

# What's been Achieved and What's to be Done

K. Yokoya

2012.12.20 ILC Annual Meeting

# Completion of “Final Draft” of TDR

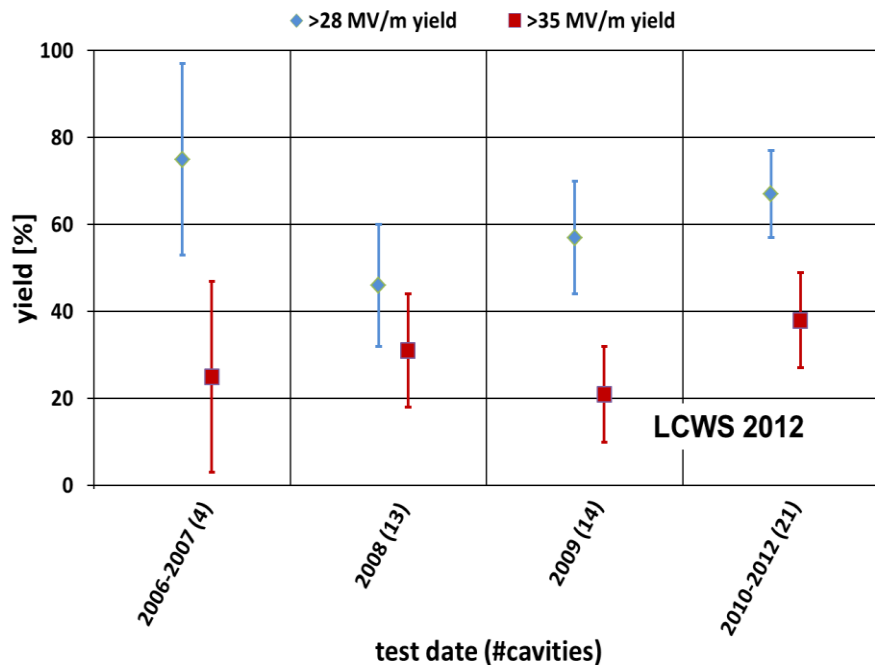
- Internal cost review, Nov.13-14, FNAL
- PAC review, Dec.13-14, KEK
- Hand-over ceremony, Dec.15, Tokyo
- External cost review, Feb.6-7, London
- Last ILCSC, Feb.21-22, TRIUMF

# Cavity Gradient

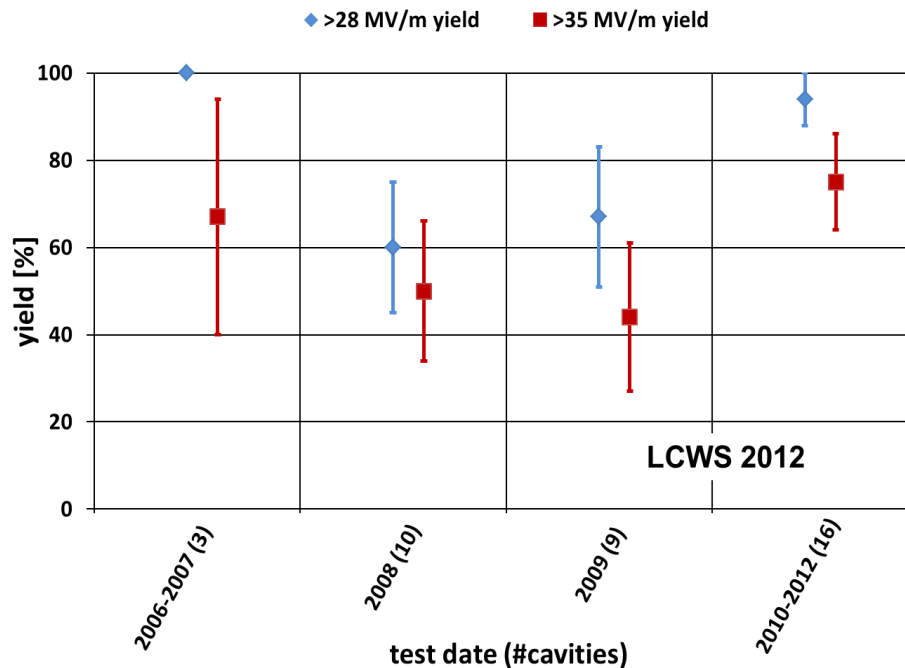
- Cavity Gradient
  - Specification in TDR
    - Vertical test 31.5MV/m +/- 20%,
    - i.e., > 28MV/m
    - yield > 90% by second pass
  - Achieved
    - 94%
    - average 37.1MV/m
- Operating Gradient
  - Specification in TDR 31.5MV/m +/- 20% (25.2—37.8)

# Cavity Gradient: Production Yield, Yearly Progress

1st pass yield - established vendors, standard process



2nd pass yield - established vendors, standard process

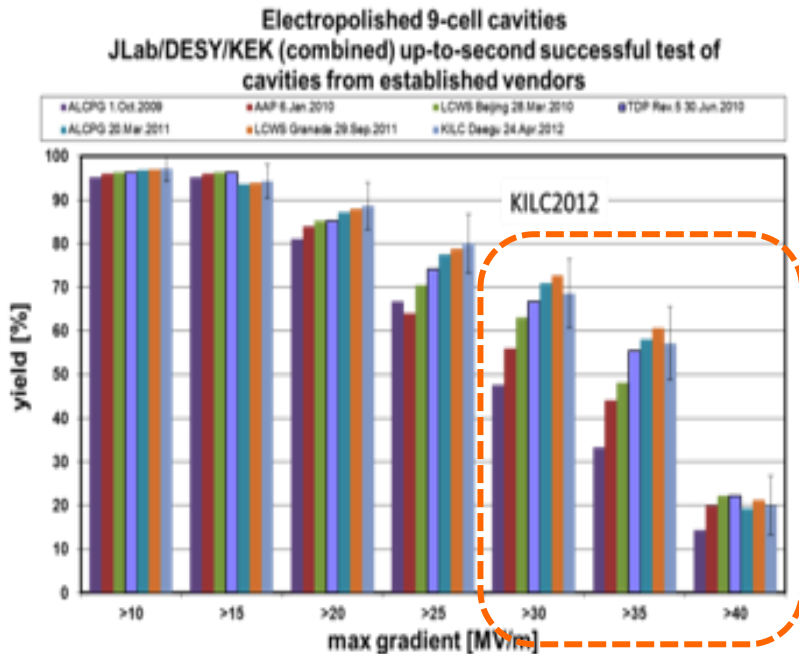


Year 2010 - 2012	1 <sup>st</sup> cycle	2 <sup>nd</sup> cycle
G ≥ 28 MV/m	67 (+/-10) %	94 (+/-6) %
G ≥ 35 MV/m	38 (+/-11) %	75 (+/-11) %
<G> above 28 MV/m	35.1 MV/m	37.1 MV/m

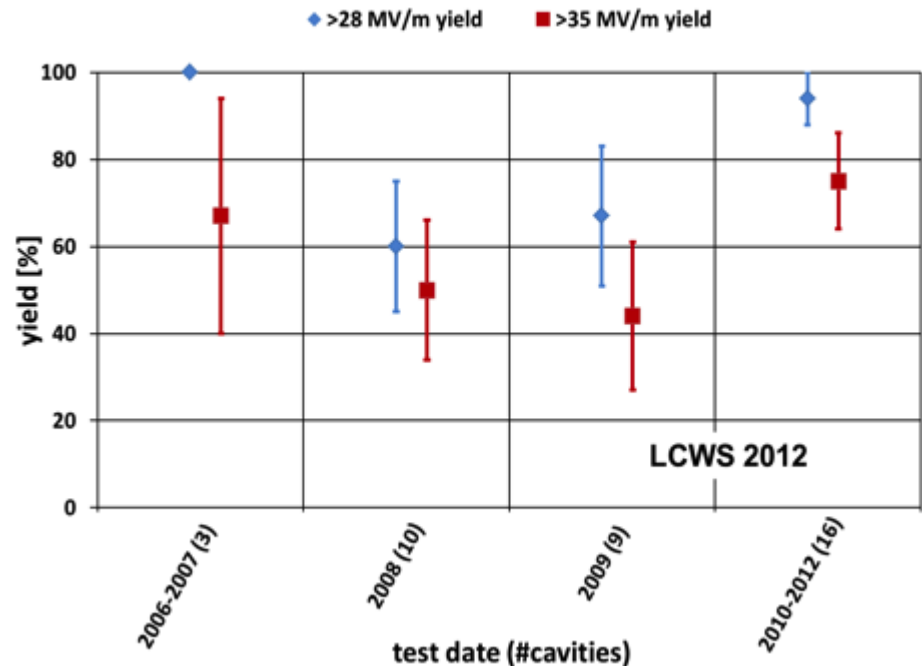
# Cavity Gradient:

## Production Yield Progress since 2006

2012.12.13 A.Yamamoto



2nd pass yield - established vendors, standard process

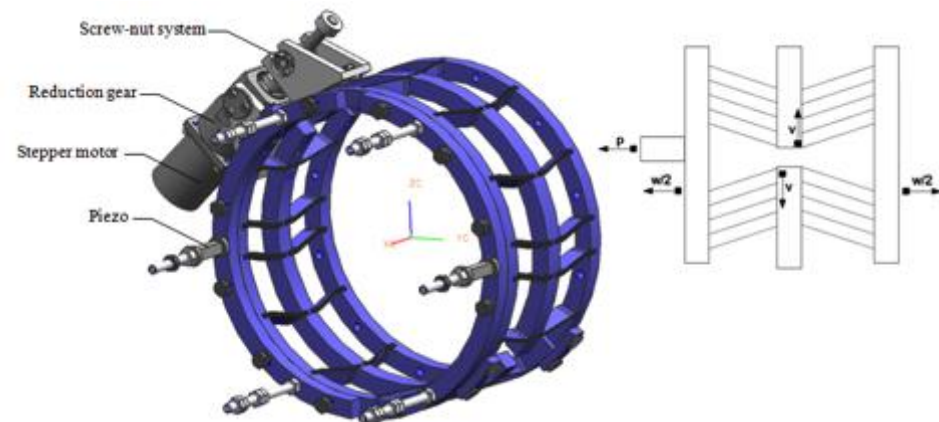


- Integrated statistics since 2006 in 2<sup>nd</sup> pass yield
- Max. gradient achieved: > 45 MV/m

2<sup>nd</sup> pass statistics for 2010 ~ 2012 period:  
Production yield: **94 %** at > 28 MV/m,  
Average gradient: **37.1 MV/m**

# SCRF System Tests

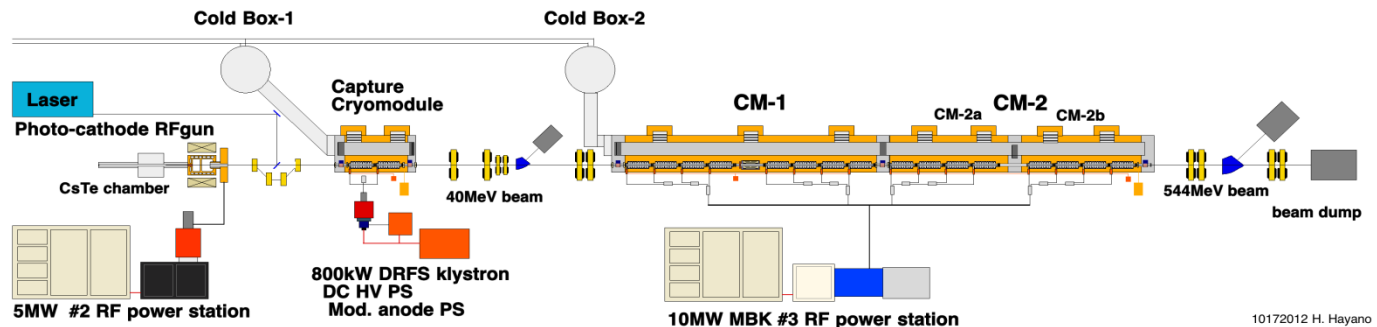
- S1-Global (no beam) in 2010
  - average 25MV/m with 7 cavities
  - stability of vector sum
    - $\Delta V$  0.03%,  $\Delta\phi$  0.0017deg rms
  - plug-compatibility
  - comparison of cavity shape, couplers and tuners
  - TESLA-type, TTF-III, blade tuner chosen because of the cost
  - TESLA-like, STF coupler, slide-jack also satisfy the TDR specifications
- FLASH (with beam)
  - average 32MV/m
  - 9mA in 2009
  - 0.8ms, 4.5mA in 2012
- FNAL
  - CM1 test done
  - CM2 to be done in 2013 (no beam)
- KEK STF
  - Capture cavity + beam (Quantum Beam) in 2012, 1mA
  - CM1 + beam in 2013



# Remaining R&D (SCRF)

- Local repair
  - Study of field emission and radiation
- Japan has to learn and develop
  - TTF-III coupler (STF-II coupler)
  - blade tuner (← slide-jack tuner)
  - These were chosen because of the cost
  - reliability must be examined
- Beam tests
  - STF2
    - CM1 with beam in 2013
    - CM2b included
    - compatibility with ERL design ?

**STF Phase-2 Accelerator Plan**



10172012 H. Hayano

# Industrialization Study

- Cavity fabrication
  - lower cost
- Procurement model
  - hub-labs
  - component tests
  - module tests





# Accelerator Area Systems R&D

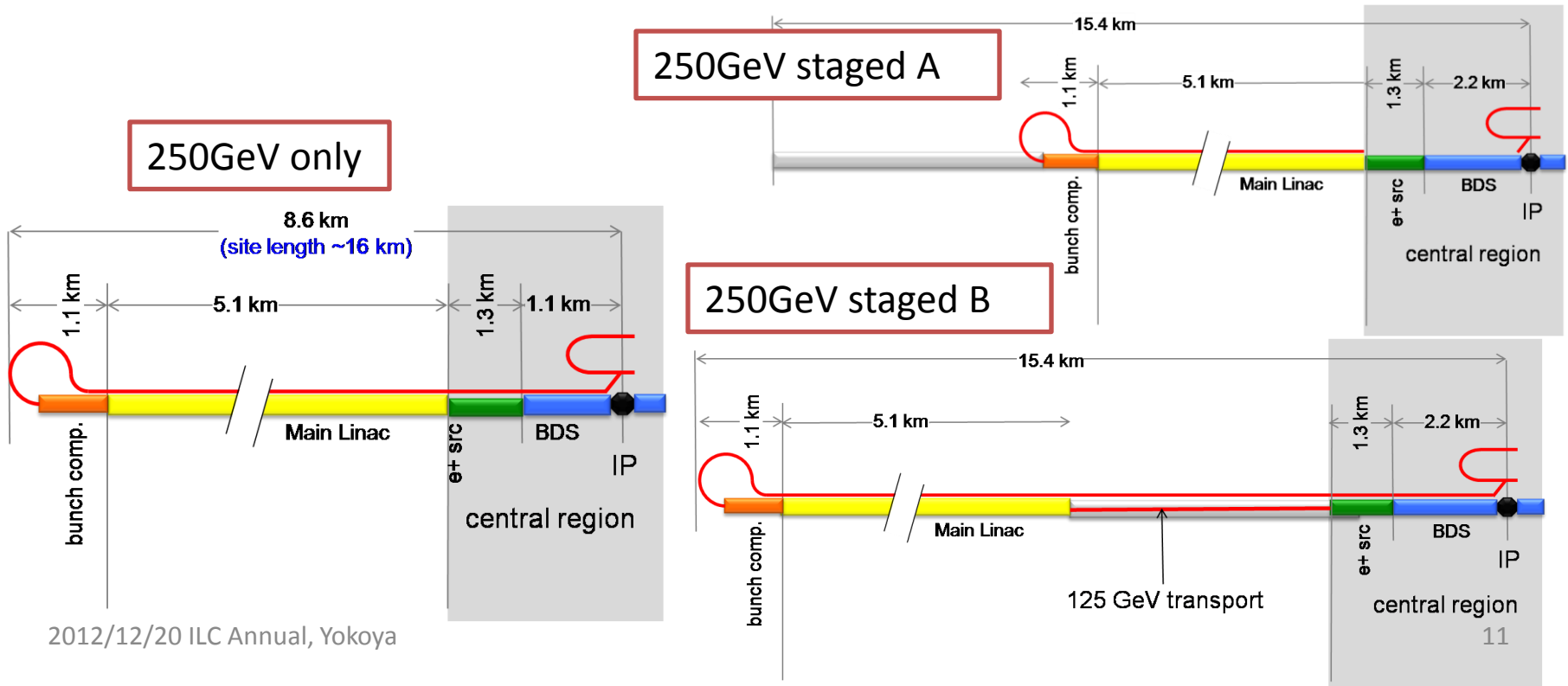
- CsrTA
  - Electron-cloud study by international team
  - Simulation method established based on measurements
  - Mitigation technique proposed and adopted for ILC
- ATF2
  - ~150nm achieved but still on the way
- DR kicker
  - ATF, Frascati, SLAC
- Positron
  - undulator: magnet fabrication, field test
  - target: eddy current study
  - capture: flux concentrator design

# Remaining R&D (other than SCRF)

- Positron
  - Rotating target
    - vacuum seal
    - shock wave on target
  - Flux concentrator
  - photon collimator (upgrade)
  - short-pitch undulator
  - conventional scheme
    - rotating target
    - linac loading compensation
- Fast kicker
  - low impedance
- ATF2
  - Goal 1
  - Goal 2

# Remaining Design Issues

- Staged design
  - optimization of 250GeV machine
- Site-specific design
  - down-selection of site in summer next year
  - CFS
- Engineering design everywhere



# Cost Estimation

- TDR cost will be disclosed soon or later in ILC  
Unit = US\$ 2012 Jan
- Easy to convert it to Yen by going back to the original excel sheet using PPP
- But this is still “VALUE”, not cost
- Cost estimation for Japanese site
  - Funding model (assumption only)
  - how to include ‘contingency’?

# World Next Year

- Europe
  - European Strategy: already ballistic
- US
  - CSS2013: “Snowmass on Mississippi” Jul.29-Aug.6
    - <http://www.snowmass2013.org/tiki-index.php>
  - followed by P5
  - need a ‘white paper report’ from ILC side
- Asia
- Global event
  - Official name: “The International Linear Collider - A World-wide Event - From Design to Reality”
  - June 12, 2013 (almost fixed)
- LC Workshops
  - May 27-31 ECFA at DESY
  - Nov.11-15 LCWS2013 at Tokyo Univ.

# Snowmass Preparation

- Energy Frontier
  - Chip Brock (Michigan State), Michael Peskin (SLAC)
- Intensity Frontier
- Cosmic Frontier
- **Frontier Capabilities**
  - William Barletta (MIT), Murdock Gilchriese (LBNL)
  - Six accelerator capability groups
    - 1. Energy Frontier Hadron Colliders
    - **2. Energy Frontier Lepton and Gamma Colliders**
      - conveners: M. Palmer (FNAL), K. Yokoya (KEK), M. Klute (MIT), M. Battaglia (UCSC)
      - Meeting at MIT in April 9-11
    - 3. High Intensity Secondary Beams Driven by Protons
    - 4. High Intensity Electron and Photon Beams
    - 5. Electron-ion Colliders
    - 6. Accelerator Technology Testbeds and Test Beams
  - Non Accelerator
- Instrumentation Frontier
- Computing Frontier
- Education and Outreach