



Cavity Gradient R&D for ILC – ‘S0’

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Initial Concept:

- **2006:**
 - Field emission was considered the most important limitation
 - Statistics were thought to be required to demonstrate control of field emission → meant building and testing (**sufficiently**) **multiple** cavities
 - S0 plan based (in part) on the need for ‘statistics’
 - TTC – authored recommendation (January 2006)
- **2007:**
 - The recommendation proved ‘on-target’
 - Field emission greatly reduced (15% of total – Geng, JLab; also Reschke, DESY) – *directly proven with very limited statistics*
 - Thermal Quench now considered the most **critical** limitation!
 - BUT: gradient limit increased only a little AND gradient limit spread remained
- **Re-evaluate ‘initial’ 2006 strategy →**



Optical inspection and thermal monitoring



S0 in 2009:

- **Understand the HAZ; electron beam weld (EBW) parameters**
 - each manufacturer does it differently. (Akira and mcr [planning](#) to visit companies, [world-wide](#))
- **‘Close the loop’ on the defects before full chemistry (KEK)**
 - DESY, US starting to use precision optical inspection
 - implementation of optical inspection QC cycle for XFEL industrial production?
- **Identify quench-causing defects >20 MV/m**
 - equator EBW HAZ? radius? crystallography / impurities (US plan...)
- **Study interaction between EBW / annealing / weld strength / RRR**
 - Singer et.al., TESLA 2003-07
 - tesla.desy.de/new_pages/TESLA_Reports/2003/pdf_files/tesla2003-07.pdf
- **Present plans provide adequate cavities and treatment cycles →**
 - studies and recommendations are a top priority (another request to TTC?)

RRR near EBW

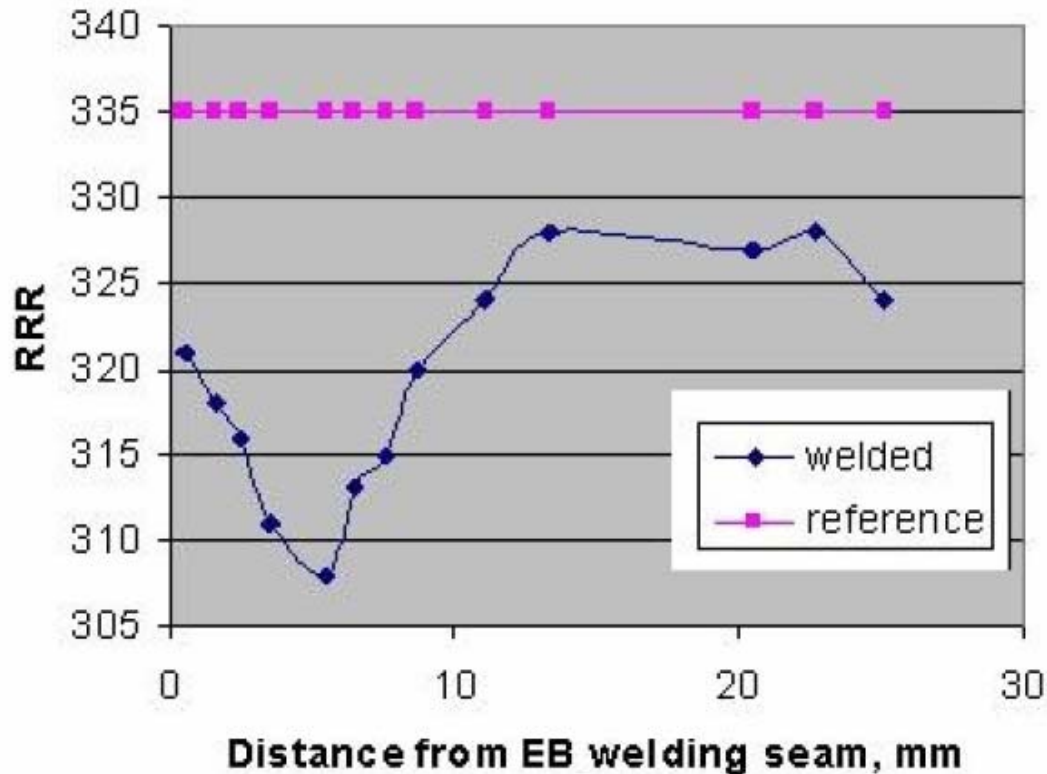


FIGURE 5. RRR in the welding seam versus distance from the welding seam (welded at pressure 2×10^{-5} mbar, ACCEL 1996)

- Singer et al.
- The HAZ morphology is complex –
 - superficial explanation of defects



2009 – XFEL Cavity Fabrication

- **XFEL will order cavities in 2009**
- **Present indication:**
 - *Likely to use optimum treatment process – EP / Ethanol rinse*
 - Processing / testing starts 2010
- ***Initial DESY 2008 / Accel cavity / final EP-Ethanol rinse results very promising***
- **How to work with the XFEL team to maximize mutual benefit?**