

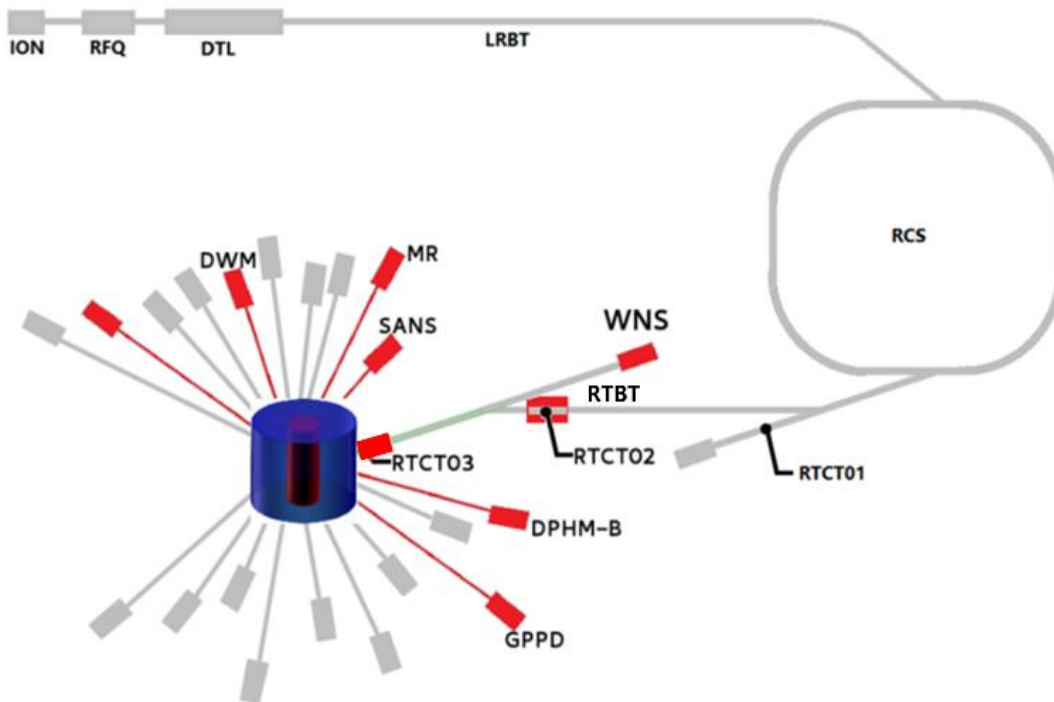
The Proton Beam Realtime Monitor System in CSNS

Jian ZHUANG



zhuangj@ihep.ac.cn

Proton Beam Measurement

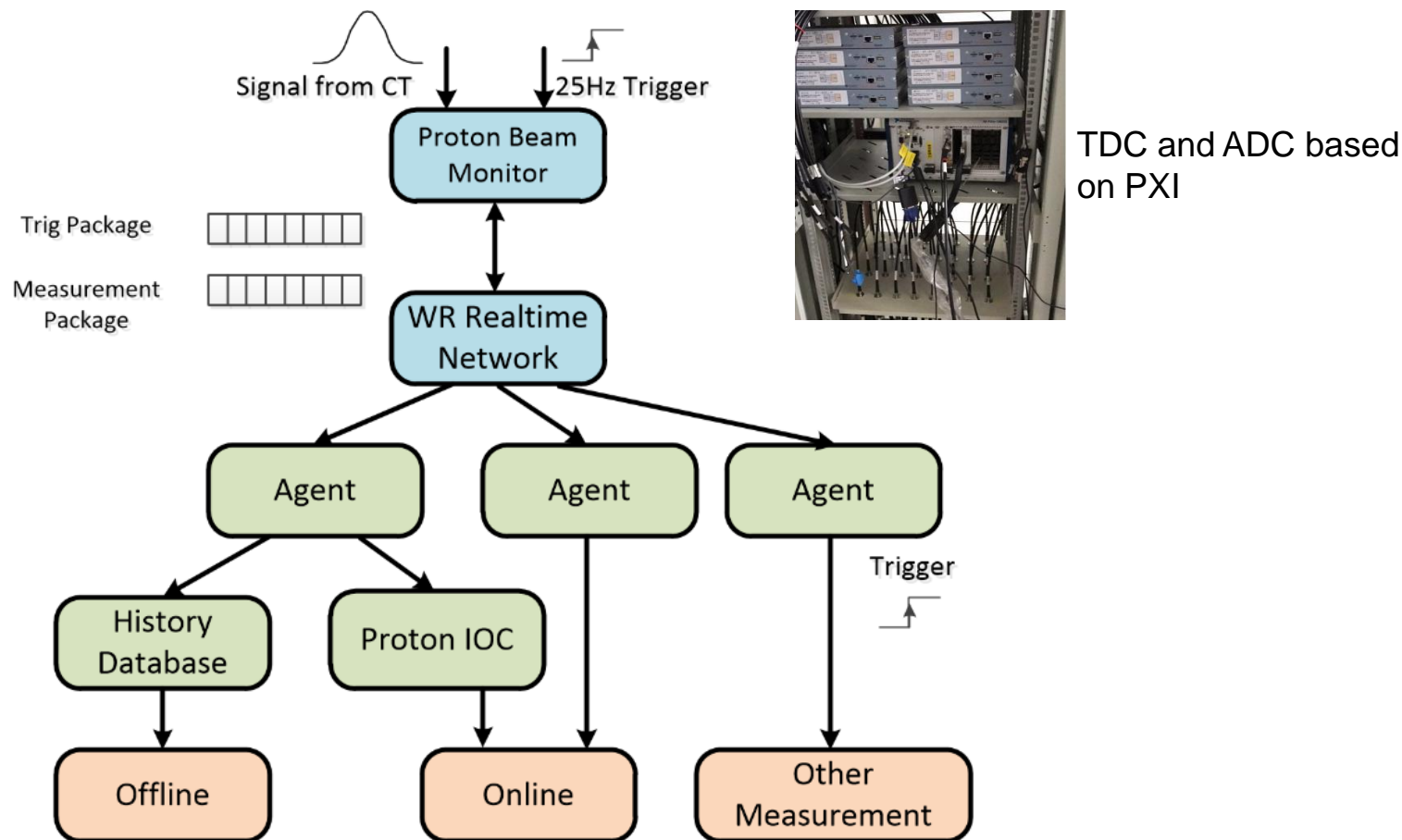


Measured at RTCT02 and RTCT03

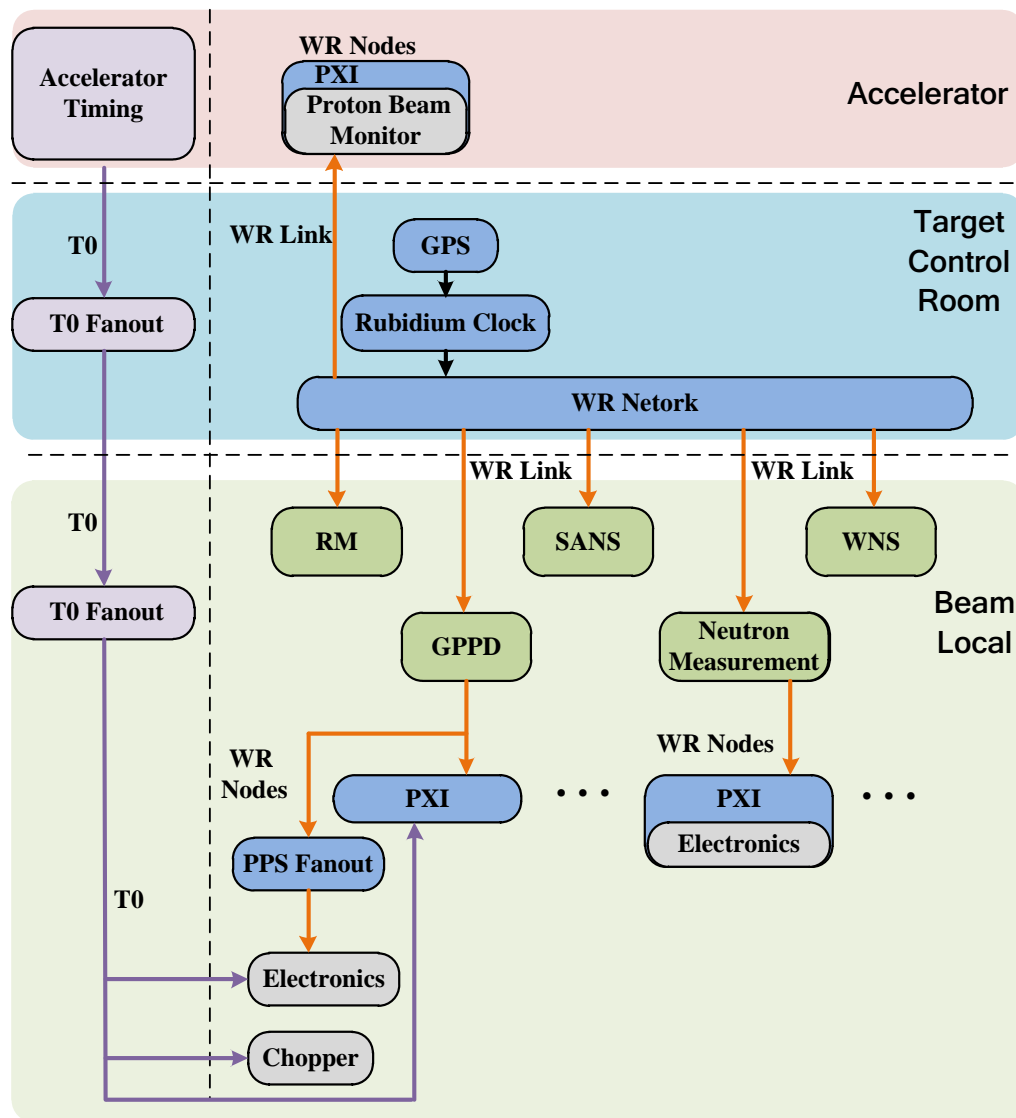
In CSNS, the proton charge needs to be measured,

- to normalize neutron flux by the physical analysis software.
- option of termination conditions and statistical data of a neutron experiment.
- The time of proton bunch passing the beam monitor is also can be an option as the start of neutron flight time.

Architecture of Real-Time Proton Charge Monitor



Trigger and Timing



Realtime Package based on LXI Potocal

Name	Field	Type	Length
Domain	HW_Detect	string	3 Bytes
	Domain	uint8	1 Byte
Event ID	Trigger Type and signal ID, hardware and Channel ID	string	16 Bytes
	Sequence No.	uint32	4 Bytes
Serial number			
Timestamp	seconds	uint32	4 Bytes
(Trigger time)	nanoseconds	uint32	4 Bytes
	fractional_nanoseconds	uint16	2 Bytes
	Epoch	uint16	2 Bytes
Flags	Flags	uint16	2 Bytes
Data Field	Data Field		66 Bytes
END	End (0x00)	uint16	2 Bytes

Fix Length to Simply the
design of FPGA Program

Field	Type	Length	Typical Vaule
Data Length	uint16	2 Bytes	0x04
Identifier	unit8	1 Bytes	0xf7
Proton bunch Sequence	unit32	4 Bytes	
Data Length	uint16	2 Bytes	0x08
Identifier	unit8	1 Bytes	0xf9
Proton Trigger Time	unit64	8 Bytes	
Second			
Data Length	uint16	2 Bytes	0x04
Identifier	unit8	1 Bytes	0xf7
Proton Trigger Time	unit32	4 Bytes	
Nanosecond			
Data Length	uint16	2 Bytes	0x04
Identifier	unit8	1 Bytes	0xf6
Proton Charge	unit32	4 Bytes	
ct01			
Data Length	uint16	2 Bytes	0x04
Identifier	unit8	1 Bytes	0xf6
Proton Charge	unit32	4 Bytes	
ct02			
Data Length	uint16	2 Bytes	0x04
Identifier	unit8	1 Bytes	0xf6
Proton Charge	unit32	4 Bytes	
ct03			

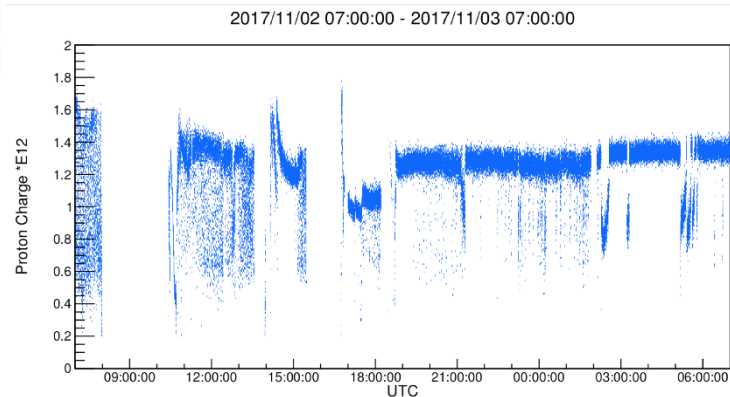
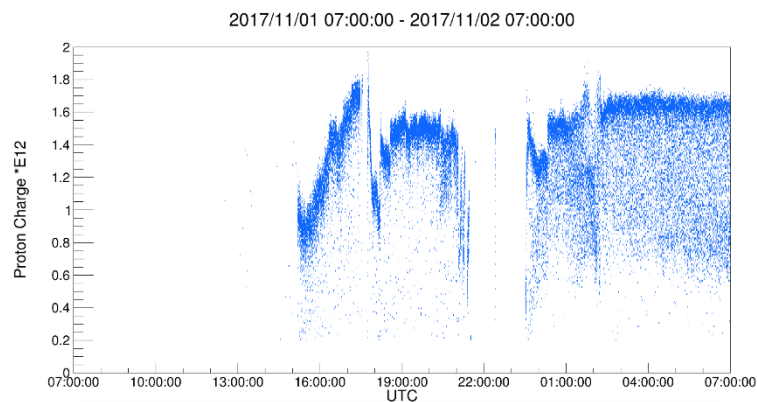
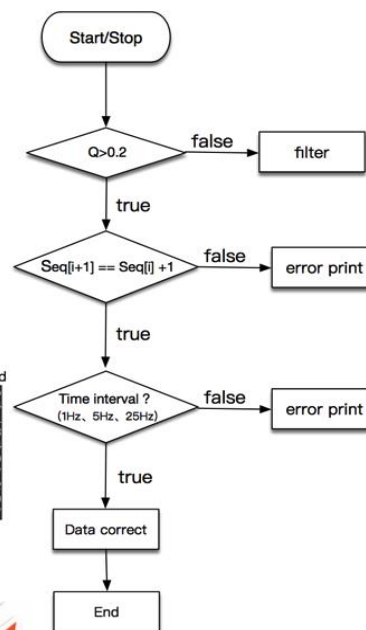
Data Check and Publish

秒上	秒下	序列号	质子电荷数
1509836403	782028168	143918	1.48483
1509836404	782028192	143919	1.49160
1509836405	782028214	143920	1.48601
1509836406	782028237	143921	1.51652
1509836407	782028260	143922	1.42877
1509836408	782028283	143923	1.45174
1509836409	782028306	143924	1.47185
1509836410	782028329	143925	1.44557
1509836411	782028353	143926	1.45267
1509836412	782028376	143927	1.47187
1509836413	782028391	143928	1.46758
1509836414	782028415	143929	1.45629
1509836415	782028437	143930	1.47797
1509836416	782028461	143931	1.46299
1509836417	782028484	143932	1.46138
1509836418	782028506	143933	1.49253

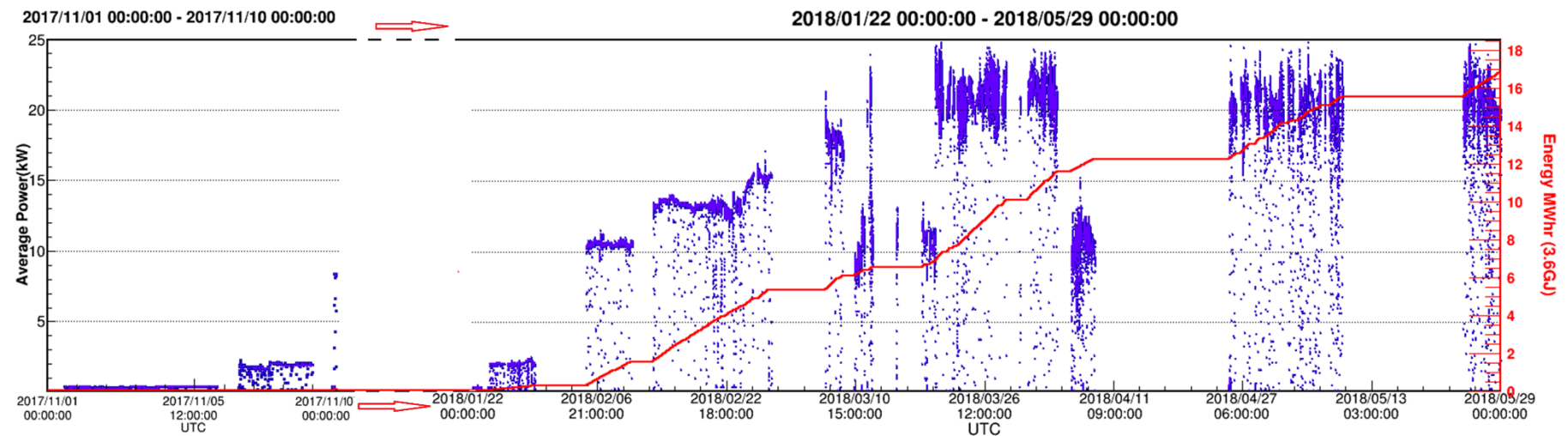
质子流强Q
1.48322
1.48665
1.487
1.48878
1.54013
1.50834
1.49785
1.53321
1.53009
1.50168
1.48516

质子序列号Seq
26981
26982
26983
26984
26985
26986
26987
26988
26989
26990

质子脉冲时间time
second nanosecond
1509713381 779317846
1509713382 779317864
1509713383 779317891
1509713384 779317908
1509713385 779317934
1509713386 779317959
1509713387 779317977
1509713388 779318002
1509713389 779318020
1509713390 779318037



Runing in CSNS



- From 1 Nov, 2017 to Now, 9.524×10^7 proton bunches in CSNS
- About 17Mwhr on target
- The monitor system running good

Thanks!