

8.23.1 Procedure for 2 GeV Beam Separator High Voltage Conditioning in D-Line

1. Purpose

To provide instruction for the Beam Separator Group to conduct safe, temporary high voltage conditioning of the 2 GeV/ Beam Separators located in the D-line with beam off.

This operation should be performed via a PLC computer program which allows the operator to set level spark rates and current ramp voltage conditioning modes.

2. Responsibility

- 2.1 Only the Separator Operator, or the Separator Electrical Engineer, can operate the high voltage power supply to the Beam Separators.
- 2.2 The Separator Group Supervisor is responsible for the power supply when the separator is not being tested by maintaining LOTO of the separator power supply switch, and maintaining the group lock key.

3. Prerequisites

- 3.1 Beam Separator under vacuum ($P < 1 \times 10^{-6}$)
- 3.2 There shall be an operations log near the control racks at all times. All changes in operational status shall be recorded with time, date and responsible personnel signature.
- 3.3 All personnel in the area shall wear appropriate dosimetry.
- 3.4 The key for the HV interlock chassis shall be provided to the operator and Separator Electrical Engineer.
- 3.5 Any openings into the caves must be posted with flashing lights, H.V. warning signs and radiation signs.
- 3.6 Beam Separator Operator must attach red tags and locks on the A & B 208 volt power switches per [BNL ESH Standard 1.5.1](#) before working on power supplies. These switches are located on the wall directly opposite separator "B" high voltage controls. All other personnel entering the separator area shall apply their own lock to the 208V power switch.

4. Precautions

- 4.1. When voltages either across the separator gap or from a plate to ground exceed 10 kV, the separator may produce x-rays. The amount of radiation produced is a function of the separator voltage and current. The x-rays produced are negligible at low currents. The separator may spark at any time, however, and draw large currents. Therefore, the potential for radiation exposure is always present.
- 4.2. The peak radiation level near the separator during a high voltage spark may be as high as: 1000 mR/hr.
- 4.3. All electrical hazards associated with the separators are isolated within grounded enclosures. It should always be kept in mind that this is a **VERY HIGH VOLTAGE SYSTEM** (800 kV) and that contact with cables and chassis should be kept to a minimum as a good operating practice.
- 4.4. The voltage levels are as follows:
 - All Separator Components Maximum 800,000 V dc
 - Control Cabinets 208 V/1 phase/60 Hz 4000 V/20 kHz
 - Cables 4000 V/20 kHz
 - Pumps 208 V/1 phase/60 Hz

5. Procedure

- 5.1. The Separator Group Supervisor shall designate an operator or a sweep team to perform the following:
 - 5.1.1. First sweep the upstream separator #1 cave making sure that barriers and radiation warning signs are in place. Reset the H.V. Security Interlock for cave door #1.
 - 5.1.2. Next sweep the downstream separator #2 cave. Make sure that the barriers and radiation warning signs are in place. Reset the H.V. Security Interlock for cave door #2 ONLY IF security for door #1 HAS NOT BEEN BROKEN.
 - 5.1.3. Remove red tags and locks from 208 volt power switches #1 & #2 per [BNL ESH Standard 1.5.1](#), if applied
 - 5.1.4. Close 208 volt switches.

- 5.2 Application (Turn-on) High Voltage by Operator
 - 5.2.1 Verify that vacuum pumps are on and valves are in the desired position for operation.
 - 5.2.2 Set the PLC current to appropriate value (normal 5-50 uA).
 - 5.2.3 Verify that the ion gauge controls are on and the base pressure on the separator is $< 1 \times 10^{-6}$.
 - 5.2.4 Verify “Local/Remote” switch in remote. Turn on the power to each of the KEK supplies for both supplies (+ and -), for the separator that is to be tested. Make sure lights are flashing.
 - 5.2.5 Press “High Voltage On” push button on plc program.
 - 5.2.6 Fill out separator log with appropriate data.
- 5.3 Removal (Turn-off) High Voltage by Operator
 - 5.3.1 Push “High Voltage Off” button on PLC program.
 - 5.3.2 Turn off High Voltage warming lights on gates.
 - 5.3.3 Make appropriate entry into logbook.
- 5.4 Lock Out of Power Supplies
 - 5.4.1 The Operator shall open the 208 volt switches and LOTO per [BNL ESH Standard 1.5.1](#).
 - 5.4.2 Inform the External Beam Group Supervisor so that the supervisor can apply a group LOTO to the 208V power switch.

6. **Documentation**

- 6.1 Separator logbooks #1 and #2.

7. References

7.1 H.V. Power Supply Operating Manual DCG 600 K, Issue B, Nichicon Corp.

7.2 [BNL ESH Standard 1.5.1.](#)

8. Attachments

None