

Cavity performance

vertical test → horizontal test → CM test

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On behalf of the ILC Database Group

with special thanks to Detlef Reschke, Lutz Lilje and Jim Kerby for their assistance

Baseline Assessment Workshop, Tsukuba/WebEx

September 10, 2010

Cavity performance

vertical test -> horizontal test -> cryomodule test

At IPAC10 in May 2010, for the Sept.9-10 Baseline Assessment Workshop, the ILC Database Group was charged to provide data on performance change

vertical test (VT) -> horizontal test (HT) -> cryomodule (CM) test

using:

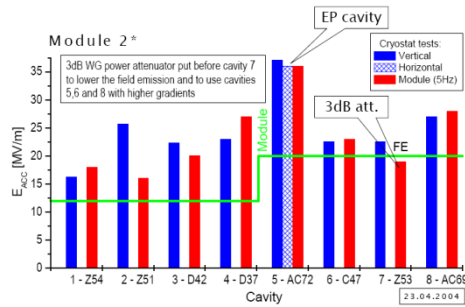
- (1) Existing data from DESY (e.g., Denis Kostin, SRF2009)
- (2) Additional data from Fermilab/JLab for vertical test -> horizontal test

This is a status report. The work is in progress.

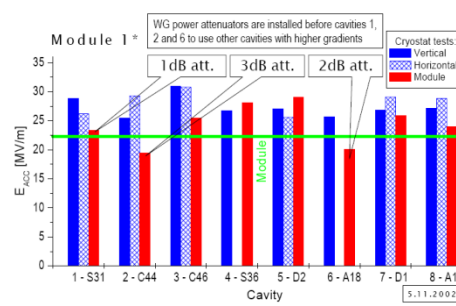
DESY/FLASH Cavity Performance



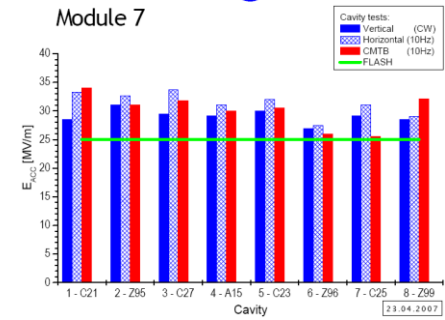
Cavities @ ACC1



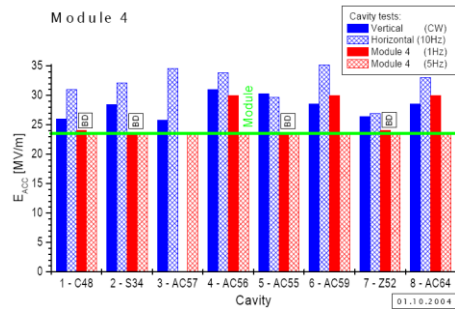
Cavities @ ACC2



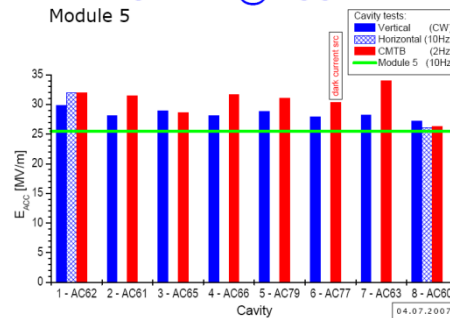
Cavities @ ACC3



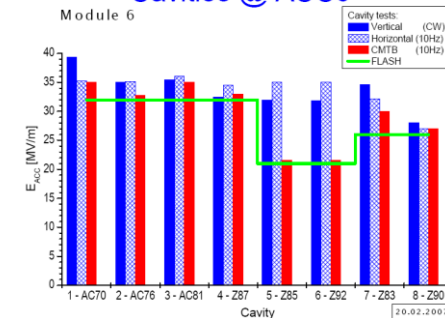
Cavities @ ACC4



Cavities @ ACC5



Cavities @ ACC6



evaluated error margins for accelerating gradients in this test are about $\pm 10..16\%$.

These cavities are installed in FLASH; the data are easily accessible

Data are courtesy of DESY

Source: D.Kostin, Grömitz 2008

<https://indico.desy.de/getFile.py/access?contribId=28&resId=0&materialId=0&confId=1433>

10.Sep.2010

CMGinsburg BAW

DESY/FLASH upgrade module

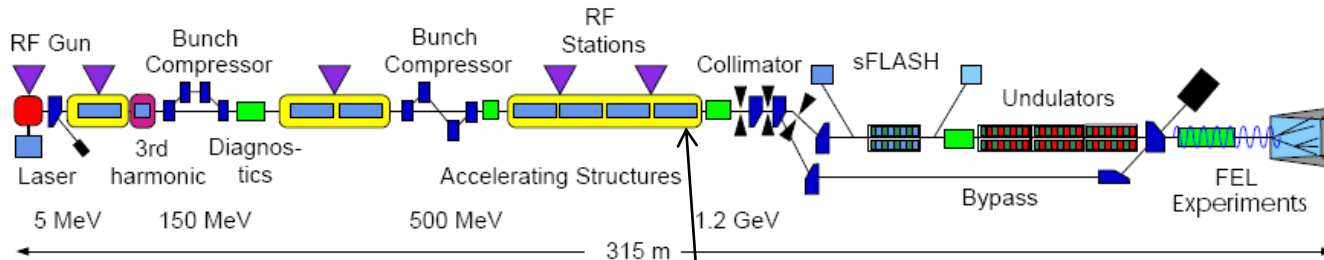
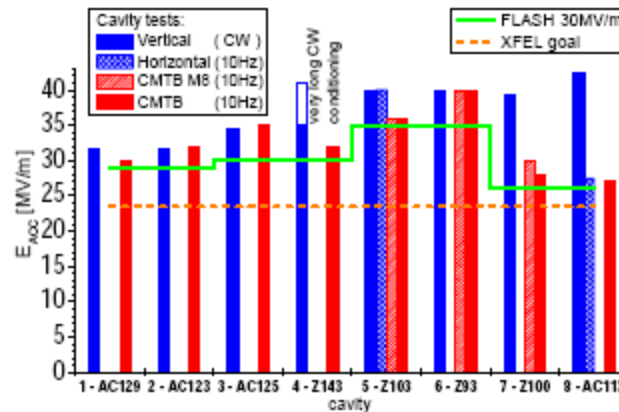


Figure 1: Layout of the FLASH linac after the upgrade (not to scale).

Cavities@ACC7

PXFEL1



These cavities are installed in FLASH; the data are easily accessible

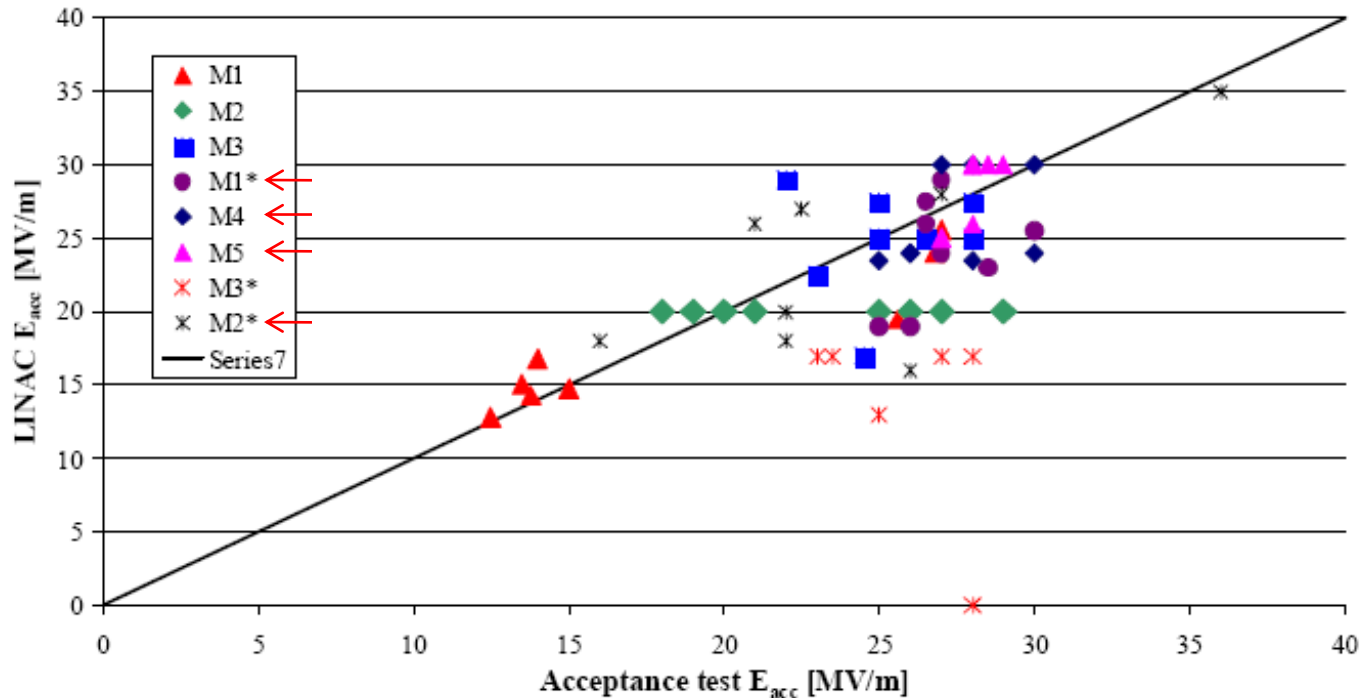
Data are courtesy of DESY

Source: D. Kostin et al., SRF2009

<http://cern.ch/AccelConf/SRF2009/papers/tuppo005.pdf>

DESY VT vs. CM Test Performance

Four CM from p.2: ACC1=M2*, ACC2=M1*, ACC4=M4, ACC5=M5 included here



Additional data exist, but are less easily accessible.

Have to be careful not to double-count cavities for re-assembled CMs

Our goal is to make a similar updated plot, to compare performance

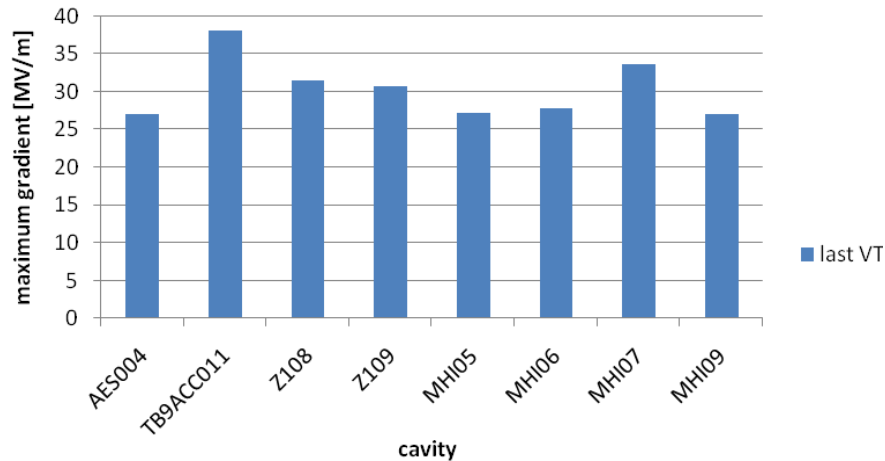
Data are courtesy of DESY

Source: L. Lilje et al., EPAC 2006

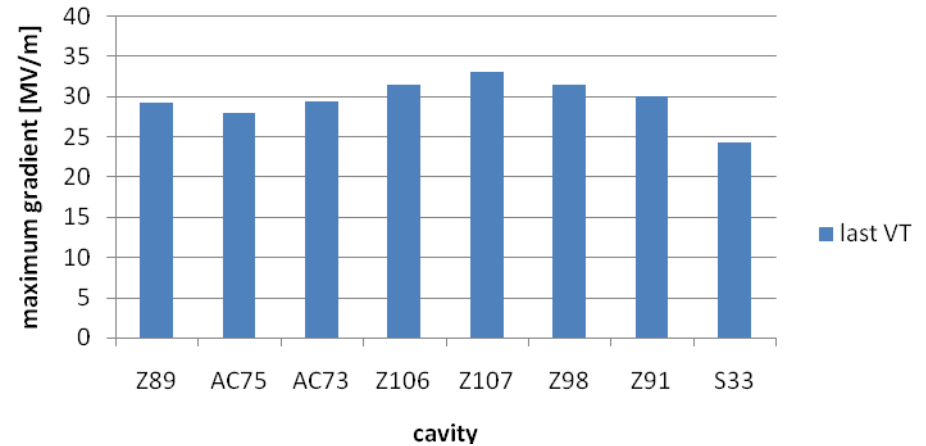
<http://accelconf.web.cern.ch/AccelConf/e06/PAPERS/MOPCH155.PDF>

more international data available soon

S1-Global (KEK, DESY, Americas cavities)

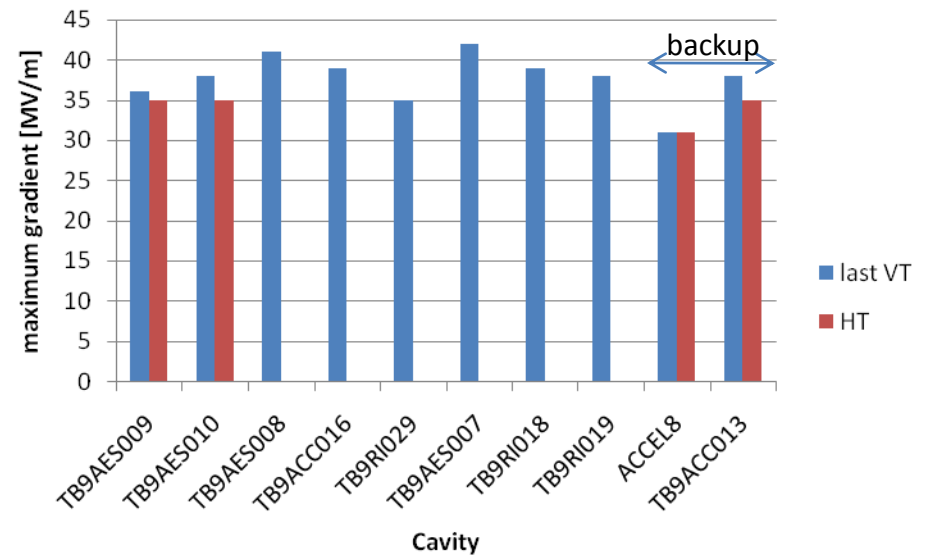


Fermilab-CM1 (DESY cavities)



- S1G: CM test by end-Sept.2010
- CM1: CM test by end-Dec.2010
- CM2: horizontal tests by Dec.2010;
CM test in 2011

Fermilab-CM2 (Americas Cavities)



VT/HT/CM Test Comparison Summary/Plans

☐ Available data

- 56 cavities from 7 cryomodules easily accessible
 - M1*, M2*, M4, M5, M6, M7, PXFEL1
 - Comparing VT/CM test: 20 gradients go up, 25 go down, 11 are mixed or same
 - Several types of surface processing (#bcp=35, #ep=17, #ep+=4)
 - All cavities have VTs and CM tests; some do not have HTs
- <56 add'l cavities from 7 cryomodules available, but data less accessible
 - M1, M2, M3, M3*, M3**, M8; must be careful not to double-count any cavities
 - PXFEL2 results not yet publicly available
- Near-future data: PXFEL3, S1-Global, Fermilab-CM1, Fermilab-CM2

☐ Issues

- Surface processing type: We assume this comparison is a test of the assembly rather than surface processing, and we use all process types for comparison
- Gradient meaning limits comparison
 - Get different gradients for different input power (CW, pulsed w/different rep rates)
 - Field emission effects not included so far
 - Measurement error in gradient: 10-16% HT, 5-10% in VT

☐ Plan

- Sebastian is getting the DESY data and confirming consistency of the data set with DESY colleagues, then the ILC database group will make requested plots