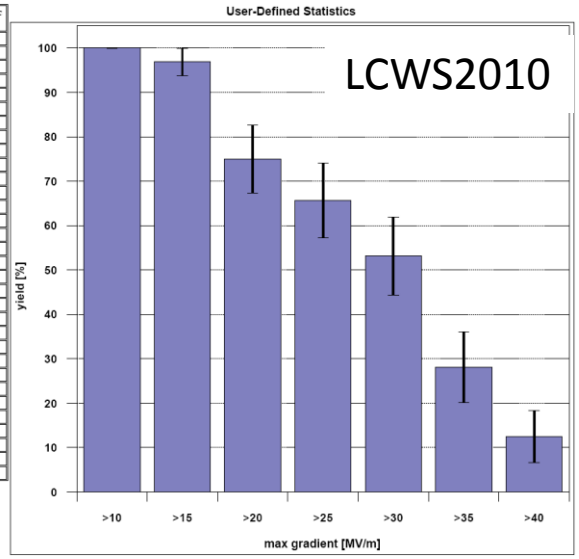
ILC Cavity Performance Evaluation TDP/R&D plan (Rel-5) and BAW-1

Originally reported by
C.M. Ginsburg
On behalf of the ILC Database Group
At SCRF WebEx meeting, June 20, 2010, and

A few slides added by
A.Yamamoto
For SCRF WebEx Meeting
July 28, 2010

1st pass

No.	Cavity	Test Date	Max. Eacc [MV/m]
1	TB9ACC013	01.Dec.08	41.80
2	TB9ACC014	09.Feb.09	41.50
3	TB9AES008	26.Aug.09	41.10
4	TB9AES007	16.Mar.10	41.00
5	AC122	26.Aug.08	38.88
6	AC115	11.Dec.07	38.60
7	TB9AES010	06.Nov.09	37.70
8	TB9ACC011	21.Aug.08	37.00
9	TB9ACC012	07.Jul.08	35.10
10	Z134	13.Nov.09	34.94
11	AC125	15.Jun.08	34.59
12	AC150	30.Jan.09	34.33
13	TB9AES009	18.Aug.09	33.40
14	Z143	09.Oct.08	32.57
15	Z106	21.Feb.07	31.70
16	AC127	13.Feb.09	31.25
17	TB9ACC016	14.Dec.09	31.20
18	ACCEL7	05.Sep.06	29.00
19	AC149	28.Jan.09	26.51
20	AC124	05.Feb.09	26.01
21	Z137	24.Feb.09	25.23
22	Z139	12.Sep.08	24.93
23	Z142	01.Jul.09	20.58
24	TB9AES005	27.Mar.09	20.50
25	ACCEL6	12.Dec.06	19.00
26	Z141	16.Apr.08	18.29
27	TB9ACC015	02.Jul.08	18.00
28	Z130	01.Sep.08	17.30
29	Z131	20.Aug.08	17.17
30	Z132	19.Aug.08	16.83
31	AC126	05.Sep.08	16.37
32	TB9AES006	09.Apr.09	14.10



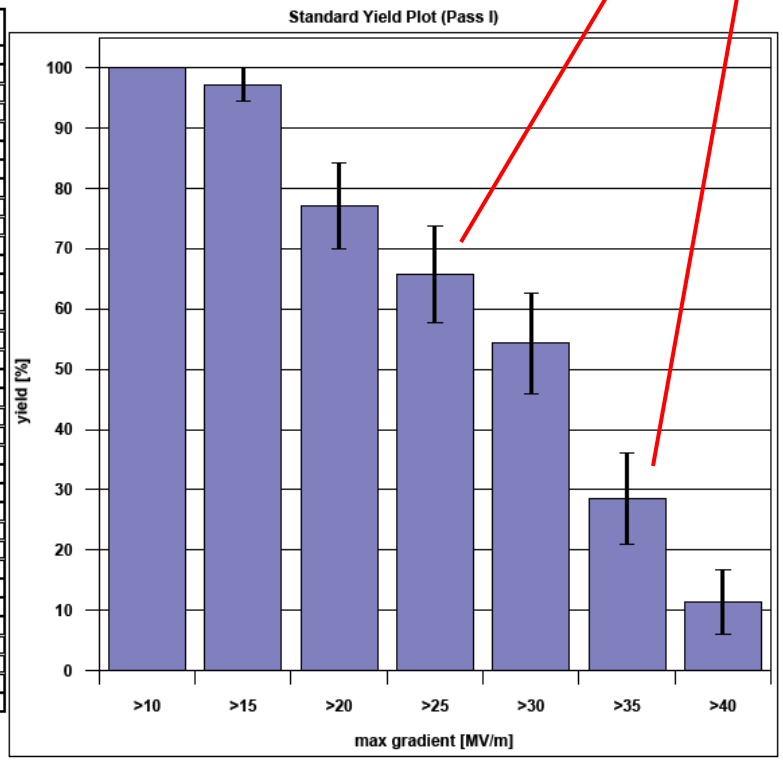
First-pass cavity yield at >25 MV/m is (66 +- 8) %

(66 +- 8) %

>35 MV/m is (28 +- 8) %

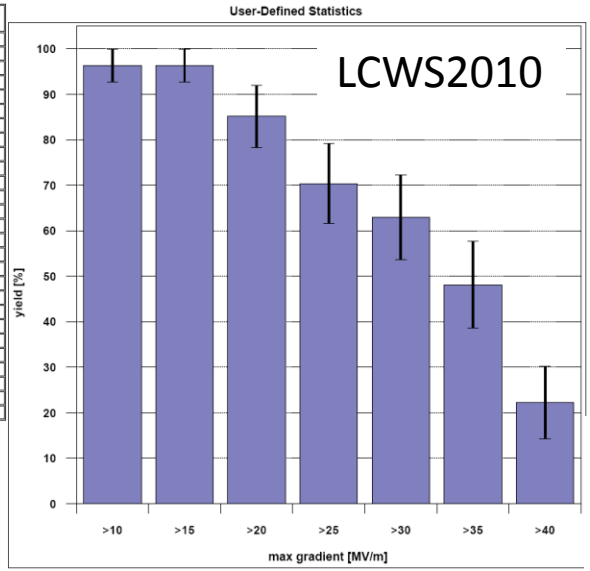
(29 +- 8) %

No.	Cavity	Test Date	Max. Eacc [MV/m]
1	TB9ACC013	01.Dec.08	41.80
2	TB9ACC014	09.Feb.09	41.50
3	TB9AES008	26.Aug.09	41.10
4	TB9AES007	16.Mar.10	41.00
5	AC122	26.Aug.08	38.88
6	AC115	11.Dec.07	38.60
7	TB9RI019	11.Jun.10	38.00
8	TB9AES010	06.Nov.09	37.70
9	TB9ACC011	21.Aug.08	37.00
10	TB9ACC012	07.Jul.08	35.10
11	Z134	13.Nov.09	34.94
12	AC125	15.Jun.08	34.59
13	AC150	30.Jan.09	34.33
14	TB9AES009	18.Aug.09	33.40
15	TB9RI018	15.Apr.10	33.10
16	Z143	09.Oct.08	32.57
17	Z106	21.Feb.07	31.70
18	AC127	13.Feb.09	31.25
19	TB9ACC016	14.Dec.09	31.20
20	ACCEL7	05.Sep.06	29.00
21	AC149	28.Jan.09	26.51
22	AC124	05.Feb.09	26.01
23	Z137	24.Feb.09	25.23
24	Z139	12.Sep.08	24.93
25	AC146	06.May.10	23.63
26	Z142	01.Jul.09	20.58
27	TB9AES005	27.Mar.09	20.50
28	ACCEL6	12.Dec.06	19.00
29	Z141	16.Apr.08	18.29
30	TB9ACC015	02.Jul.08	18.00
31	Z130	01.Sep.08	17.30
32	Z131	20.Aug.08	17.17
33	Z132	19.Aug.08	16.83
34	AC126	05.Sep.08	16.37
35	TB9AES006	09.Apr.09	14.10



2nd pass

No.	Cavity	Test Date	Max. Eacc [MV/m]
1	TB9ACC013	01.Dec.08	41.80
2	TB9ACC014	09.Feb.09	41.50
3	ACCEL7	18.Jan.07	41.20
4	TB9AES008	26.Aug.09	41.10
5	Z143	12.Nov.08	41.00
6	TB9AES007	16.Mar.10	41.00
7	TB9ACC016	11.Feb.10	39.30
8	AC122	26.Aug.08	38.88
9	AC115	11.Dec.07	38.60
10	TB9AES010	06.Nov.09	37.70
11	TB9ACC011	21.Aug.08	37.00
12	TB9AES009	07.Oct.09	36.00
13	TB9ACC012	07.Jul.08	35.10
14	AC150	08.May.09	33.23
15	Z139	20.Oct.08	32.75
16	Z106	27.Feb.07	31.50
17	AC124	19.May.09	30.93
18	ACCEL6	23.Jan.07	29.00
19	AC127	11.Jun.09	27.85
20	AC149	05.May.09	23.27
21	TB9AES006	11.Sep.09	22.20
22	Z141	14.May.08	20.70
23	TB9AES005	09.Apr.09	20.50
24	TB9ACC015	14.Jul.08	19.00
25	Z131	25.Nov.08	17.96
26	Z130	15.Oct.08	16.60
27	AC126	21.Oct.08	6.14



First-pass cavity yield at >25 MV/m is (70 +- 9) %

(74 +- 8) %

>35 MV/m is (48 +- 10) %

(56 +- 10) %

No.	Cavity	Test Date	Max. Eacc [MV/m]
1	TB9ACC013	01.Dec.08	41.80
2	TB9ACC014	09.Feb.09	41.50
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4	TB9AES008	26.Aug.09	41.10
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13	TB9ACC011	21.Aug.08	37.00
14	TB9AES009	07.Oct.09	36.00
15	TB9ACC012	07.Jul.08	35.10
16	AC150	08.May.09	33.23
17	Z139	20.Oct.08	32.75
18	AC124	19.May.09	30.93
19	ACCEL6	23.Jan.07	29.00
20	AC127	11.Jun.09	27.85
21	TB9AES006	11.Sep.09	22.20
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23	TB9AES005	09.Apr.09	20.50
24	TB9ACC015	14.Jul.08	19.00
25	Z131	25.Nov.08	17.96
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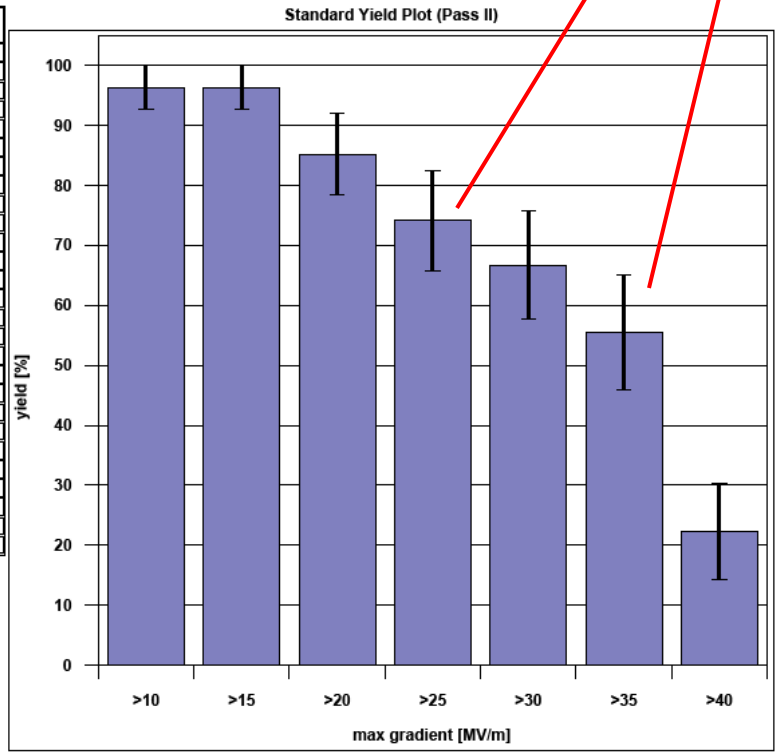
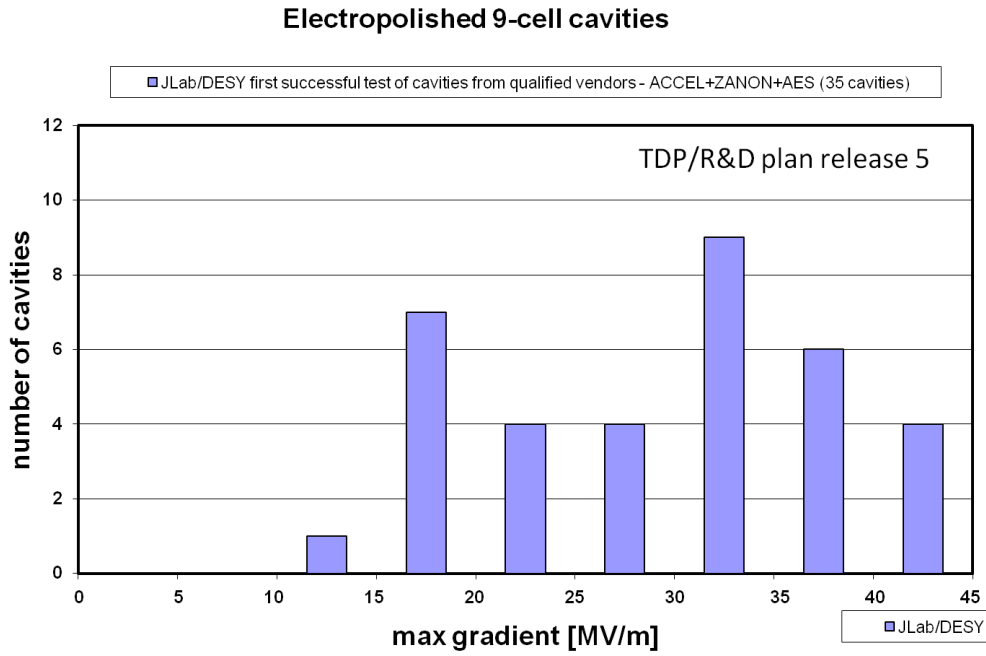
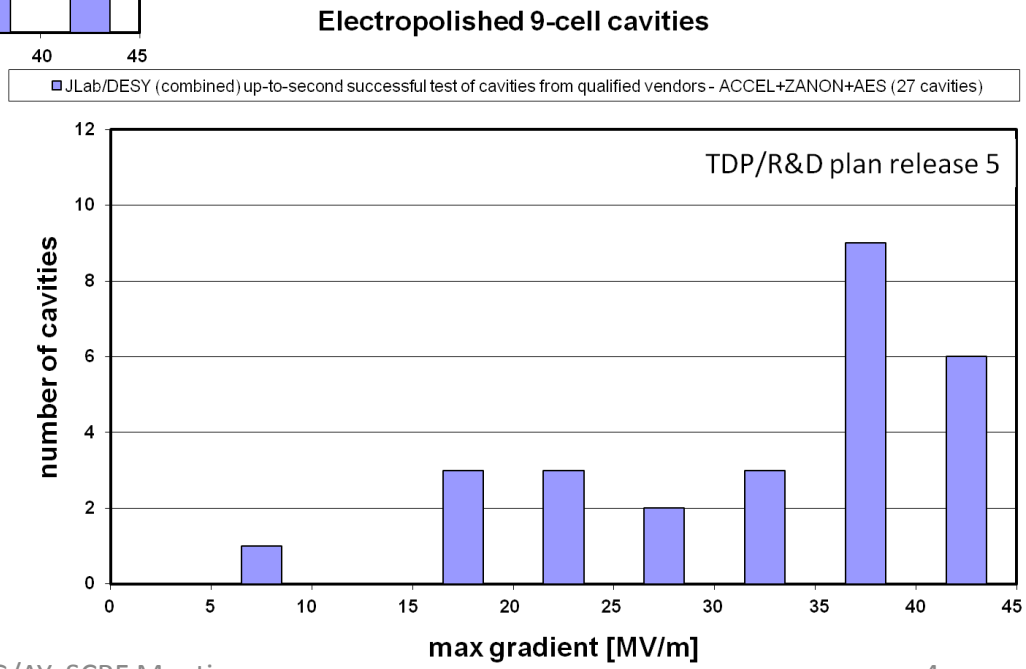
27	AC126	21.Oct.08	6.14

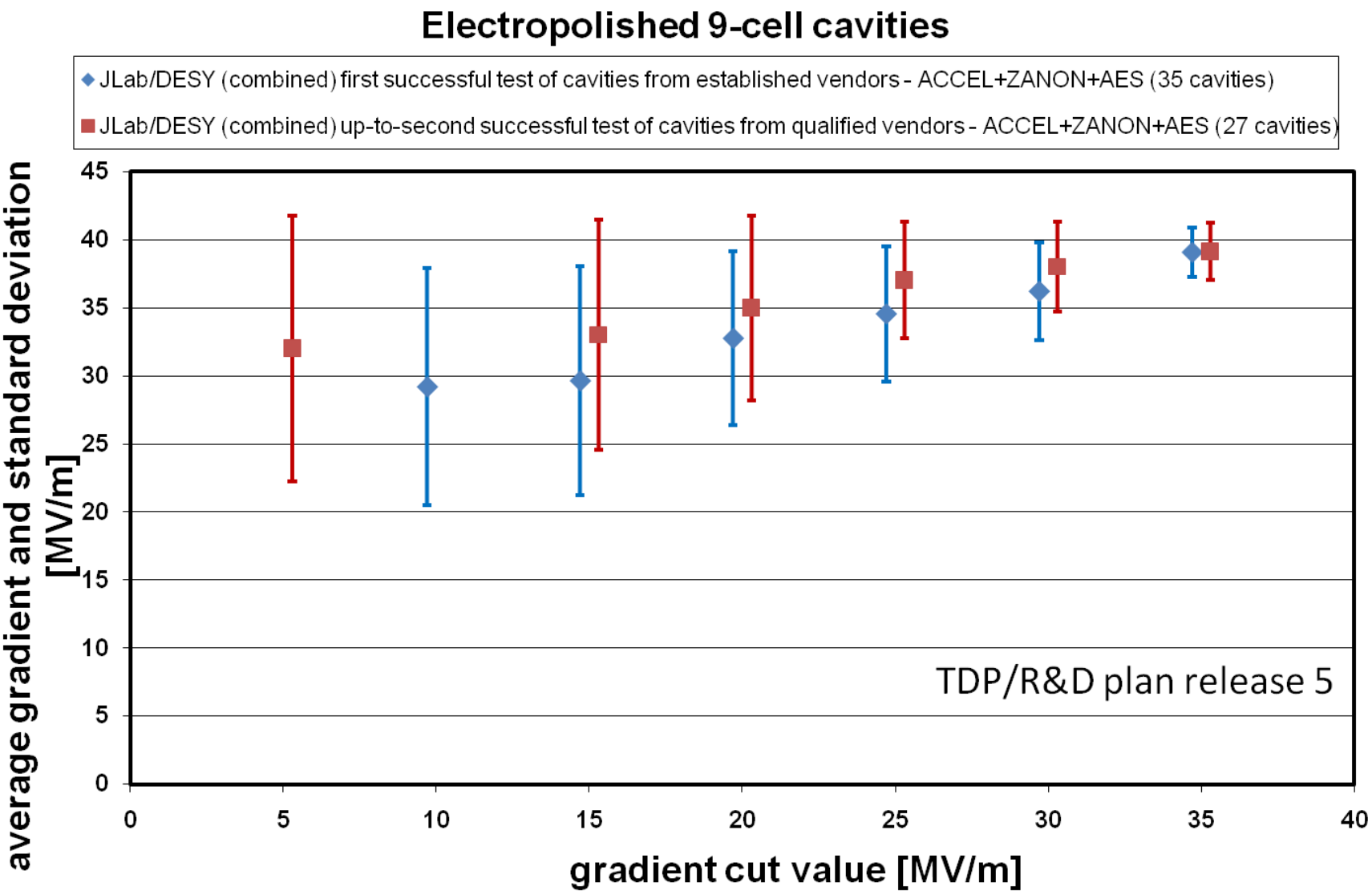


More plots for the document





More plots for the document



Comments on the plots

- In LCWS2010 plots, two cavity tests were mistakenly included in the 2nd pass plots which shouldn't have been
  - Z106 and AC149 had no surface treatment in between 1st and falsely-labeled 2nd passes
  - automation is an excellent thing
- For TDP/R&D plan release 5, three additional new cavities are included: TB9RI018 and TB9RI019 from JLab (1st and 2nd pass plots, but see note below), and AC146 from DESY (1st pass only)
  - 35 cavities for 1st pass, 27 cavities for 2nd pass
- Within the database group we are discussing how best to include one of the cavities (TB9RI018)
  - The standard EP process at JLab was known to have poor temperature stability, suspect water introduced in the acid mixture during mixing; Rongli specified "do not include"
    - "Do not include" normally means system limitation implies could not determine cavity limitation from test, and test to be repeated w/o additional surface preparation
    - If process was non-standard, the cavity would not be included in any plots
      - Problem in standard process, not new process
      - From R&D perspective, it is interesting to have the cause and effect of such a deviation from normal performance understood
    - From an earlier email exchange, I believe Rongli wants this cavity included in the plots
    - Opinion from the database group is mixed, and clearly Rongli's specific input is needed
  - Next steps
    - I changed the status in the database to "include" for the purposes of making the plots in this talk, then changed it back
    - The contributing institution specifies the "include" flag, therefore this requires Rongli's confirmation about the preferred specification of the cavity in the database

Further To Do List for BAW-1

- The key issues to address for the cavity performance evaluation are:
  - Reduction in the horizontal bin size, if justified by the gradient measurement error
  - Cavity performance tracks/changes from vertical test to horizontal test to cryomodule test in current data samples
  - Cavity performance evaluation to be extended to 3rd pass process, if a sufficiently useful data set become available
  - Radiation emission to be added as further quantitative evaluation of the cavity performance.
- The primary tasks planned for completion by September 2010 are:
  - To create a standard plot tracking cavity performance for new vendors if there are new data available.
  - To study Q_0 at the 31.5 MV/m operating gradient and Q_0 at the 35 MV/m vertical qualification gradient for data in the first- and second-pass data selections, for cavities which reach these gradients. This requires the adoption of a common algorithm to interpolate between measurements. As a later step, we will include this information in the ILC database.
  - To evaluate annual progress of the maximum field gradient, at least, at the first-pass evaluation, which can be widely and easily applied to cavity production in various projects (e.g. XFEL, Project-X) in a consistent fashion with the ILC R&D cavities.