STAR-TOFp "HVSys" Compliance

March 6, 2000

The STAR Time-Of-Flight Patch (TOFp) uses a custom integrated system of Cockroft-Walton bases to power the phototubes in the detector. This system is called "HVSys," and detailed descriptions of the system and its specific implementation in STAR-TOFp can be found in Refs [1, 2, 3]. The system has been shown to meet all performance requirements.

The HVSys system was reviewed for its compliance with BNL Safety regulations on December 16, 1999 (see Ref. [2]). The only major issue that arose during this review concerns one component of this system, the so-called "System Module," which is effectively a smart 200V power supply. This module is not U/L listed, nor has it been independantly tested by a certified laboratory such as U/L. While the BNL regulations for certification of such a module for use in STAR are evolving at present, [4] it was requested that the manufacturer of the System Module address each of the points raised in Ref. [5]. The responses provided by V. Astakhov [6], the manufacturer of HVSys, are presented here.

Contents

1 Table I: Fabrication/Inspection Checklists

1.1 Wiring/Fuse

Item: wire insulation is appropriate for service (temperature, chemicals, radiation, etc.)
Compliance? yes

Item: proper size terminals are used for wire size, insulation, terminal screws, and connector pins
Compliance? yes

Item: crimps are made in a neat and wormanlike manner per manufacturer's instructions
Compliance? yes

Item: soldering is performed per manufacturer's instructions
Compliance? yes

Item: all connections are made using manufacturer's approved devices or methods
Compliance? yes

Item: soldered connections are mechnically secure prior to soldering
Compliance? yes

Item: switches disconnect all ungrounded conductors of the circuit controlled when in the off position unless no live exposed parts from this circuit are contained in the unit.
Compliance? yes

Item: panel front fuse holder screw shells are at ground potential
Compliance? yes

Item: fuse is the firt item in the circuit
Compliance? yes

Item: wire ampacity up to the fuse is the same as the power cord
Compliance? yes

Item: wire ampacity after the fuse meets or exceeds the labelled ampacity of the fuse
Compliance? yes

Item: fuses are used to protect internal wiring and power leaving cabinet

is wire ampacity is smaller than feeder protection
Compliance? yes

1.2 Marking/Labelling

Item: main power switch is labelled "Main"
Compliance? Currently labelled as "Power" - will be changed to "Main"

Item: enclosure is labelled if supplied by multiple power sources
Compliance? yes

Item: ON/OFF positions or hazardous voltage switches are labeled.
Compliance? Will be so labelled.

Item: capacitors discharge in 3 seconds or less unless labelled as hazardous
Compliance? yes

Item: required fuse sizes are marked on the fuse holder
Compliance? yes

1.3 Enclosure Considerations

Item: internal temperature does not exceed rating of all wire insulation and devices
Compliance? yes

Item: cooling is appropriate for expected heat generation
Compliance? yes

Item: no external hazards are present
Compliance? yes

Item: enclosure is appropriate for service (materials, heat capacity, etc)
Compliance? yes

Item: enclosures are made of non-flammable materials
Compliance? yes

1.4 Mechanical Considerations

Item: separation of circuits is provided for circuits of different voltages unless all conductores are insulated for the highest voltage present.

Compliance? yes

Item: all opening minor dimensions are less than 25mm (not sockets, connectors, etc)
Compliance? yes

Item: sharp edges are filed smooth and rounded off
Compliance? yes

Item: grommets or similar protection are provided for cables entering or leaving the enclosure
Compliance? yes

Item: power cords exiting chassis are provided with strain relief so as not to exert force on terminals
Compliance? yes

Item: wiring channels are smooth, free from burrs, and provide wiring with mechanical protection from pinching, abrasion, etc
Compliance? yes

Item: cable harness is neet and installed in a workmanlike manner
Compliance? yes

1.5 Chassis

Item: chassis is grounded by wire and is not dependent on mounting to cabinet.
Compliance? yes

1.6 Cabinets

Item: No exposed live parts over 50 Volts unless there are interlocks on all cabinet doors/entrances
Compliance? yes

Item: all interconnect cords use female connectors for live voltages over 50 Volts
Compliance? yes

Item: cabinet is grounded through power cord
Compliance? yes

Item: other grounds may also be used in addition to the power ground as appropriate
Compliance? yes

References

[1] "TOFp Technical Description," available from http://bonner-mac8.rice.edu/~TOF/default.html.

[2] "TOFp Safety Review Talk," available from http://bonner-mac8.rice.edu/~TOF/default.html.

[3] "HVSys Information," available from http://bonner-mac8.rice.edu/~TOF/default.html.

[4] J. Curtiss, private communication.

[5] "Engineering Standard," ESB Technical Committee, LLNL, obtained via FAX from J. Curtiss, Mar. 3, 2000.

[6] V. Astakhov (JINR-Dubna), astakhov@sunhe.jinr.ru.