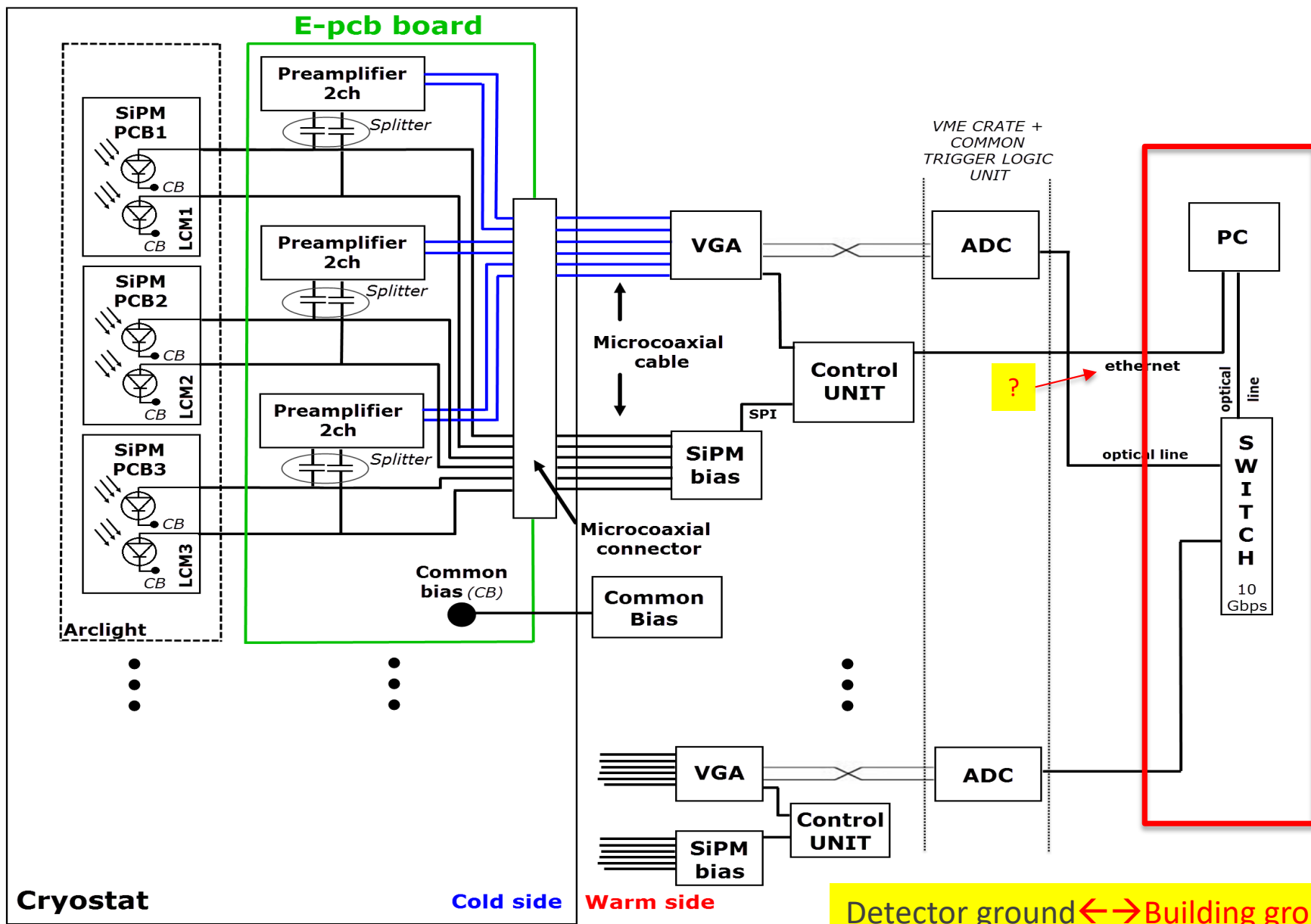# Networking for 2x2 in MINOS

- Don't have complete info yet from subsystems, so this is just to start the discussion

- To focus on subsystems with front-end boards connecting to network directly: light and charge readout

# Things to consider for subsystem on detector ground

- Front-end to be on detector ground for charge, light and drift HV

- Prefer DAQ on building ground

  – DAQ servers and network switches

- Popular network switch ports on the market: ethernet and SFP$^+$

  – 10 gbps switch provides SFP$^+$ ports for optical fiber cables

  – 1gpbs switch with ethernet ports for CAT5/6 cables (copper)

- DAQ server connection choices:

  – Behind network switch: Cat5 (copper wires) or PCIe/SFP$^+$ (fiber)

  – directly cable to front-end with PCIE/SFP$^+$ (DUBNA ADCs?)

- Front-end network ports and cables

  – Charge readout cards with CAT5 cable on ethernet port

  – Light readout ADC with optical fiber on SFP$^+$ port

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Light readout – from Nikolay's DUNE CM talk

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DUBNA ADCs with 10gbps optical link
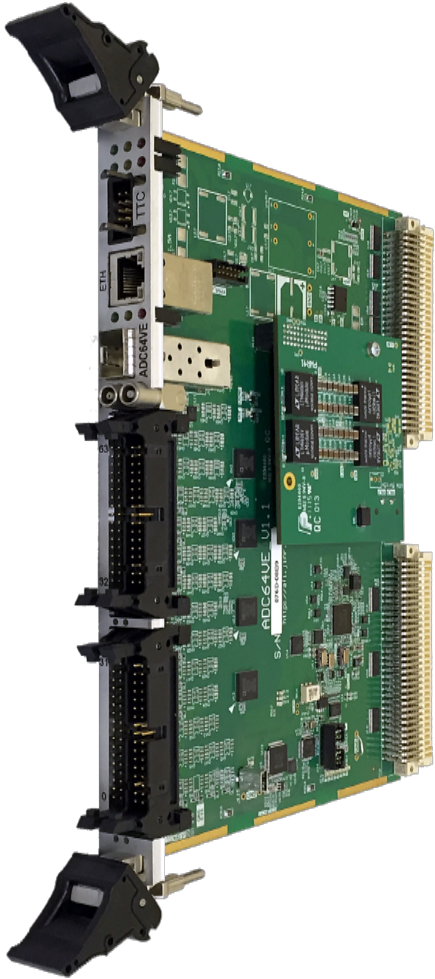
- 7 ADCs needed for 2x2 readout
  - https://www.overleaf.com/read/bvfxwxsmycmk
  - https://afi.jinr.ru/ADC64s

- Is the optical link on ADC a SFP$^+$ port?

- Does DAQ server need 10G speed? If not, can we use PC without PCIe/SFP$^+$?

- Control unit on detector ground? If so, need to use cooper-to-fiber to separate from DAQ

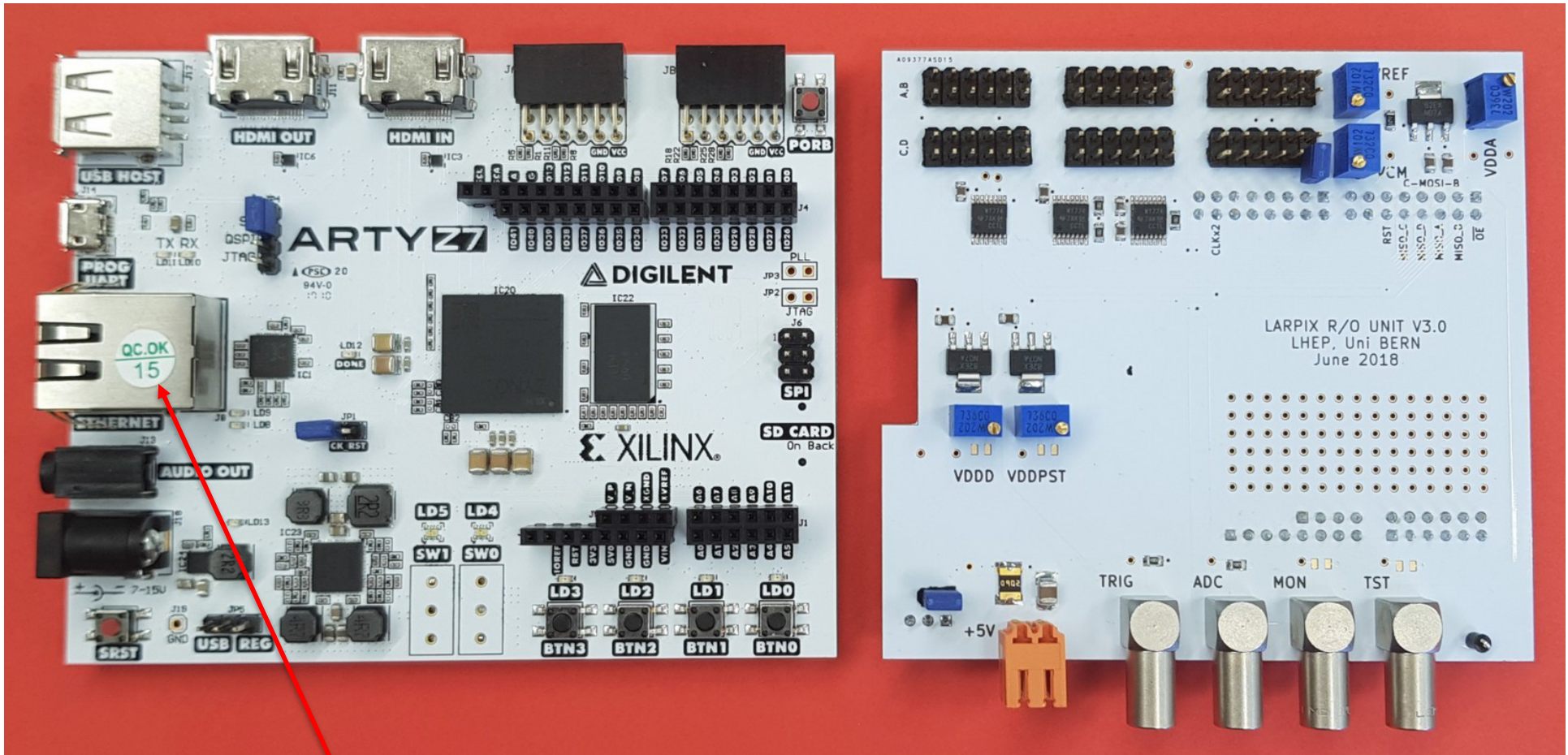ADC SFP+(fiber) →10G Network Switch →SFP+ (fiber) or ethernet DAQ server

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Charge readout –Francesco's talk in Oct'19

Arty Z7 cards

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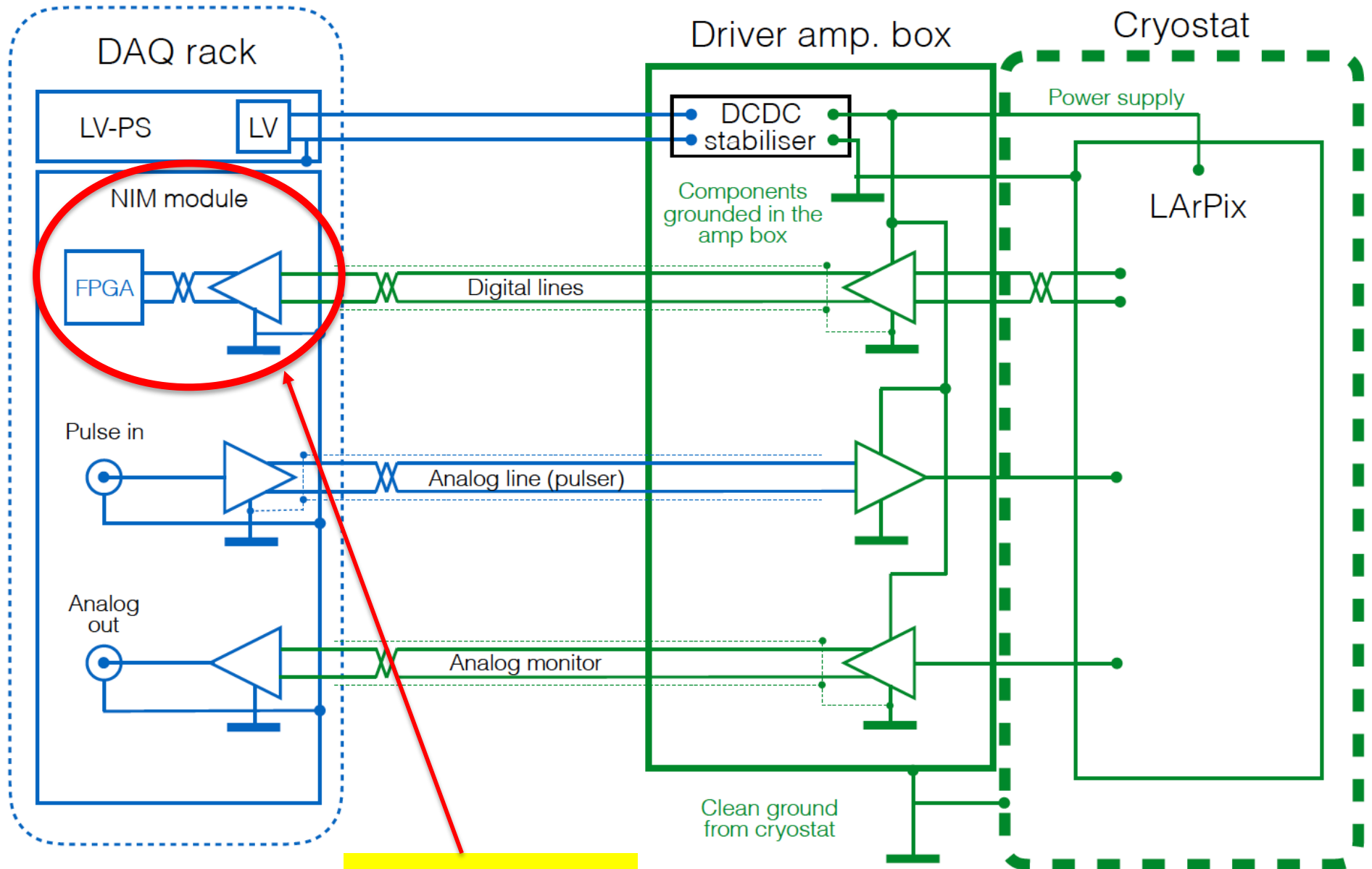
Charge Readout – Arty Z7 cards with ethernet port

16 cards for 2x2 readout

- ART Z7 Ethernet (CAT5) →Fiber converter → 10G Network Switch → DAQ server
  - 16 copper → fiber converters
- ART Z7 Ethernet (CAT5) →1G Network Switch →PCIe/SFP$^+$ DAQ server
  - 1G switch putting on on detector ground instead (break the rule?)

Do we put network switch on detector ground

- No – Stick the rule of switches on building ground

  - Charge readout (ArtyZ7) need 16 CAT6->Fiber converters

  - May not be easy for future near detector implementation

- Yes – change the rule

  - Charge readout ArtyZ 7 cards plugged in switch directly

  - DAQ needs PCIe/SFP$^+$ card

  - New rule for networking switch – approval by Linda?

- In either case, need new network switches for 2x2 in MINOS

  - New 10gbps (SFP$^+$ port) switch for light readout (from DUBNA?)

  - New 1gbps (ethernet port) switch for charge readout

  - Existing MINOS 1gbps switch for DCS, Cryogenics control and Minerva

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Hardware info - PCIe card for DAQ server

PCIe/SFP$^+$ network card

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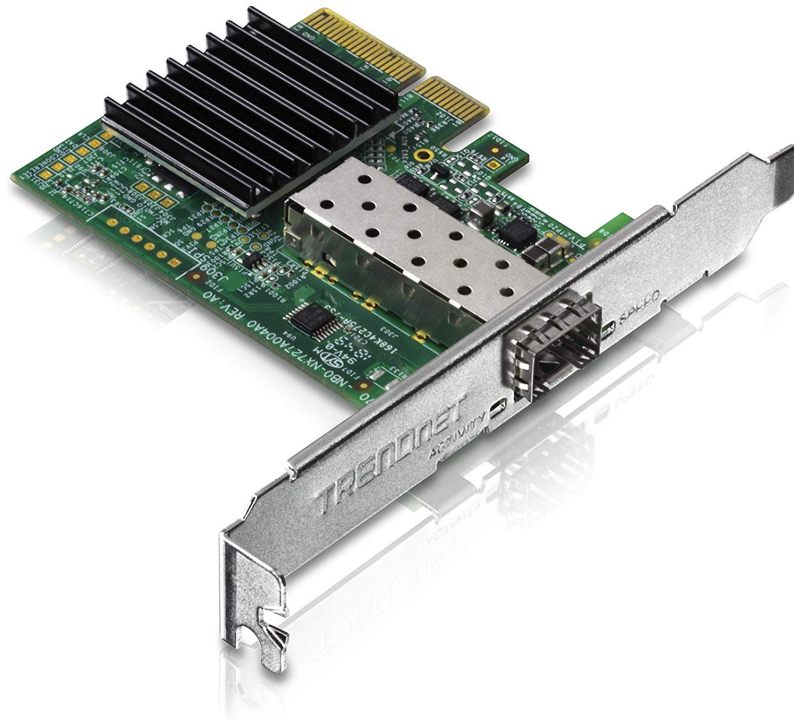
Hardware info – 10 gbps switch

24-port SFP$^+$ switch

Cisco SG550XG-24F-K9-NA
Systems 24-Port 10G SFP+
Stackable Managed Switch

12-port SFP$^+$ plus 12 10GBase-T switch

Cisco SX550X-24FT Stackable
Managed Switch with 24 Ports
10 Gigabit, 12 Ports
10GBase-T plus 12 SFP+
slots, L3 Dyamic Routing,
Limited Lifetime Protection

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Hardware info – 10 gbps switch

14-port SFP⁺ switch from Dlink:
http://www.dlink.lt/en/products/1/2166.html

Project

DXS-1100-16SC

EasySmart Switch with 14-port SFP+ and
2-port 10GBASE-T/SFP+ combo design

Is this what DUBNA bought?

WHERE TO BUY

Drift HV

SL150kV 1200W POWER SUPPLY

SPELLMAN HIGH VOLTAGE ELECTRONICS CORPORATION

- CABLE CONNECTED 150kV @ 1200W POWER SUPPLY
- REQUIRES ONLY 8.75˝ (5U) PANEL HEIGHT
- EXTENSIVE ANALOG INTERFACE
- ARC QUENCH/ARC COUNT/ARC TRIP
- COMPREHENSIVE DIGITAL FAULT DIAGNOSTICS

www.spellmanhv.com/manuals/SL150KV

Spellman's SL150kV rack mount high voltage power supply is designed for scientific and industrial OEM applications requiring 150kV at 1200 watts in a compact cable connected standard sized rack. Models are available in positive, negative or reversible polarity. The SL150kV is fully arc and short circuit protected. Excellent regulation specifications are provided along with outstanding stability performance. The vacuum encapsulated high voltage output section assures reliable corona free operation by eliminating any concerns due to environmental factors.

TYPICAL APPLICATIONS

Electrostatics
HiPot Testing
Semiconductor Processing
Capacitor Charging

OPTIONS

200	200Vac Input Voltage
AOL	Adjustable Overload Trip
APT	Adjustable Power Trip
AT	Arc Trip
BFP	Blank Front Panel
CPC	Constant Power Control
DPM4	4.5 Digit Panel Meters
EFR	External Fault Relay
LL(X)	Non-Standard HV Cable Length (10 standard)
NAD	No Arc Detect
NSS	No Slow Start
RFR	Remote Fault Reset
SS(X)	Non-Standard Slow Start (6 seconds standard)

SPECIFICATIONS

Front Panel Controls:
Front Panel Controls Power ON/OFF switch, HV ON Switch, HV OFF Switch with preset feature, 3.5 digit backlight digital meters for display of output voltage and output current, 10 turn locking potentiometers with counting dials for adjustment of both output voltage and output current.

Front Panel Indicators:

HV ON	High Voltage Inhibit
HV OFF	Over Current
Voltage Control Mode	Over Voltage
Current Control Mode	Arc
Interlock Open	Regulation Error
Interlock Closed	Overtemperature

Input:
220Vac ±10%, 50/60 Hertz

Output Voltage:
0 to 150kV

Output Polarity:
Positive, negative or reversible specify at time of order

Output Current:
8mA

Output Power:
1200W

Voltage Regulation:
Load: 0.01% of rated voltage for a full load change
Line: ±0.01% of rated current over specified input voltage range

Current Regulation:
Load: 0.01% of rated current ±100µA for full voltage change.
Line: ±0.01% of rated current over specified input voltage range

Ripple:
0.1% peak to peak of maximum output

Temperature Coefficient:
100ppm/°C.

Stability:
100ppm/hr after a 2 hour warm up, for both voltage and current regulation

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Things to consider for subsystem on building ground

- DCS, cryogenic control, and all MINERvA

- MINOS 1gpbs network switch at upstream end of the hall

- Detector at downstream end: long cat5/6 cables required

- DAQ servers behind network switch or talking to front-end electronics directly

  – Share servers with other subsystems

- Isolation from subsystems on detector ground

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MINERvA DAQ

Near Hall Overview

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