Experience with the cold test data analysis using the DESY cavity data base

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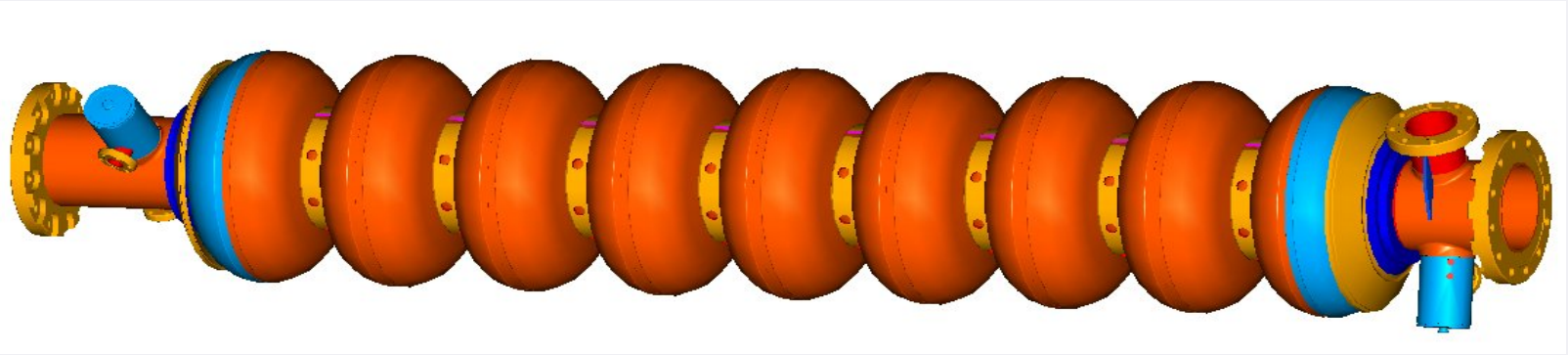
Introduction

- Available **analysed** data on quench fields:
  - i) AC-Cavities of 3rd production: ?
  - ii) Z-cavities of 4th production: yes (status of SRF 2007 poster)
  - iii) Large Grain AC112 – AC114: new
  - iv) 6th production: new, but only 2 cavities tested



AC-cavities of 3rd production

Quick and dirty analysis only:

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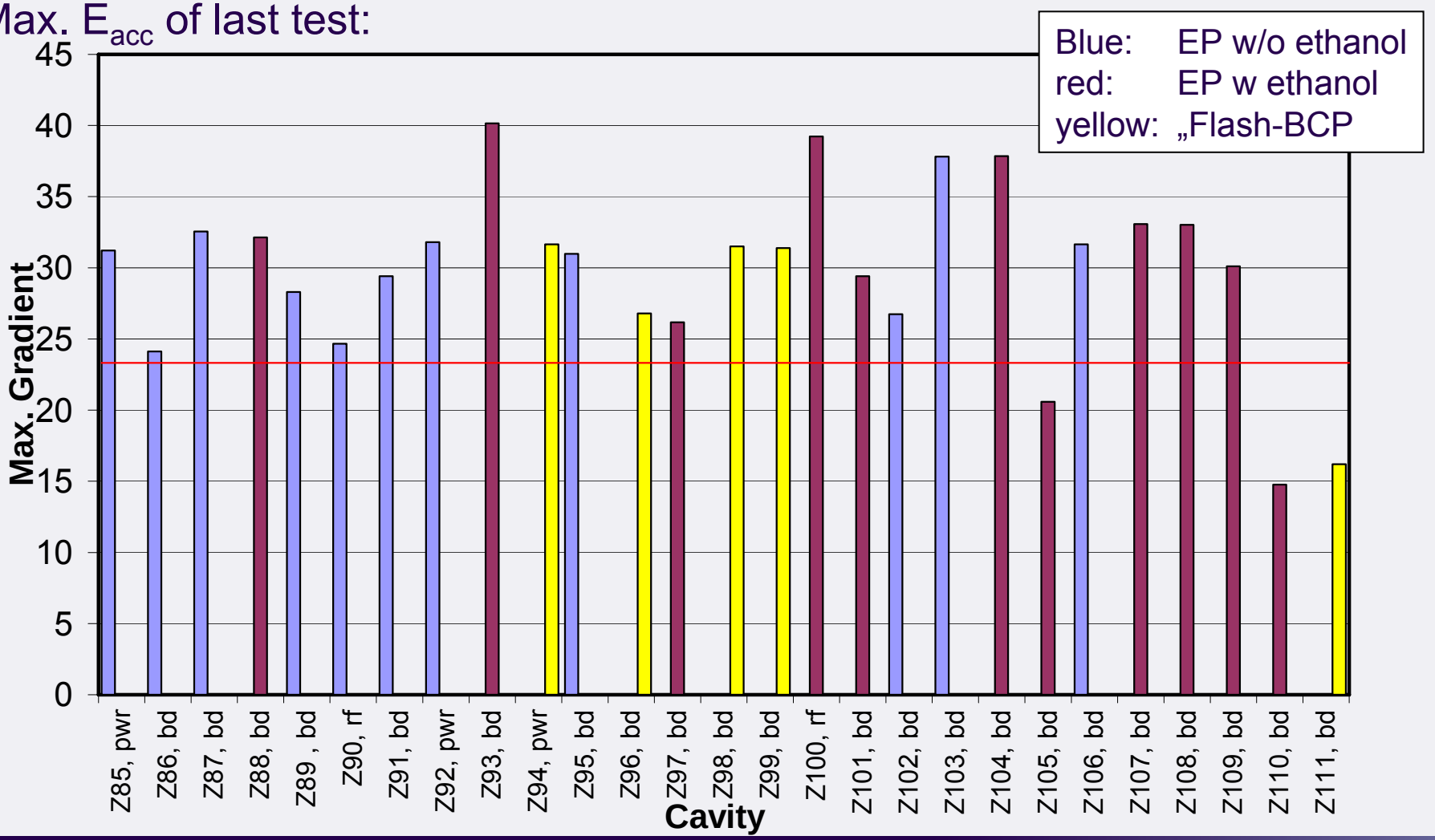
Z-cavities of 4th production

- Status of SRF 2007 paper still valid

- Vertical test results of 27 (out of 30) cavities analysed
- Final preparation by EP w/o ethanol, EP w ethanol and “Flash-BCP” after previous main EP

Z-cavities of 4th production (ctd.)

- Max. E_{acc} of last test:

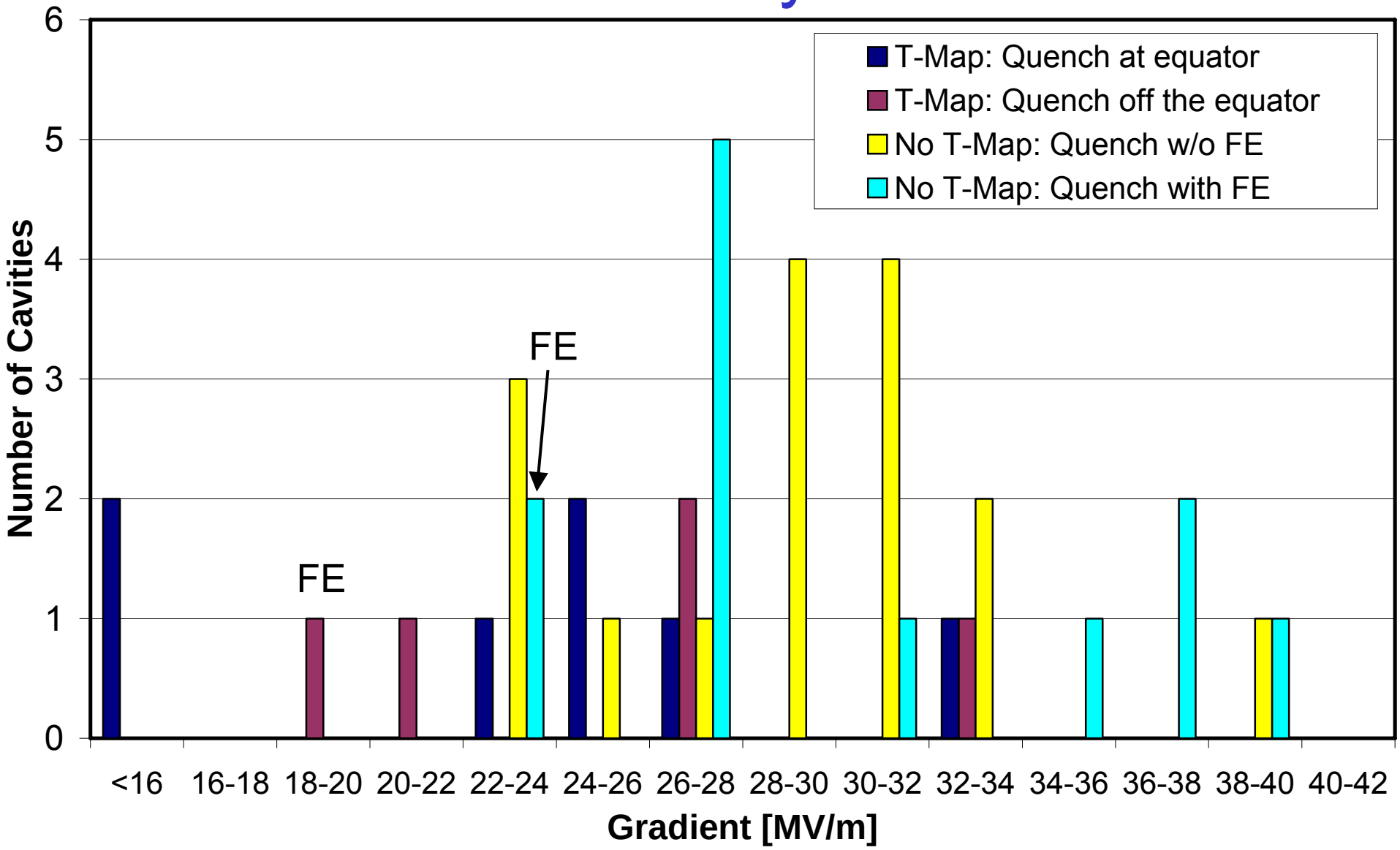


Quench analysis

- Distinguish between local thermal breakdown, FE induced quench, MP,…?
- Distinguish between material defect and fabrication problem
  => T-map required!!
- Late decision to analyze all low-gradient cavities with T-Map !
  => no T-Map data available for
  e.g. Z86 (24 MV/m), Z88 (23 MV/m, strong FE), Z97 (24 / 26 MV/m)
  (again: some cavities with good performance after re-treatment)

- **All tests after new prep analysed !!!** => double or triple counting possible
- Four categories for analysis independent of preparation:
  i) Identified Quench by T-Map at equator => fabrication fault probable
  ii) Identified Quench by T-Map off the equator (or unclear)
  => material problem, FE, ...
  iii) Quench w/o FE (no T-Map)
  iv) Quench with FE (no T-Map)

Quench analysis II



Quench locations of Z-cavities

Cavity	Gradient	Quench location	Preparation + remark
Z82, test 2	28 MV/m	cell 9, **equator**	EP + 127C; no FE
Z83, test 2	25 MV/m	cell 1 with two hot areas i) **equator**; ii) upper cup	EP + 127C; no FE
Z85, test 2	33MV/m	cell 3, **equator** area; but highest dT 2 resistors off the equator ??	EP + 124C; some FE
Z87, test 3	33 MV/m	cell 4, lower cup; far off equator	EP; few FE
Z89, test 2	28 MV/m	7/9pi-mode(!): cell 5, lower cup, hot area from equator to iris ??	EP + 120C; some FE
Z94, test 2	28 MV/m	cell 3, upper cup, 3 resistors off the equator	BCP; few FE
Z101, test2	26 MV/m	Cell 7, **equator** area	EP, some FE
Z104, test 1	20 MV/m	Cell 7, lower cup, far off equator => FE induced	EP, strong FE
Z105, test 6	21 MV/m	Cell 6, lower cup near iris *(after degradation)*	EP + bake, few FE
Z108, test 2	23 MV/m	Cell 8, upper cup, hot area equator to iris??	EP; no FE
Z110, test 2	14 MV/m	Cell 8, **equator** + lower cup (3 resistors off equator	EP, no FE
Z111, test 2	16 MV/m	Cell 6, **equator**	BCP, no FE

Result of Quench analysis

- Note: All cavity tests limited by quench are analyzed !!
  => includes double counting of cavities after reprocessing

- Again: Broad scatter of $E_{acc,max}$ from 15 MV/m to 40 MV/m !
  Quench field w/o FE: $\langle E_{acc,max} \rangle = (28{,}9 \pm 4{,}3)$ MV/m (w/o Z110 + Z111)
  Quench field with FE: $\langle E_{acc,max} \rangle = (29{,}7 \pm 5{,}6)$ MV/m

- T-Map shows two cavities with probable production fault:
  => Z110 after EP + Z111 after "EP+" with ≈ 15 MV/m
  (Z108 showed unclear T-Map with 23 MV/m; re-processed: 33 MV/m, bd, no FE)
- Two more cavities w/o T-Map with quenches below 24 MV/m:
  Z86, EP: 24 MV/m (used for blade tuner experiment)
  (Z93, EP: 23 MV/m (re-processed with $E_{acc,max}$ > 36 MV/m))

Large Grain AC112 – AC114 (5th production)

- 3 large grain nine-cells of Heraeus Nb
- First tests after pure BCP treatment with 120 – 140 µm removal

- Max. Gradients with quench:

=> AC112 BCP: 30 MV/m
AC113 BCP: 27 MV/m
AC114 BCP: 27-29 MV/m

- First tests after EP result in disastrous results ????

New 6th production

- 2 fine grain cavities testes up to now

1) AC115 w full EP treatment: 39 MV/m
quench located off equator

2) AC117 w long EP and final 18µm BCP: max. 31 MV/m w/o quench
last 27 MV/m w strong FE
(no T-maps)

- AC115: impressive qualification of Plansee/Heraeus Nb (exceeds single-cell results)