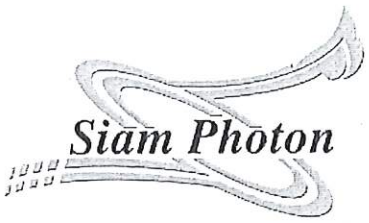

Terms of Reference

of the

"mTCA.4 Timing System for 1.2 GeV Siam Photon Source"

Synchrotron Light Research Institute (Public Organization)

Synchrotron Light Research Institute (Public Organization)
111 University Ave., Muang District, Nakhon Ratchasima
Thailand 30000

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1. BACKGROUND

Synchrotron Light Research Institute (Public Organization) plans to upgrade the timing system for the current 1.2 GeV synchrotron light source machine. According to this plan, the present NIM-based timing system must be replaced by a new and modern event-based system that can provide similar operation with the existing system timing requirement.

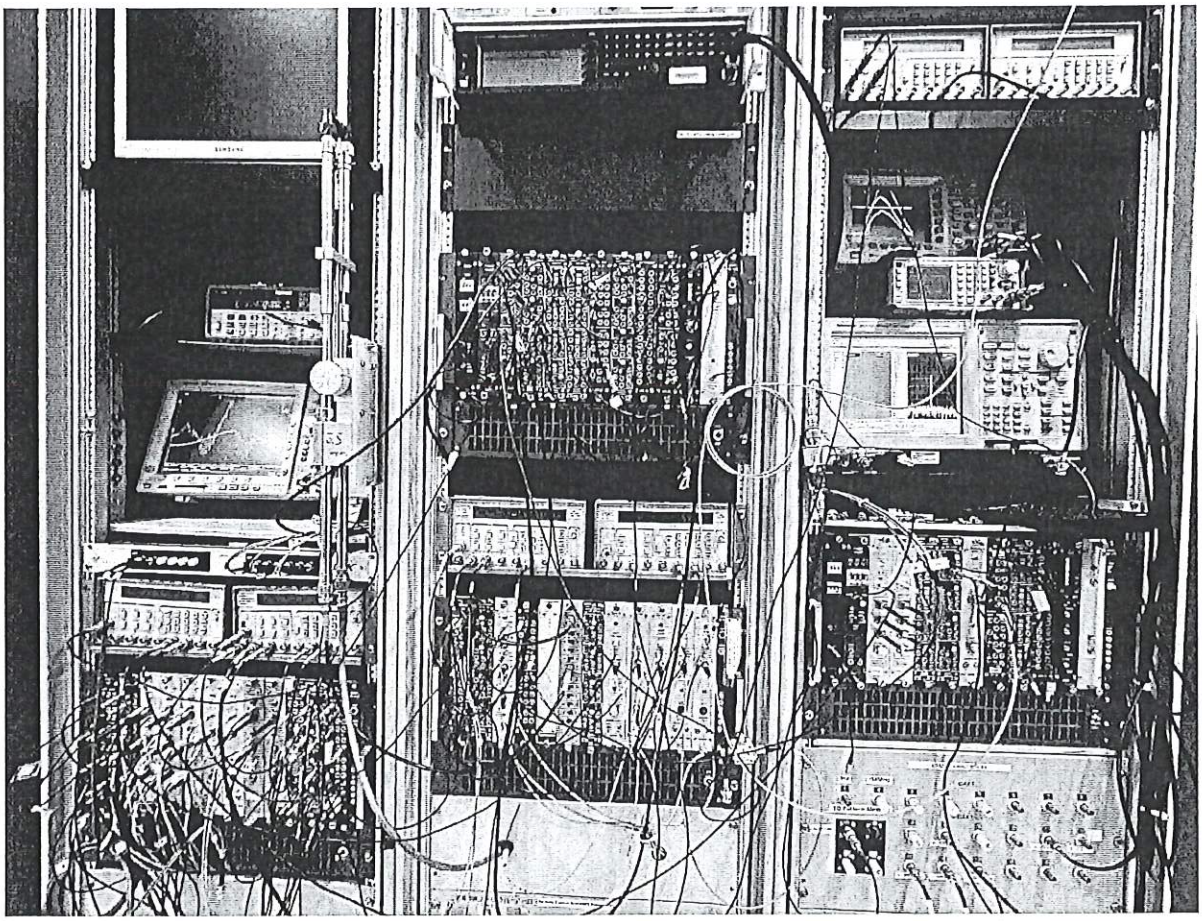

Figure 1: Existing NIM-based timing system at SLRI control room.

2. FUNCTIONALITIES AND PARAMETERS

The timing system sends trigger signals to all parts of the accelerator at the right time to generate electrons in the LINAC, accelerate them in the booster, eject them from the booster and inject them into the storage ring.

The timing system controls how the electrons are distributed in the RF buckets around the storage ring or defines which bucket the electrons are injected into.

Storage ring's timing system parameter are

- The circumference of the storage ring is 81.3 m.
- Time for 1 revolution of the storage ring is $81.3/ 3 \times 10^8 = 271 \times 10^{-9}$ seconds or 271 ns.
- The electrons are kept moving (accelerated) and bunched into buckets by the RF cavity.
- The RF frequency is 118MHz. Its period T = 1/f = 1/118MHz = 8.47nS.
- The number of RF cycles occurring during 1 revolution is therefore 271/8.47 = 32. All the electrons injected will be bunched by the RF into these 32 RF "buckets" which all will circulate every 271 nS.
- The distance between buckets is 81.3/32 = 2.54m, the wavelength of 118MHz.

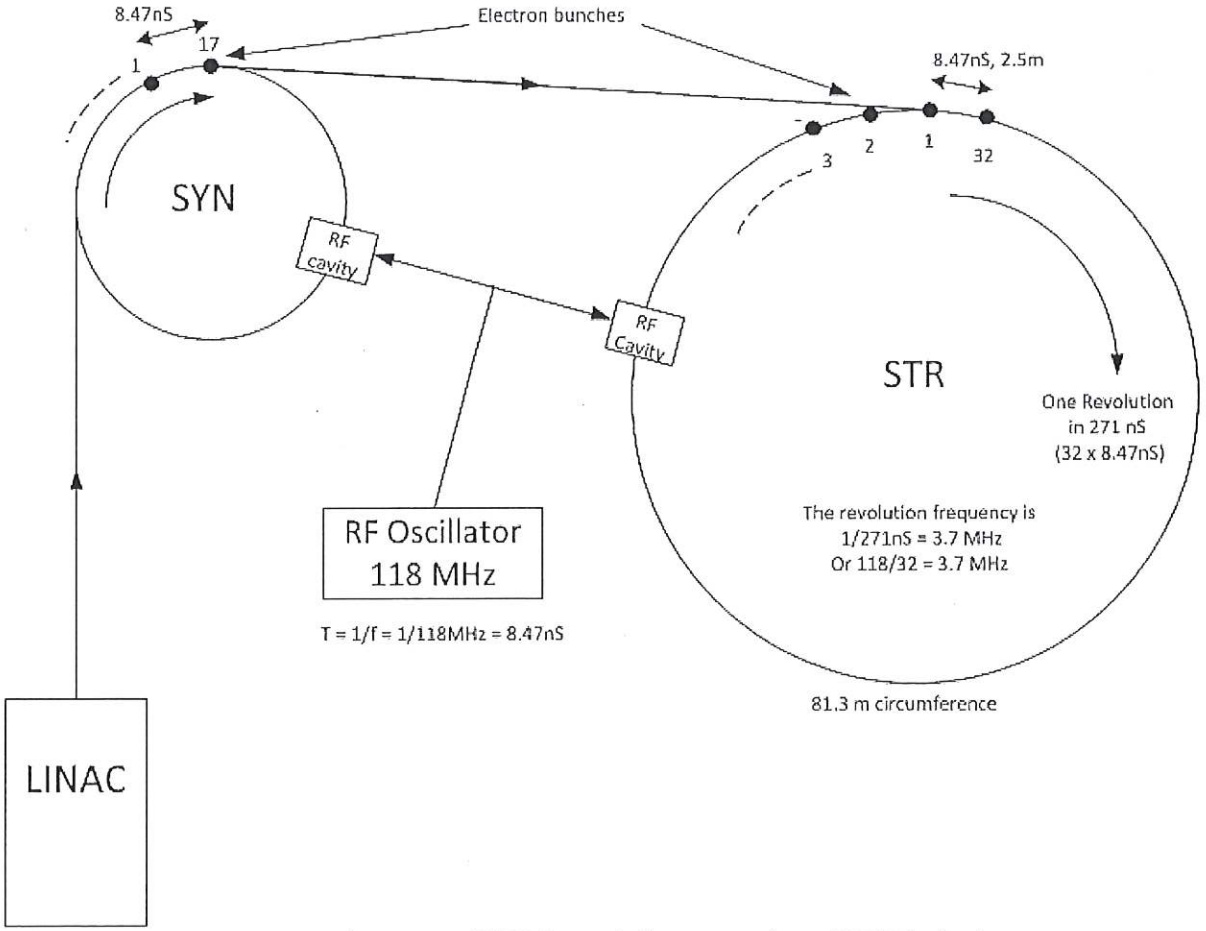

Figure 2: Booster synchrotron (SYN) and Storage ring (STR) timing parameters diagram.

The list of client components in the machine that are controlled by existing timing system is shown in the following table:

No.	Device Code	Device Name	Device Type	Signal
1	LINAC	LINAC	Electron gun activating	TTL
2	Y-SMI-M	Synchrotron Injection Septum	Pulse power supply	TTL
3	Y-BMP-M1	Synchrotron Bump Magnet 1	Pulse power supply	TTL
4	Y-BMP-M2	Synchrotron Bump Magnet 2	Pulse power supply	TTL
5	Y-BMP-M3	Synchrotron Bump Magnet 3	Pulse power supply	TTL
6	Y-BMP-M4	Synchrotron Bump Magnet 4	Pulse power supply	TTL
8	Y-QD-M	Synchrotron De-focusing Quadrupole	Pulse power supply	TTL
9	Y-QD-M1	Synchrotron De-focusing Quadrupole (Old-INITIAL)	Pulse power supply	TTL
10	Y-QD-M2	Synchrotron De-focusing Quadrupole (Old-START)	Pulse power supply	TTL
11	Y-QD-M3	Synchrotron De-focusing Quadrupole (Old-STOP)	Pulse power supply	TTL
12	Y-QF-M	Synchrotron Focusing Quadrupole	Pulse power supply	TTL
13	Y-QF-M1	Synchrotron Focusing Quadrupole (Old-INITIAL)	Pulse power supply	TTL
14	Y-QF-M2	Synchrotron Focusing Quadrupole (Old-START)	Pulse power supply	TTL
15	Y-QF-M3	Synchrotron Focusing Quadrupole (Old-STOP)	Pulse power supply	TTL
16	Y-BM-M	Synchrotron Bending Magnet	Pulse power supply	TTL
17	Y-BM-M1	Synchrotron Bending Magnet (Old-INITIAL)	Pulse power supply	TTL
18	Y-BM-M2	Synchrotron Bending Magnet (Old-START)	Pulse power supply	TTL
19	Y-BM-M3	Synchrotron Bending Magnet (Old-STOP)	Pulse power supply	TTL
20	Y-KM-M	Synchrotron Kicker Magnet	Pulse power supply	TTL
21	Y-SMD-M	Synchrotron Extraction Septum	Pulse power supply	TTL
22	Y-DLLRF	Synchrotron DLLRF	RF DLLRF	TTL
23	S-BMP-M1	Storage Ring Bump Magnet 1	Pulse power supply	TTL
24	S-BMP-M2	Storage Ring Bump Magnet 2	Pulse power supply	TTL
25	S-BMP-M3	Storage Ring Bump Magnet 3	Pulse power supply	TTL
26	S-SMI-M	Storage Ring Injection Septum	Pulse power supply	TTL
27	S-EBPM	Electron BPM - Revolution Frequency	Beam Position Monitor	LVTTL
28	S-EBPM	Electron BPM - Trigger	Beam Position Monitor	LVTTL
29	Streak-CAM	Streak Camera - Revolution Frequency	Streak camera	TTL/NIM
30	Streak-CAM	Streak Camera - Trigger	Streak camera	TTL/NIM

3. LIST OF HARDWARE COMPONENTS

Item	Item name	Quantity	Unit	Specifications
1	mTCA-EVR-300U	3	module	• Event Receiver • mTCA.4 platform • 2x Universal I/O slots • 2x front panel TTL inputs • rear I/O • bit rate 1.0 to 3.33 Gbps, event clock rate 50 MHz to 166.6 MHz • capability to drive TCLKA/TCLKB through GTX logic
2	mTCA-EVRTM-300	4	module	• Rear I/O Module for the mTCA.4 Event Receiver and Event Master • 5x Universal I/O slots support both input and output modules • logic to support UNIV-LVPECL-DLY and UNIV-TTL-DLY modules in all slots
3	UNIV-TTL5V	15	module	• Universal I/O 5VTTL Output Modules • 2x outputs

4. WARRANTY

The contractor warrants for a period of 18 months after delivery and final acceptance. Hardware warranty for a period of 18 months is as specified by the manufacturer.

Signature..... Purchaser
Natthawut Suradet