Specification profile tables for Coupler

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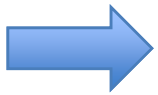
Specification Profile Tables

The purpose of table:

to understand specification of function, specification of physical dimensions, etc.
to understand what is fixed, what is not fixed, for item by item.
to facilitate 'Plug compatibility' concept.

Tables visualize the specifications for;



Cavity
Tuner
Coupler

We had the discussion

at Cavity Kick-off meeting in DESY (Sep. 2007),
at ML-SCRF meeting in DESY (Jan. 2008),
at GDE meeting in Sendai (Mar. 2008),
at ML-SCRF meeting in FNAL (Apr. 2008)
at GDE meeting in Chicago (Nov. 2008)

Updated table for coupler is followings;

Coupler specification profile table

Coupler	condition	specification	unit and comments	further comments
Power requirements	Operation	>400	kW for 1600 us	
	Processing	>1200	kW upto 400 us	need after vac break, cool-down
		>600	kW larger than 400 us	need after vac break, cool-down
	Processing with reflection mode	>600	kW for 1600us	in Test stand
Processing time	warm	<50	hours	after installation, definition of power/pulse_width target are the same as 'Power Requirement' above.
	cold	<30	hours	after installation, definition of power/pulse_width target are the same as 'Power Requirement' above.
Heat loads /coupler	2K static	< 0.063	W	
	5K static	< 0.171	W	depend on tunability
	40 K static	< 1.79	W	
	2K dynamic	< 0.018	W	
	5K dynamic	< 0.152	W	
	40K dynamic	< 6.93	W	
Cavity vacuum integrety	# of windows	2		
	bias capablity	yes		
RF Properties	Qext	Yes/No	tunable	decide later
	Tuning range	1-10	10^6 if tunable	
Physical envelope	Position		compatible to TTF-III	decide later
	Flange		compatible to TTF-III	decide later (to cavity, to cryostat)
	waveguide		compatible to TTF-III	decide later
	support		compatible to TTF-III	decide later
Instrumentation	vacuum level	>= 1		
	spark detection	0	at window	
	electron current detection	>= 1	at coax	
	temperature	>= 1	at window	

*** yellow boxes indicate 'not fixed'**

Coupler design comparison

Existing ILC candidates are;

TTF-III (FLASH, XFEL) : ILC baseline design
TTF-V
TW-60

STF baseline (STF-BL cavities)
capacitive coupling (STF-LL cavities)

Coupler Design comparison

Main Coupler (Cold)

		TESLA500	TESLA800	LAL-Orsay	STF	STF
		TTF-3	TTF-5	TW-60	STF-BL	Capacitive
Tune ability		Yes		No	No	No
					Other Device	
Port Diameter	mm	40	62	62	60	40
Position from cell	mm	45			58	55
Coax. Diameter	mm	40	62	62	60-->82	40-->72
Impedance	Ω	70	70	50	50	35-->24
Bellows		1	1	No	No	1
		Support for Heavy Connection Flange.		Easy Assembly		Heavy Flange
Window Type		Cylinder	Cylinder	Coax. Disk	Coax. Disk	Disk
Window Size	mm	ϕ40	ϕ62		ϕ92 / 22, t6.2	ϕ102, t3.6
2k Static Load	W				0.05	0.1
5k Static Load	W	0.5			1	1
5k Dynamic Load	W	0.3			0.2	2
						5k Load of 1 W costs ^2k Euro for 20 Years Operation.

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Coupler Design comparison (cont.)

Warm Coupler						
		TTF-3	TTF-5	TW-60	STF-BL	Capacitive
Coax. Diameter	mm	62	62	62	82-->104	72
Impedance	Ω	50	50	50	50	24
Bellows		1	1	1	2	1
Window Type		Cylinder	Cylinder	Coax. Disk	Coax. Disk	Cylinder
Window Size	mm	ϕ62	ϕ62		Φ116 / 30, t6.6	ϕ112, t4, h68
80k Static Load	W				3	1.2
80k Dynamic Load	W					
Processing						
		0.5MW / 1.4msec.			1.0MW / 1.5msec.	2MW / 1.5msec.
		1.0MW / 0.4msec.			1.4MW / 0.5msec.	
Experience	# of production	~50			4	4
Diagnostics	Electron	3			3	0
	Arc	1			1	1

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end.

TTF-III coupler