A Model for Industrialization

- Total numbers of SCRF 9-cell cavities required for ILC (Main Linac +Damping Ring + others)
  - **15,764**
- A model for 9-cell cavity productions
  - **15,764 + spare + production back-up (~ 10%)**
  - **→ ~ 18,000 cavities / 4~ 5 years**
- Possible models for manufacturing
  - **Single consortium/vendor**
  - **Three regional consortiums/vendors**
  - **Six (or more) consortiums/vendors**
    - **< 3,000 >** cavities / vendor
    - **< 3 >** cavities / day / vendor (assuming 5 yrs & 200 days/yr)

Industrialization Models

- Global Vendors/Consortiums/Laboratories
  - **Research Instruments (ACCEL) and Zanon in Europe**
  - **AES, Niowave/Roark, and PAVAC in Americas**
  - **MHI, (Hitachi, Toshiba, and others) in Asia**

Production Models and Rate of SCRF Cavities				
Project	# of Cavities assumed	# of Vendors	Production period (years)	Production Rate: (Cavities/day/vendor) (at 200 ~ 250 work-days/yr)
SNS	~ 110 (including +20%)	1	3	0.2 ~0.15
XFEL	(~640)	(1) (2)	(3) (3)	(1.1 ~ 0.85) (0.55 ~ 0.43)
ILC	**(~ 18,000) (including +10%)**	**(1) (3) (6)**	**(5) (5) (5)**	**(18 ~ 14.4) (6 ~ 4.8) (3 ~ 2.4)**

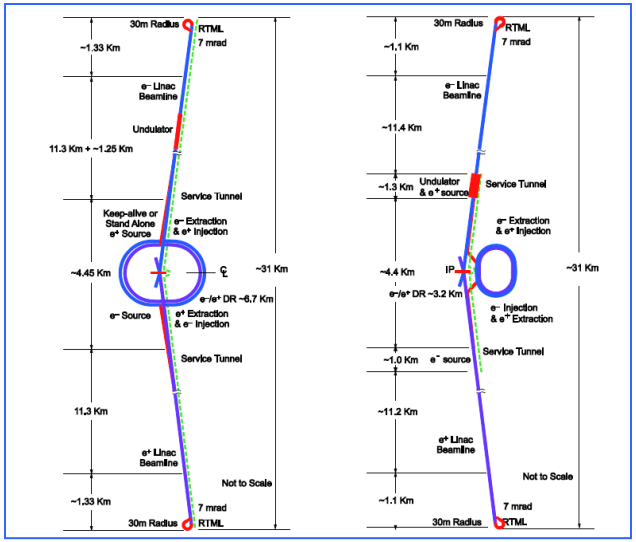
Prepare for ILC-scale Industrialization

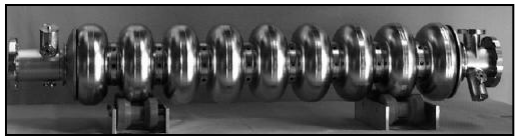
- Learn from previous efforts and current status:
  - Industrialization study for TESLA (1990's)
  - Recent R&D progress (in ~ 10 years)
  - Current status in industries (in progress)
- Learn from industrialization of XFEL Project
- Encourage Laboratory / Industry partnerships
  - Realized in all 3 regions
    - Europe: XFEL, Americas: Venders manufacturing, Asia: A pilot plant at KEK
  - Prepare for cost-effective production and quality control in cooperation with industries
- Communication with Industries
  - 1st: Visit Venders (done in 2009)
  - 2nd: Workshop (done at IPAC-10 satellite meeting)
  - 3rd: Call for Response with a preliminary specification and cost estimate by industries

SCRF-ML Technology Required

RDR Parameters	Value
C.M. Energy	500 GeV
Peak luminosity	$2x10^{34}$ $cm^{-2}s^{-1}$
Beam Rep. rate	5 Hz
Pulse time duration	1 ms
Average beam current	9 mA (in pulse)
Av. field gradient	**31.5 MV/m**
# 9-cell cavity	**14,560**
# cryomodule	**1,680**
# RF units	**560**

RDR → SB2009





Global Plan for SCRF R&D

Year	07	2008	2009	2010	2011	2012
Phase	TDP-1			TDP-2		
Cavity Gradient in v. test to reach 35 MV/m	→ Yield 50%			→ Yield 90%		
Cavity-string to reach 31.5 MV/m, with one-cryomodule		Global effort for string assembly and test (DESY, FNAL, INFN, KEK)				
System Test with beam acceleration			FLASH (DESY) , NML (FNAL) STF2 (KEK, test start in 2013)			
Preparation for Industrialization				Production Technology R&D		

Numbers of processes trade-off

	Yield %	Fabrication of Dumb-bell with EBW	Fabrication of End group EBW	Assemble 9-cell Cavity With EBW	Number of machines and processes required		
					EB Welding	Vertical Test	Electro-polishing
Case1 R&D phase	100	1 seam / welding cycle (3 hrs/3 cycle)	1 seam / welding cycle (11 hrs / 11 cycle)	one 2(4,8)-cell / welding cycle (9 hrs/9 cycle)	12	6	6
	90					7	
Case2 Current prod.	100	8 dumb-bell / welding cycle (6.5/8 hrs/3 cycle)		one 9-cell / 2 welding cycle (4.7 hrs / 2 cycle)	8 → 7*	6	6
	90					7	
Case3 Mass Production Study	100		8 end group / welding cycle (46.7/8 hrs/11 cycle)		5 → 4*	6	6
	90					7	

* In case of common EBW machines