Status of MicroTCA.4 in IHEP accelerators

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on behalf of our team
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Outline

1. Applications
2. Developments
3. New products
4. Compatibility
5. Future plans

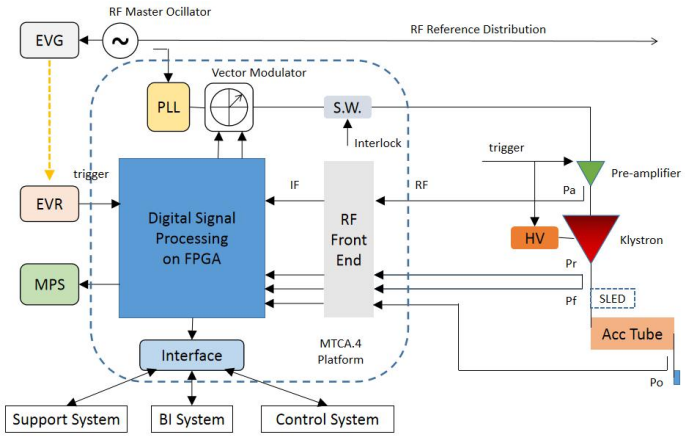
1. Applications

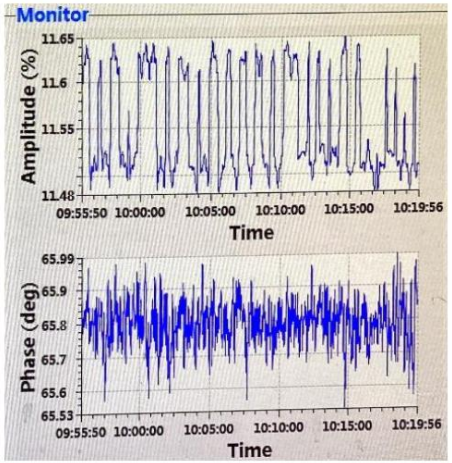
1. Applications

- **Sub Harmonic Bunchers (SHB)**
- Frequency: 142.8MHz/571.2MHz; PPS:1-50Hz; Pulse duration: 60us;
- upgrated of RF FE box, SSAs, power meter, timing interface, server, archiver, cabling, firmware of LLRF controller.
- 2 SIS8300L2/SIS8900 boards for 2 NC bunchers and SSAs
- Crate: ELMA; MCH: NAT; CPU: Kontron;

1. Applications

- **1st LLRF for S-band NC e-LINAC of BEPCII**
- upgrated 15 years old hardware;
- new MTCA.4/SSA/RFFE, fully digital;
- monitor RF signals and HV modulator;
- φ<0.5deg(pp) and A<0.2%(pp);
- 1 SIS8300L2/DWC8VM1: Struck;
- MCH/CPU: NAT;
- 5 more in the next 2 months;





2. Developments

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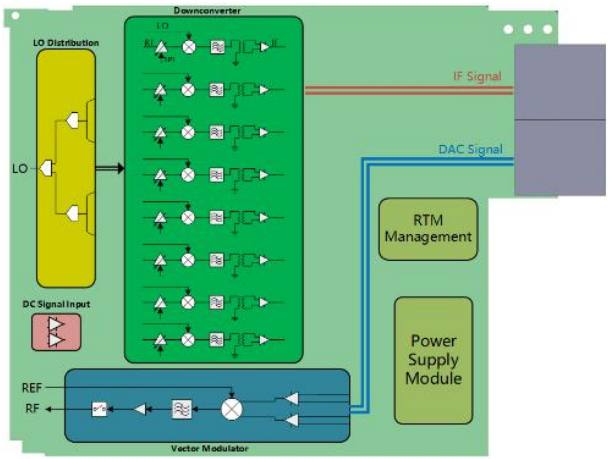
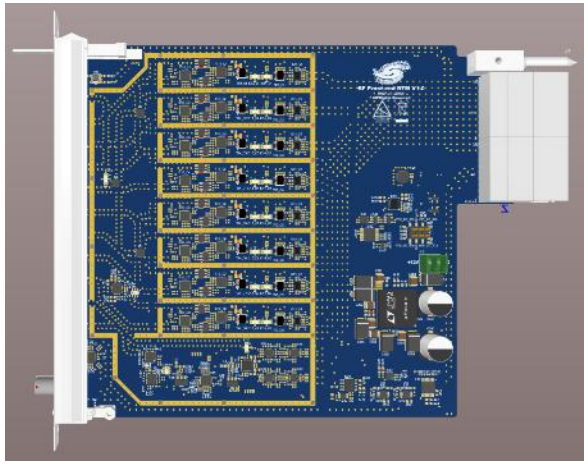
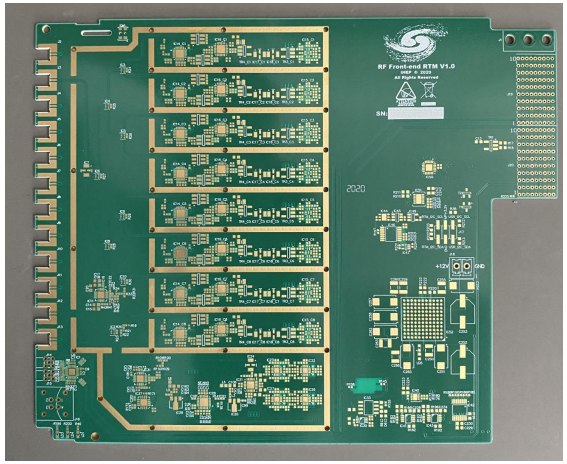
- **RTM board**
- with downconverters and vector modulator;
- cover from 100MHz-6GHz;
- will be used in the near future projects;
- work with SIS8300L2



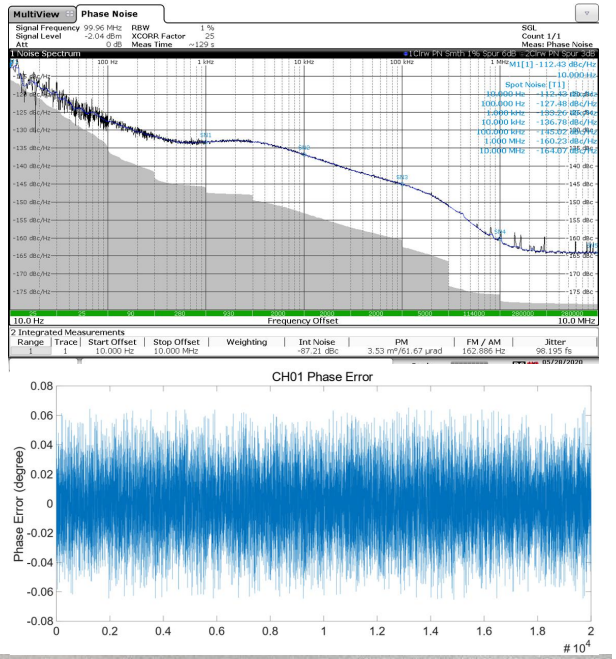


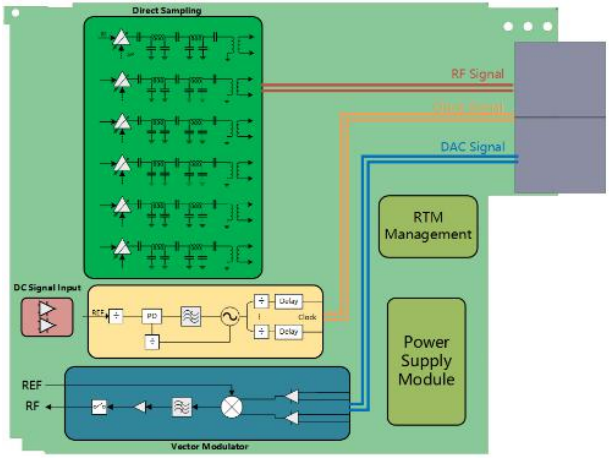


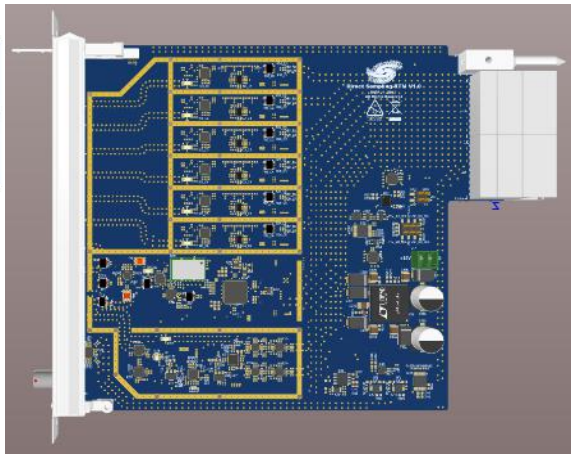
Courtesy by Gan Nan

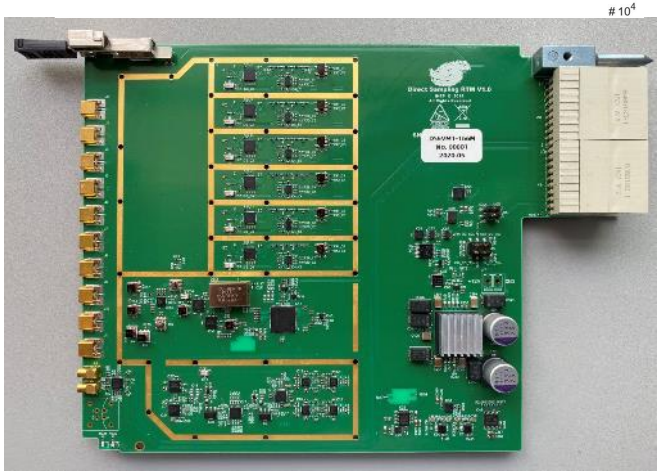
2. Developments

- **RTM board**
- with direct sampling;
- bandwidth 0-650MHz;
- test: input ref = 499.8MHz, output clock frequency = 99.96MHz, jitter = 98fs(rms, 10Hz-10MHz);
- with SIS8300L2 phase error <0.15deg(pp)
- used for <600MHz, SR/circular/Proton;





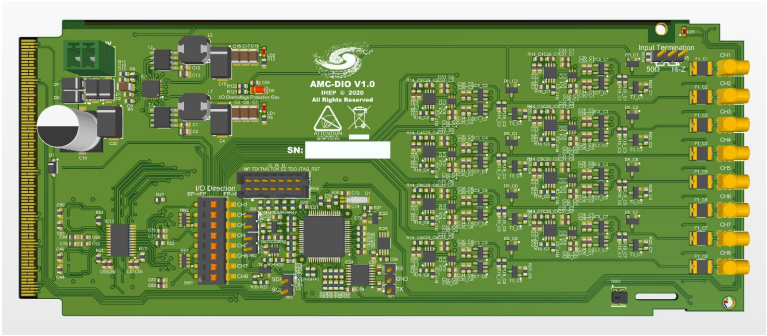


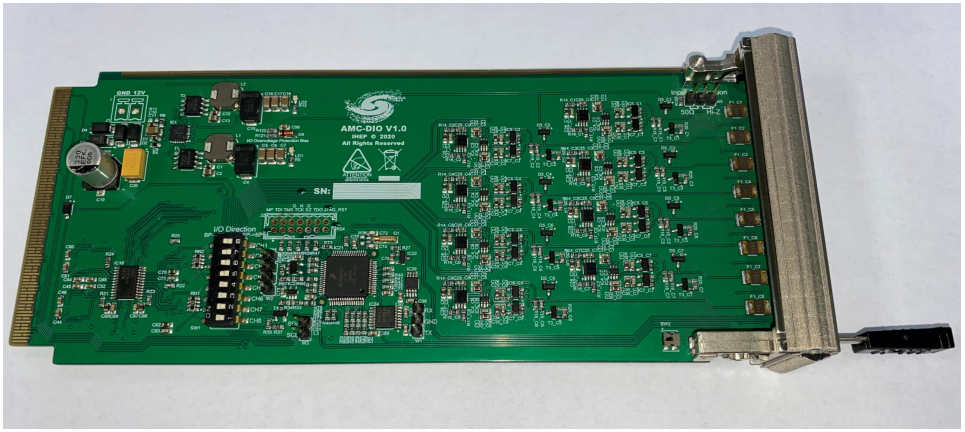


Courtesy by Gan Nan

2. Developments

- **AMC board**
- digital IO board for 8 channels timing trigger fanout;
- MMC took Samway solution;
- good compatibility with NAT MCH, e.g. power on/off, LED logic, information in MCH;

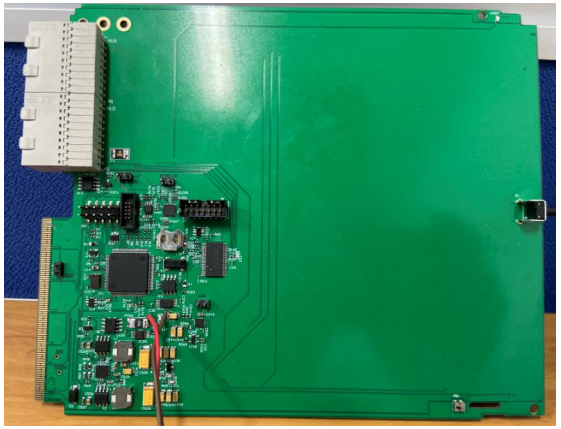


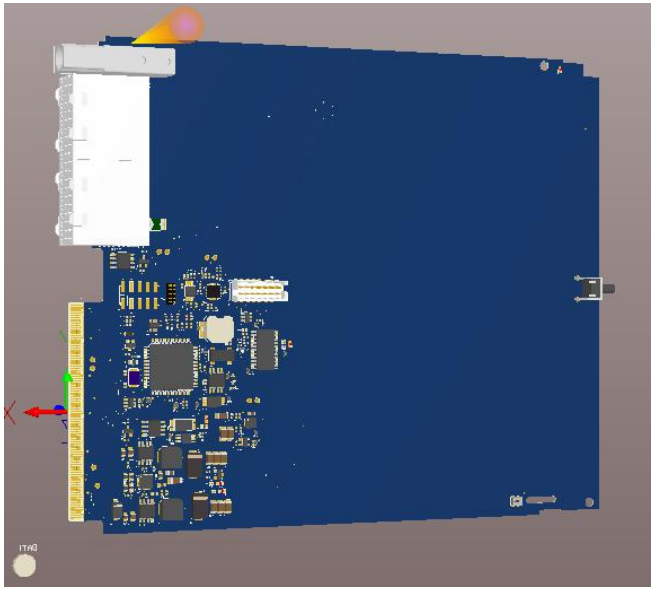


Courtesy by Gan Nan

2. Developments

- **OpenMMC**
- demo board of AMC to evaluate openmmc;
- logic right, power OK, temperature monitor OK, good with NAT MCH;
- MCU: LPC1764;
- next step: under debug, e.g. RTM power/PCB;
- new version:





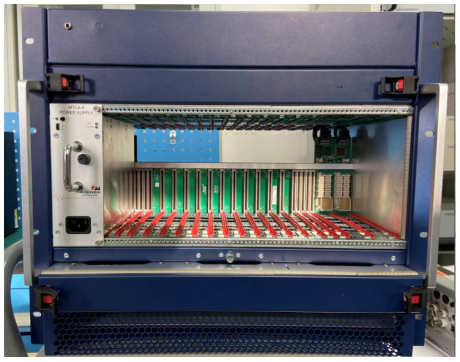
https://github.com/lnls-dig/openMMC

https://ohwr.org/project/afck

Courtesy by Han Sheng

3. New products

- Several crates has been produced in China:
- ELMA 9U: 5 ordered, first is under test at IHEP
- nVent 3U/9U: first 9U is under test at IHEP;
- YZITECH (Chinese) 10U: 1.5kW integrated PS



4. Compatibility

- **NAT MCH:**
  - good compatible with AMC from DESY MMC(Struck/MRF);
  - good with OpenMMC, minor bugs, basically good;
  - good with Samway MMC;
  - with some abnormal with Vadatech MMC/chassis;
  - good with NEW chassis of nVent 3U/ELMA 9U/YZI 10U, some small errors but no big one, still under test and debug
- **Vadatech MCH:**
  with some abnormal with DESY MMC(Struck);
- **Samway MCH:**
  - will be delivered and tested within 1 month;

5. Future Plans

- MicroTCA.4 has been chosen for HEPS LINAC and timing system;
- HEPS LINAC will be installed first later next year, >5 needed;
- BEPCII LINAC will install 5 LLRF in 3 months, another 14 in 3 years;
- A universal AMC board has been designed and will be used for IHEP/CSNS future accelerator projects, hardware and firmware finished in the next 6 months;
- Promote community in China, workshop@May@China;

Thank you for your attention!