

Global Cavity Database Report

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**On behalf of the database group (as part of S0 effort):
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Kirk Yamamoto (KEK), Zack Conway (Cornell)**

October 1, 2009

- Everyone uses the same data to make plots – a common denominator in yield calculations
- If you show a plot, you specify “I made xxx cuts on the data” and anyone could reproduce it (they might also argue with your cuts)

reliability
transparency
reproducibility



- All RF tests from the last couple of years are included; may be flagged for exclusion
- Uniform criteria for data entry: only allowed values for as many as possible items
- Define everything which might vary or have underlying subtleties, e.g., "LABX#1" might be a final surface treatment referenced as a well-defined recipe anyone can look up.
 - If something changes significantly, treatment specification becomes LABX#2, also referenced, etc.
- No private/sensitive vendor data
- Anything referred to in a comment field must be for information only, and not data selection purposes
- Minimize effort required for compliance
- Please provide regular updates at predetermined (by Akira) times



- Database is currently an Excel file, not yet a real database
 - http://tdserver1.fnal.gov/project/ILC/S0/ILC-Cavity-Database/DB_coord.html
- Sections
 - Cavity-specific: process type, cavity type, etc.
 - RF-test-specific: gradient, Q0 at max gradient, test limitation, etc.
 - Database-specific: include RF test or not and if not, why not?
- Starting point: Sebastian Aderhold's optical inspection spreadsheet
- DESY agreed to provide limited support for inclusion of global data into their database – this is not implemented yet
 - all the participating labs agreed to put their data into the DESY database 😊



Details of the dataset



data source for this talk

- Previous “PAC” production plot [25 (DESY) + 14(JLab)] included these data:

- **DESY: Production 4&6, EP, with or without He tank, “last test” as of March 2009**
 - Production 4 [10 cavities] Z88, Z93, Z97, Z100, Z101, Z104, Z106, Z107, Z108, Z109
 - Production 6 [15 cavities] AC115, AC117, Z130, Z131, Z137; AC122, AC124, AC125, AC126, AC127, AC149, AC150, Z132, Z139, Z143
- **JLab: 14 cavities EP’d and tested at JLab (best test)**
 - Accel/RI [8 cavities] : A6, A7, A8, TB9ACC011, TB9ACC012, TB9ACC013, TB9ACC014, TB9ACC015
 - Not ACCEL or Zanon [6 cavities]: AES001, AES002, AES003, AES004, Ichiro-5, JLab-2

7/7/2009 Excel spreadsheet contains data from all three regions, from the last few years

- **KEK [5 cavities]: [MHI005:MHI009]**
 - Requiring already-qualified vendor eliminates all
- **JLab, Cornell, Fermilab [18 cavities]: [A5: A9], [TB9ACC010:TB9ACC015], [AES001:AES004], [TB9AES005:TB9AES006], JLAB-2**
 - [Reduces to 7] Requiring already-qualified vendor [-7] and standard processing [-3] and one not proc/test yet [-1]: ACCEL6, ACCEL7, [TB9ACC011:TB9ACC015]
- **DESY [39 cavities]: [AC112:AC129], [Z130:Z145], [AC146:150]**
(Production batches 5, 6, &7 are represented)
 - [Reduces to 15] Requiring EP [-13], a successful first test [-8], fine-grain [-3]: AC115, AC122, AC124, AC125, AC126, AC127, Z130, Z131, Z132, Z137, Z139, Z141, Z143, AC149, AC150

- We may be able to increase statistics by up to 10 more cavities without testing more cavities by requesting to include DESY production 4 in the database effort
 - This may also be the only hope of a sensible time-dependence plot in the near-term



“Qualified-Vendor” Production Yield Plot - Method



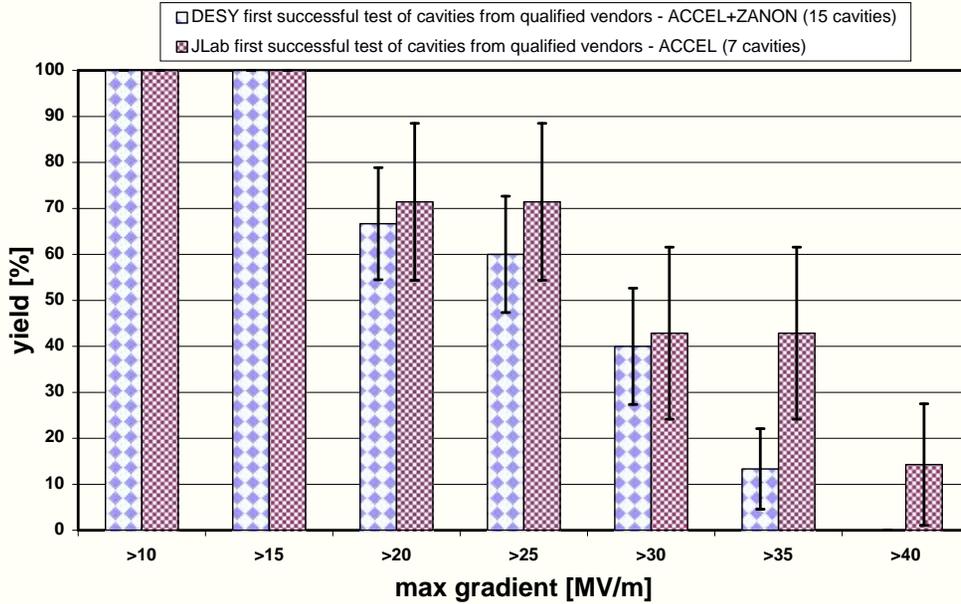
- Database version 7/7/2009
- Cuts
 - Cavity from qualified vendor: ACCEL or ZANON
 - Fine-grain cavity
 - Use the first successful (= no system problem) test
 - Standard EP processing: no BCP, no experimental processes
 - Defined as JLab#1, DESY#2 (weld tank before test), DESY #4 (weld tank after test)
 - (Ignore test limitation)
- Also known as “first-pass”
- Include binomial errors



“Qualified-Vendor” Production Yield Plot

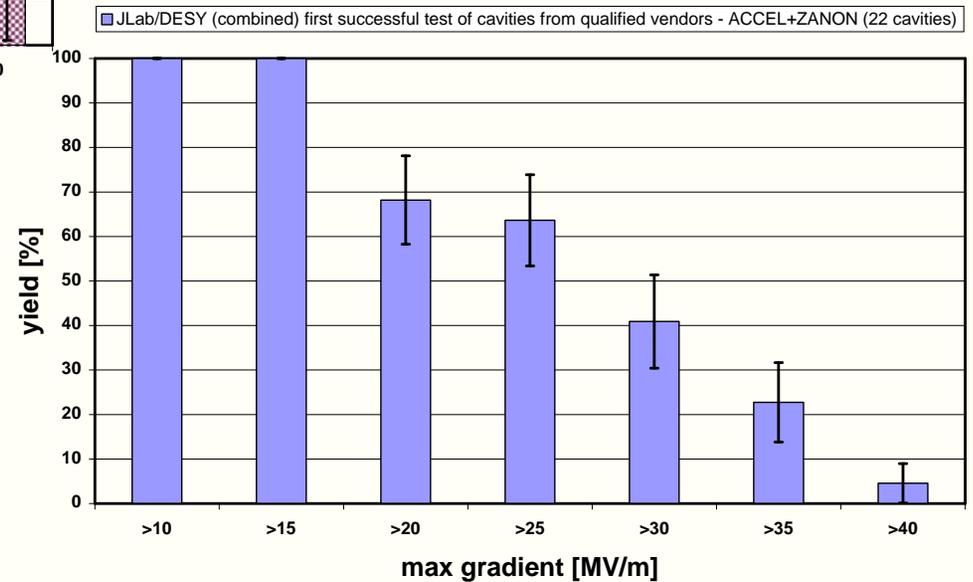


Electropolished 9-cell Cavities



Since DESY and JLab yields are statistically consistent, can combine them to get a smaller error bar

Electropolished 9-cell cavities

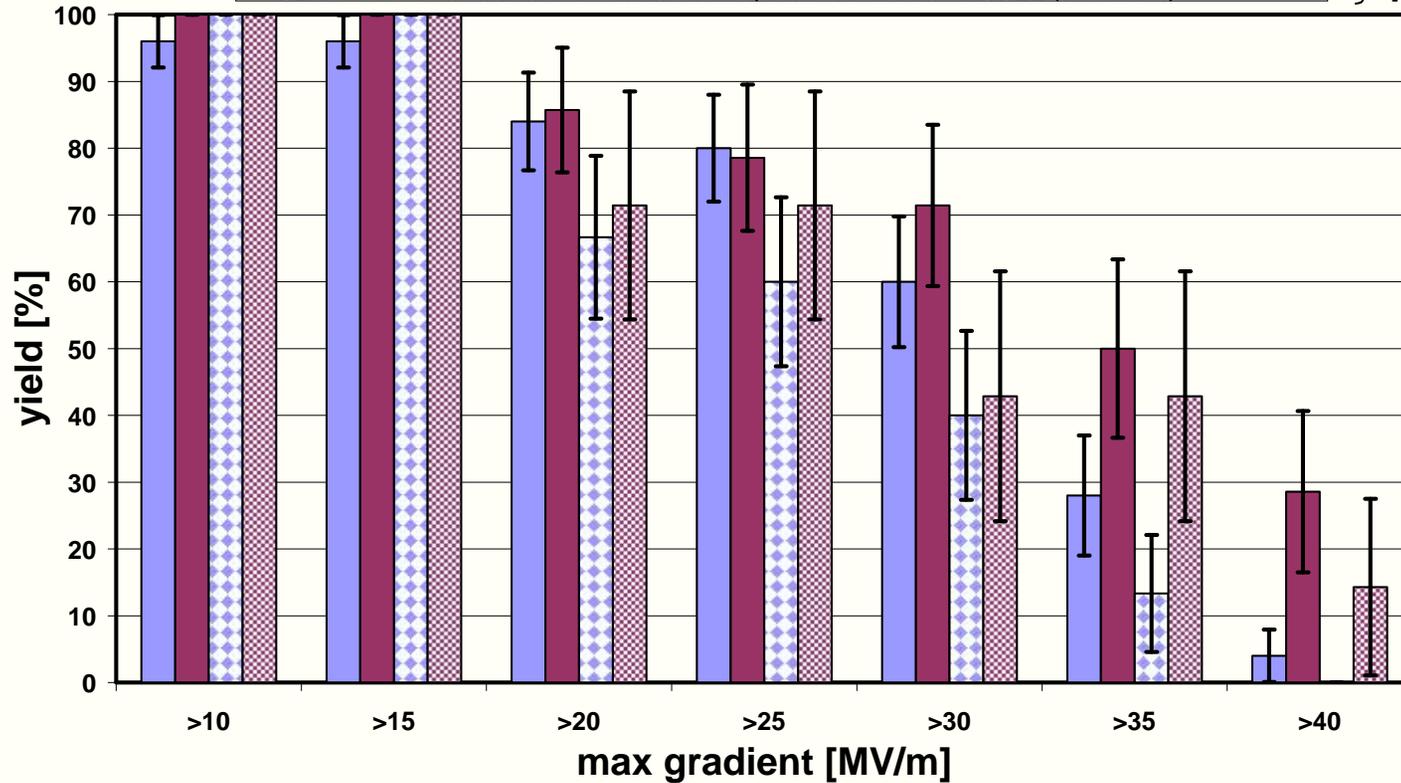


Electropolished 9-cell Cavities

“PAC” yield {

- DESY last test (25 cavities)
- JLab best test (14 cavities)
- DESY first successful test of cavities from qualified vendors - ACCEL+ZANON (15 cavities)
- JLab first successful test of cavities from qualified vendors - ACCEL (7 cavities)

} new yield



New yields from DESY & JLab are statistically consistent with each other
Old yields from DESY & JLab are also statistically consistent with each other

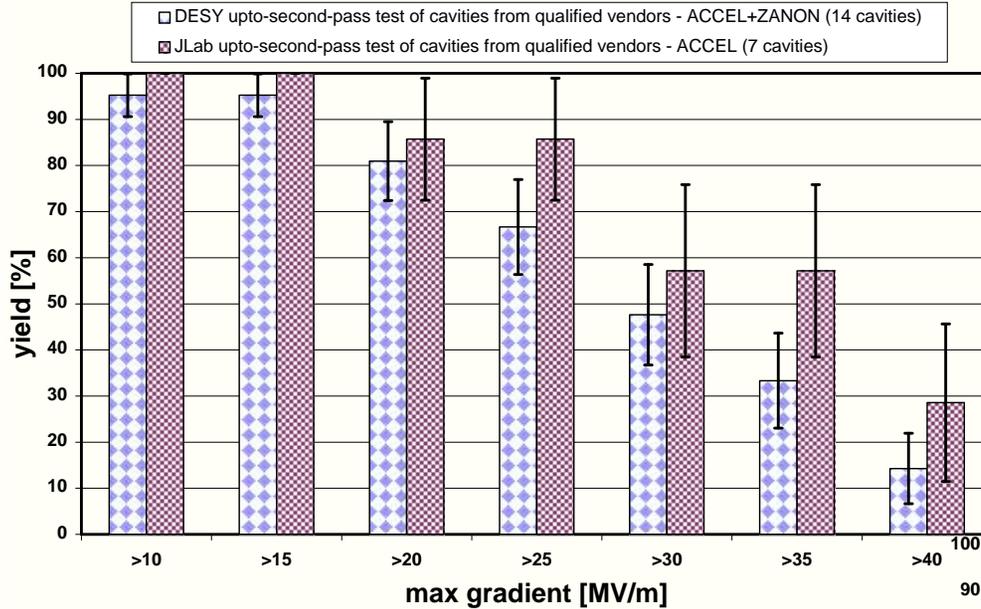
- Database version 7/7/2009
- Cuts
 - Cavity from qualified vendor: ACCEL or ZANON
 - Fine-grain cavity
 - Use the first successful (= no system problem) test
 - Standard EP processing: no BCP, no experimental processes
 - Defined as JLab#1, DESY#2 (weld tank before test), DESY #4 (weld tank after test)
 - (Ignore test limitation)
 - Second pass
 - if (Eacc(1st successful test)<35 MV/m) then
 - if (2nd successful test exists) then
 - » plot 2nd test gradient
 - else
 - » plot nothing [assume 2nd test didn't happen yet]
 - endif
 - else
 - plot 1st successful test gradient
 - endif
- Include binomial errors



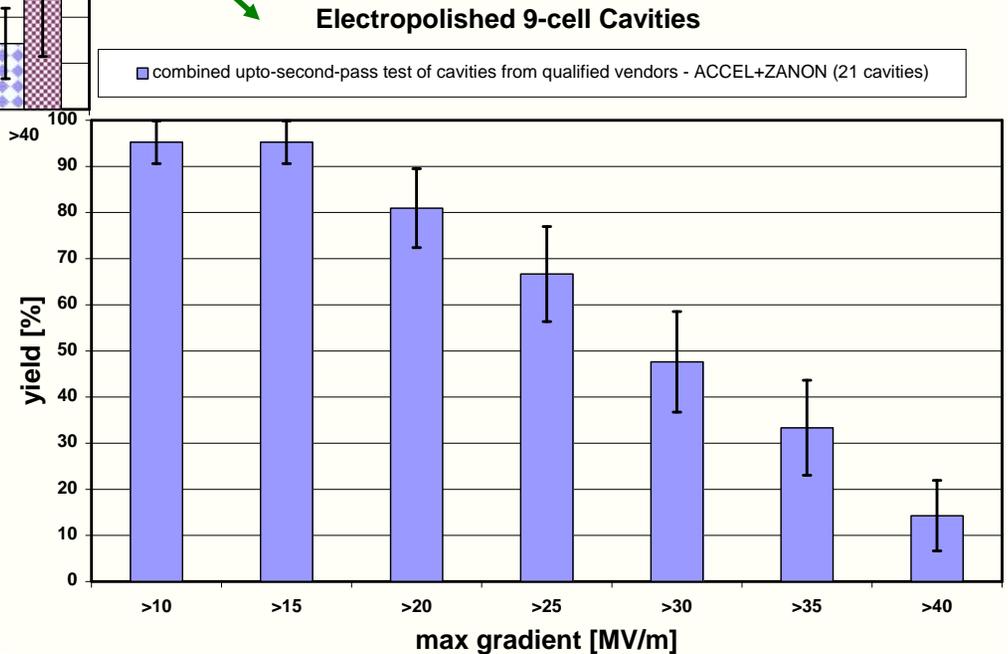
Up-to-second-pass yield, qualified vendors



Electropolished 9-cell Cavities



Since DESY and JLab yields are statistically consistent, can combine them to get a smaller error bar



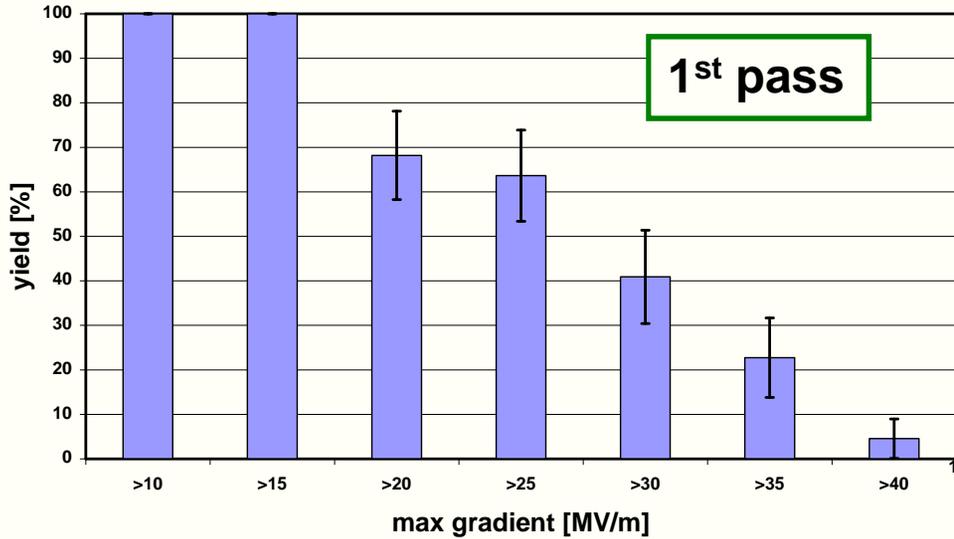


Compare 1st and 2nd pass yields, qualified vendors



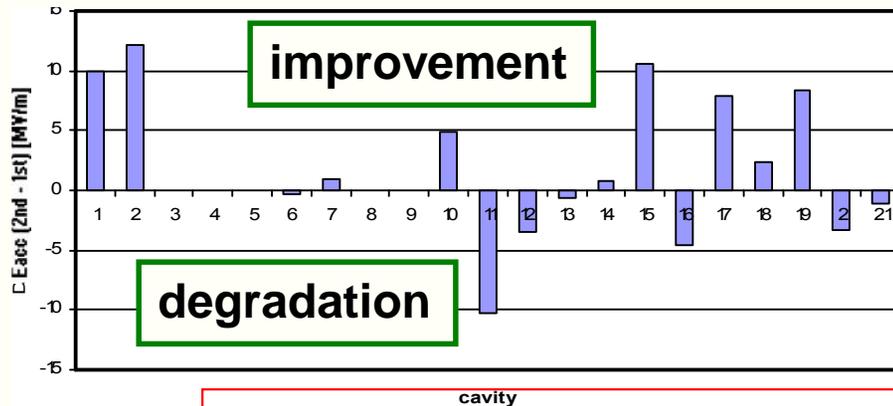
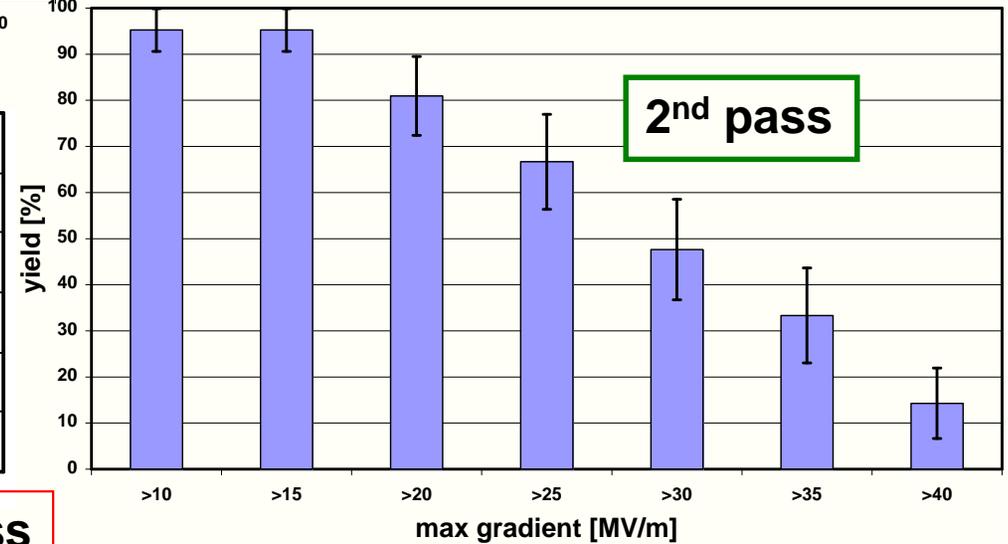
Electropolished 9-cell cavities

JLab/DESY (combined) first successful test of cavities from qualified vendors - ACCEL+ZANON (22 cavities)



Electropolished 9-cell Cavities

combined upto-second-pass test of cavities from qualified vendors - ACCEL+ZANON (21 cavities)



yield is improved after 2nd pass

- Database version 7/7/2009
- Cuts [same except as marked]
 - Cavity from vendor: MHI or AES
 - Fine-grain cavity
 - Use the first successful (= no system problem) test
 - Standard EP processing: no BCP, no experimental processes
 - Defined as KEK#1 or JLAB#1
 - (Ignore test limitation)
 - Second pass
 - if (Eacc(1st successful test) < 35 MV/m) then [NB: none reached 35 MV/m]
 - if (2nd successful test exists) then
 - » plot 2nd test gradient
 - else
 - » plot nothing [assume 2nd test didn't happen yet]
 - endif
 - else
 - plot 1st successful test gradient
 - endif
- Include binomial errors

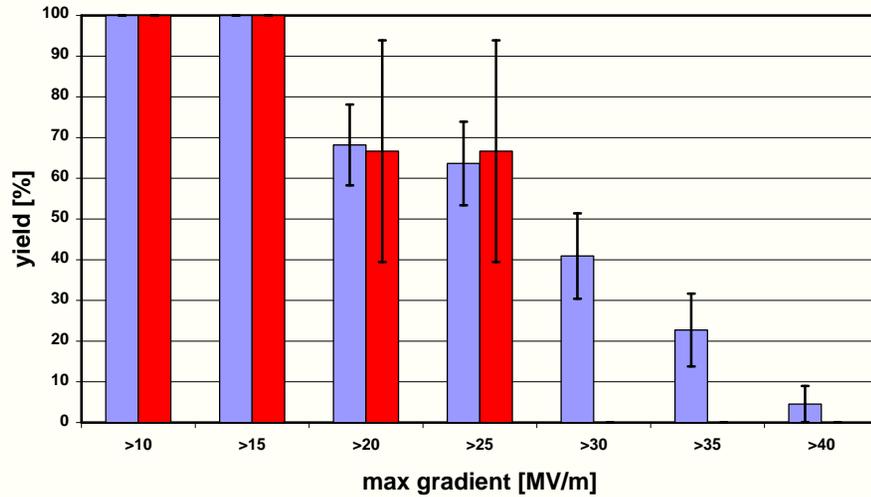


Compare first-pass of new/established vendors



Electropolished 9-cell cavities

JLab/DESY (combined) first successful test of cavities from qualified vendors - ACCEL+ZANON (22 cavities) MHI#5,6,7

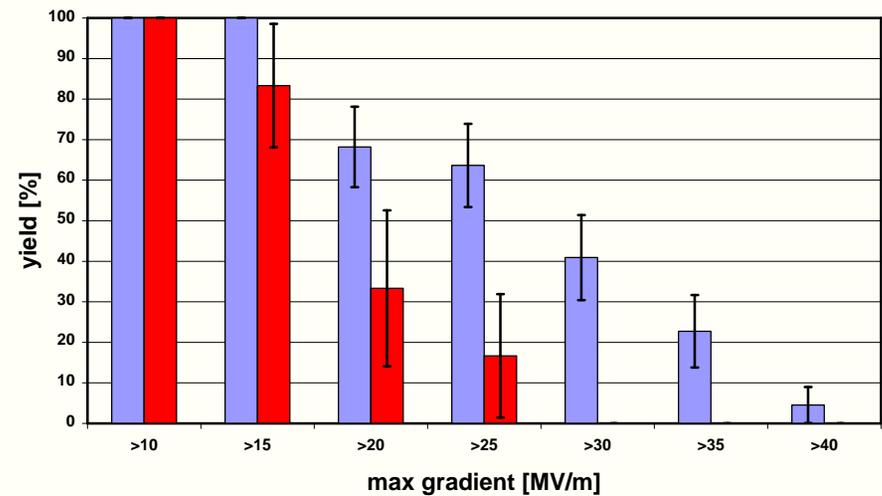


MHI005, MHI006, MHI007

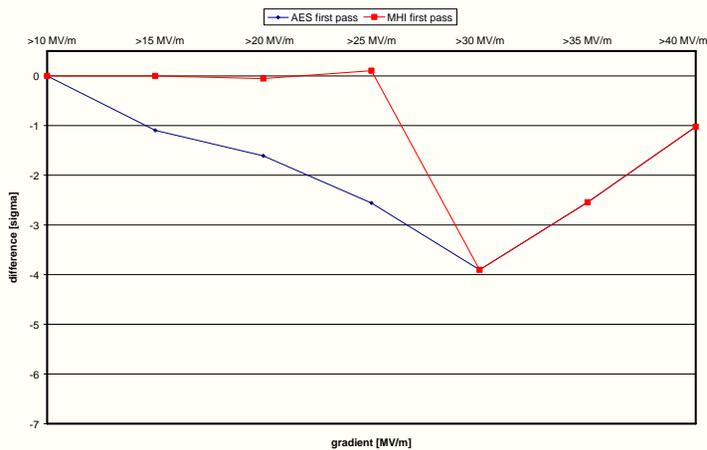
AES001, AES002, AES003, AES004, TB9AES005, TB9AES006

Electropolished 9-cell cavities

JLab/DESY (combined) first successful test of cavities from qualified vendors - ACCEL+ZANON (22 cavities) AES1-6

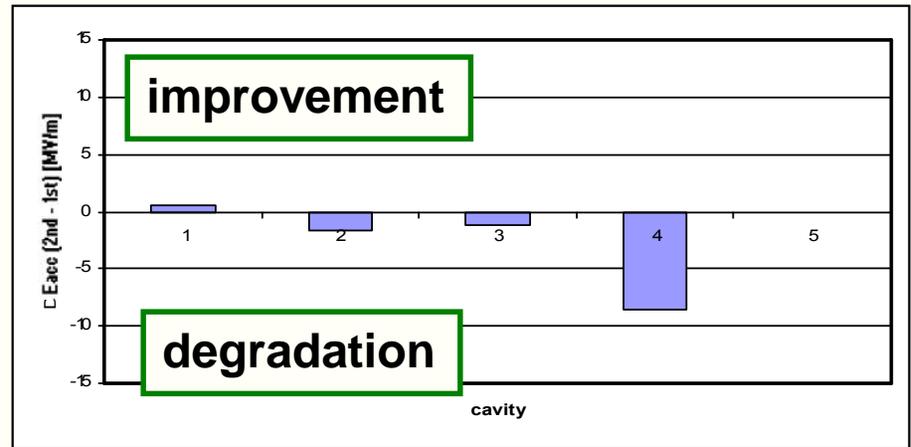
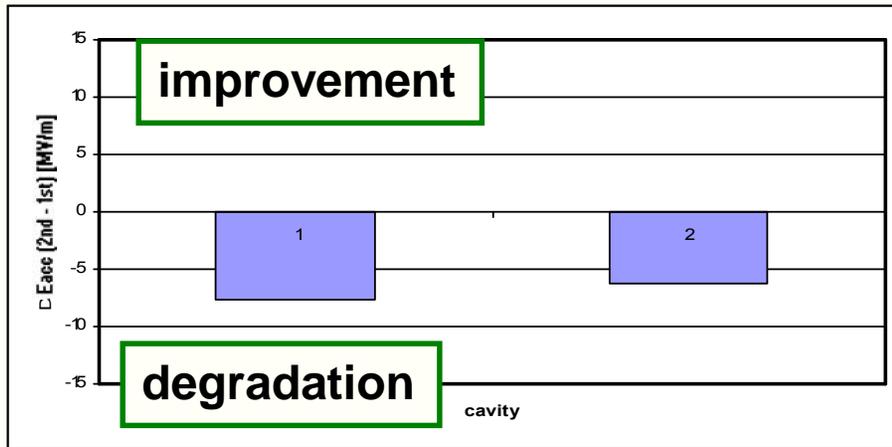


Comparison of new/established vendors



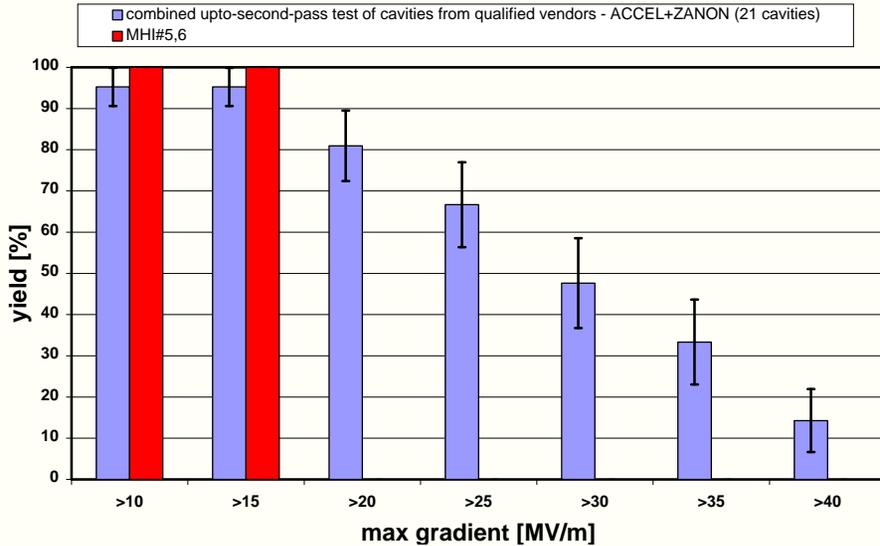


1st to 2nd pass for new vendors



**A word of caution:
The new-vendor cavities were not improved in the 2nd pass...**

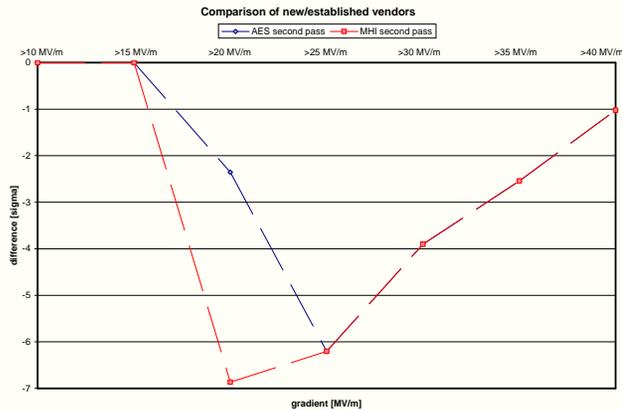
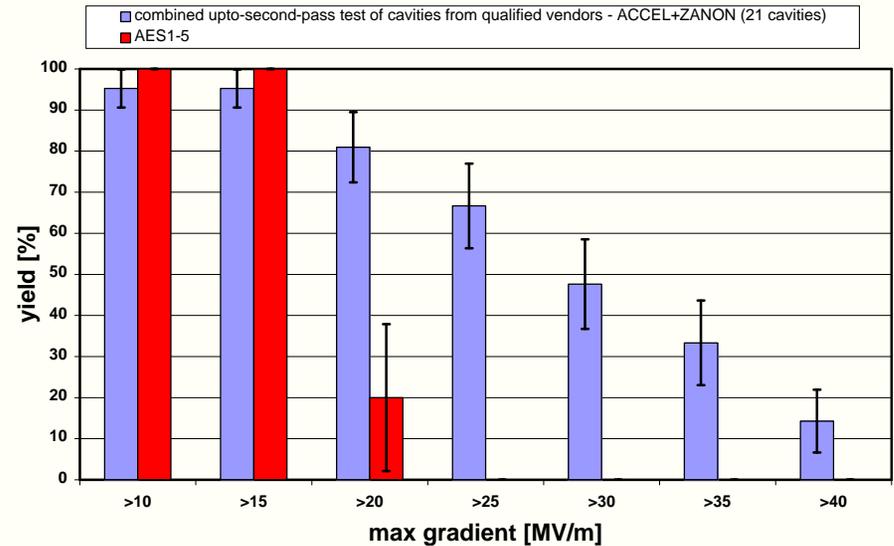
Electropolished 9-cell Cavities



MHI005, MHI006, MHI007

AES001, AES002, AES003, AES004, TB9AES005, TB9AES006

Electropolished 9-cell Cavities



Because degradation occurred between 1st and 2nd process/test, I wouldn't draw conclusions about vendor accomplishment from these plots



- **Spreadsheet**
 - Add DESY Production 4
 - Few entries to be completed and minor errors to be fixed (don't affect plots)

- **Database itself**
 - Develop with DESY colleagues the precise tools for database uploading
 - if you have an opinion on this other than “it must minimize work” please let us know
 - Add a limited number of new stored quantities



- ✓ FALC meeting July 13, 2009
 - Provide an example plot of production yield, citing caveats (whatever they are at the time)
 - Using preliminary and incomplete data for past 2-3 years from the simple Excel spreadsheet format, no web interface
 - Provide the people list, and the plan
- ✓ End July 2009: Determine whether DESY DB is viable option, and timescale for implementation
- ALCPG/GDE Sept. 28 - Oct. 2, 2009
 - Dataset is web-based (thanks to support by DESY)
 - Some well-checked, easily explainable, and near-final plots available for discussion such as
 - Production yield
 - ✓ Qualified vendors
 - ✓ New vendors
 - ✓ Process yield
 - Time evolution of some quantities
- End Nov. 2009: With colleagues' input, finalize DB tool, web interface, standard plots, possibly with longer-term tool improvement plans

before time evolution & web-based tool, add Prod 4