# Global Cavity Data Base
# &
# Gradient Yield

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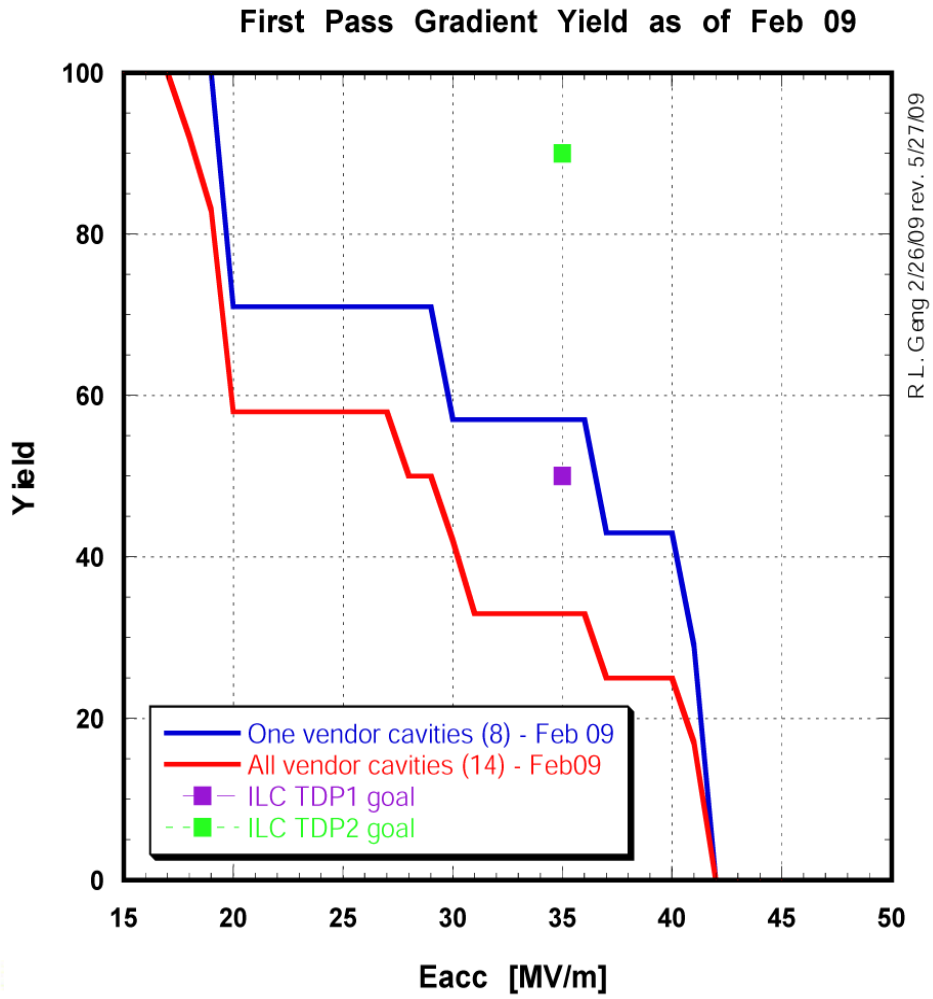
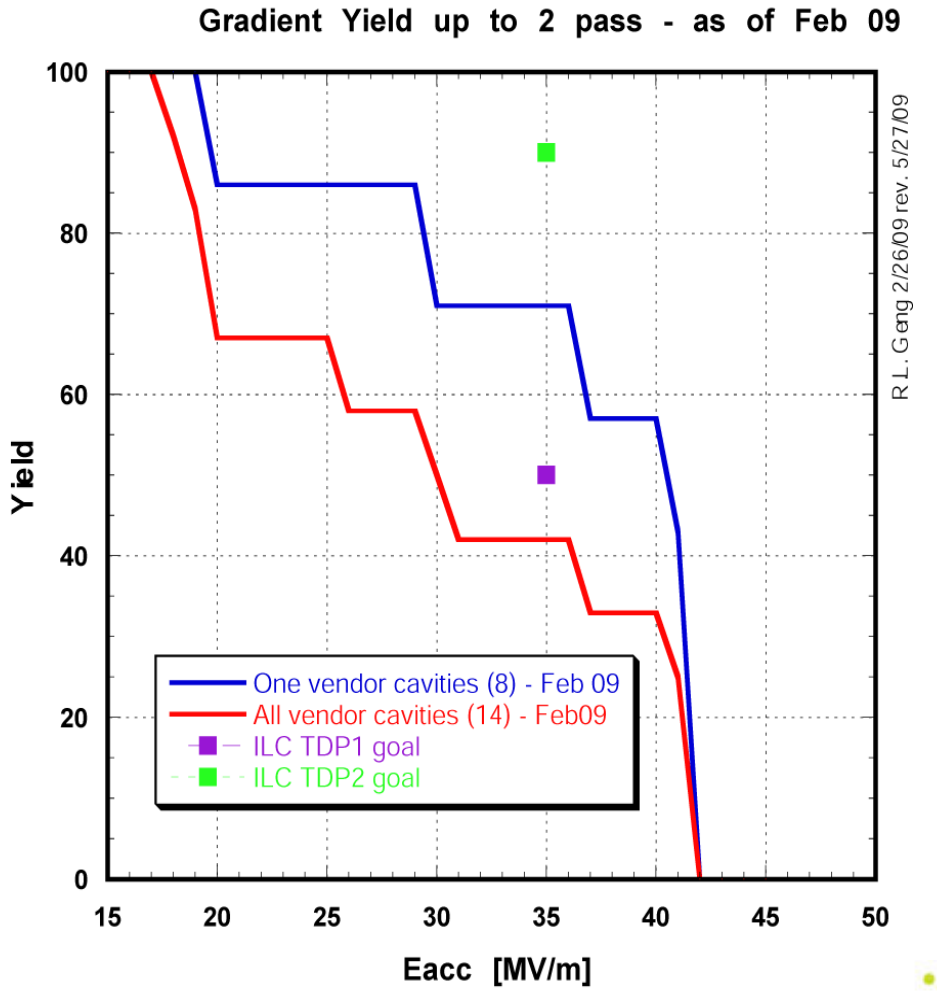
# Two-Pass Yield Proposal @ AD&I Mtg

First-pass result decides path forward:
- Move on for S1 if spec met
- Re-process (Re-HPR; Re-EP; Local repair) if spec not met

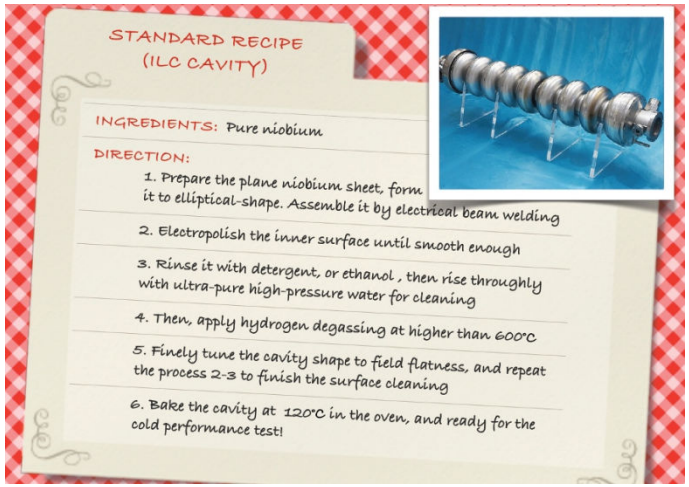
An example based on real data from JLab



# Global Data Collection

- Q: which cavity should be included?
  - **cavities made/processed w/ "standard recipe"**
  - **Truth is there is no uniform specification for cavity fabrication or processing**
    - Finished EBW spec?
    - EP process spec?
    - End surface spec?
  - **Obvious variability examples**
    - Material from different vendors
    - Cavity shape difference
    - EBW weld prep & orientation
    - Pre-EP surface treatment
    - EP parameters and protocols, EP orientation
    - Hydrogen out-gassing time and temperature



# Global Data Collection

- Proposition 1: all cavities fabricated and processed according to following rough steps
  - **Fine grain sheet material**
  - **Deep drawing & EBW**
  - **Initial field flatness tuning**
  - **Bulk EP for heavy removal**
  - **H2 removal with vacuum furnace**
  - **Final tuning field flatness (and frequency)**
  - **Final EP for light removal**
  - **Post-EP cleaning**
  - **Clean room assembly**
  - **Low temperature bake-out**
  - **2K RF test**

# Global Data Collection

- Proposition 2: accept known variabilities
  - **Fine grain niobium irrespective of vendors**
  - **EBW irrespective of prep design welding para.**
  - **Cavities w/ or without helium tank**
  - **With or without pre-EP treatment (BCP, CBP…)**
  - **EP irrespective of parameters & protocols**
    - Horizontal EP or vertical EP
    - H2SO4/HF/H2O ratio, pre-mixing or on-site mixing
    - Cell temp. control or return acid temp. control
    - W/ or w/o acid circulation after voltage shut off
    - Post-EP cleaning: ER or USC or H2O2 rinsing
  - **H2 out-gassing irrespective of temp. & time**
  - **HPR irrespective of nozzle style, HPR time**
  - **CR assembly irrespective of practice variability**

# First-Pass Data

- What it is
  - **First RF test result following all steps applied**
  - **Should be the final power rise data**
    - as some cavities "processing" well
- What it is not
  - **May not necessarily the first RF test of the cavity**
    - Example: some cavities were tested before low temperature bake-out for FE screening purpose
  - **Should not include data of cavities with known material flaw, equipment malfunctioning, human error etc.**

# Second-Pass Data

- What it is
  - **Cavities failed to meet ILC gradient and Q spec**
  - **Re-treated and re-tested for a second time; re-treatment can be:**
    - Re-HPR (for FE reduction)
    - Re-EP (for FE reduction or defect removal)
    - Post-purification (for defect stabilization) ?
    - Repair (local grinding, local re-melting…) followed by re-process and re-test (for defect removal)
- What it is not
  - **Cavities already passing ILC spec**
  - **Re-test without physical changes on RF surface (e.g. T-mapping test)**

# Beyond Two Pass…

- Some cavities may be re-processed and re-tested more than two passes anyway for various reasons
- We may still want to monitor these data for purpose of learning.
- Cavity exchange effort falls into this category
  - **For cross checking facilities**
  - **For cross checking processing variability**
  - **For cross-calibrating measurement error bars**

# Challenges and Opportunities

- Challenge: Integrating globally data with known variability in cavity fab., proc. & handling
- It is possible yield of sub-set data may be different
  - **materials from different vendors**
  - **cavities manufactured by different vendors**
  - **cavities processed at different labs**
- Provides reality of “global” gradient
- True leaning opportunities toward “standard recipe”
- This global data base effort will be very useful and success is necessary
- Thank Camille for her leadership & excellent start

# Comments

- Should include cavities even with known defect – but should be flagged not for gradient yield evaluation