Gⁿ internal Readiness Review **BigBite Electronics and Trigger**

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University of Connecticut

SBS collaboration meeting 2019/08/05



Project scope

Multiple goals to achieve:

* Electronics:

- **Electronics assembly** for all BigBite subsystems (Calorimeter, GRINCH, hodoscope, GEMs) with help of respective groups

- integration in DAQ and cosmics commissioning

- * BigBite Trigger:
 - Logic layout
 - Logic assembly
 - Connection to BB calorimeter and cosmics tests.



BigBite detector:



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<u>GRINCH</u>: (See Todd Averett's talk) 510 PMTs; 32 NINO – 510 TDC ch – 64ADC ch* (ADC calibration); 64 HV channels (PMT), LV (NINOs); 4 24-way HV cables+1 LV cable; 88 17-pair flat ribbon cables (TDC signal); 64 RG50 coax cables* (ADC calibration); + cables for: PMT-NINO signal, PMT HV, NINO LV distribution + 32 LDVS-2-ECL;

HODOSCOPE: (See Rachel Montgomery's talk)

180 PMTs;

12 NINO – 180 TDC ch – 64ADC ch* (ADC calibration);

180 HV channels (PMT), LV (NINOs);

2 48-way HV cables+2 LV cables;

24 17-pair flat ribbon cables (TDC);

64 RG50 coax cables* (ADC calibration);

+ cables for: PMT-NINO signal, PMT HV, NINO LV distribution

+ 12 LDVS-2-ECL;

* shared between both

BigBite detector:





Status of equipment: electronics and cabling

| BigBite Front-end / Trigger | | |
|--|---|--|
| NIM bins (6 – including 2 high power ones) | On site (TED): Installed in Front end racks | |
| Trigger NIM logic components (amplis, splitters, summers, fan-in/fan-outs, discris, octal & quad logic units) | On site (TED): tested, installed in their crates in Front end, cabled (cabling tested with pulser, cosmics) | |
| Cables to connect logic components | On site (TED): tested, installed. | |
| BNC-BNC Front-end side signals cables (54+104) | On site (TED): tested, installed. | |
| Flat 17-pair front-end side logic signals cables (14) | On site (TED): tested, installed (1 to be shortened). | |
| 243 Cables to connect logic to calorimeter blocks (10m BNC-lemo) | On site (TED): tested, labelled, installed. | |
| Fast Trigger Cable | On site, to be identified | |
| BigBite Electronics weldment | | |
| 9U VME crate for TS | On site (TED), installed, to be tested | |
| 6 (7?) TI modules | On site (TED+), to be identified | |
| NIM logic for retiming | On site, to be identified | |
| Computer / scope | On site, 1 of each in TED if we need others, to be identified | |
| BBECal 1 Fastbus crate | On site (TED), installed, to be tested, moved, rearranged | |
| BBECal 6 ADC (LC 1881M) + 2 TDC (LC 1877) | On site (ESB), installed, to be tested | |
| 2 Lecroy HV crates + 21 CAEN 1461N HV modules | On site (ESB), installed, tested | |
| VME crate + VETROC modules | On site (TED); installed, tested | |
| 6 CAEN 1421P modules | On site (TED); installed | |
| Electronics for Timing hodoscope | see Rachel Montgomery's talk | |
| Electronics for GEMs | see Evaristo Cisbani's talk | |

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Big Bite front end logic



Status of equipment: electronics and cabling

| Cables | | |
|--|---|--|
| Cables for Calorimeter signal (347 BNC-BNC) | On site (TED), tested, labelled, to be installed | |
| HV cables for calorimeter (243) | On site (TED): tested, labelled, installed. | |
| 22 16 Coax BNC-flat 17-pair (calorimeter signal to DAQ modules) | On site, to be identified, tested, organized, labelled | |
| Cables for GRINCH TDCs (64 17-pair flat-ribbon 30m) | On site: tested, labelled, 32 in TED / 32 in ESB, to be (re)installed | |
| Cables for GRINCH ADC-TOT calibration (64 BNC-BNC) | borrowed from ECAL; 32 in TED / 32 in ESB, to be (re)installed | |
| 4 24-way HV Cables + distribution boxes + cables to PMTs | On site (TED): tested, labelled, installed. | |
| LV cable for GRINCH NINO (1) + cables for distribution to NINOs | On site (TED): tested, labelled, installed. | |
| Cables for Hodoscope TDC (24 17-pair flat-ribbon) | On site (TED): tested, labelled, to be installed | |
| Cables for Hodoscope ADC-TOT calibration (64 BNC-BNC) | Shared with GRINCH (or to be borrowed from ECAL) | |
| 48 Hodoscope HV Cables (2) + distribution boxes + cables to PMTs | On site (TED): tested, labelled, to be installed | |
| LV cable for Hodoscope NINO (2) + cables for distribution to NINOs | On site (TED): tested, labelled, installed. | |
| 23 Optical fiber (25 m) MPD – SSP connection | To be procured | |
| 23 NIM cables (15 m ?) trigger dist + 21 10 cm cables (clock dist) | To be identified / procured | |
| 16 x HV cables (15 m ?) | Cables to be built, tested | |
| 6 x LV cables pairs (15 m ?) | To be identified / procured | |



BB weldment layout



Most crates in place, *needs cabling*:

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(NB: 1 or 2 FB crates could go out of the way if need be)

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BB weldment layout



Status of ancillary infrastructure

| BigBite Front-end / Trigger | | |
|--|---|--|
| Front End rack assembly (2 racks) | In TED high bay, still needs to be shortened (no emergency) | |
| BigBite Electronics weldment | | |
| BigBite weldment (8 racks) | In TED | |
| New BigBite weldment platform | Built ! | |
| Bertha for power supply | In TED, in strain for 208 V tri-phased plugs (need 5 total, have 2+2) | |
| Other | | |
| Rack for GRINCH / hodoscope level translator | Use former GRINCH rack | |
| Rack for GEM front end | Use already available rack in Test Lab | |
| Rack for GRINCH gas panel | In TED | |



New BigBite
Weldment platform



Location of equipment in TED high bay: **Massive rearrangment**



~10.5 m

Status of DAQ software

| | DAQ |
|---|-------------------------|
| | NOT SETUP, NOT READY! |
| HV | |
| Grinch, Calorimeter (Lecroy crate + raspberry pi) | Functional |
| Hodoscope (Caen SY1527) | Functional (via telnet) |
| GEMs | Functional |

100 Miles DPO

26 Apr 2019 16:19:23 CHIZ

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Focus on DAQ!!!

5.

SET TO

FORCE VILAVEFORM INTENSITY

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DELAY

RUNY STOP

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Manpower and completion timeline

* Status as of early August 2019:

- * BigBite front-end assembled, tested;
- * BigBite weldment in TED, a large fraction of items installed in;
- * About a half of the "long" cables have been installed from detector package to weldment
- * no DAQ yet

* power supply issue (need 1 extra 208V tri-phased – had discussed with Chuck, can be done with help of electric group)

* a few items to install in weldment (mainly GEMs stuff to integrate);

* the other half of long cables to install

Short term goals:

- * mid-August: (i.e. the end of next week)
 - * Complete (+) the cabling from detector and front-end to weldment ;
 - * cable things in weldment (*);
 - * setup coda on TED computer (need to talk to Alex again)
- * early September:
 - * DAQ functional => start calorimeter gain matching with cosmics.

(*) i.e. do as much while students are still here - see next slide;



Manpower and completion timeline

Great manpower during summer:

* up to 3 postdocs part time: Scott Barcus, Arun Tadapelli (both JLab), and myself (UConn);

- * 2 grad students: Sebastian Seeds, Provakar Datta (both UConn);
- * 1 Masters student: Ashley Yoon (CNU);
- * 2 intern undergrad students: Abby Hellman (UVA), Josh McMullen (NMU);
- + GRINCH team: Maria Satnik, Carlos Ayerbe (W&M);
- + Hodoscope team: Rachel Montgomery, John Annand, Tony Clarkson (UGlasgow);

All of them were of great help to:

- * test, label, install cables
- * rearrange items in TED, in the weldment

+ Assistance from Hall A techs:

Chuck Long, Bob Tucker, Heidi Fansler, Andrew Lumanog, Jessie Butler. => Racks move from old to new weldment, weldment move from ESB to TED, move detector package in TED

- + Engineering team: Walter Akers et al.,
- => weldment assembly

Most students gone next week, however...



(suggested) location of equipment in the Hall

BB at 33 degrees



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Open questions:

- * Small additional shielding area for NINO PS
- * Level translator/refreshers.
- * Cable path ? (i.e. couldn't we really get it shorter ?)

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