Short Introduction to SAMURAI-TPC (or sTPC or SPiRIT)

SAMURAI TPC: Design overview

Rigid Top Plate
Primary structural member, reinforced with ribs.
Holds pad plane and wire planes.

Front End Electronics
Liquid Cooled

Pad Plane (108x112)
Mounted to bottom of top plate.
Used to measure particle ionization tracks

Field Cage
Defines uniform electric field.
Contains detector gas.

Wire Planes (not visible)
Mounted below pad plane.
Provide signal multiplication and gate for unwanted events

Beam

Voltage Step-Down
Prevent sparking from cathode (20kV) to ground

**Calibration
Laser Optics**

Target Mechanism

Thin-Walled Enclosure
Protects internal components, seals insulation gas volume, and acts as major structural member

Rails
For inserting TPC into SAMURAI vacuum chamber

How the TPC works

- Charged particles ionize gas inside
  - Ionized electrons drift toward pad plane
- Signal from electrons detected on pads
  - Positions and time of arrival → 3D path
- Infer momentum from curvature of particle tracks in magnetic field
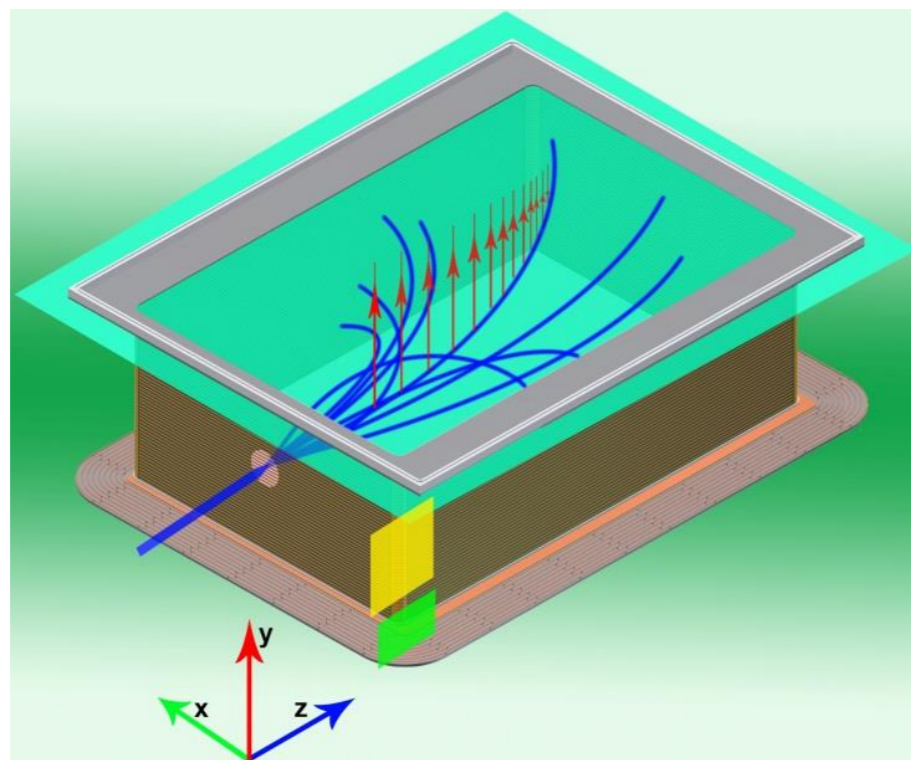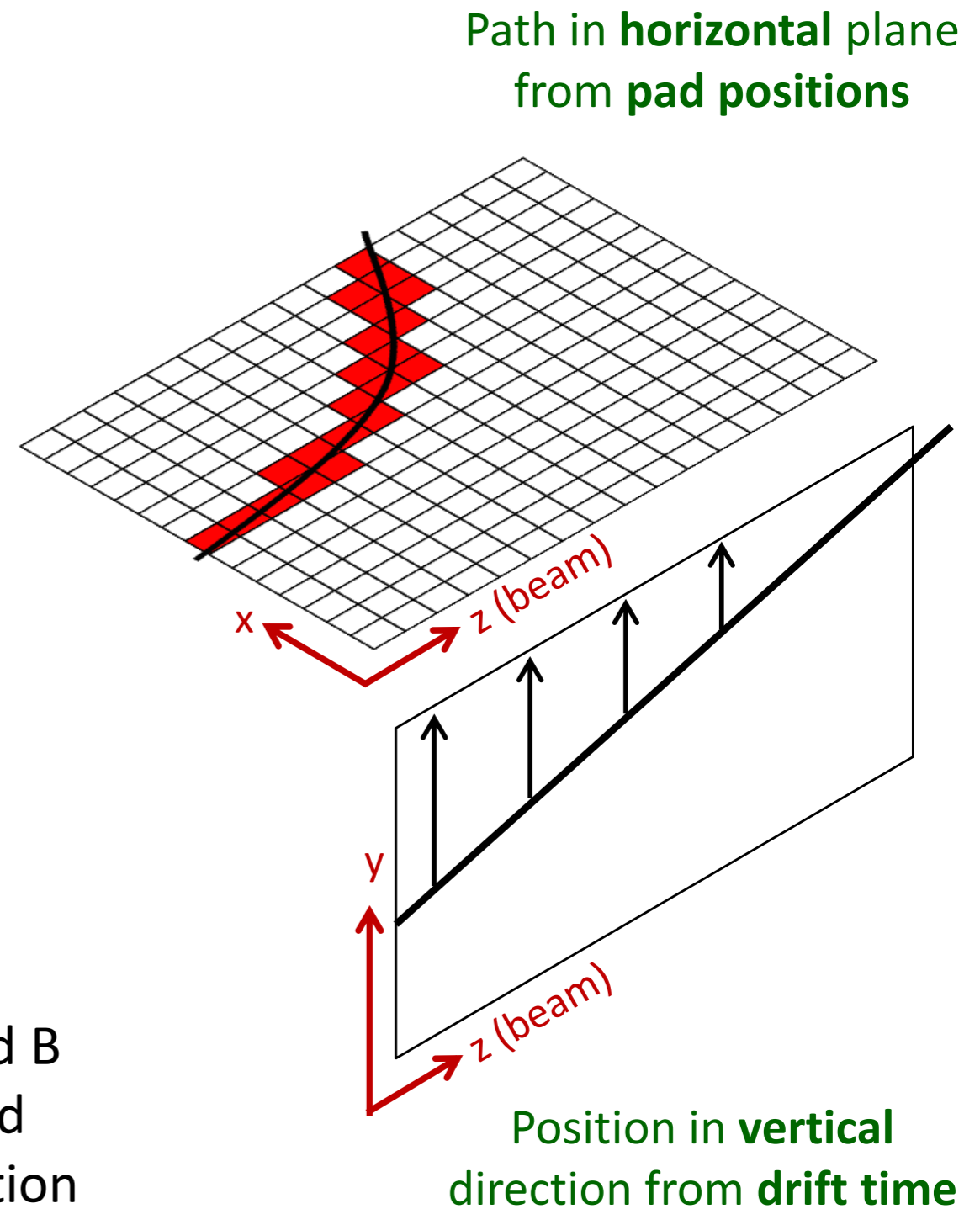- Particle type from energy loss and magnetic rigidity

E and B field direction

Position in **vertical** direction from **drift time**

Figure courtesy of J. Estee

Figure courtesy of J. Barney

| SAMURAI TPC Parameters	
Pad Plane Area	1.34 m x 0.86 m
Number of pads	12096 (112 x 108)
Pad size	12 mm x 8 mm
Drift distance	53 cm
Pressure	1 atmosphere
Gas composition	90% Ar+10% CH_4
Gas gain	3000
E field	120 V/cm
Drift velocity	5 cm/μs
dE/dx range	Z=1-8, π, p, d, t, He, Li-O
Two track resolution	2.5 cm
Multiplicity limit	200

Pad Plane
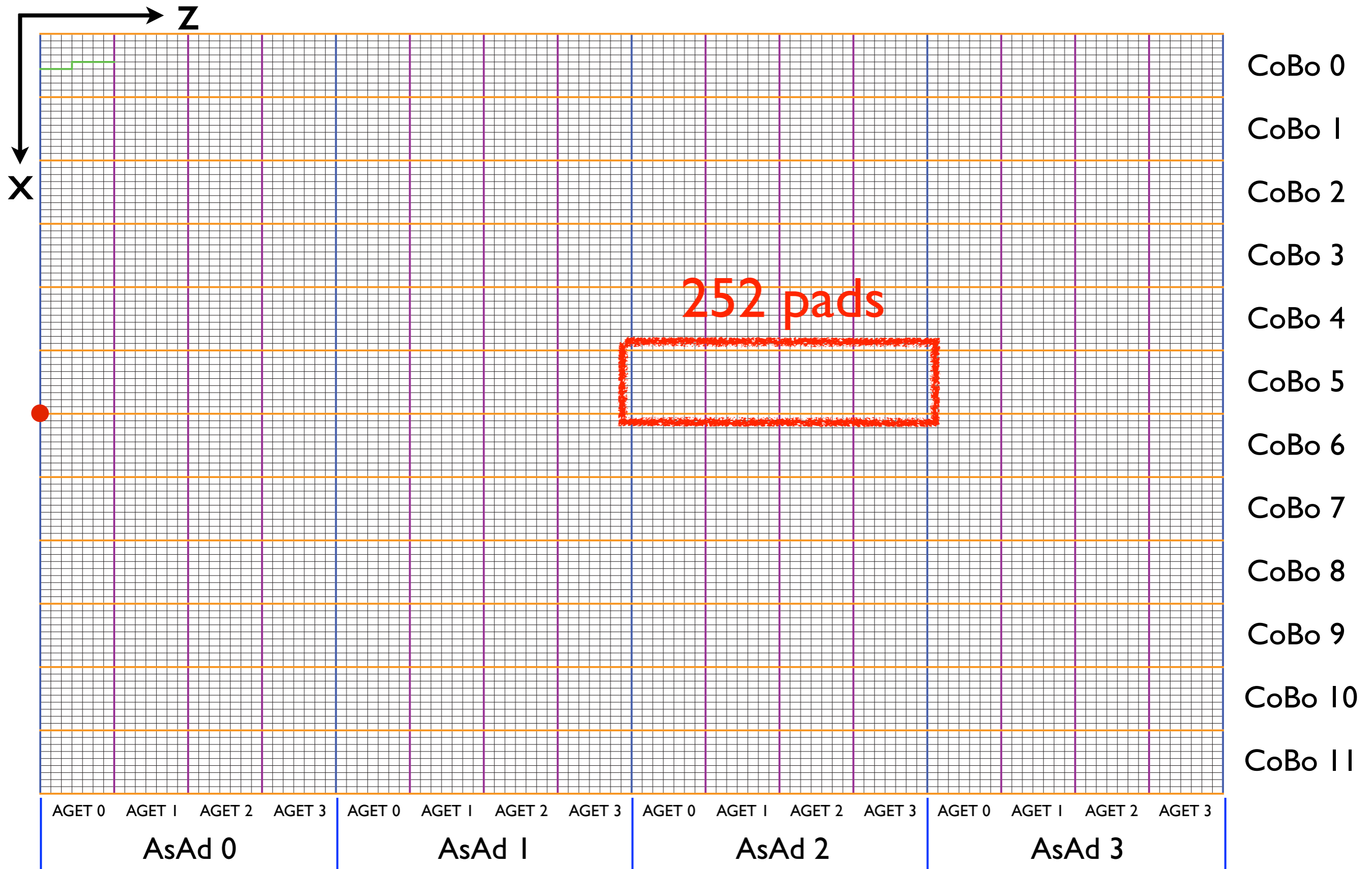
coincidence rate: 0.6 cps

or rate: 15 cps

cosmic ray
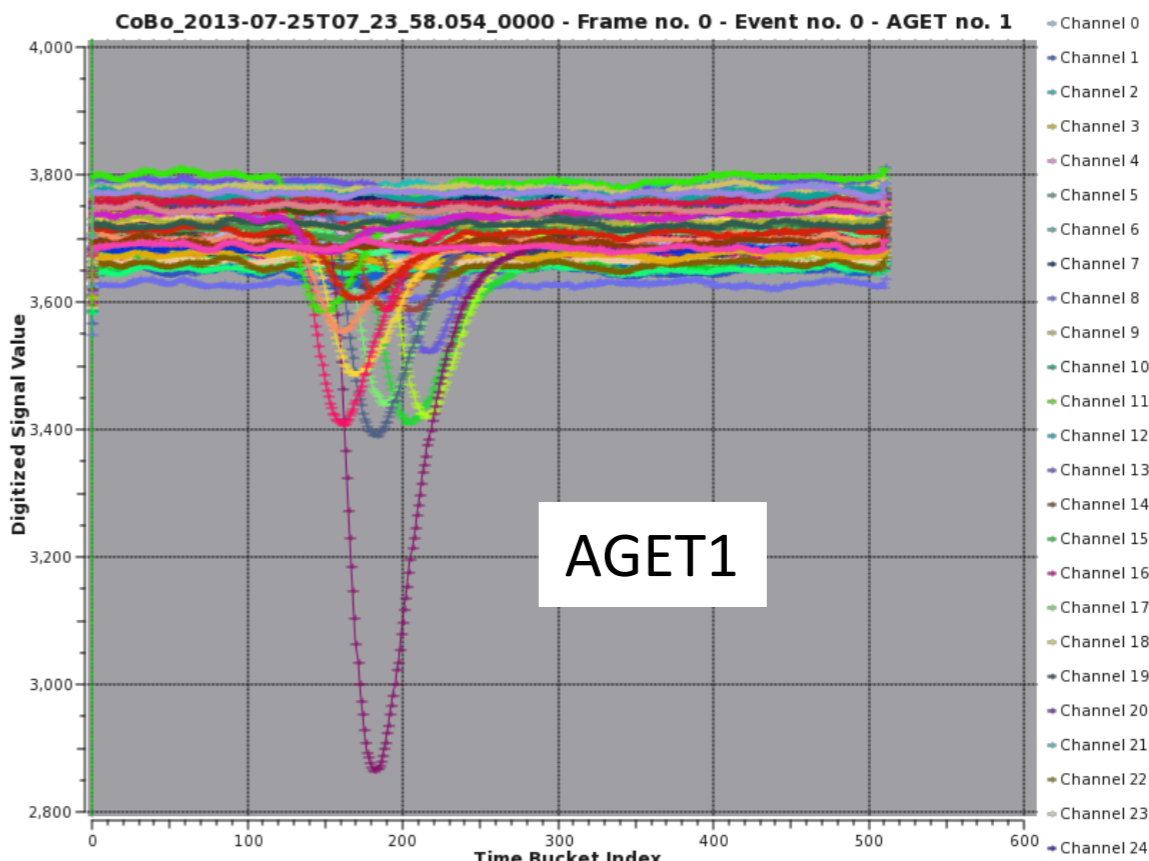
scintillator
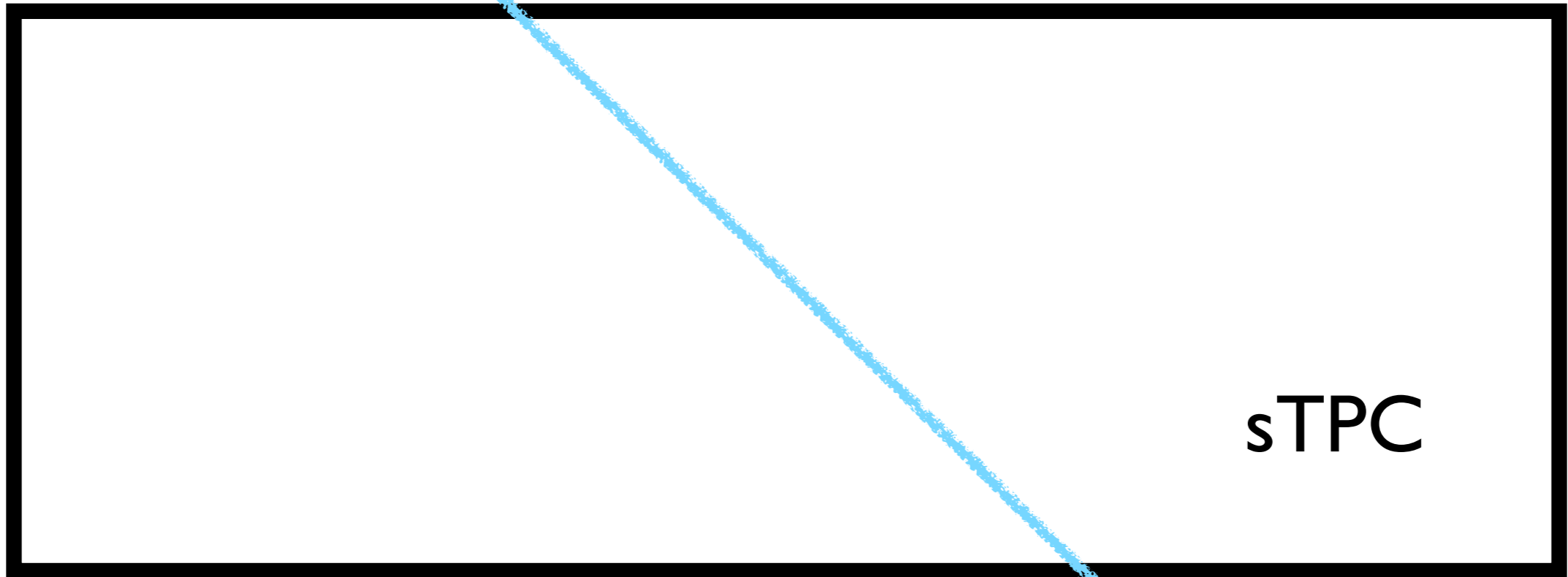
sTPC

scintillator
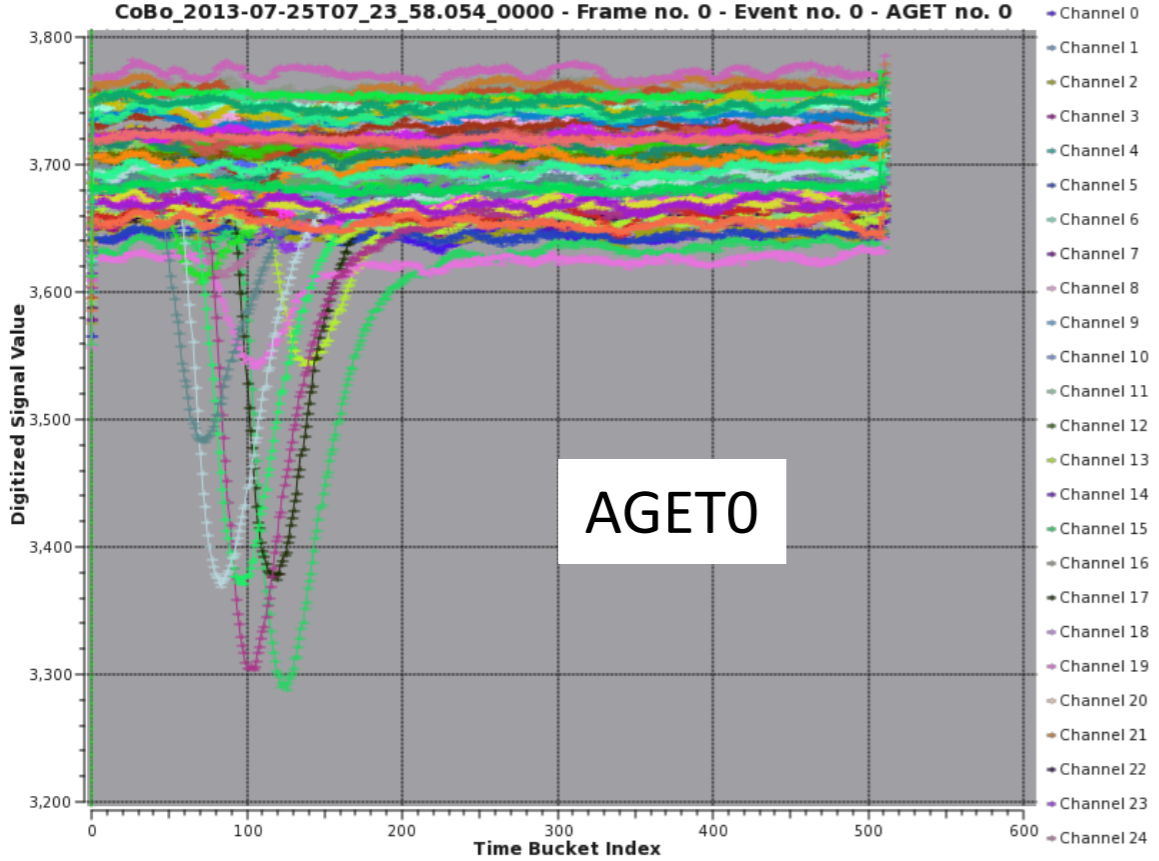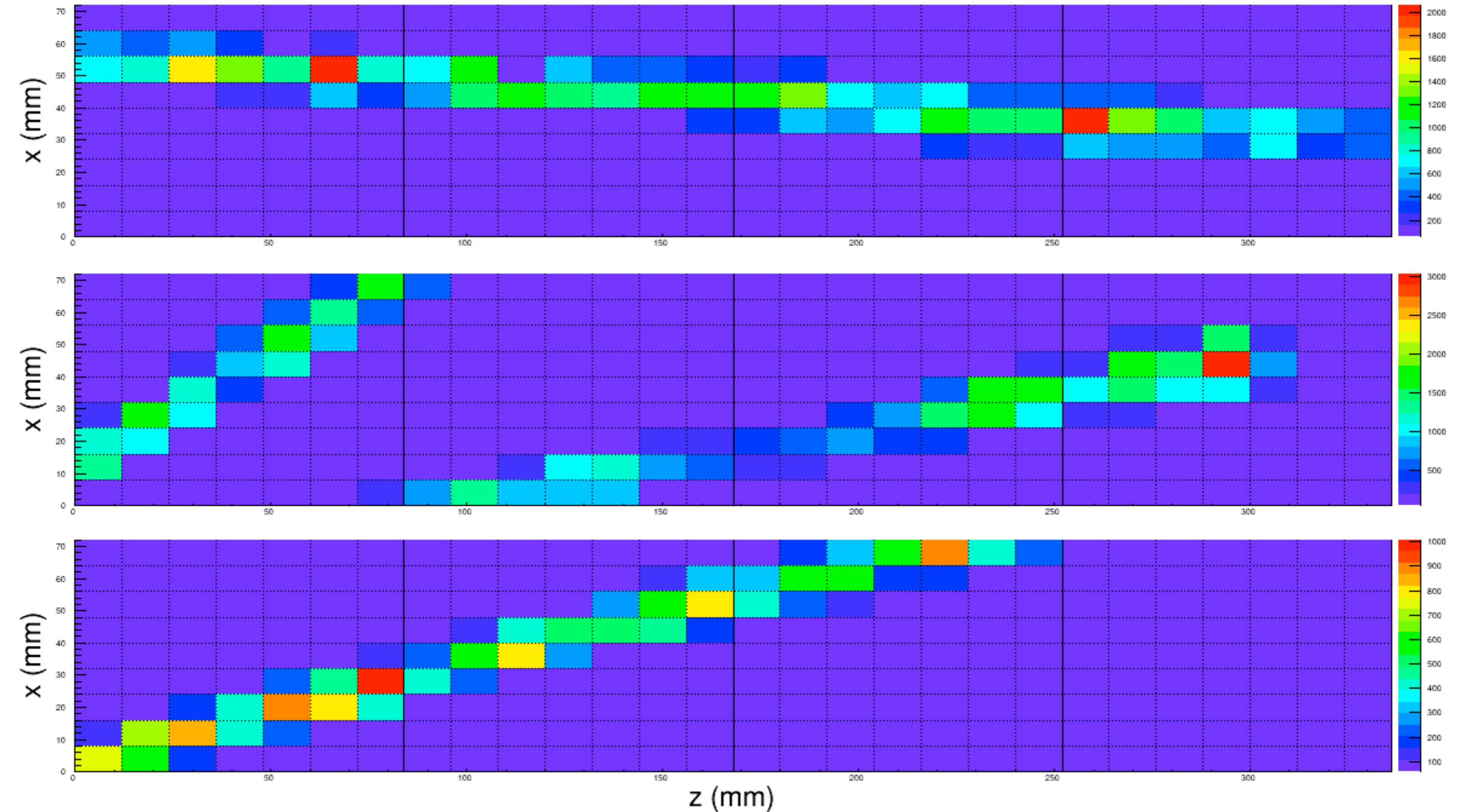
upstream

downstream
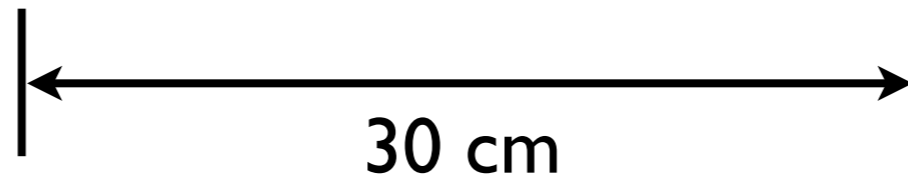
30 cm

Photo from Aki's slide

Cosmic Event 0 (July 24th, 2013 @NSCL)
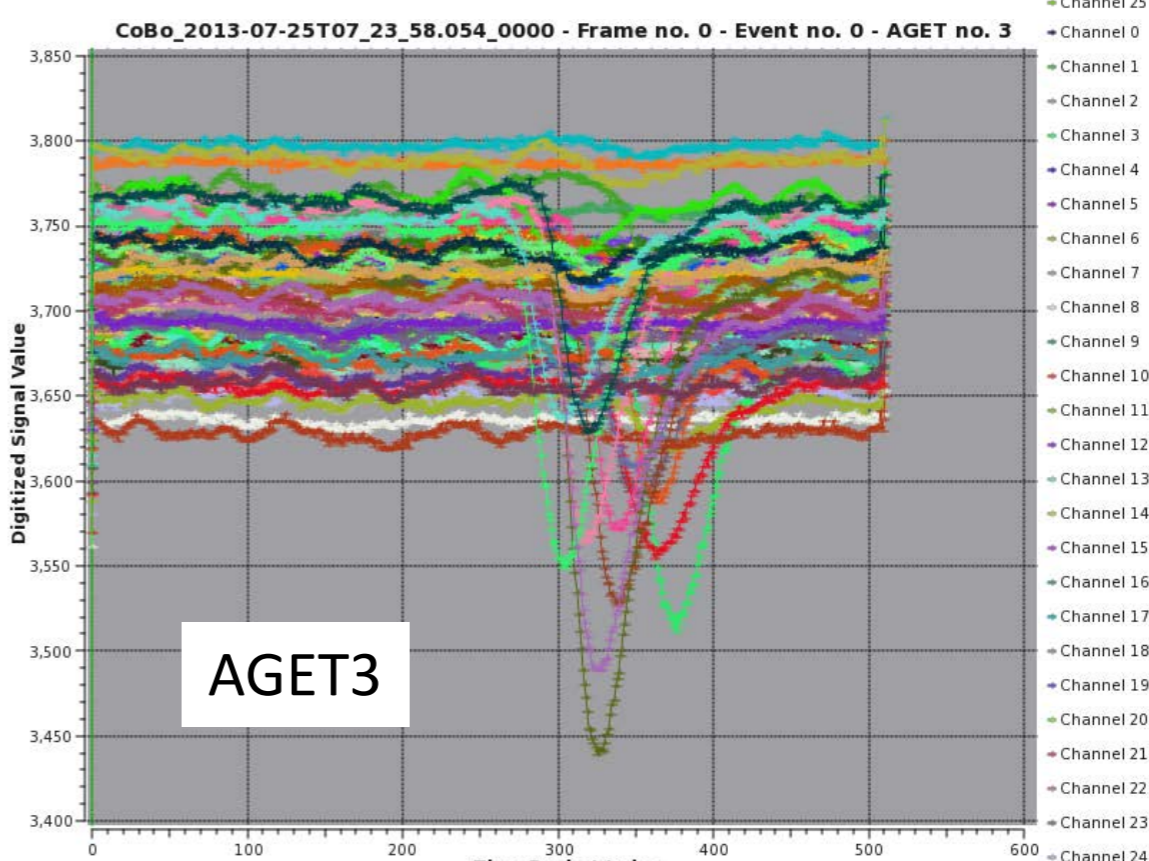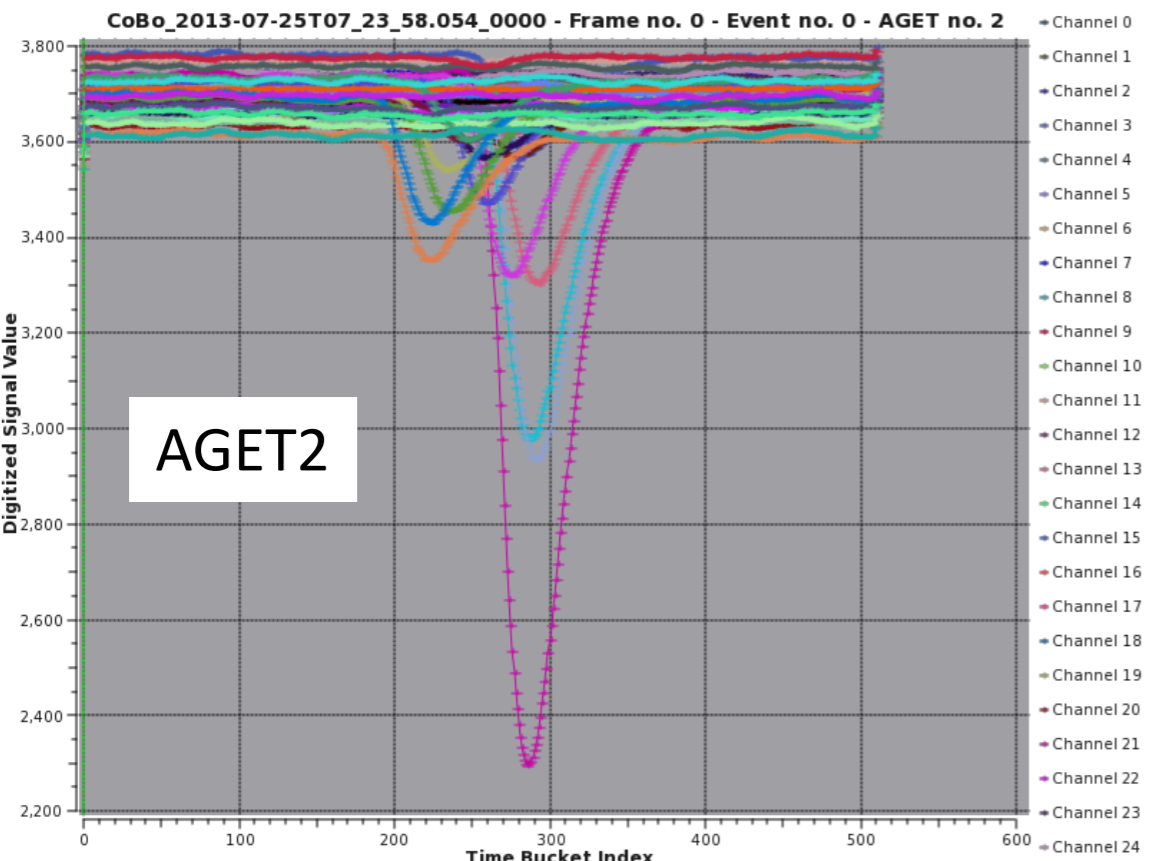
Event Displays on Pad Plane

CoBo_2013-07-27T15_35_00.669_0000.graw
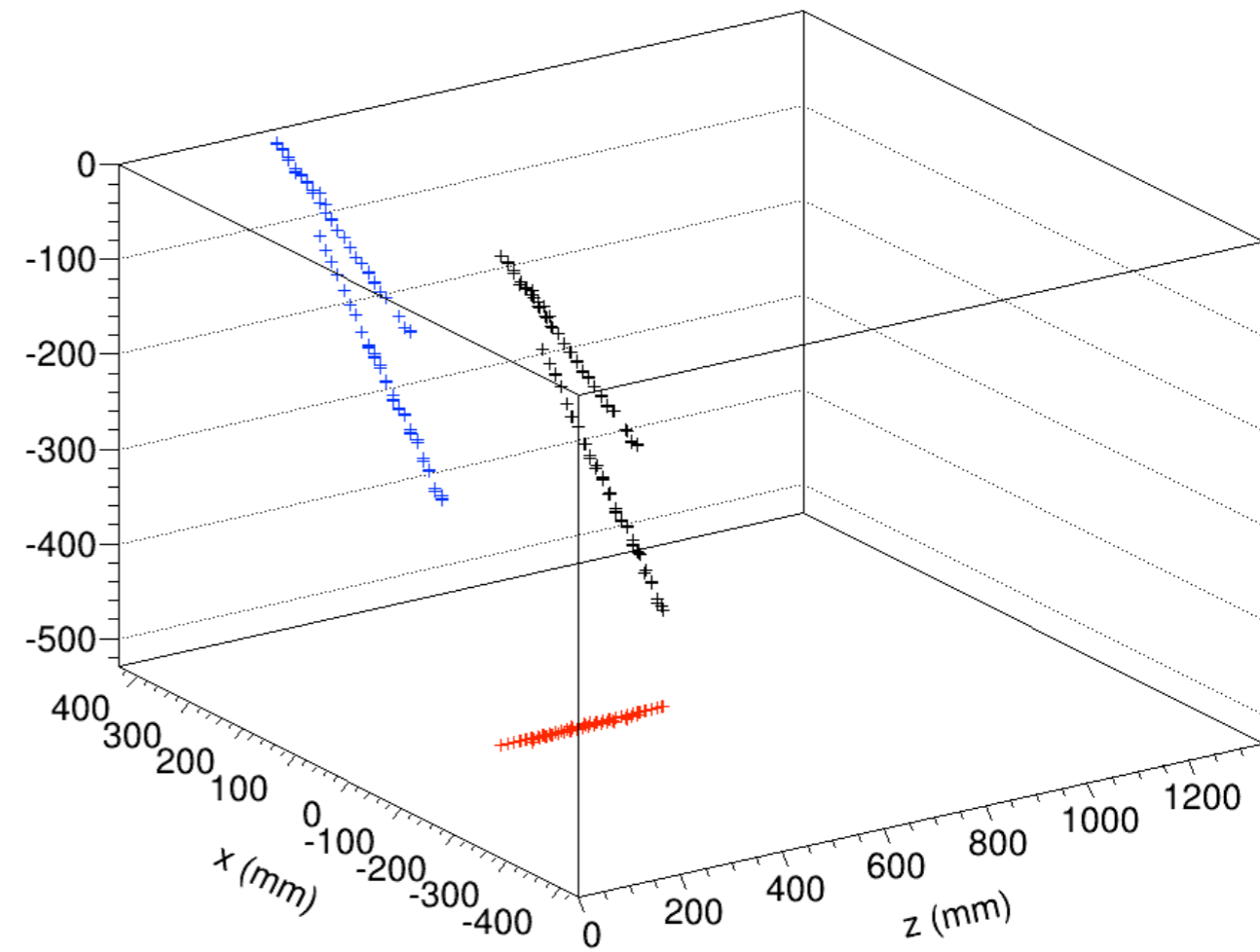
Hit Display (~100 events)

CoBo_2013-07-27T15_35_00.669_0000.graw   without any cut
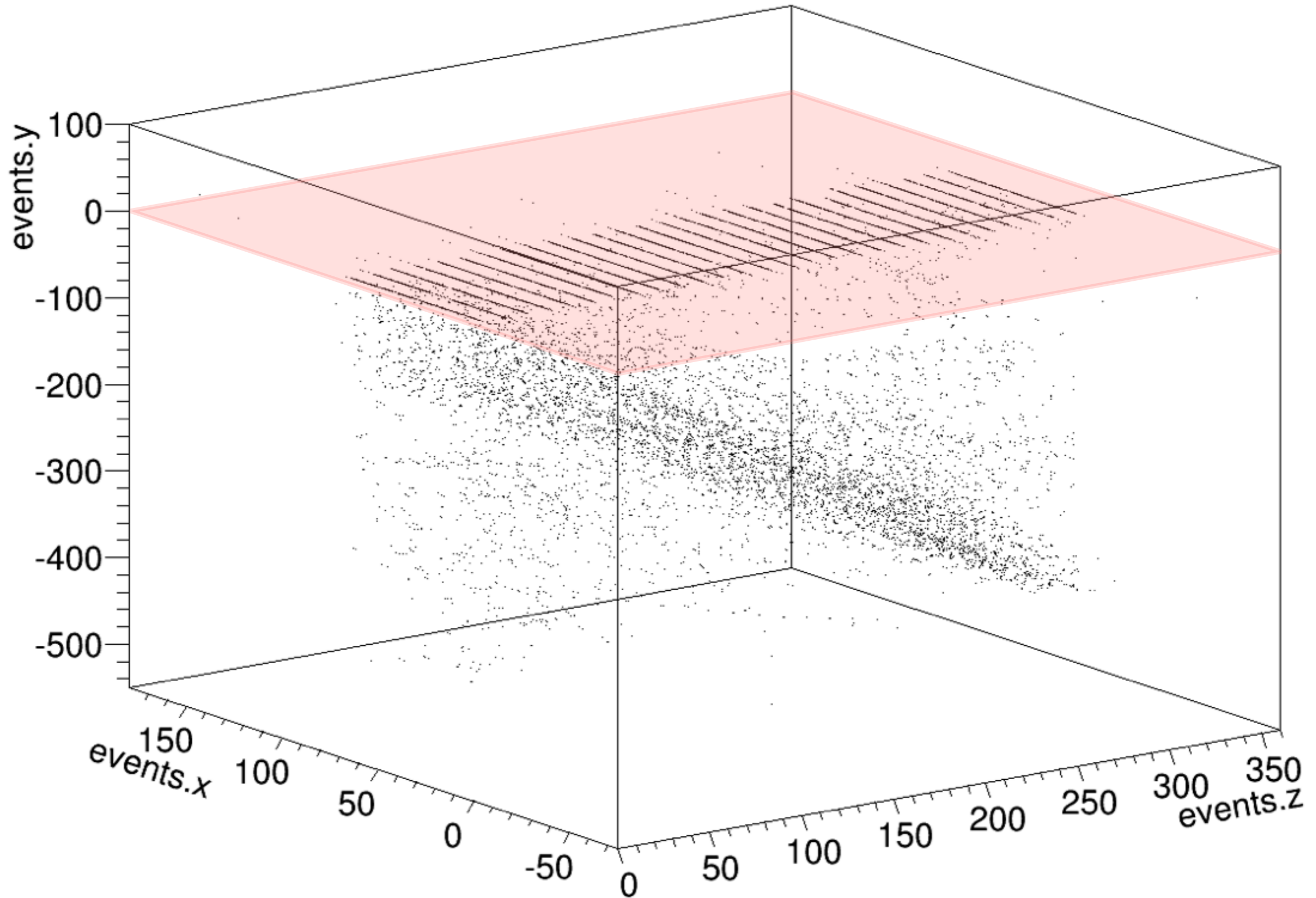
Hit Display (1 event)

CoBo_2013-07-27T15_35_00.669_0000.graw
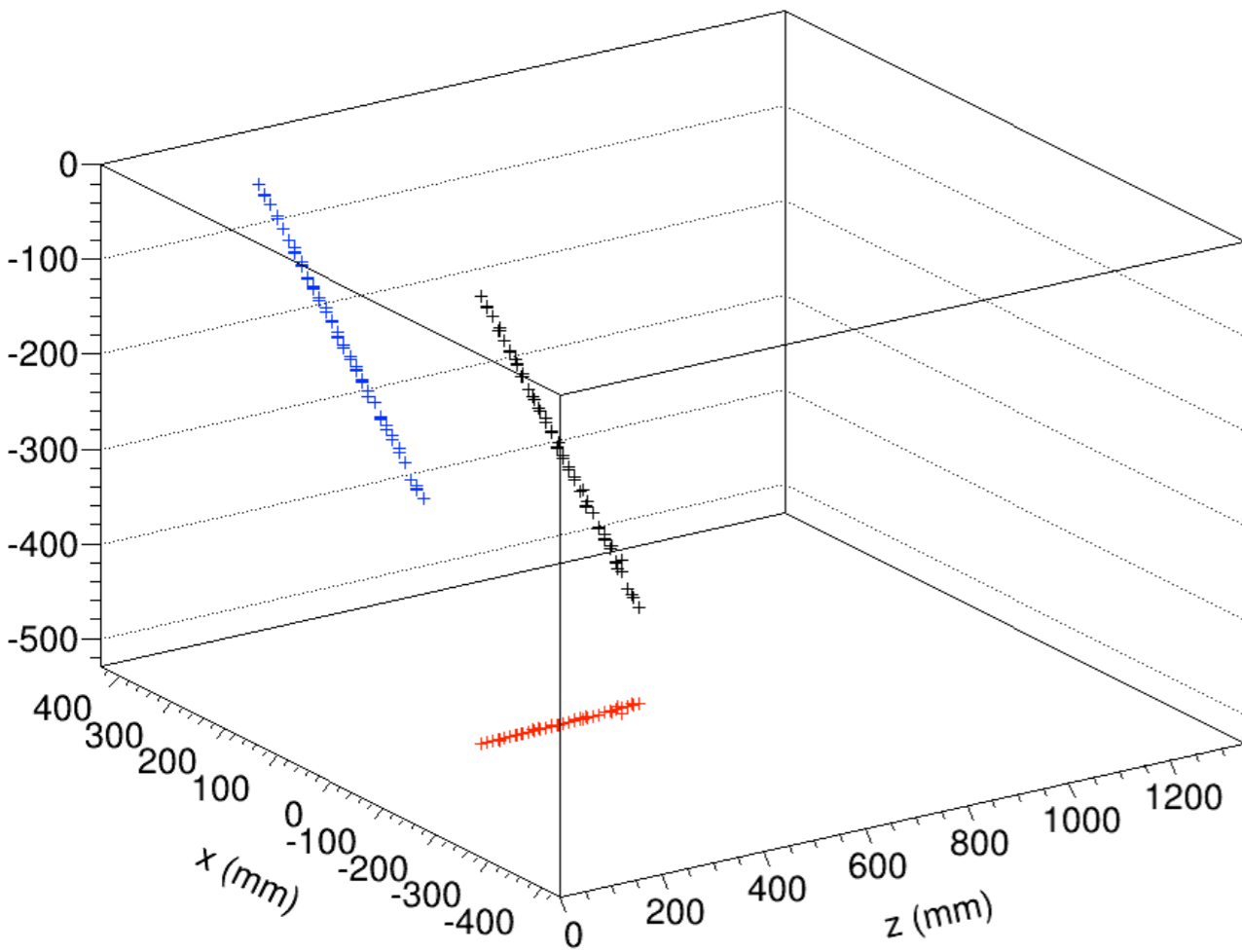
Miscellaneous Works

Converting binary files

You can learn binary I/O !

MPOD HV&LV Power Supply System Controller

Crate Main Power: **On** [Turn Off]

It takes a few seconds for the settings to be applied.
Don't change properties too fast.

Make sure that the settings are changed before you turn on!

Name	Voltage	Current	Measured Sense V	Measured Current	Measured Terminal V	Switch
U0	3.4004 V	5.0000 A	0.0000 V	0.0000 A	0.0000 V	[Off]
U1	3.6396 V	5.0000 A	0.0000 V	0.0000 A	0.0000 V	[Off]
U2	8.0000 V	5.0000 A	0.0000 V	0.0000 A	0.0000 V	[Off]
U3	8.0000 V	5.0000 A	0.0000 V	0.0000 A	0.0000 V	[Off]
U4	8.0000 V	5.0000 A	0.0000 V	0.0000 A	0.0000 V	[Off]
U5	8.0000 V	5.0000 A	0.0000 V	0.0000 A	0.0000 V	[Off]
U6	8.0000 V	5.0000 A	0.0000 V	0.0000 A	0.0000 V	[Off]
U7	8.0000 V	5.0000 A	0.0000 V	0.0000 A	0.0000 V	[Off]
U100	3.6299 V	5.0000 A	0.0000 V	0.0000 A	0.0000 V	[Off]
U101	3.6299 V	2.0000 A	0.0000 V	0.0000 A	0.0000 V	[Off]
U102	4.0000 V	5.0000 A	0.0000 V	0.0000 A	0.0000 V	[Off]
U103	4.0000 V	5.0000 A	0.0000 V	0.0000 A	0.0000 V	[Off]
U104	4.0000 V	5.0000 A	0.0000 V	0.0000 A	0.0000 V	[Off]
U105	4.0000 V	5.0000 A	0.0000 V	0.0000 A	0.0000 V	[Off]
U106	4.0000 V	5.0000 A	0.0000 V	0.0000 A	0.0000 V	[Off]
U107	4.0000 V	5.0000 A	0.0000 V	0.0000 A	0.0000 V	[Off]

U0 Output Configuration

Measurement

Sense Voltage [V]	0.0000	Power of the Load [W]	0.0000
Terminal Voltage [V]	0.0000	Power of the Module [W]	0.0000
Current [A]	0.0000	Hotspot Temerature [°C]	47.0000

Nominal Values

		max.		
Sense Voltage [V]	3.4004	16.1602	Ramp Up [V/s]	100.0000
Current Limit [A]	5.0000	5.0500	Ramp Down [V/s]	100.0000

No Ramp at Switch Off ☐
Fast Regulation (Cable length < 1m) ◉
Moderate Regulation (Cable length > 1m) ○
Slow Regulation (Cable length > 50m) ○

Supervision

		max.	on failure:
min. Sense Voltage [V]	0.0000		ignore the failure
max. Sense Voltage [V]	16.1602	16.0000	ignore the failure
max. Terminal Voltage [V]	16.1602	16.0000	switch off this channel
max. Current [A]	5.0500	5.0000	ignore the failure

[Confirm] [Cancel]

You can learn PHP, HTML, Javascript and CSS !