



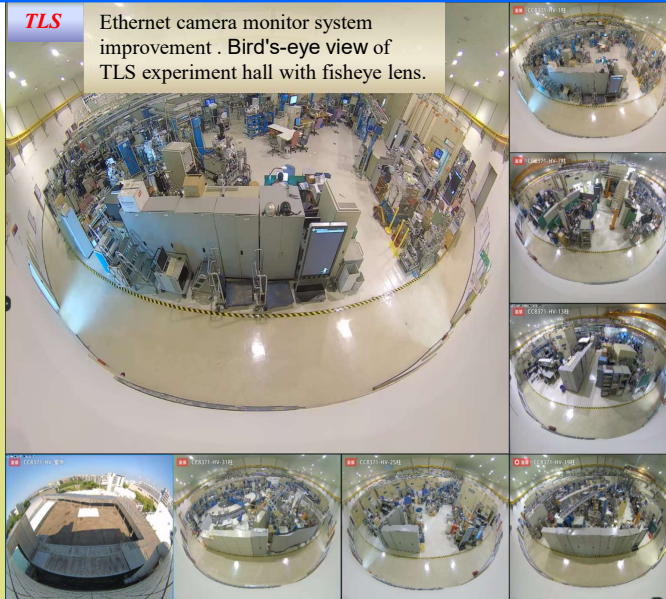
Diagnostic Software of Operation in the NSRRC

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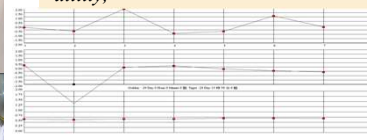
Taiwan Photon Source (TPS) have been operated and opened for users two years. TPS is a 3 GeV electron energy, 518 meter circumference, low-emittance synchrotron storage ring which will offer one of the synchrotron x-ray sources, provide cutting-edge experimental facilities and novel multidisciplinary scientific research. Amount of instruments and devices these must be monitored and controlled by single operator. The diagnostic tools and software are effective to reduce operator loading. These tools are developed with same concept, combined with two difference machine is effective and reduce maintenance efforts. These software will be reported in this workshop.

TPS

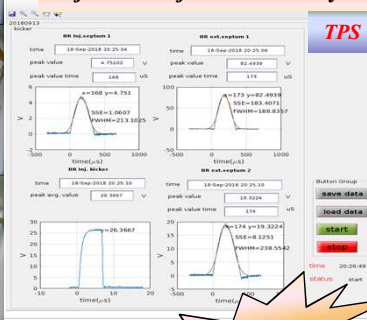
Ethernet camera monitor system improvement . Bird's-eye view of TLS experiment hall with fisheye lens.



TPS Single pass BPM: Transport line beam trajectory recording utility,



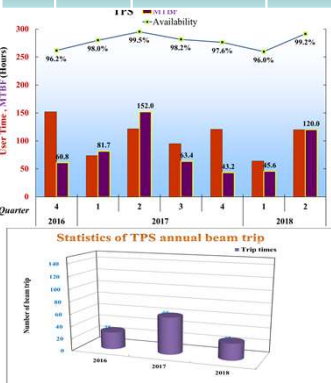
Injection adjustment utility



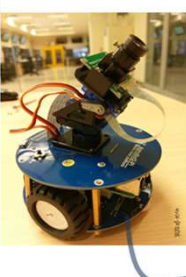
TPS/TPS operation statistic and history utility

TLS/Year	Schedule user time (hours)	Availability	MTBF (hours)	Operation mode	Beam stability ΔI/I0
2003	5017	97.2%	313.6	Decay	86%
2004	4235	97.5%	132.3	Decay	85%
2005	4576	96.8%	81.7	Decay/Top-up	76%
2006	5552	96.7%	40.8	Top-up	81.3%
2007	5219	98.1%	85.6	Top-up	98.1%
2008	5726	97.9%	112.3	Top-up	98.5%
2009	5402	97.9%	77.2	Top-up	89.2%
2010	5286	97.4%	81.3	Top-up	82.1%
2011	5818	95.9%	55.4	Top-up	89.4%
2012	5197	98.1%	44.8	Top-up	91.4%
2013	5178	99.5%	140	Top-up	95.5%
2014	5645	99.4%	182.1	Top-up	94.1%
2015	5327	98.7%	84.6	Top-up	87.7%
2016	5526	98.2%	100.5	Top-up	97.5%
2017	4669	98.5%	259.4	Top-up	97.0%

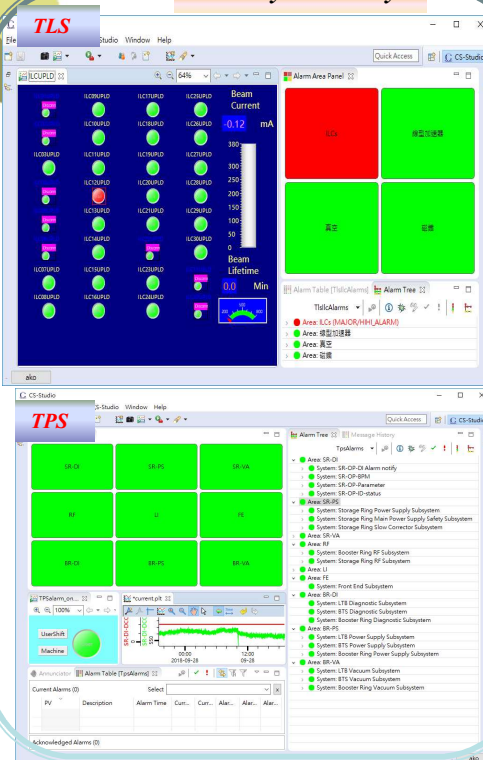
Year	Quarter	Scheduled User Time	Availability	MTBF	Operation mode
2016	4	1521	96.17%	60.84	Top-up
2017	1	735	98.00%	81.67	Top-up
	2	1216	99.52%	152.0	Top-up
	3	951	98.16%	63.4	Top-up
	4	1209	97.63%	43.18	Top-up
2018	1	639	95.96%	45.64	Top-up
	2	1200	99.16%	120.00	Top-up



History/Statistic/Environment Monitor



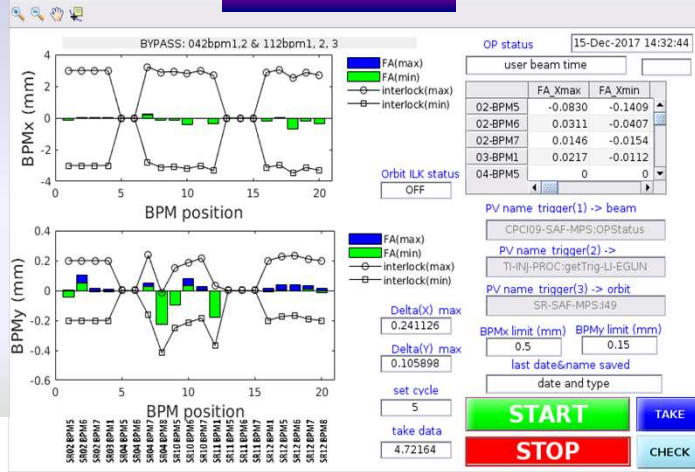
Alarm system utility



Post-mortem utility

- BPM 10KHz data recording in the beam trip.
- BPM 10KHz data display in the injection.
- BPM turn by turn data recording in the beam trip.
- Orbit interlock boundary display to alarm system in advance.
- Artificial intelligence and big data processing are applied to beam trip searching.

TPS orbit interlock



Various detector driver
Wifi remote control → auto pilot

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