SCRF Monthly WebEx Meeting
June, 1, 2011

1. Report from PMs (15 min.)
   1. GDE SCRF related meeting plan in 2011~2012 (PMs)
   2. Report from ILC-PAC (M.R.)
   3. Progress in PMs visiting industrial partners (A. Y.)
   4. Plan for the workshop on SCRF Cavity Technology and Industrialization (JK/AY)
2. Report from TA Group Leaders
   1. Cavity Gradient R&D: R. Geng
   2. Cavity Integration: H. Hayano
   3. Cryomodule: P. Pierini
   4. Cryogenics: T. Peterson
   5. HLRF: S. Fukuda & C. Nantista
   6. ML Integration: C. Adolphsen
3. Special Discussions (30 min.)
   1. Proposal for S1-Global progress report and discussion in TTC, Beijing, December (AY)
   2. TD Report Plan (to focus on the HLRF/DRFS and some others, today) (SF) .
   3. Plan for SCRF session in LCWS-11, Granada, Spain, Sept. 25 – 29 (JK/AY)

Meeting Schedule related to SCRF (2011~)

Month	Day	Place	Meeting
2011 May	4 →6 19-20	Web Taipei	Monthly meeting ILC-PAC (SCRF: R&D report by R. G. and H.H.; Industrialization by A.Y.)
June	1 6-8 29	Web DESY Web	Monthly meeting FLASH-9mA workshop Monthly meeting
July	24 27	Chicago Web	Cavity industrialization WS, as a satellite meeting of SRF2011 (25~29) Monthly meeting
August	24	Web	Monthly meeting
Sept.	5-9 21 26-30	San Sebastian Web Gradana	IPAC-2011 Monthly meeting WWS-GDE (ILC-CLIC collab.) meeting
Oct.	19	Web	Monthly meeting
Nov.	14-15 16	Prague Web	UKC-PAC Monthly meeting
Dec.	5-8 14	Beijing Web	TTC meeting Monthly meeting
2012, Jan.	11 18 19-20	Web KEK KEK	Monthly meeting S1-Global Workshop (proposed) SCRF TDR Preparation Review & WS
Feb.	8	Web	Monthly meeting

Visiting Companies in Progress

	Date	Company	Place	Technical sbject
1	2/8	**Hitachi**	Tokyo (JP)	Cavity/Cryomodule
2	2/8	**Toshiba**	Yokohana (JP)	Cavity/Cryomodule, SCM
3	2/9	**MHI**	Kobe (JP)	Cavity / Cryomodule
4	2/9	**Tokyo Denkai**	Tokyo (JP)	Material (Nb)
5	2/18	**OTIC**	NingXia (CN)	Material (Nb, NbTi, Ti)
6	3/3	**Zanon**	Via Vicenza (IT)	Cavity/Cryomodule
7	3/4	**RI**	Koeln (DE)	Cavity
8	3/14, (4/8)	**AES**	Medford, NY (US)	Cavity
9	3/15, (4/7)	**Niowave**	Lansing, MI (US)	Cavity/Cryomodule
10	4/6	**PAVAC**	Vancouver (CA)	Cavity
11	4/25	**ATI Wah-Chang**	Albany, OR (US)	Material (Nb, Nb-Ti, Ti)
12	4/27	**Plansee**	Ruette (AS)	Material (Nb, Nb-Ti, Ti)
13	5/24	**SDMS**	Sr. Romans (FR)	Cavity
14	7/6	**Heraeus**	Hanau (DE)	Material (Nb, Nb-Ti, Ti)

Integration of the Information through Communication with Industry

(updated, 2011-3-3)

- 1st cycle (by April 2011):
  - GDE visits industrial partners to explain ‘request of information’, in Feb. ~ April, 2011
  - GDE expects responses from industrial partners, by the end of April, 2011
- 2nd cycle (by July 2011):
  - GDE individually communicate with the industrial partner, and propose some ways of cost-effective approaches,
  - GDE expect their responses and evaluation,
- 3rd cycle (by November 2011):
  - GDE scopes the cost estimate up date.

The 2nd workshop on SCRF

Technology and Industrialization for the ILC

as a satellite meeting of SRF 2011

- Date: July 24, 2011
- Place: Chicago
- Agenda:
  - Introduction
  - Reports from SCRF cavity/cryomodule industry
  - Reports from SC material vendor
  - Comments from Regional Hub-laboratory
  - Discussions on the ILC SCRF industrialization model
- Note:
  - Open for everybody,
  - Industrial participation anticipated

ILC-PAC, Taipei, May, 2011

- SCRF TA report requested:
  - SCRF Cavity and System R&D
    - Cavity Gradient : Rongli Geng
    - Cavity Integration and Test: Hitoshi Hayano
  - SCRF Industrialization
    - Progress in visiting Companies: Akira Yamamoto
    - Cost estimate update
    - Further plan
- Some notes from M. Ross >>> next page

RF Unit testing – post 2012

- **CM2-4 (or CM1-3) in NML make up the ILC 3 CM RF unit test. While this test will not be finished before the end of the TDP in late 2012, we intend to complete it in the two years following.**
- **We have two baseline HLRF schemes and a backup which is based on the RDR. The KCS and RDR schemes retain the 3 CM RF unit from point of view of the power distribution system and the LLRF controls.**

PAC Review, 19-20 May

- **In the recent Pac review, the committee stressed the S1 Global cryomodule gradient and tuner performance.**
  - This was a concern.
  - The committee asked for a work-plan to address these shortcomings and failures
- **The NML 3 CM ILC RF unit test will be the concluding step of the work-plan**

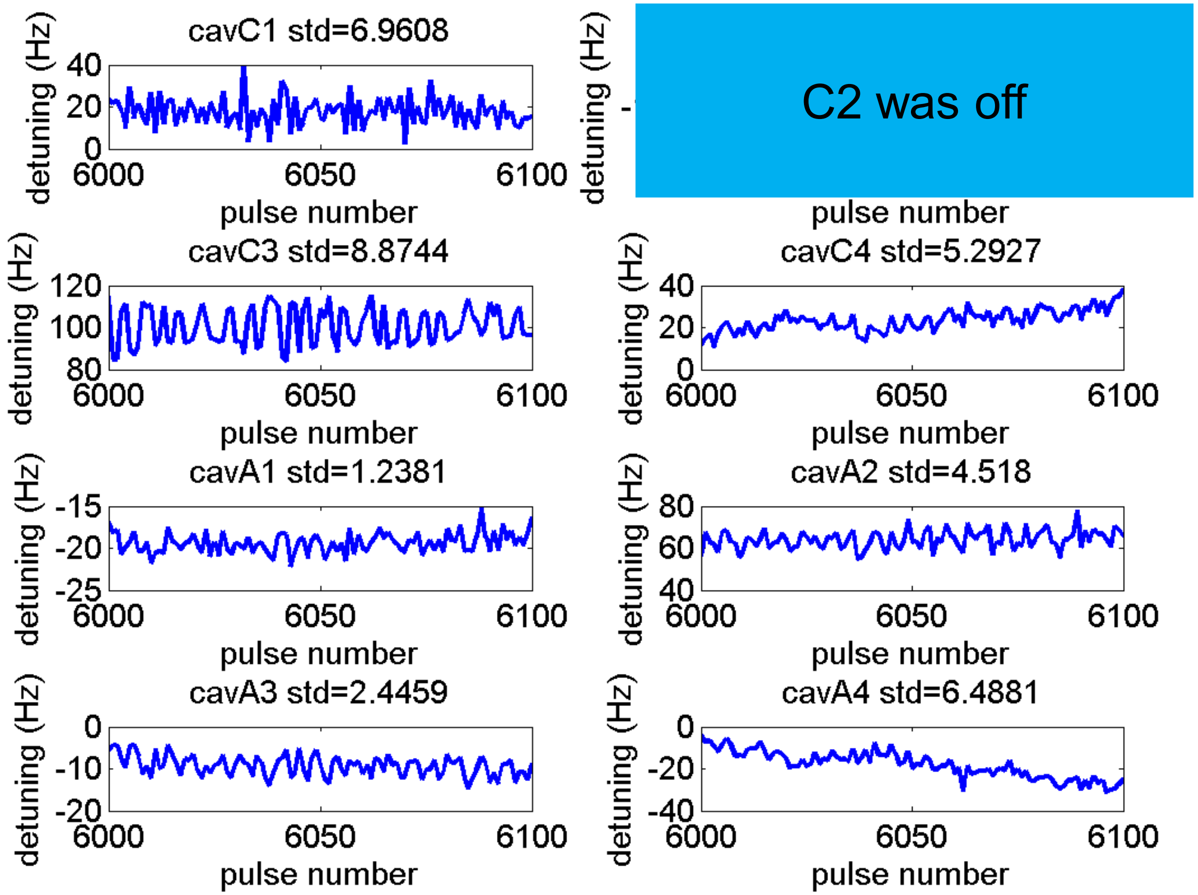
RF Unit testing – post 2012

- **Recent results from Flash, CM1 and S1 Global show the importance of having a number of cavities to control in parallel.**
  - From Flash, we are finding the precision needed to preset Q_ext – albeit at low gradient.
  - From CM1, we see substantial heat loss without quench and some signs of vibration.
  - From S1 Global we see how vector sum regulation can become unbalanced because of a single unstable low gradient cavity. Regulation still works but is not optimum.

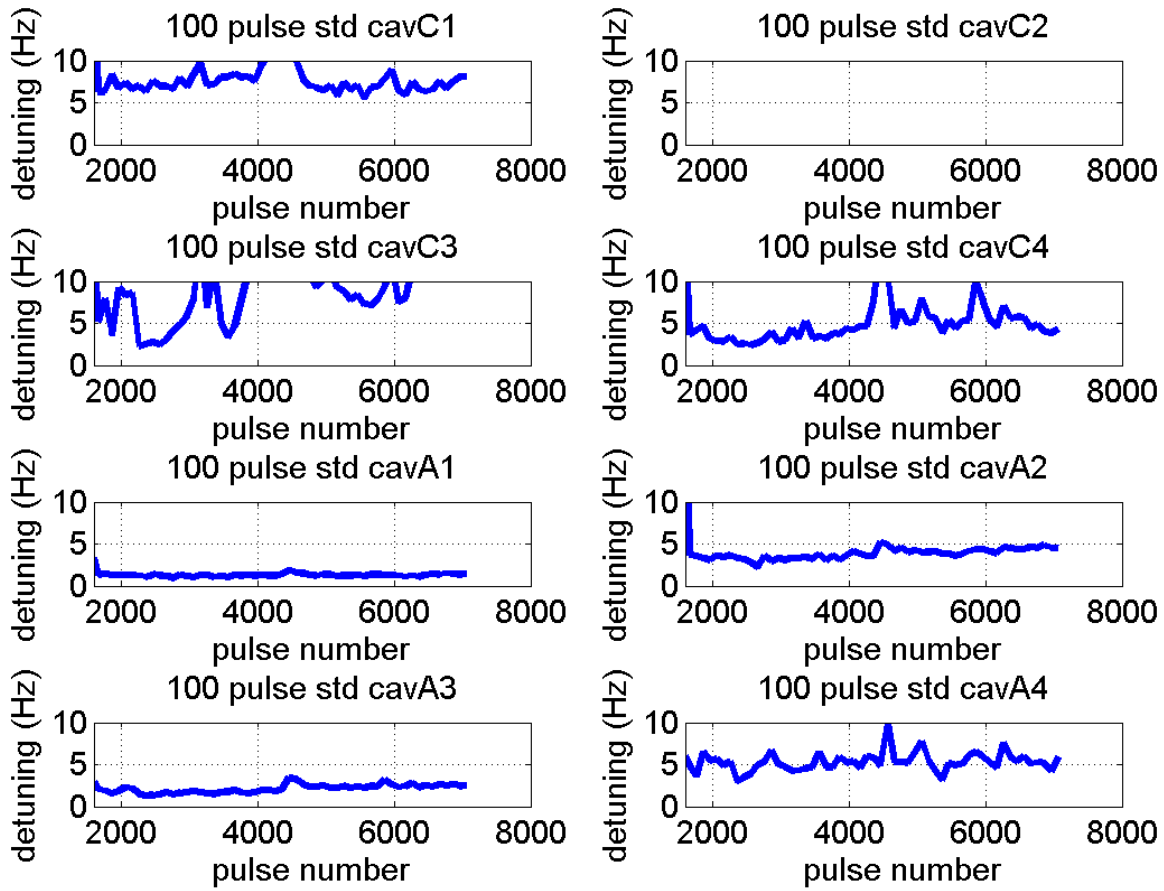
RF Unit testing – post 2012

- **From S1Global and CM1 we have seen 4 different types of detuning behavior.**
-

Detuning – closeup (6000-6100)



Cavity detuning, as estimated using the code “analysis_8cav_cPCI2” for S1Global baseline pulses numbered 6000 to 6100 in the 7195 pulse data sample recorded 15 December, 2010. (Cavity C2 was off.) The standard deviation of the estimated detuning for the 100 pulses is shown for each cavity. Note that the apparent detuning of each cavity appears to be uncorrelated. There also appears to be different characteristic frequencies – note the differences between the data for C1, C3, C4 and A4. The average detuning for the A cavities is 3.7 (±2.3) Hz and the average detuning for the three C cavities is 7.0 (±1.8) Hz.


100 pulse std cavC1
100 pulse std cavC2
100 pulse std cavC3
100 pulse std cavC4
100 pulse std cavA1
100 pulse std cavA2
100 pulse std cavA3
100 pulse std cavA4
detuning (Hz)
pulse number
10
5
0
2000
4000
6000
8000

Subjects to be discussed on SCRF

at Joint ILC-CLIC Meeting

Gradana, Sept. 25^29, 2011

- TDR preparation
  - Progress reports, and further discussions
    - Sub-section writers/editors' participation anticipated
    - Contents to be discussed, today
    - Interim process to prepare for the SCRF TDR preparation review to be held at KEK on Jan. 19 – 20.
- SCRF R&D
  - Progress of TDP R&D
  - R&D Plan for 1 TeV upgrade

SCRF Parallel Session and Subjects to be discussed

1. TD report preparation

- Part-1:
- 1) 9-cell cavity Gradient R&D progress to meet requirement for TDR
- 2) Cavity-string R&D progress
- 3) SCRF accelerator test facility progress with FLASH
- 4) SCRF cavity and cryomodule industrialization technology and industrialization models.
- Part-2:
- 1) ML Accelerator design
  including beam dynamics, alignment tolerance, tracking tune-ability with steering,
- Part 3:
- 1) Future prospect toward 1 TeV with cost-effective ways
  including cavity gradient and Q0 improvement, and cost-effective fabrication technology

2. Special technical topics (preparation for TTC WG)

- 1) S1-Global results and analysis
- 2) NML status and plan
- 3) PXFEL progress and analysis
- 4) Cavity-string gradient degradation issues,

Agenda for WWS-GDE Meeting, Granada, September, 26- 30, 2011

- Day 1:
  - Plenaries--PMs baseline design after BAWs
  - Task leader summaries of current status, description of chapters of TDR, parameters as they know them, needs. up to 1 hour each.
  - They could start by reading the RDR and associated cost estimate and talking about what has been changed, improved, etc.
- Day 2; 3; 1/2 day 4
  - Small working groups on text, discussions on interfaces, discussion of machine design parameters that are falling through the cracks or things that need to be drawn up in following 6 months.
  - Preliminary inputs to cost chapter. Agreement on models to be used for production. Maybe a couple of talks on system tests as they educate the technical portions of the text.
  - These could be done in a small group settings, or via webex. Creation of decent outline for TDR. Placeholders for figures, etc.
- Day 5:
  - summary; plenaries as required.

Technical Update in ML and SCRF RDR to TDR

Sybhect	RDR	TDR
ML Integration	Twin tunnel 5 Hz operation 31.5 MV/m (fixed)	Single tunnel 10 Hz –alternate operation 31.5 MV/m +/-20%
Cavity	35 MV/m with yield 80 %	Yield plot evaluation R&D goal: 35 MV/m at 90% Production :35 +/-20% spread
Cavity Integration		Plug compatible design Mag. shield inside (proposed) Industrialization
Cryomodule	w/ 5 K shield Quadrupole w/ LHe cooling	w/o 5 K bottom-shield (proposed) Conduction-cooled magnet
Cryogenics		
HLRF / LLRF	RDR/RF-unit configuration	KCS or DRFS configuration RDR RF Backup option
1 TeV path		Alternate shape (LL) Hydro-forming, Large-grain

Proposal for S1-Global Progress Report and Discussions in TTC meeting

- to organize a one-day full working group dedicated to cryomodule and cavity-string assembly test

- including S1-Global, NML, and PXFEL cavity-string test specially focuding on cavity gradient degradation, tuner, and coupler issues, in a part of TTC, and

- to organize a separate one day meeting (may be one afternoon (12/8) and one morning (12/9) in the folloiwing day
- to discuss specific ILC-GDE oriented issues, (such as what should be our baseline in TDR).

- As a further possibility, we may include HLRF and LLRF issues related to S1-Global in the separate meeting

  (because of the limited time in the TTC meeting).

backup

RDR to TDR

- Re-visit of SCRF in RDR
  - Outline and contents

- Plan proposed for SCRF in TDR
  - Chapter 1: TD Phase R&D
  - Chapter 2: RDP Reference Accelerator Design

Main Linac and SCRF in RDR

Chapter	Contents
1. Overview	1,1 Introduction 1.2 Superconducting RF (3 pages) 1.3 The ILC baseline design 1.3.6 Main Linac (3 pages)
2. Acc. Description	2.6 Main Linac (10 pages) 2.6.1 Overview 2.6.2 Beam parameters 2.6.3 System description 2.6.4 Accelerator physics issue 2.6.5 Accelerator components
3. Technical Systems	3.4 Klystrons (4) 3.5 RF distribution (4) 3.6 Cavities (8) 3.7 Cryomodules (5) 3.8 Cryogenic systems (7) 3.9 Low level RF controls (7) 2.10 Instrumentation (9)
4. CF & Siting …	

1. Overviews

Section		
1.2 SCRF		- Cavity and cryomodule outlook - Cavity gradient (Q vs G) status - Cavity assembly and preparation process
1.3 ILC Baseline design	1.3.6 Main Linac	- Functional requirements - System description -Challenges

2. Accelerator Descriptions

2.6 Main Linac	1. Overview	
	2. Beam parameters	-Nominal beam parameters (table)
	3. System description	-RF unit (RF unit figure/table, Cryomodule cross s) -Linac layout
	4. Accelerator physics issue	-Optics -Beam dynamics -Operation
	5. Accelerator components	-Cavities and Cryomodule -Quad package -Vacuum system -Beamline components (table)

3. Technical Systems (3.4, 3.5)

3.4 Klystrons	1. Overview	
	2. Technical description	-L-band klystron -Damping ring klystron
	3. Technical issue	-L-band klystrons
	4. Cost estimation	
	5. Components	(1.3 GHz, 650 MHz klystron table)
3.5 RF Distribution	1. Overview	
	2. Technical description	-RF unit diagram -Wave guide circuit configuration
	3. Technical Issues	-Wave gude -Tap-offs, curculators, and tuners
	4. Cost estimation	
	5. Components	- Components table

3. Technical Systems (3.6, 3.7)

3.6 Cavities	1. Overview	
	2. Technical description	-Cavity design -Cavity fabrication (design parameters) -Cavity processing -Peripheral components -Cavity performance requirements -Alternative cavity designs
3.7 Cryomodules	1. Overview	
	2. Technical description	- Cross section figure
	3. Technical issues	-The cryomodule -- structual description, heat-load table -Quadrupole/corrector/BPM package -Damping ring and beam delivery CMs -Shipping of cryomodule
	4. Cost estimateion	
	5. Table of CM types	

3. Technical Systems (3.8)

3.8 Cryogenics Systems	1. Overview	-overall cryogenics layout
	2. Technical Issues	-Cryogenic system definition -Cryogenic cooling scheme for ML -- Cooling scheme of a cryo-string -- Length and ypical arrangement -- Two-phase helium flow w/ slope - LHe management in 1.3 GHz modules -Sources, DR, BDS system -Heat load and cryogenic plan power -- ML heat load and cryo-plant size -- DR cryogenics -- ILC cryogenic plant size - He inventory (relative He-mass chart)
	3. Cost estimation	

3. Technical Systems (3.9, 3.10)

3.9 LLRF Control	1. 0verview	
	2, Technical Description	- Tolerance of phase & amplitude control
	3. Technical Issues	-Harware architecture -Digital technologies -Sofware architecture
	4. Components	
3.10 Instrum.	1. Overview	
	2. Technical description	-Beam position monitor -Beam profile monitors -Beam current monitors -Beam phase monitors -Beam loss monitors -Beam feedback systems
	3. Technical issues	-Feedback harware -Layout
	4. Cost est. methodology	
	5. Table of components	

TDR Part 1: RD Phase R&D

- Focus on TD Phase R&D (progress)
  - An extension/update of Int. Report (IR), but more conclusive
  - The basis of the technical decisions of the design baseline described in Chapter 2
    - Introduction/Overview
    - **SCRF technology**
    - Accelerator systems (CESR-TA, ATF)
    - Concluding (or scummary)
    -
  - **SCRF Technology**
    - Cavity gradient (R. Geng)
    - Cavity integration (H. Hayano)
    - Cavity-String/cryomodule integration
      - >> S1 Global, NML, (H. Hayano/E.Kako, somone(FNAL)
    - SC accelerator system test >> FLASH (J. Carwardine)
    - SCRF Infrastructure/facility development (each lab.)

TDR Part 2: ILC Accelerator Design

- Focus on Accelerator Reference Design
  - Equivalent (replacement) for the RDR,
    - No significant change from RDR, but be updated
  - Accelerator system oriented description,
    - Relevant technical components be dealt with in each specific section, with better order.

      1. Introduction
      2. Overciw, layout and parameters
      3. Main Linac
      4. Sources
      5. Damping Rings
      6. RTML / bunch compressors
      7. BDS/MDI
      8.CFS
      9. TeV upgrade path

- **Main Linac**
  - Linac acc. Design
    - beam dynamics , alignment, (K. Kubo, C. Adolphsen)
  - SCRF Cavity/Cryomodule
    - Cavity and Cavity Integration (R. Geng, H. Hayano)
    - Cryomodule (P. Pierini)
    - Magnet (TBD)
    - Instrumentation (H. Hayano, P. Perini)
  - Cryognenics (T. Peterson)
  - HLRF and LLRF (S. Fukuda/C. Nantista, S. Michizono)
  - ML Integration (C. Adolphsen)