Accelerator Physics Diagnostic PV Requests

This document gives a high level overview of the Accelerator Physics requested PVs. Detailed PV requests are in the accompanying spread-sheet. The general desire is to have a consistent interface to information across the different types of diagnostics. Also, we wish to be able to compare time dependent behavior from the output of one diagnostic system with another.

Quantities averaged over a macro-pulse.

In addition to the actual averaged quantity, we wish to know when the averaging started and stopped. The start and stop times will be relative to cycle start.

Turn-by-turn arrays

These arrays will provide information about the time dependent behavior during a macropulse. In order to be able to compare one waveform with that from another diagnostic device, we are requesting information as to when the waveform starts (relative to cycle start) and the time period of each array element. Preferably the time period will be “1 turn”, but if the sampling hardware cannot support this, the “sampling period” can be longer.

Fast time sample arrays

For some instruments, the response is sufficiently fast to be able to get time structure within a mini-pulse. For these “fast-array” PVs, we request the time from cycle start corresponding to the start of the first array element, the period of each array element, and also the number of elements (settable). The latter is to control the size of the arrays being transferred.

Time issues

For consistency we are using units of “turns” for time, for all time related PVs (a turn will always be ~ 1 micro-sec). There is PV available to convert this to micro-sec if needed.

We assume these PVs will be updated on the 6 Hz event.

Changes:

2/17/03 Updated time PVs associated with TBT arrays, and averaging periods.
3/5/02 - Updated the current monitor PVs
1/14/02 Added profile monitor, emittance device, and noted LBNL ready PVs (yellow highlight)
11/12/01 - Added priority, switched RF raw signals to I and Q

11/30/01 Changed RF averages to be over the RF period, not beam period
Added RF and diagnostic PV to set/read the tDelay for averaving over the macropulse

Process Variables	Name	Different PVs for each user type	Single PVs for all user types	Priority
General				
User type of pulse	pulseType			
BPMs				
Macropulse Averages:				
X position averaged over the macropulse (mm)	xAvg		x	1
Y position averaged over the macropulse (mm)	yAvg		x	1
Magnitude averaged over the macropulse (AU)	ampAvg		x	1
Phase averaged over the macropulse (deg)	phaseAvg		x	1
Length of the averaged period (number of turns)	tAvgLen		x	1
Delay time from cycle start to beginning of average period (number of turns)	tAvgDelay		x	1
Minipulse arrays:				

X position array, holding average over each minipulse (mm) (1)	xTBT	x		1
Y position array, holding average over each minipulse (mm) (1)	yTBT	x		1
Magnitude array, holding average over each minipulse (AU) (1)	ampTBT	x		1
Phase array, holding average over each minipulse (deg) (1)	phaseTBT	x		1
Time delay from cycle start to the first array element (number of turns)	tDelayTBT			
The sample period of each TBT array element, in units of turns. Normally = 1, need not be an integer.	tSamplePeriod	x		
Multi-mode stuff				
X position averaged over the macropulse (mm) (5)	xAvg*	x		3
Y position averaged over the macropulse (mm) (5)	yAvg*	x		3
Magnitude averaged over the macropulse (AU) (5)	ampAvg*	x		3
Phase averaged over the macropulse (deg) (5)	phaseAvg*	x		3
Length of the averaged period (number of turns)	tAvgLen*	x		3
Delay time from cycle start to beginning of average period (number of turns)	tAvgDelay*	x		3
X position array, holding average over each minipulse (mm) (1)	xTBT*	x		3
Y position array, holding average over each minipulse (mm) (1)	yTBT*	x		3
Magnitude array, holding average over each minipulse (AU) (1)	ampTBT*	x		3
Phase array, holding average over each minipulse (deg) (1)	phaseTBT*	x		3
Time delay from cycle start to the first array element (number of turns)	tDelayTBT*			3
The sample period of each TBT array element, in units of turns. Normally = 1, need not be an integer.	tSamplePeriod*	x		3
X position averaged over 10 macropulses (mm) with discrimination (7)	xAvgBar		x	3
Y position averaged over 10 macropulses (mm) with discrimination (7)	yAvgBar		x	3
Phase averaged over 10 macropulses (deg) with discrimination (7)	phaseAvgBar		x	3

Current Monitors

Macropulse averages:				
current averaged over a macropulse (mA)	currentAvg		x	1
Charge, averaged over the enitre macropulse (charge - particles)	Particles		x	1
Length of the averaged period (number of turns)	tAvgLen		x	1
Delay time from cycle start to beginning of average period (number of turns)	tAvgDelay		x	1
Charge, averaged over the 10 macropulses (charge - particles), with discimination (7)	ParticlesBar		x	3
Minipulse arrays:				
Current array, holding average over each minipulse (mA) (1)	currentTBT		x	1
Time delay from cycle start to the first array element (number of turns)	tDelayTBT		x	1
The sample period of each TBT array element, in units of turns. Normally = 1, need not be an integer.	tSamplePeriod		x	1
Multi-mode stuff:				
current averaged over a macropulse (mA)	currentAvg*	x		3
Charge, averaged over the enitre macropulse (charge - particles)	Particles*	x		3
Length of the averaged period (number of turns)	tAvgLen*	x		3
Delay time from cycle start to beginning of average period (number of turns)	tAvgDelay*	x		3
Current array, holding average over each minipulse (mA) (1)	currentTBT*	x		3
Time delay from cycle start to the first array element (number of turns)	tDelayTBT*			3
The sample period of each TBT array element, in units of turns. Normally = 1, need not be an integer.	tSamplePeriod*	x		3
Fast waveform arrays				
Current array, holding average over a short period,typically < 1 micro sec (mA)	fastArray		x	1

Time delay from cycle start to the first array element (number of turns)	tDelayFastArray		x	1
The sample period of each TBT array element, in units of number of turns	tFastArrayPeriod		x	1
nArrayElements (settable)	nFastArray		x	1

Fast BLMs

Macropulse averages

Loss averaged over the macropulse (mA)	lossAvg		x	1
Length of the averaged period (number of turns)	tAvgLen		x	1
Delay time from cycle start to beginning of average period (number of turns)	tAvgDelay		x	1

minipulse arrays

Loss array, holding average over each minipulse (mA) [(1)]	lossTBT	x		1
Time delay from cycle start to the first array element (number of turns)	tDelayTBT			1
The sample period of each TBT array element, in units of turns. Normally = 1, need not be an integer.	tSamplePeriod	x		1

Multi-mode stuff

Loss averaged over the macropulse (mA)	lossAvg*		x	3
Length of the averaged period (number of turns)	tAvgLen*		x	3
Delay time from cycle start to beginning of average period (number of turns)	tAvgDelay*		x	3
Loss array, holding average over each minipulse (mA) [(1)]	lossTBT*	x		3
Time delay from cycle start to the first array element (number of turns)	tDelayTBT*			3
The sample period of each TBT array element, in units of turns. Normally = 1, need not be an integer.	tSamplePeriod*	x		3

Fast waveform arrays

Current array, holding average over a short period,typically < 1 micro sec (mA)	fastArray		x	1

Time delay from cycle start to the first array element (number of turns)	tDelayFastArray		x	1
The sample period of each TBT array element, in units of number of turns	tFastArrayPeriod		x	1
nArrayElements (settable)	nFastArray		x	1
Slow BLMs				
Macropulse averages				
Loss averaged over the macropulse (mA)	lossAvg		x	1
Length of the averaged period (number of turns)	tAvgLen		x	1
Delay time from cycle start to beginning of average period (number of turns)	tAvgDelay		x	1
minipulse arrays				
Loss array, holding average over each minipulse (mA) [(1)]	lossTBT	x		1
Time delay from cycle start to the first array element (number of turns)	tDelayTBT			1
The sample period of each TBT array element, in units of turns. Normally = 1, need not be an integer.	tSamplePeriod	x		1
Multi-mode stuff				
Loss averaged over the macropulse (mA)	lossAvg*		x	3
Length of the averaged period (number of turns)	tAvgLen*		x	3
Delay time from cycle start to beginning of average period (number of turns)	tAvgDelay*		x	3
Loss array, holding average over each minipulse (mA) [(1)]	lossTBT*	x		3
Time delay from cycle start to the first array element (number of turns)	tDelayTBT*			3
The sample period of each TBT array element, in units of turns. Normally = 1, need not be an integer.	tSamplePeriod*	x		3
Neutron Detectors				
Averaged loss (mA)	lossAvg		x	1
Length of the averaged period (sec)	tAvgLen		x	1

Faraday Cup

Macropulse averages:			
current averaged over a macropulse (mA)	currentAvg	x	1
Charge, averaged over the enitre macropulse (charge - particles)	Particles	x	1
Length of the averaged period (number of turns)	tAvgLen	x	1
Delay time from cycle start to beginning of average period (number of turns)	tAvgDelay	x	1
Charge, averaged over the 10 macropulses (charge - particles), with discimination (7)	ParticlesBar	x	3
Minipulse arrays:			
Current array, holding average over each minipulse (particles) (1)	currentTBT	x	1
Time delay from cycle start to the first array element (number of turns)	tDelayTBT	x	1
The sample period of each TBT array element, in units of turns. Normally = 1, need not be an integer.	tSamplePeriod	x	1

Energy degrader

Macropulse averages:			
current averaged over a macropulse (mA)	currentAvg	x	1
Charge, averaged over the enitre macropulse (charge - particles)	Particles	x	1
Length of the averaged period (number of turns)	tAvgLen	x	1
Delay time from cycle start to beginning of average period (number of turns)	tAvgDelay	x	1
Charge, averaged over the 10 macropulses (charge - particles), with discimination (7)	ParticlesBar	x	3
Minipulse arrays:			

Current array, holding average over each minipulse (particles) [1]	currentTBT		x	1
Time delay from cycle start to the first array element (number of turns)	tDelayTBT		x	1
The sample period of each TBT array element, in units of turns. Normally = 1, need not be an integer.	tSamplePeriod		x	1
Magnets				
Field setpoint (cycle) (T/m)	fieldSet		x	1
Field setpoint (quickset) (T/m)	fieldQuick		x	1
Field readback (T/m)	fieldRB		x	1
Is the magnet in a proper cycled state? (boolean)_	cycleValid		x	1
Current readback (A)	I			
Current setpoint without cycling (A)	I_Quick			
Current setpoint with cycling (A)	I_Set			
RF				
Macropulse averages				
Cavity Amplitude set point (kV)	cavAmpSet		x	1
Cavity Phase set point (deg)	cavPhaseSet		x	1
Cavity amplitude averaged over the rf on period (kV)	cavAmpAvg		x	1
Cavity phase averaged over rf on period (deg)	cavPhaseAvg		x	1
Forward amplitude averaged over the rf on period (kV)	forwardAmpAvg		x	1
Forward phase averaged over rf on period (deg)	forwardPhaseAvg		x	1
Reflected amplitude avg. over the rf on period (kV)	reflectAmpAvg		x	1
Reflected phase averaged over rf on period (deg)	reflectPhaseAvg		x	1
Length of the averaged period (number of turns)	tAvgLen		x	1
Delay time from cycle start to beginning of average period (number of turns)	tAvgDelay		x	1
Turn-by-turn arrays				
Cavity amplitude array vs time for RF period (kV) [2]	cavAmpTBT	x		1
Cavity phase array vs time over RF period (deg) [2]	cavPhaseTBT	x		1
Forward amplitude array vs time for RF period (kV) [2]	forwardAmpTBT	x		1
Forward phase array vs time over RF period (deg) [2]	forwardPhaseTBT	x		1

Reflected amplitude array vs time over RF period (kV) [2]	reflectAmpTBT	x		1
Reflected phase array vs time over RF period (deg) [2]	reflectPhaseTBT	x		1
Time delay from cycle start to the first array element (number of turns)	tDelayTBT			
The sample period of each TBT array element, in units of turns. Normally = 1, need not be an integer.	tSamplePeriod	x		1
Multi-mode PVs:				
Cavity amplitude averaged over the rf on period (kV)	cavAmpAvg*	x		3
Cavity phase averaged over rf on period (deg)	cavPhaseAvg*	x		3
Forward amplitude averaged over the rf on period (kV)	forwardAmpAvg*	x		3
Forward phase averaged over rf on period (deg)	forwardPhaseAvg*	x		3
Reflected amplitude avg. over the rf on period (kV)	reflectAmpAvg*	x		3
Reflected phase averaged over rf on period (deg)	reflectPhaseAvg*	x		3
				3
Cavity amplitude array vs time for RF period (kV) [2]	cavAmpTBT*	x		3
Cavity phase array vs time over RF period (deg) [2]	cavPhaseTBT*	x		3
Reflected amplitude array vs time over RF period (kV) [2]	reflectAmpTBT*	x		3
Reflected phase array vs time over RF period (deg) [2]	reflectPhaseTBT*	x		3
Forward amplitude array vs time for RF period (kV) [2]	forwardAmpTBT*	x		3
Forward phase array vs time over RF period (deg) [2]	forwardPhaseTBT*	x		3
Cavity I array - raw data for the macropulse, for RF period (kV) [4]	cavIRaw*	x		3
Cavity Q array - raw data for the macropulse over RF period (kV) [4]	cavQRaw*	x		3
Profile Monitor [3]				
X position array indicating wire positions (mm)	xPos		x	1
X intensity array indicating intensity at each position (AU)	xIntense		x	1
Y position array indicating wire positions (mm)	yPos		x	1
Y intensity array indicating intensity at each position (AU)	yIntense		x	1
Diag position array indicating wire positions (mm)	xyPos		x	1
Diag intensity array indicating intensity at each position (AU)	xyIntense		x	1
Beam pulse length	From Coles		x	
Number of steps	:Steps		x	

Number of averages per position	:NoMeas	x
Wire Bias voltage	:Bias	x
Start position	:Step1Pos	x
Stop position	:FinalPos	x
Park Position – This is the position that the wires go to activate the limit switches	:ZeroPos	x
Back ground measurement – This will be used to take the amplifier/non beam noise subtractions	:Bkgrnd	x
Horiz_Gain	:GainH	x
Vert_Gain	:GainV	x
VH_Gain	:GainVH	x
Current position (acutator position)	:Pos	x
Horz_wire_position	:PosH	x
Vert_wire_position	:PosV	x
VH_wire_position	:PosVH	x
Horiz_wire_curr	:WireH	x
Vert_wire_curr	:WireV	x
VH_wire_curr	:WireVH	x
RUN/Stop	:GoStop	x
Go_to_Start_Position	:RetractPos	x

Emittance

Zero position... nominally it is the pos.. that the emittance and scanner are siting out side of the beam at some limit switch.	:EMS:ZeroPos	x
Step 1 position... position that the first data point is taken.	:EMS:Step1Pos	x
slit size	:EMS:SlitSize	x
wire spacing	:EMC:WireSpc	x
number of wires	:EMC:NoWires	x
gear ratio (step size of collector V.S.. slit)	:EMS:GearRatio	x
distance between slit and collector (wires).	:EMS:DistS2C	x
number of steps.	:EMS:Steps	x
Horizontal V.S.. vertical scan.	:EMS:Disp	x
final position. <== we can do some error checking from the redundancies and the readback of LVDT.	:EMS:FinalPos	x
Go/Stop	:EMS:GoStop	x
retract to (a) start of scan V.S.. (b) position (zero).	:EMS:RetractPos	x

wire gain.	:EMC:Gain	x	
background measurements V.S.. beam measurements.	:EMS:Bkgrnd	x	
Beam current.	:EMS:Current	x	
source pulse rate.. is it .1 Hz vs. 6 Hz V.S. 10 Hz.... I might use this for the version 1 for monitoring.	:EMS:SrcRate	x	
other flags. this could be for the veto of the data rather than delete of element V.S.. Element	:EMS:Flags	x	
averaging.	:EMS:Avg	x	
data acquisition type, please see Ernest's jpg V.S.. other form of data storage.	:EMS:DataType	x	
number of the measurements PVs. How did you brake the data acquired. see 19	:EMS:NoMeas	x	
wire size	:EMC:WireSize	x	
slit offset	:EMS:soffset	x	
	:EMC:coffset	x	
Bunch Shape Monitor			
Z position array in rf phase (deg)	zPos	x	1
Z intensity array indicating intensity at each rf phase (AU)	zIntense	x	1
Beam pulse length	From Coles	x	
Number of steps	:Steps	x	
Number of averages per position	:NoMeas	x	
Wire Bias voltage	:Bias	x	
Start position	:Step1Pos	x	
Stop position	:FinalPos	x	
Park Position – This is the position that the wires go to activate the limit switches	:ZeroPos	x	
Back ground measurement – This will be used to take the amplifier/non beam noise subtractions	:Bkgrnd	x	
Gain	:Gain	x	
Current position (acutator position)	:Pos	x	
Wire_position	:Pos	x	
Wire_curr	:Wire	x	
RUN/Stop	:GoStop	x	
Go_to_Start_Position	:RetractPos	x	

Comments:
PVs are expected to be generated on the 1, 6 and "pushbutton" Hz
events
(1) Each array element holds an average over tSamplePeriod. Preferred value of tSamplePeriod = 1 minipulse.
(2) Preferably the array consists of values averaged over each minipulse. If averaging is not possible, the array
(3) - Position start, stop, step sizes, etc. as in the ICD.
(4) - Raw data contains unprocessed data on finer time steps than
the turn by turn average.
(5) - these averages do not include the first few turns where the current is ramped up, which are likely to include
(6) - these averages include all turns, incluing the initial beam - useful for commissioning, with short beam
(7) discrimination, means do not include in the running avaerage if
the sum signal is below a threshold (for BPMs), or charge is below
a threshold (for current monitor)
* - the PV's that are populated based on a specified "flavor" or user type, will have a suffix to the