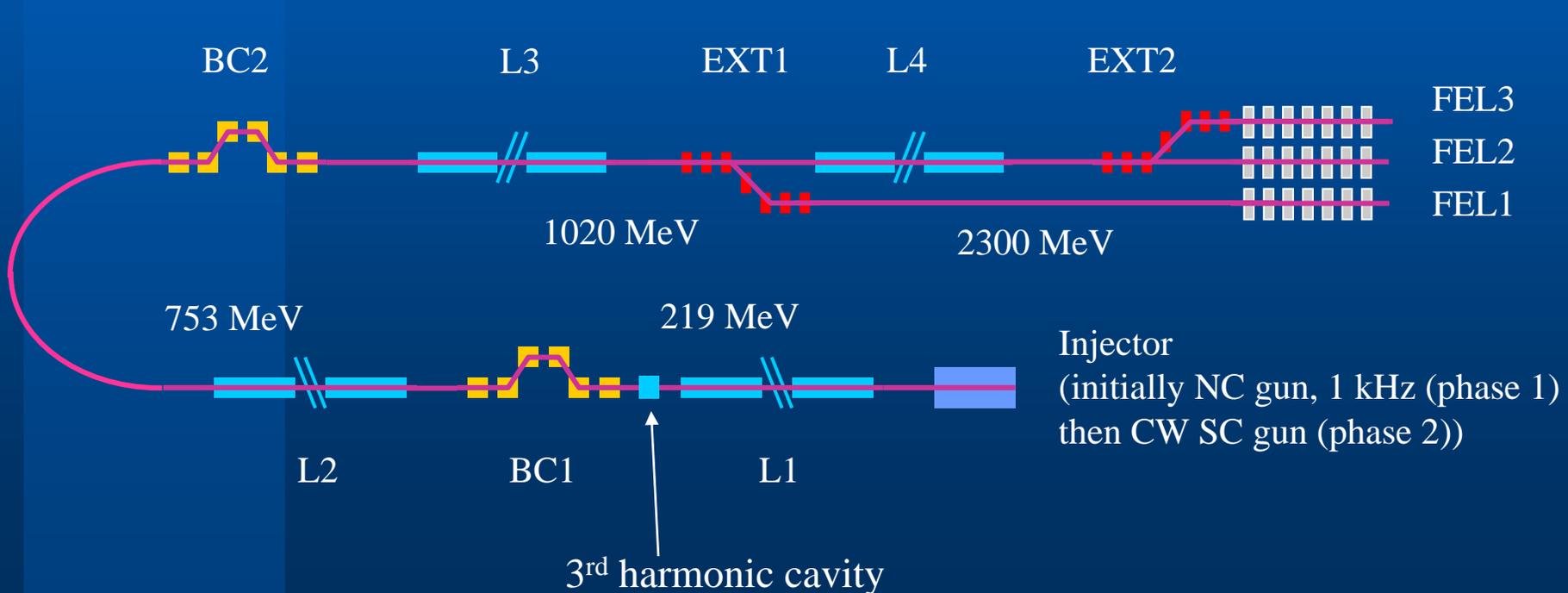
HoBiCaT --- next steps

- Klystron transmitter commissioning → now
- FPGA Units for digital low level rf feedback:
components delivered.
Software development starting → now
- Crogenic acceptance test → 10/2004
- Cold TESLA coupler test cw → 11/2004
- Installation of first 9-cell cavity → 1/2005
- Start Commissioning of electronics for
sc cavity testing → 1/2005
- IOT – Test on transmitter → 1/2005

**→ Full operational HoBiCaT Testfacility for characterizing
TESLA 9-cell cavities in cw operation mode**

BESSY FEL --- Linac Layout

- Four Linac sections
- 18 modules with 8 cavities each
- Total cryogenic load 3.5 kW@ 1.8 K



BESSY FEL status

- Technical design report submitted
- www.bessy.de download 500 pages 28 MB pdf
- Expecting good rating by Wissenschaftsrat
- Hoping for money

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