MACE CAMERA ELECTRONICS: CONTROL, MONITORING & SAFETY MECHANISMS

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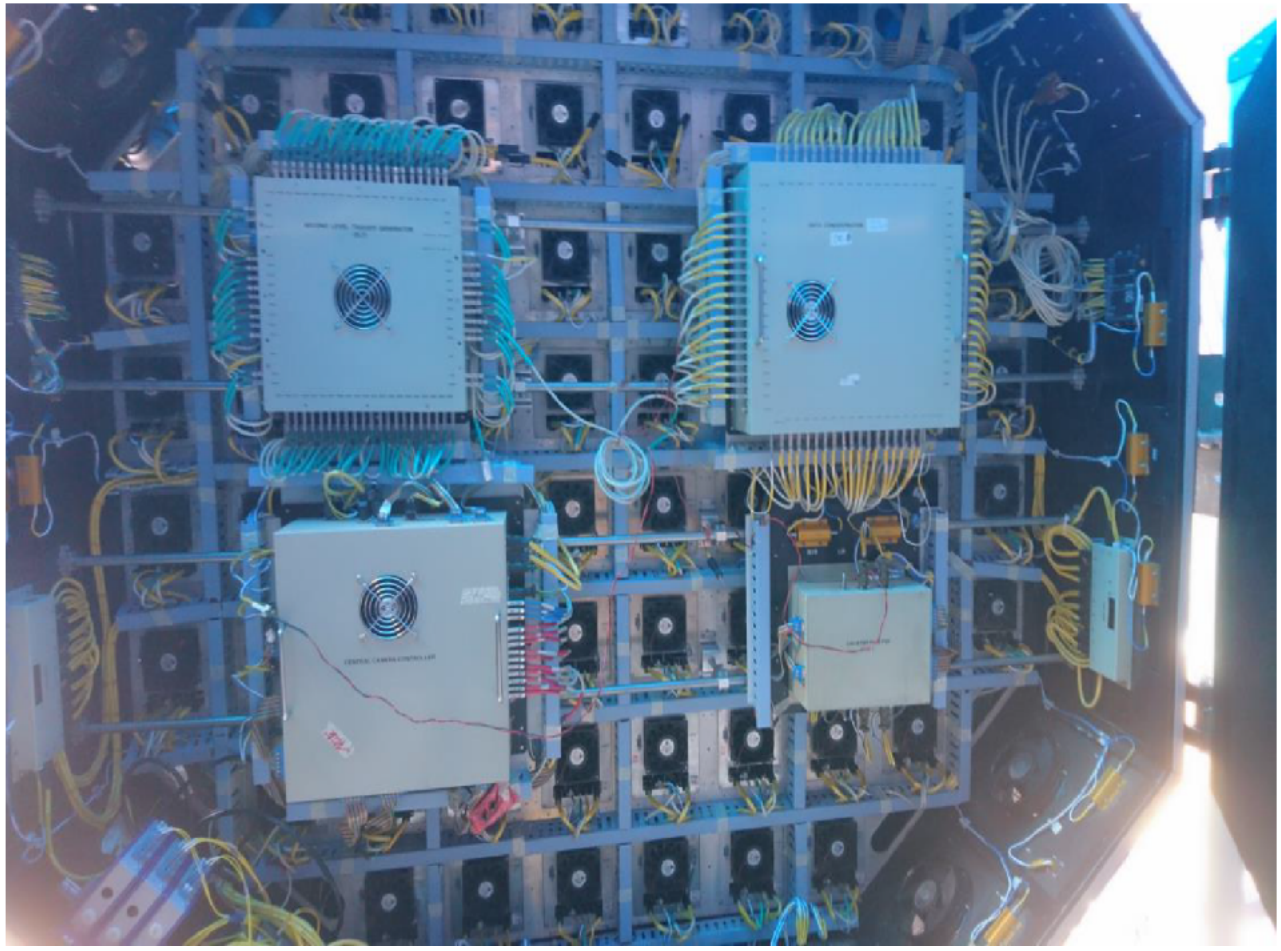
MACE Camera Electronics

Front view of MACE Camera Electronics

MACE Camera Electronics



Rear view of MACE Camera Electronics

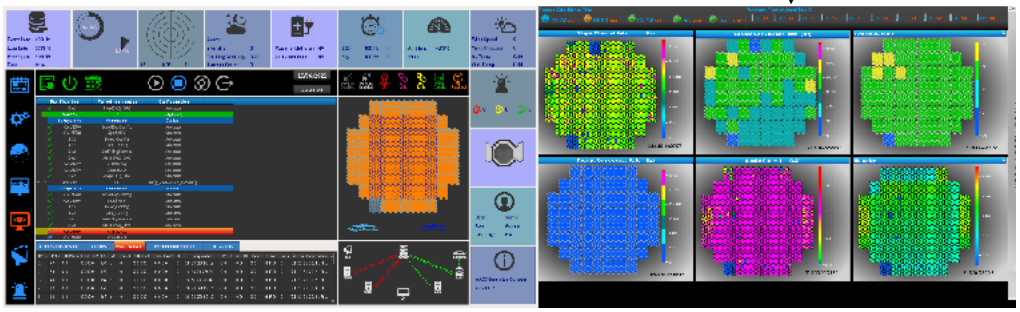
MACE Telescope & Camera operation

MACE Telescope

Local Control & Data archival

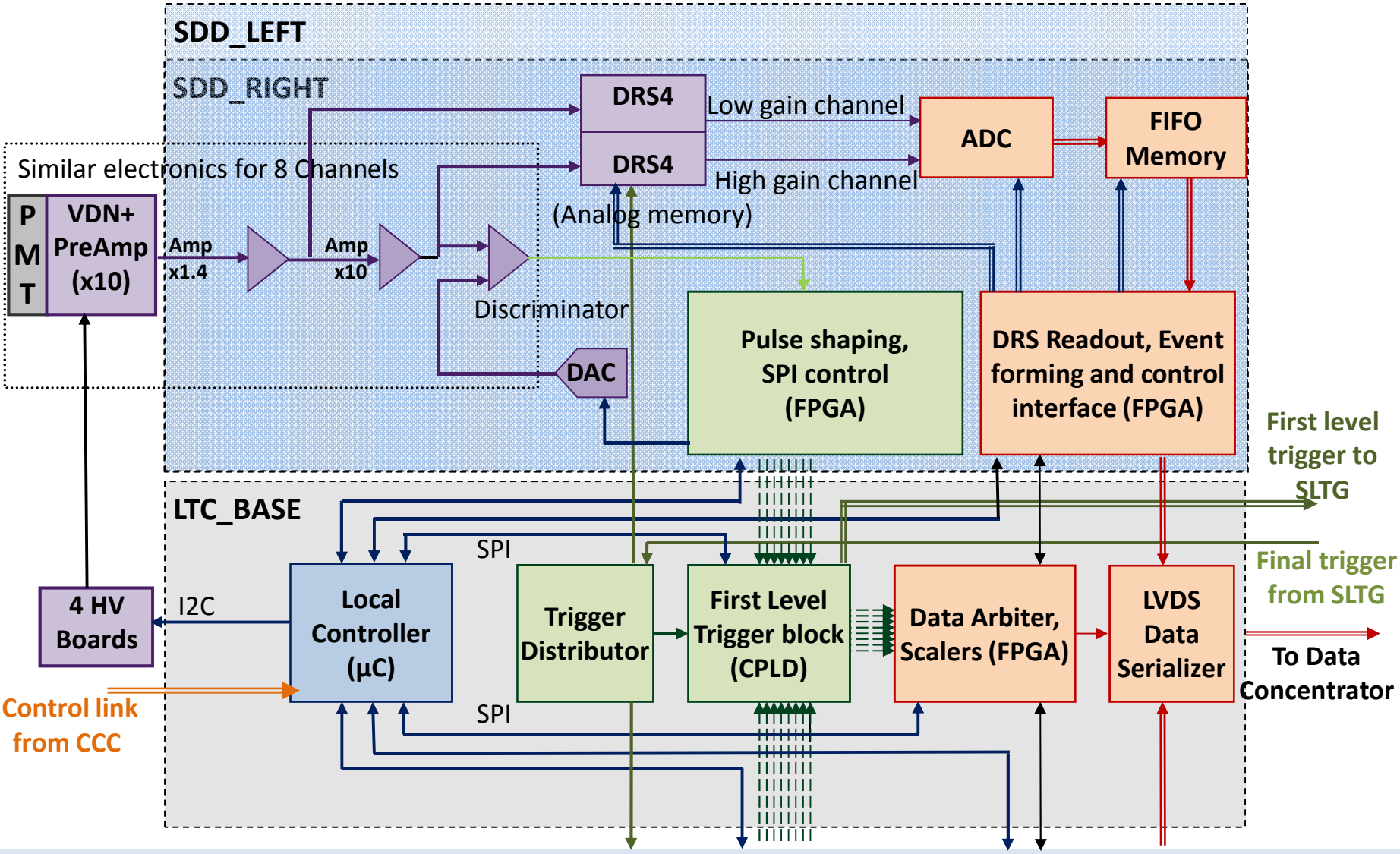
Anunet

Control Room setup at Hanle

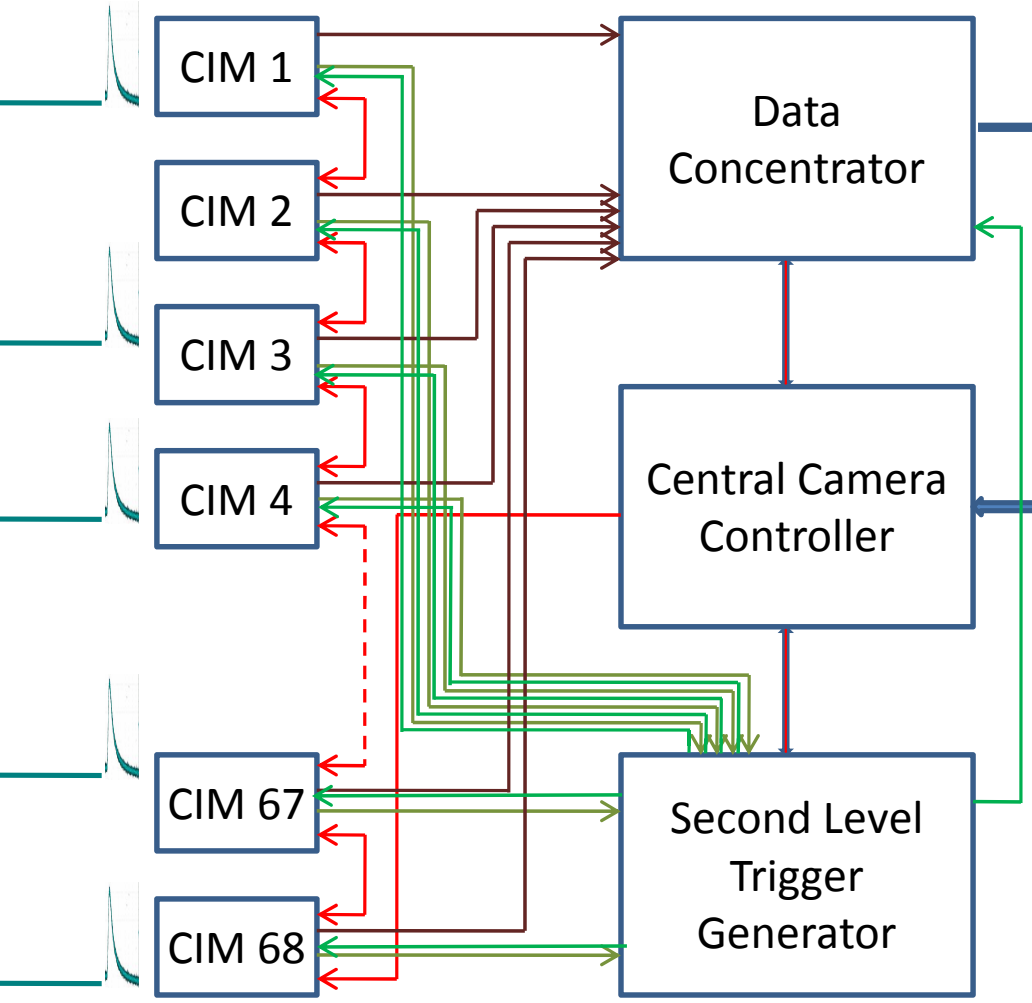


Remote operator Console at BARC, Mumbai

Front End Module (CIM)



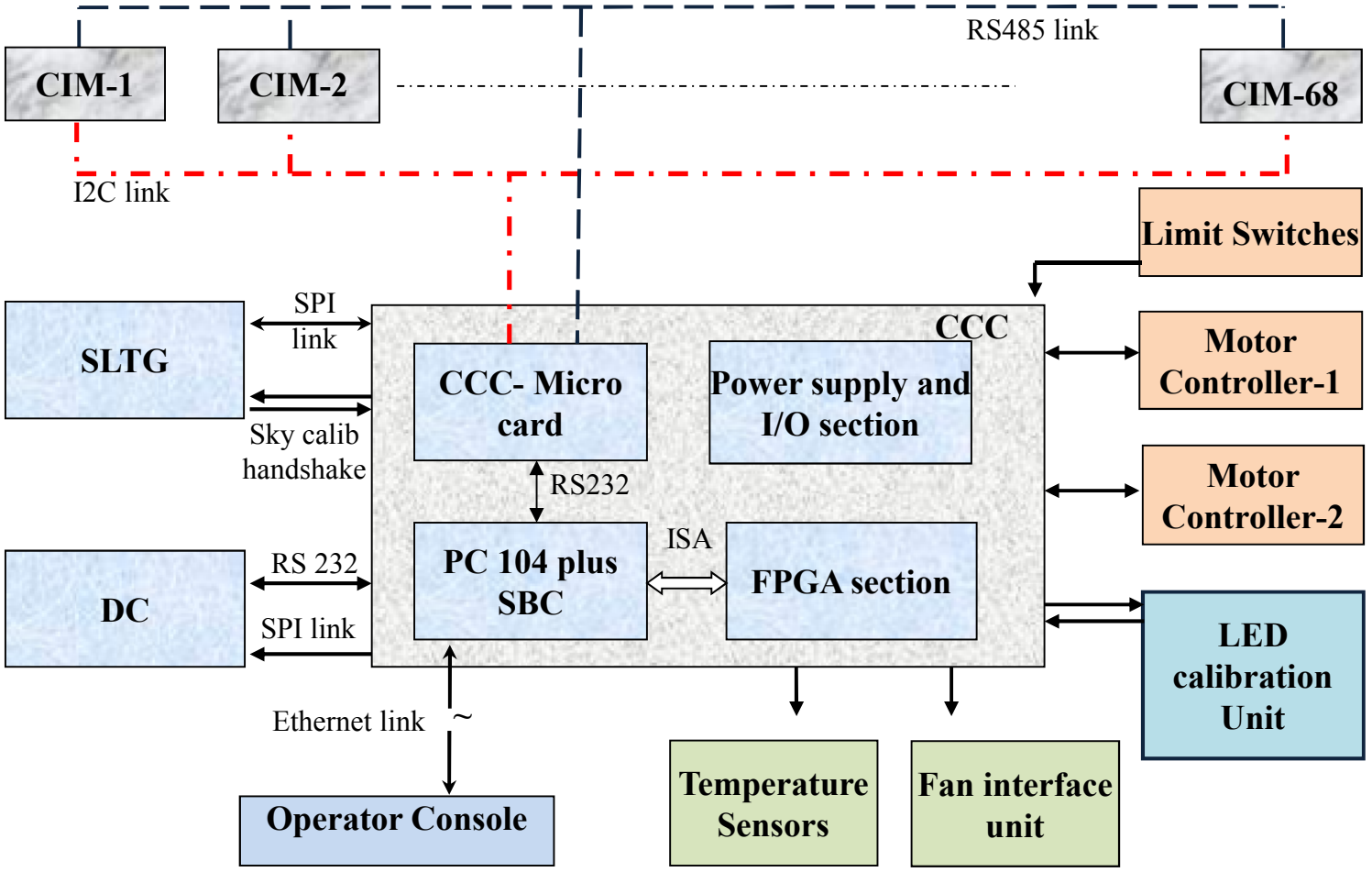
MACE Camera Block Diagram



Control & Monitoring Functions

- Sequential powering of Camera
- POST & Communication link Tests
- Initialization of various subsystems
- Regular monitoring of critical Experimental Parameters
- Ensure Synchronization of Event data
- PMT light overexposure protection
- System Safety & fault Diagnostics

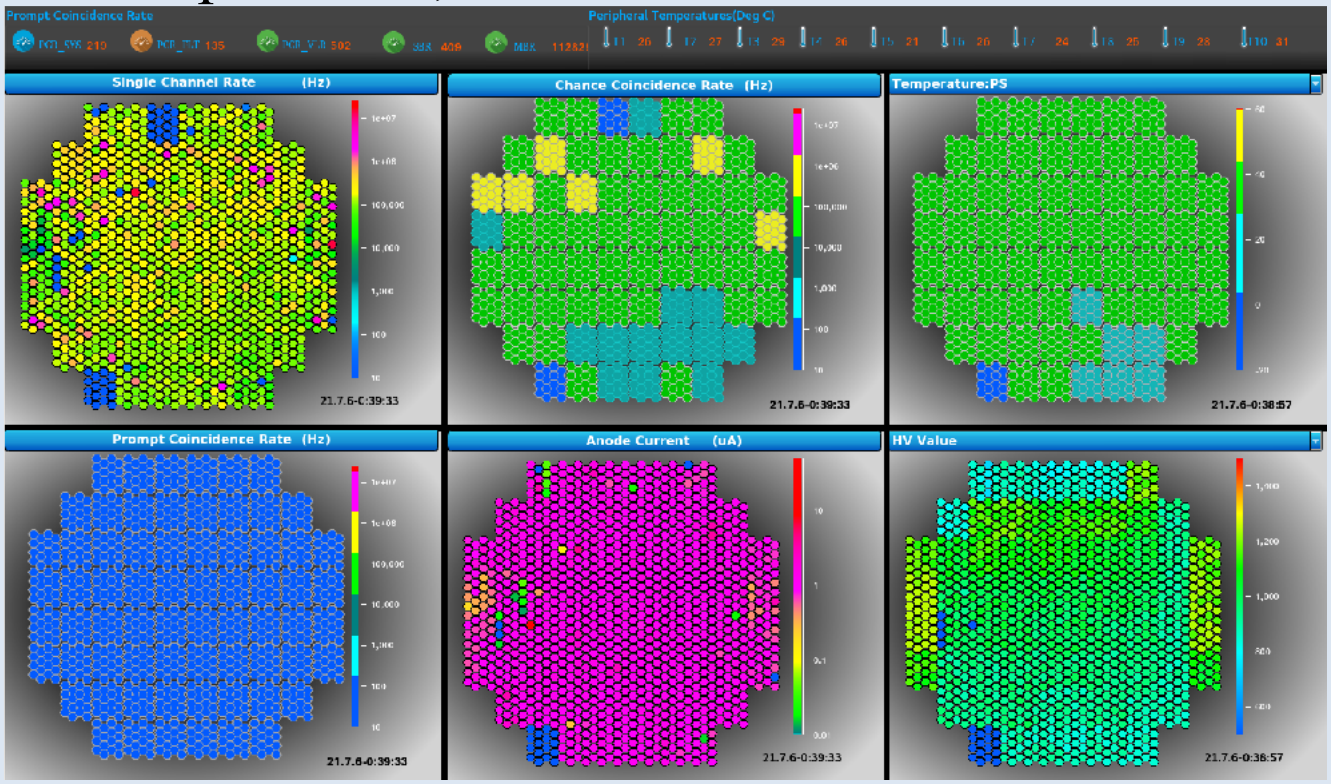
MACE Camera Control System



- System Safety & fault Diagnostics

Regular monitoring of Experimental Parameters

- HV, Anode current, Discrimination Threshold
- Various Scalars like SCR, CCR, PCR
- Module Temperatures, Disabled PMTs



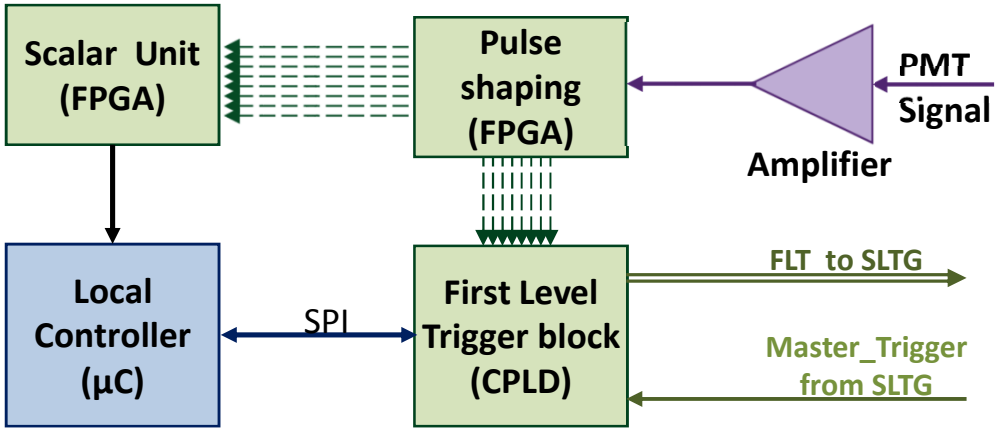
Safety & Diagnostics features

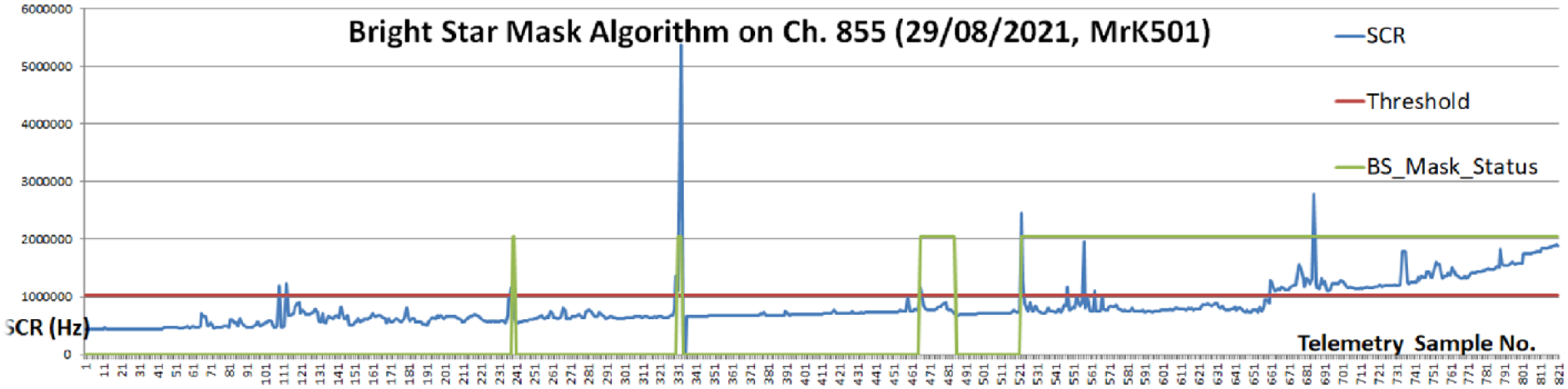
- POST Checks
- Communication link tests
- Regular Event Synchronization Checks
- Regular Telemetry Checks

Commands Result | Alarms | POST Status | Version Information | LID Status

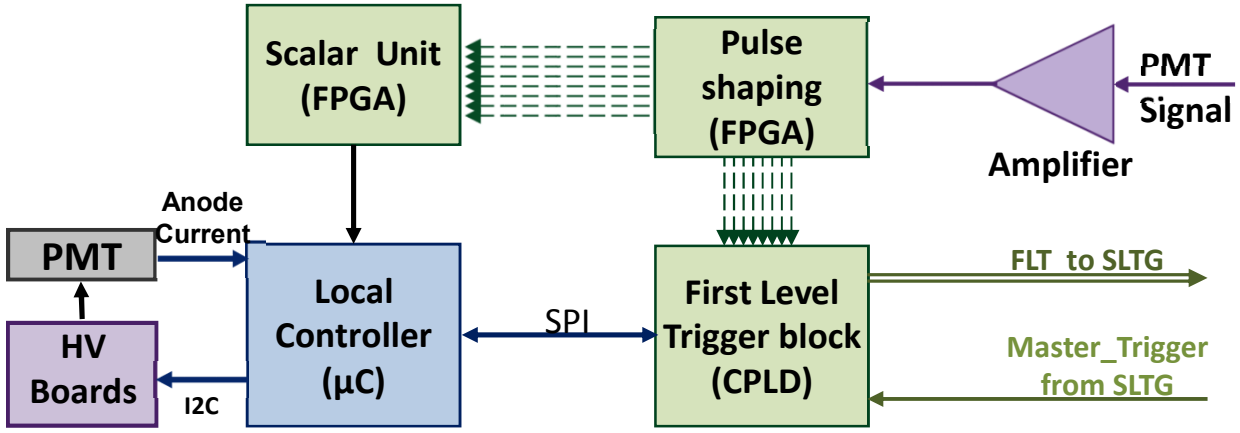
LMID	HMID	LTCMicro	LTCFPGA	PS	SPI	HVI2C	SDDLeft	SDDRight	FLT	Temperature	HV_Rb	AC_Rb	Thresh	Scalar	Calib	VersionInformation
60	70	0 0	0 0 0 0	b4	c	0	0 0 0 0	0 0 0 0	0	2b 2b 2a 2a 15	0 0	0 0	0 0	ff ff 0	0	71 21 21 21 21 ff ...
61	65	0 0	0 0 0 0	b4	c	0	0 0 0 0	0 0 0 0	0	2b 2b 2b 2a 15	0 0	0 0	0 0	ff ff 0	0	71 21 21 21 21 ff ...
62	20	0 0	0 0 0 0	b4	c	0	0 0 0 0	0 0 0 0	0	2b 2a 2a 2a 18	0 0	0 0	0 0	ff ff 0	0	71 21 21 21 21 ff ...
64	45	0 0	0 0 0 0	b4	c	0	0 0 0 0	0 0 0 0	0	2b ff 2a 29 18	0 0	0 0	0 0	ff ff 0	0	71 ff 21 21 21 ff 20
65	9	0 0	0 0 0 0	b4	c	0	0 0 0 0	0 0 0 0	0	2a 2b 2a 2b 17	0 0	0 0	0 0	ff ff 0	0	71 21 21 21 21 ff ...

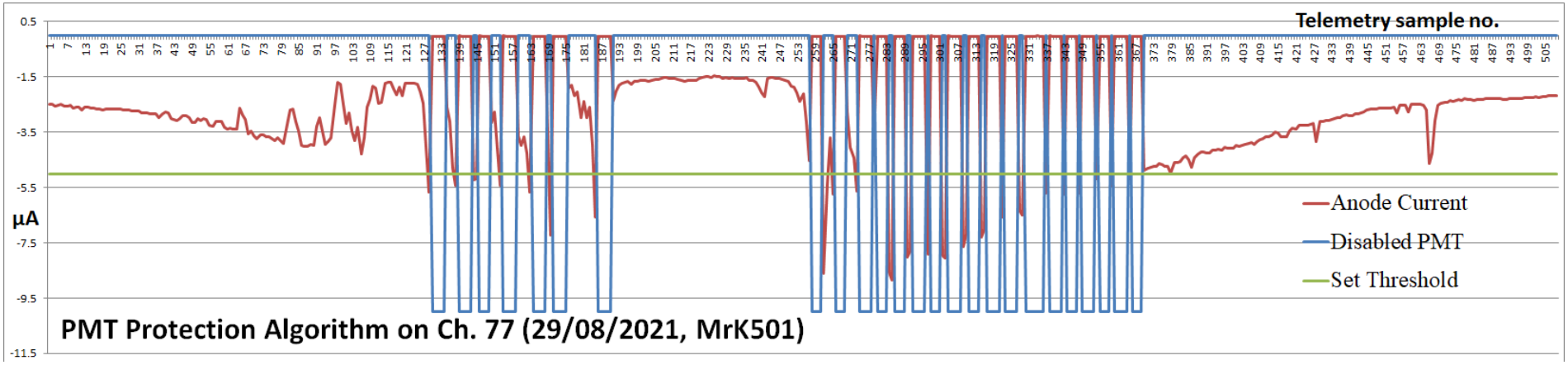
Bright star masking



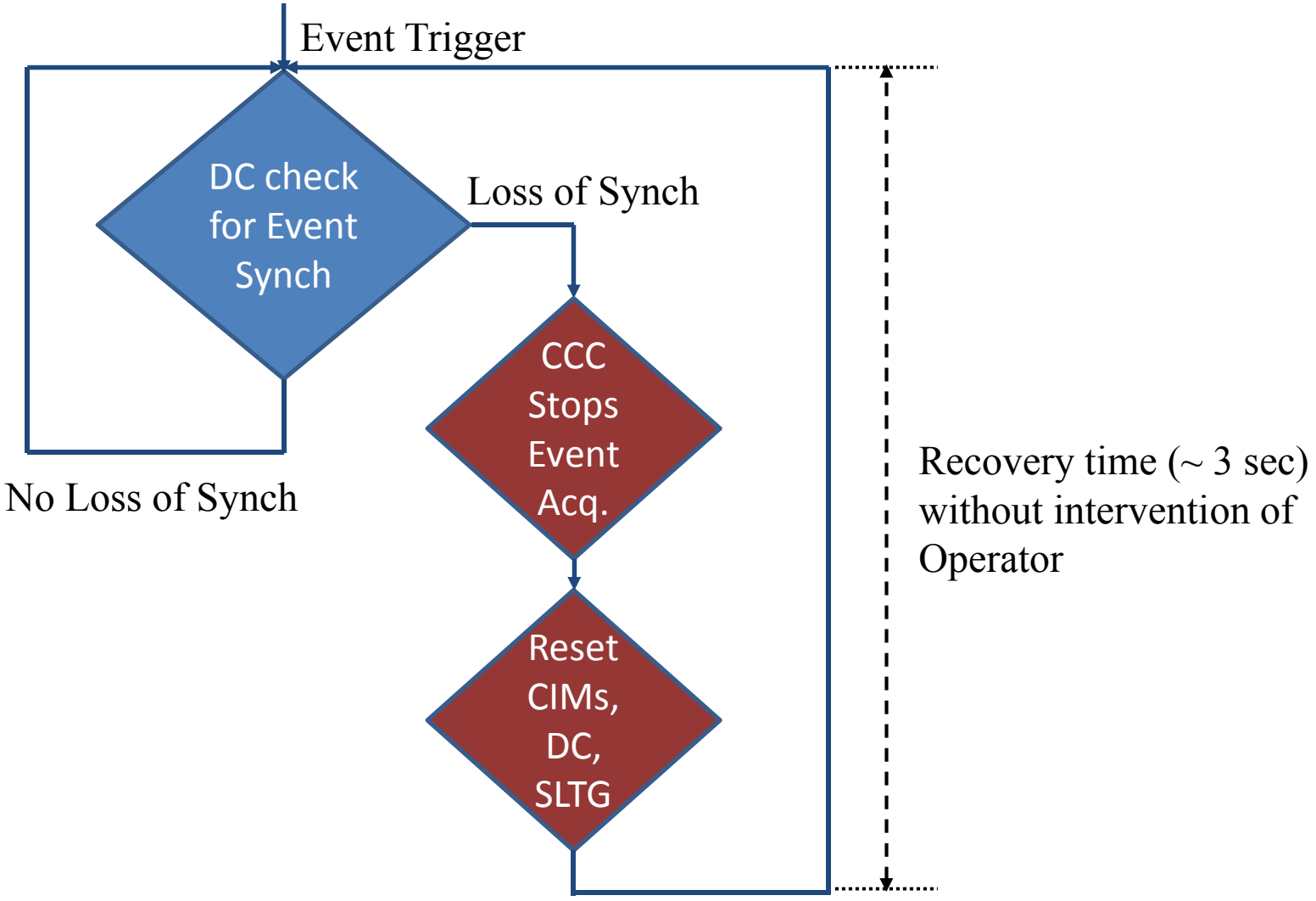


PMT light overexposure protection





Recovery from loss of event synchronization



Conclusion

- MACE Telescope is operational since early 2021.
- Control and monitoring features of Camera Electronics thoroughly tested and working satisfactorily as per design specifications.
- Event Synchronization loss is observed very rarely.
- PMT light Exposure protection algorithm working satisfactorily.
- Bright star mask algorithm working satisfactorily.


BARC
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Thanks