

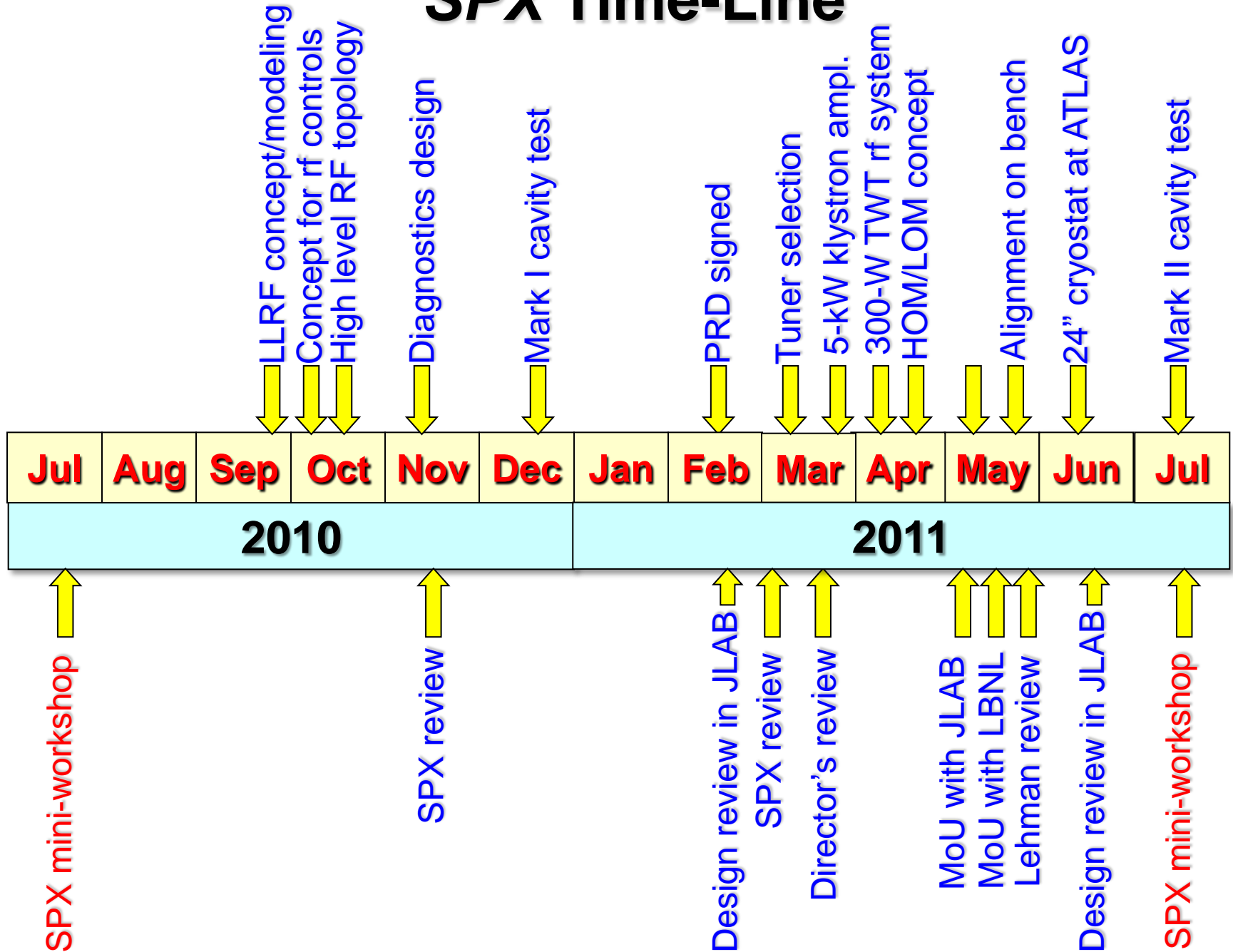
# WELCOME



to the second  
**SPX**  
summer study  
mini-workshop

July 18, 2011

# SPX Time-Line



# Performance Parameters\*

- Engineering design specs are derived from beam physics requirements
  - SPX Physics Requirement Document (PRD) spells out performance specifications

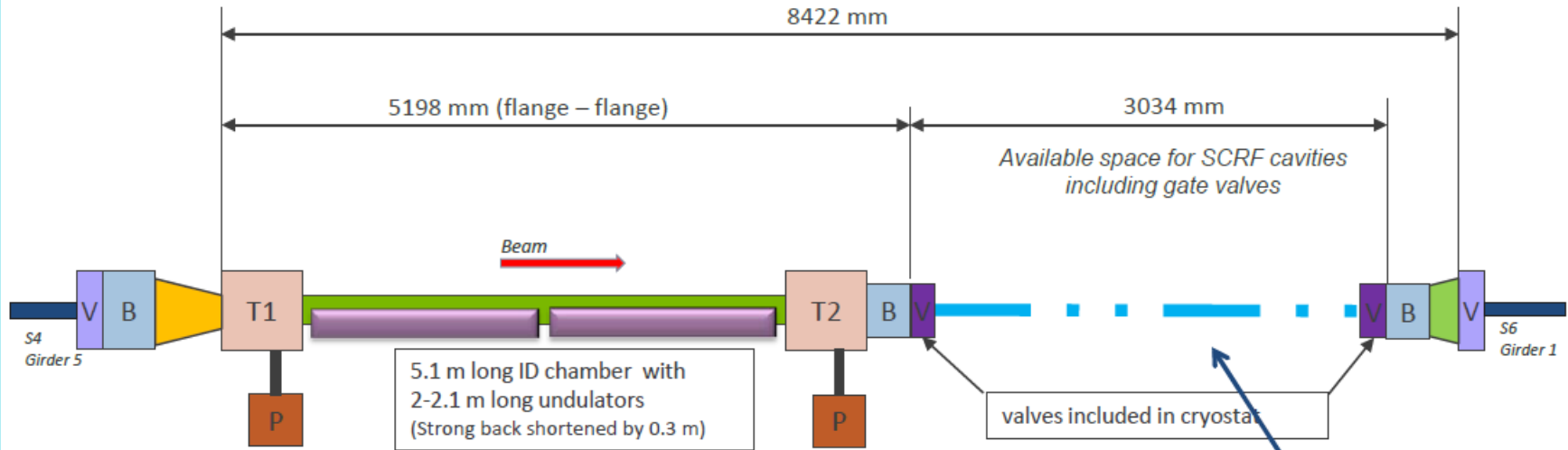
Parameter	Scope Goal	Long Term Goal
Pulse duration ( central 70% of beam)	2 ps	1 ps
Pulse duration fluctuation	10%	10%
Pulse intensity fluctuation	10%	1%
Pulse timing jitter (fraction of pulse duration)	10%	10%
Max. vertical emittance outside SPX zone	50 pm	50 pm
Vertical emittance variation outside SPX zone	10%	10%
Rms beam motion outside SPX zone ( as fraction of beam size/divergence)	10%	10%

Parameter	Scope Goal	Long Term Goal
RF deflecting voltage	2 MV	4 MV
cryomodules/cavities per cryomodule	2/4	2/8
RF frequency	2815.486 MHz	2815.486 MHz
Cavity tunability	± 200 kHz	± 200 kHz
Source tunability	± 1.5 kHz	± 1.5 kHz
Operating temperature	2.0K	2.0K

Parameter	2 MV ( Scope Goal) Rms value	4 MV (Long Term Goal) Rms value	Requirement
Common mode voltage amplitude variation	< 1%	<1%	Keep intensity and pulse length variation under 1%rms
Common mode phase variation	<4.0 deg	<4.0 deg	Keep intensity variation under 1%rms
Voltage amplitude mismatch error between sectors	<0.16 %	<0.4%	Keep rms emittance variation outside SPX under 10% of normal 35 pm
Voltage phase mismatch error between sectors	< 0.14 deg	<0.07 deg	Keep rms beam motion outside of SPX under 10% of beam size/divergence



# Schematic Layout



**B** Bellows (90 mm)

**T1** End Box Transition (200 mm)  
(SR elliptical aperture to ID chamber aperture)

**T2** End Box Transition (200 mm)  
(ID chamber aperture to cavity aperture)

**P** Vacuum Pump

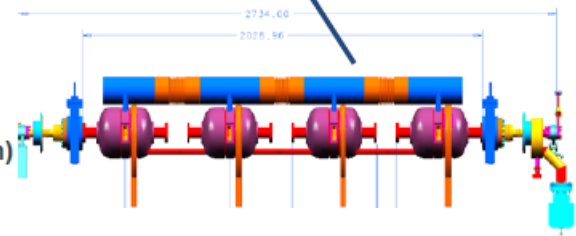
**V** Valve (85 mm)

**SR Long Taper Transition (332 mm)**

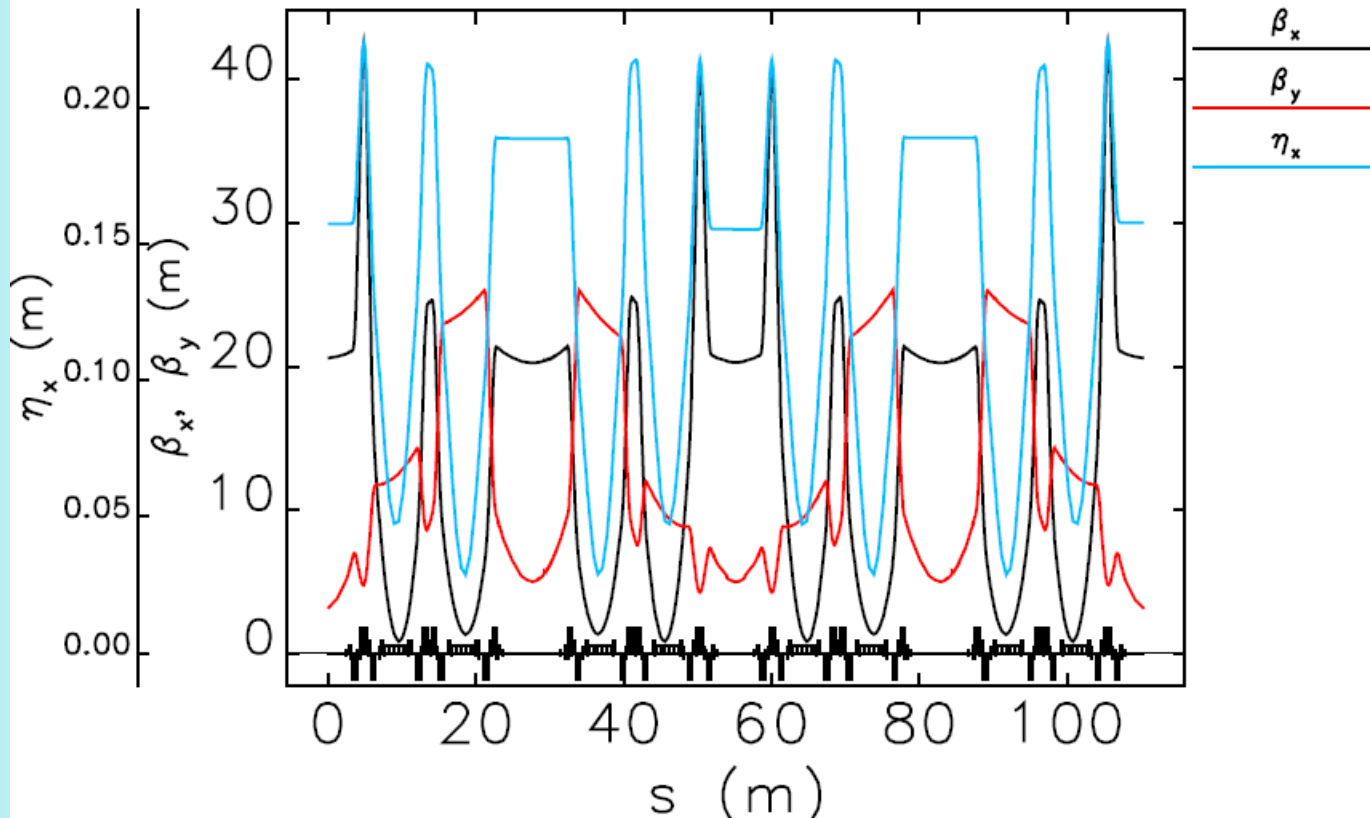
**Taper Transition (100 mm, Cavity aperture to SR aperture)**

**Canted Undulator System**

**Cryostat Valves**

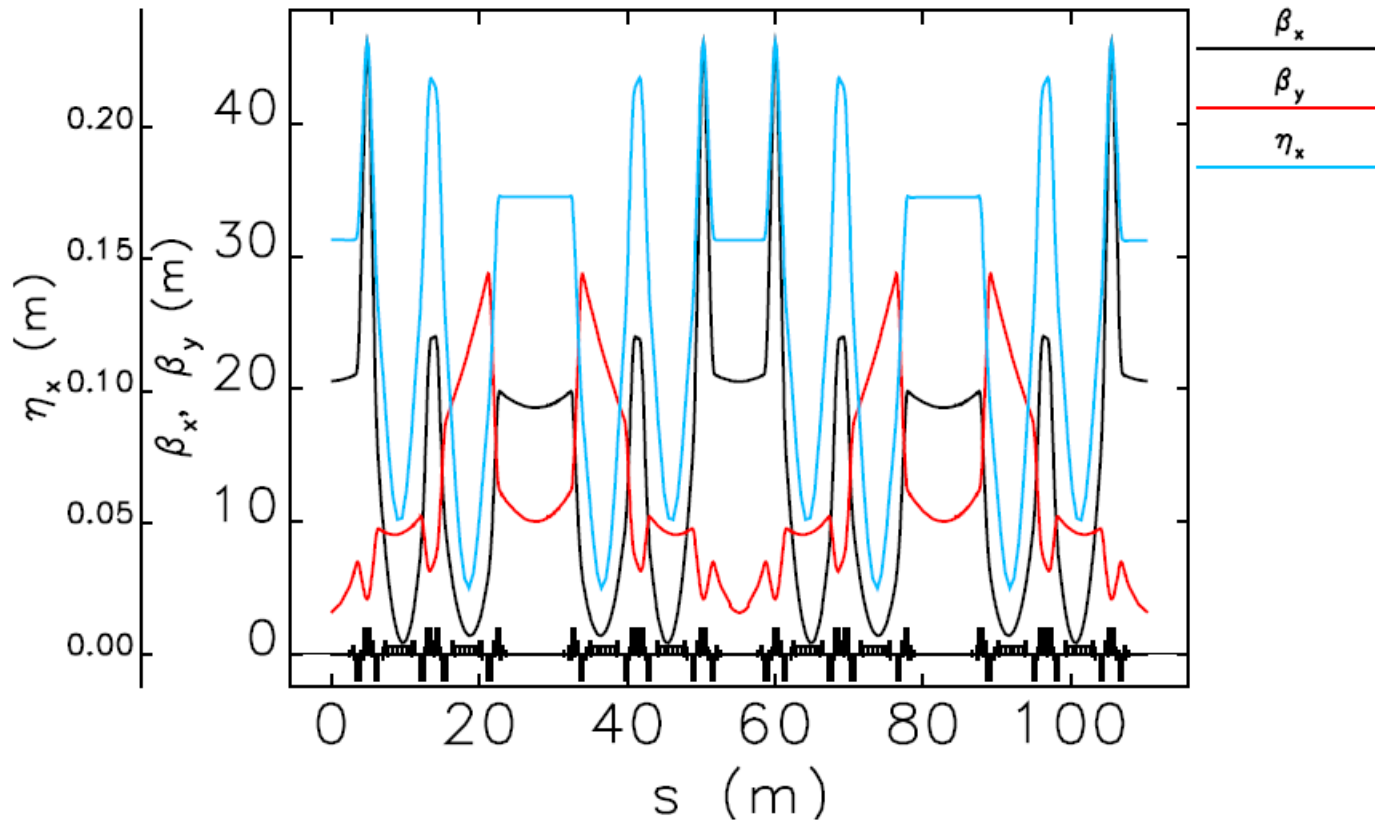


$$\Delta t_{x\text{-ray}} \propto \frac{1}{U_{rf} \sqrt{\beta_{rf}}}$$



**Currently used and studied lattice in a proposal for SPX straights sections,  $\beta = 5$  m**





**New proposed lattice (not sufficiently studied)  
with  $\beta = 10$  m or even 15 m.  
X-ray pulse can be at or under  $\sim 1$  ps using 2 MV<sup>1</sup>.**

1) V. Sajaev, AOP-TN-2011-012, May 6, 2011

