



Re-baseline and Decision Process for the Field Gradient

Akira Yamamoto

To be reported at AAP SCRF Review on April 19, 2009



TDP Goals of ILC-SCRF R&D

■ Field Gradient

- 35 MV/m for cavity performance in vertical test w/ the yield 90 % (S0)
- 31.5 MV/m for operational gradient in cryomodule
 - to build two x 11 km SCRF main linacs

■ Cavity Integration with Cryomodule

- Plug-compatible development to:
 - Encourage improvement and creative work in R&D phase
 - Motivate practical Project Implementation with sharing intellectual work in global effort

■ Accelerator System Engineering and Tests

- Cavity-string test in one cryomodule (S1, S1-global)
- Cryomodule-string test with Beam Acceleration (S2)
 - With one RF-unit containing 3 cryomodule

Global Plan for SCRF R&D

Calendar Year	2007	2008	2009	2010	2011	2012
Technical Design Phase	TDP-1			TDP-2		
Cavity Gradient R&D to reach 35 MV/m		Process Yield > 50%		Production Yield >90%		
Cavity-string test: with 1 cryomodule			Global collab. For <31.5 MV/m>			
System Test with beam 1 RF-unit (3-modulce)		FLASH (DESY)			STF2 (KEK) NML (FNAL)	



Cavity Performance Goals

■ General Goals

- Achieve **35 MV/m at $Q_0 = 8 \times 10^9$** in 9-cell cavities in low-power vertical-dewar tests.
- Achieve **31.5 MV/m at $Q_0 = 10^{10}$** in 9-cell cavities in vertical dewar tests and in the cavity string test in a cryomodule

■ For TD Phase 1 (by mid. 2010),

- the process yield > 50 % for 35 MV/m defined by:
 - the number of accepted cavities divided by the number of chemically processed cavities

■ For TD Phase 2 (by end 2012)

- the Production yield > 90 % defined by:
 - the number of accepted cavities divided by the number ordered,
 - a yield of 80% to be achieved in the first chemical process,
 - allowance for 20% of the cavities to be re-processed (2nd process).

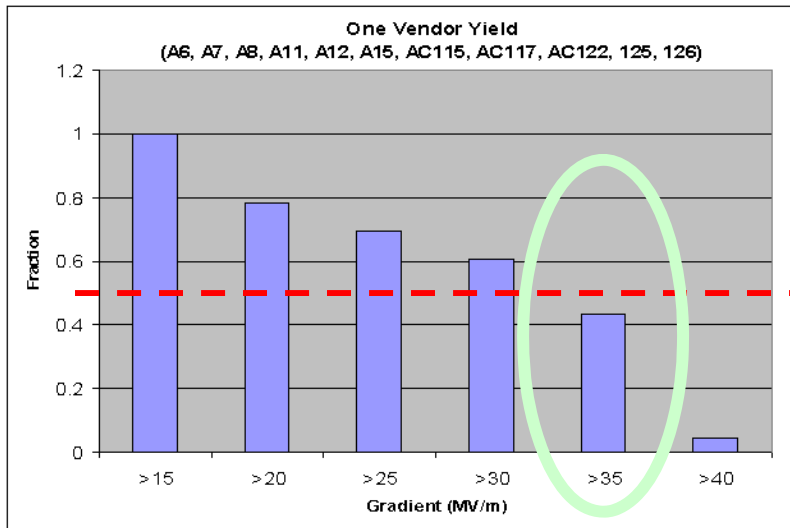
Global Yield of Cavities (November 2008)

23 tests, 11 cavities

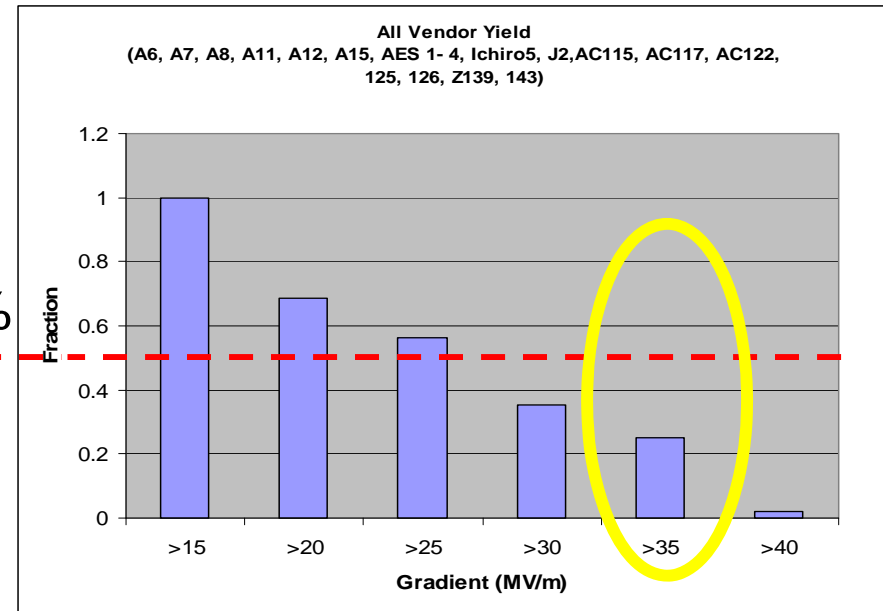
One Vendor

48 Tests, 19 cavities

ACCEL, AES, Zanon, Ichiro, Jlab



50%

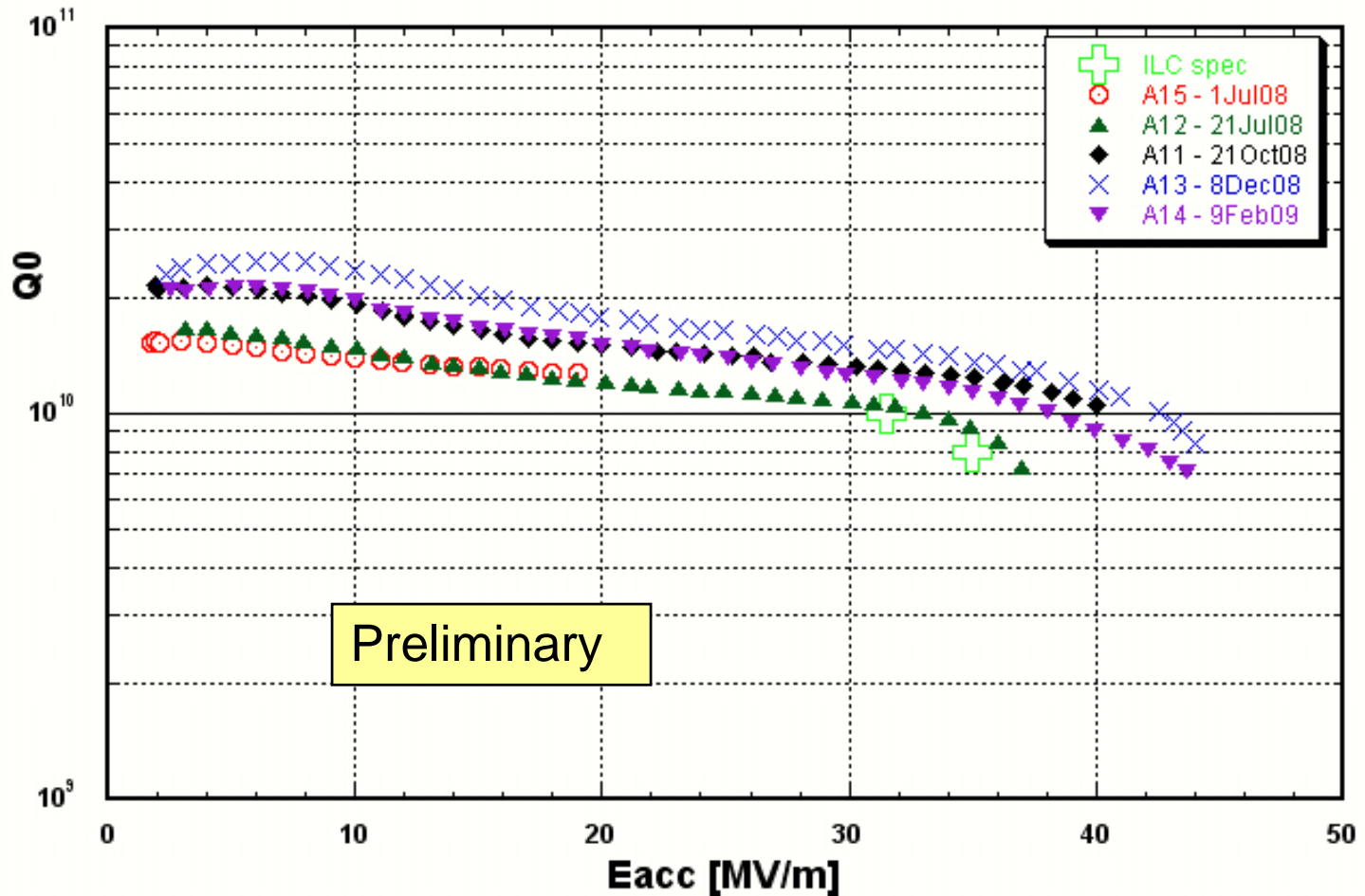


45% yield at 35 MV/m being achieved by cavities with a qualified vendor

H. Padamsee, TTC-08 (IUAC), ILC-08 (Chicago)



America R&D: Recent 9 cell series

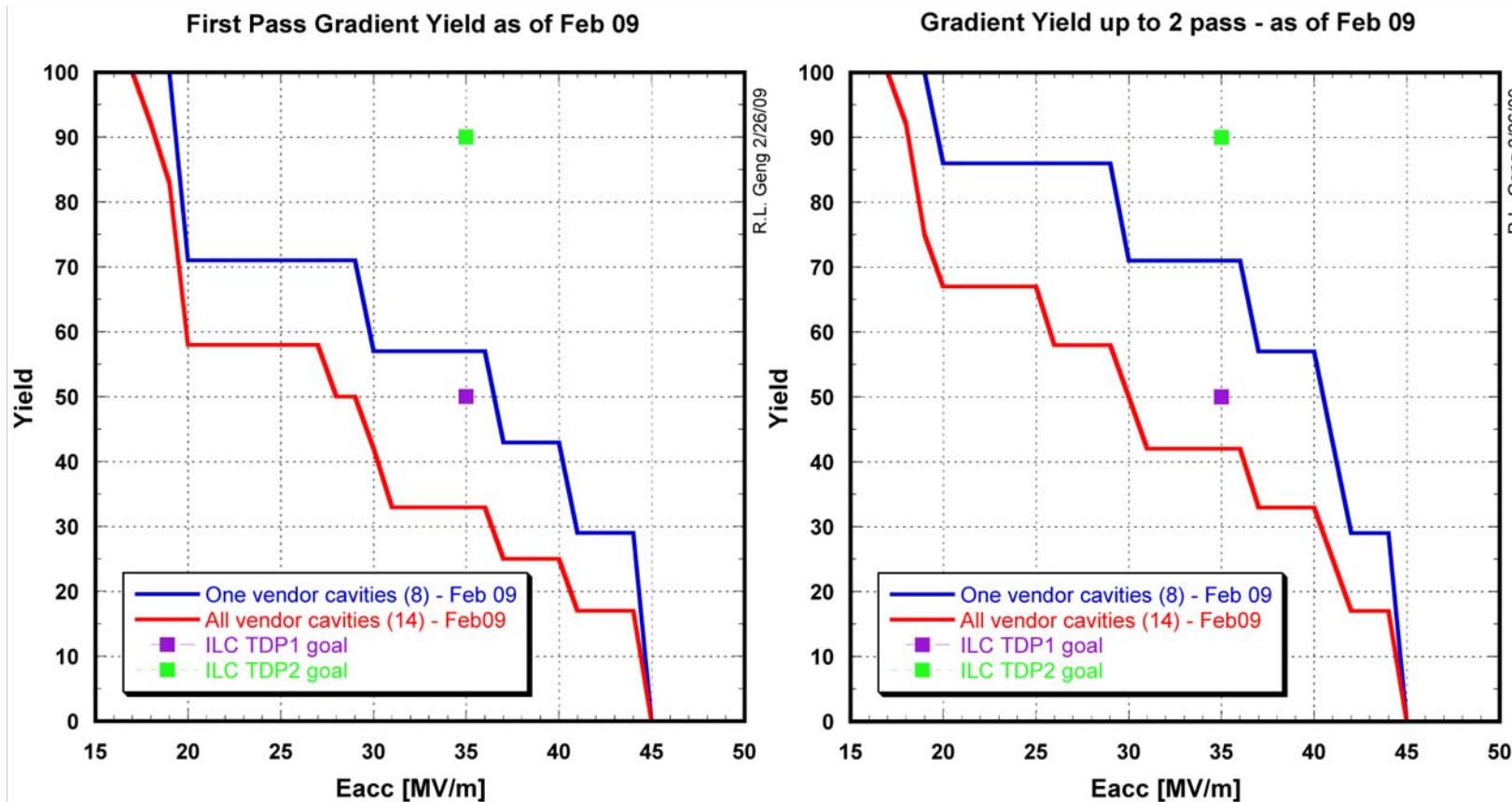


- Five 9-cell cavities: built by [ACCEL](#), and processed/tested at [JLab](#).
- All processed with one bulk EP followed by one light EP and by ultrasonic pure-water cleaning with detergent (2%).



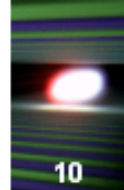
Recent Progress in Yield

First and Second Pass Yield at JLab



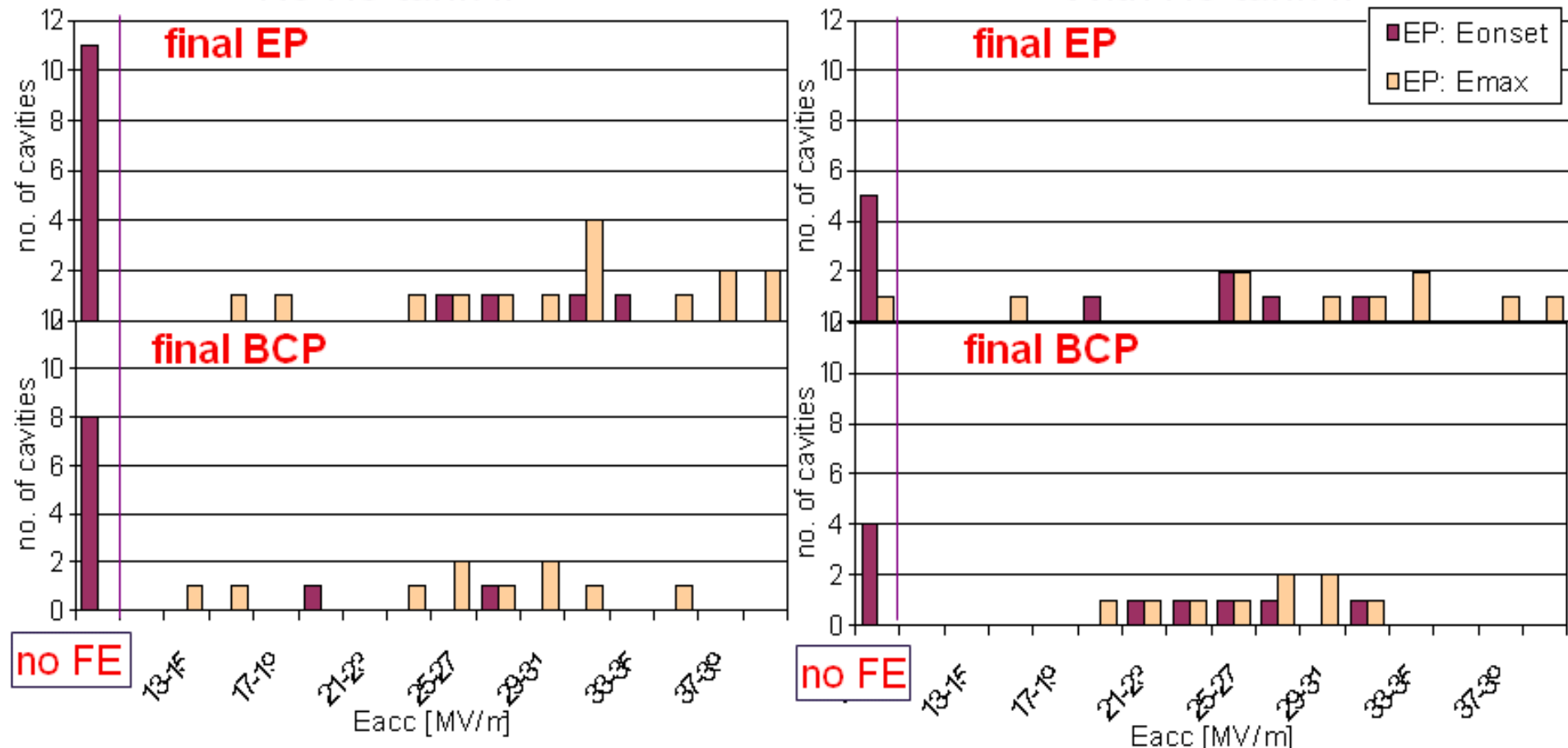
Prepared by R. Geng (Jlab)

Final preparation: Analysis of final test



No He-tank !!

With He-tank !!



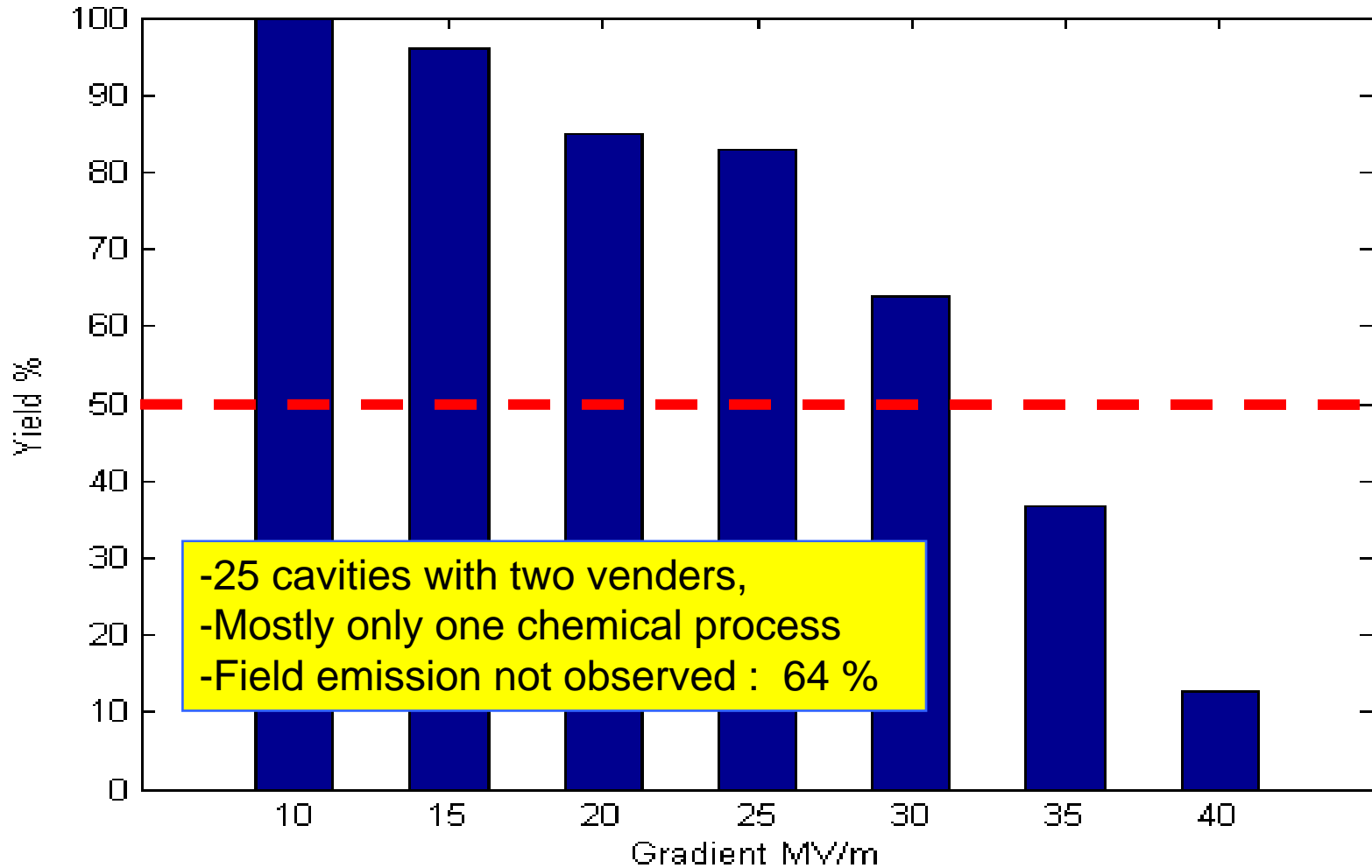
=> as expected: some improvement with respect to field emission

=> "final EP" gives higher E_{max} than "final BCP"



Recent Progress in Yield at DESY

Data provided by D. Reschke, and reassembled by M. Ross





Actions toward 2010

Over the course of the next year we expect to order/fabricate **60 cavities** and test a similar number (the sets intersect but are not identical)

- **Focus on the fabrication process**
 - especially on **EBW** and understand the reasons for defect/pits frequently observed near the heat affected zone
 - Measured exploration of improvements in the processing formula
- **Wide utilization of the diagnostic systems to better correlate defects with quenches**
 - Accumulate **more inspection** data that can be shared by the cavity community for better **feed-back to the fabrication** process
- **Boost laboratory-industry cooperation**
 - Utilize the strengths of each; the roles may vary by region



Re-baselining the Field Gradient:

A Possible Scenario

In early 2010 we will **review** the status:

- Understand the field gradient / process yield
- Estimate whether the 2012 gradient/yield target is achievable based on understanding and extrapolation of available results
 - Cuts in the data might be required due to, for instance, vendors, process modifications, experience, one-off errors....
- The 2012 target should be not just yield but on a **larger scale economic minimum**
 - accepting a lower yield (or gradient) may be the better choice if the incremental cost to raise the yield is too large
 - This could vary region to region
- The statistics may not be as large as we originally desired...
 - our interpretation of the results may have to wait or we may be forced to be more conservative
- The TDP-2 period may allow for further refinement of component technologies

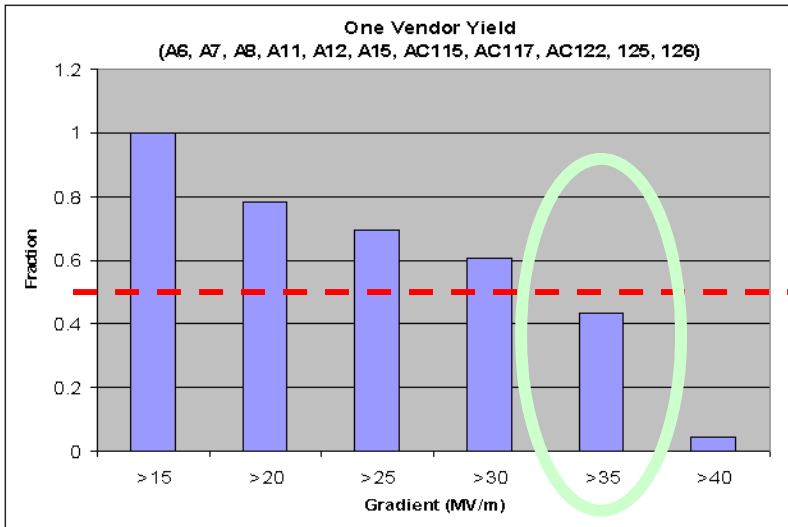
Global Yield of Cavities (November 2008) and Expectation

23 tests, 11 cavities

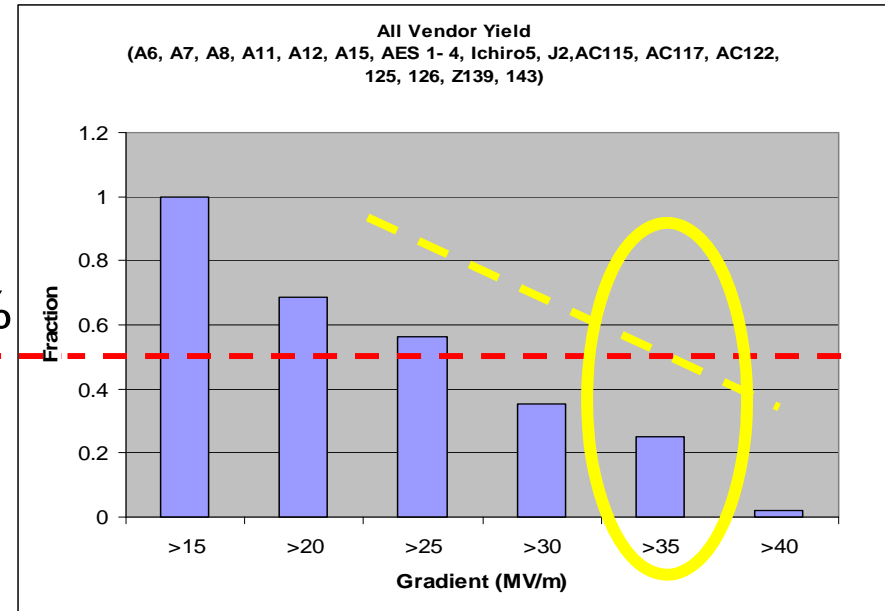
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Summary

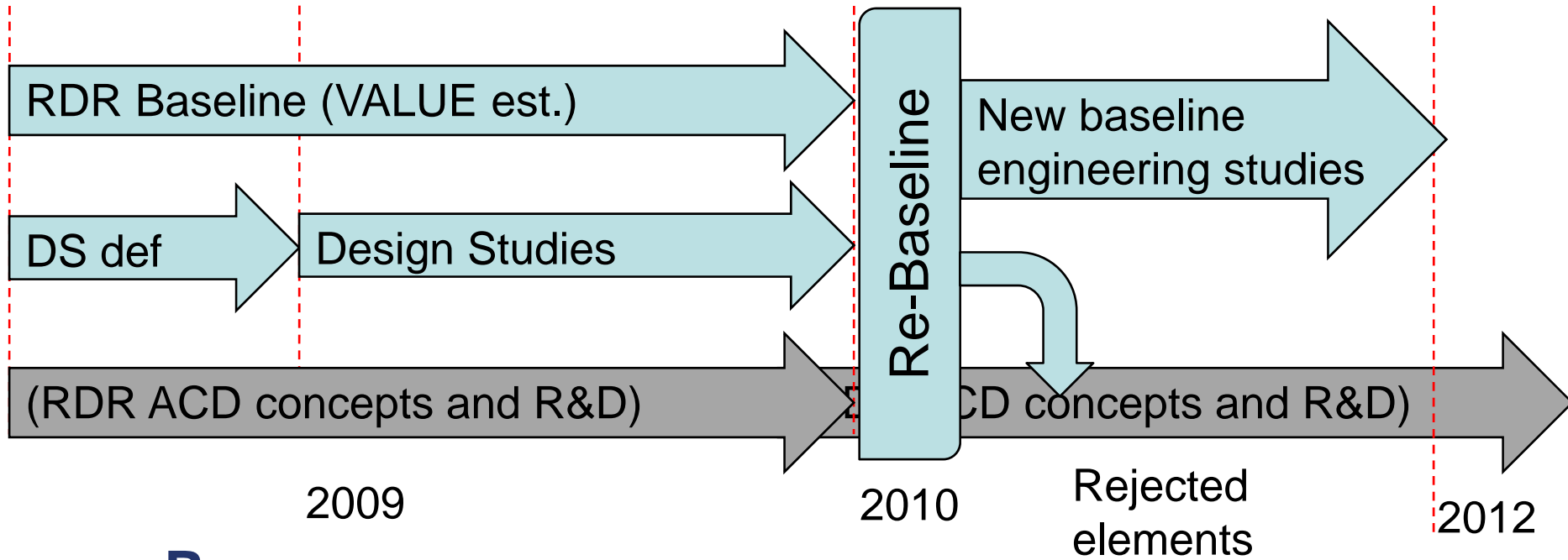
- **Status of Cavity Performance**
 - Field gradient : currently reaching 35 MV/m at a yield of 45% with the fabrication by the best qualified vender and with surface process with two leading laboratories
- **Progress being made pushing the yield curve**
 - Better fundamental understanding of current limitations
 - More statistics (~ 60) in 2009-2010
- **Re-baseline review will be made in 2010**
 - With seeking for the most cost-effective solution,



backup



Towards a Re-Baselining in 2010



- **Process**

- RDR baseline & VALUE element are maintained
 - Formal baseline
- Formal review and re-baseline process beginning of 2010
 - Exact process needs definition
 - Community sign-off mandatory



Progress Integrated at DESY

Assembled by M. Ross

