C-A Unreviewed Safety Issue (USI) Form

Title of USI: Replacement of RHIC ASE in RHIC SAD

Description of USI (use attachments if necessary): The ASE (Revision 1, 8/30/99) in Chapter 5 of the current RHIC SAD has been replaced with a revised ASE (dated 9/19/00) that was approved by DOE (Letter from F. Crescenzo to T. Sheridan dated 11/3/00).

Title and Date of Relevant SAD: RHIC SAD , 12/30/99.

Committee Chair or ESHQ Division Head must initial all items. Leave no blanks:

ITEM	APPLIES	DOES NOT APPLY
Decision to not revise the current SAD and/or ASE at this time:	RLL	
The hazard associated with the proposed work or event is covered within an existing SAD and/or ASE.	RLL	
SAD Title and Date RHIC SAD, 12/30/99.		
This Form and attachments, if necessary, shall be used to document the USI until the next revision of the appropriate SAD.	RLL	
Decision to submit a revised SAD and/or ASE to the BNL ESH Committee:		RLL ALREADY DOE APPROVED
The hazard associated with the proposed work is not appropriately included in an SAD.		RLL

Ray Karol — 6/27/01

Signature of C-A Committee Chair or C-A ESHQ Division Head — Date

Edward T Lessard — 6-28-01

Signature of C-A Associate Chair for ESHQ — Date

Department of Energy
Brookhaven Group
P.O. Box 5000
Upton, New York 11973

NOV 3 2000

Mr. Thomas Sheridan
Brookhaven Science Associates, LLC
Brookhaven National Laboratory
Upton, New York 11973

Dear Mr. Sheridan:

SUBJECT: APPROVAL OF COMMENCING RHIC ROUTINE OPERATIONS

Reference: Letter from Sheridan to Crescenzo, dated September 26, 2000 (received at BHG October 25, 2000) Subject: Request Approval for Routine Operations at RHIC

The Brookhaven Group Office (BHG) has reviewed your request for commencing Routine Operations at RHIC. Included in your request and in our review is your restriction against operation of the PHENIX RICH detector with ethane. The BHG determined that:

- the RHIC Accelerator Readiness Reviews (ARRs) performed to date are appropriate to commence Routine Operations,
- the RHIC Accelerator Safety Envelope (ASE) dated September 19, 2000 appropriately bounds Routine Operation activities and is therefore approved, and
- the risks analyzed in the RHIC Safety Assessment Document (SAD) are acceptable when Routine Operation activities are conducted within the ASE.

Based on the above, you are approved to commence Routine Operation activities for RHIC Collider and experiments with the exception of the *operation* of the PHENIX RICH detector with ethane. **IMPORTANT**: Please be aware that the use of the term *operation* above concerning ethane also includes other *pre*-operational steps necessary to make the detector operable using ethane. This would include the *introduction* of ethane into the detector and may include other precursory steps involving ethane. This point is raised since the ASEs for PHENIX

and RICH use the terms *introduction* and *operational*. Though you have elected not to operate the detector with ethane at this time, the ASEs concerning ethane still apply.

If you have any questions, please contact Peter Kelley at extension 5784 or Michael Butler at extension 3430.

Sincerely,

Frank Crescenzo, Acting
Brookhaven Group Manager

cc: R. Desmarais, BHG
M. Holland, BHG
M. Butler, BHG
D. Lowenstein BNL
E. Lessard, BNL

Accelerator Safety Envelope

Title of Facility: Relativistic Heavy Ion Collider

Date of Initial ASE: June 3, 1999

Subsequent Revision Dates: September 19, 2000

Version of the SAD that the ASE applies to: RHIC SAD, Revision 1, August 30, 1999

Signature of Preparer(s): Edward T Lessard

Signature of Collider-Accelerator Department Chair: For Derek Lowenstein

Signature of Collider Associate Laboratory Director:

Signature of Deputy Director of Operations:

ASE Contents:

Section 1. Introduction

General actions to be taken upon discovery of a violation of the Safety Envelope:

1.1. A variation beyond the boundaries described below shall be treated as a reportable occurrence, as defined by SBMS Subject Area on Occurrence Reporting. C-A Department staff shall make notifications of occurrences according to the requirements in the C-A Operations Procedure Manual.

1.2. The reference to the method used by the Collider-Accelerator Department for change control of the ASE is the C-A Operations Procedure Manual.

Section 2: BNL Safety Envelope Limits

This section contains the absolute limits that BNL places on its operations to ensure that we meet the regulatory limits established to protect our environment, public and staff/visitors and that those operations are conducted within the assumptions of the RHIC Safety Analyses documented in the RHIC SAD. BNL Safety Envelope Limits for Collider operations are:

2.1. Less than 25 mrem in one year to individuals in other BNL Departments or Divisions adjacent to a Collider-Accelerator Department accelerator facility.

2.2. Less than 5 mrem in one year to a person located at the site boundary.

2.3. Offsite drinking water concentration and on-site potable well water concentration must not result in 4 mrem or greater to an individual in one year.

2.4. Less than 1250 mrem in one year to a Collider-Accelerator Department staff member.

2.5. Maximum tritium concentration of 10,000 pCi/L in the BNL sanitary sewer effluent, caused by liquid discharges from Collider facilities averaged over a 30-day interval.

2.6. Groundwater contamination from soil activation is to be prevented.

2.7. Collider facilities airborne effluents shall not result in a dose that exceeds 0.1 mrem in one year to a person at the site boundary.

Section 3: Corresponding Collider Safety Envelope Parameters

This section identifies the measurable limitations on critical operating parameters that, in conjunction with the specifically identified hazard control considerations established by the facility design and construction, ensure that Collider operations will not exceed the corresponding Collider Safety Envelope Limits discussed in Section 2. These parameters are derived from the safety analyses described in the RHIC SAD. Collider Safety Envelope Parameters are:

Collider Beam Intensity Limit and Limits on Particle Loss

3.1. The maximum number of heavy ions in each ring shall not exceed the equivalent of 3×10^{10} Au ions at 100 GeV/u during the first year of operation. During subsequent years, the maximum number of heavy ions in each ring shall not exceed the equivalent of $2.4\text{x}10^{11}$ Au ions at 100 GeV/u. The first year of operation is FY 2000.

3.2. The maximum number of protons in each ring shall not exceed the equivalent of 3×10^{12} at 250 GeV during the first year of operation. During subsequent years, the maximum number of protons in each ring shall not exceed the equivalent of $2.4\text{x}10^{13}$ at 250 GeV. The first year of operation is FY 2000.

3.3. Loss monitoring results and radiation survey results shall be used in order to maintain beam loss "As Low As Reasonably Achievable" as defined in the BNL Radiological Manual.

3.4. Control BNL Site radiation levels such that:

3.4.1. Beam loss induced radiation within uncontrolled areas is less than 0.5 mrem in an hour or for chronic losses less than 100 mrem in a year.

3.4.2. Beam loss induced radiation in a Controlled Area is less than 5 mrem in an hour.

Classification of Radiological Areas

3.5. Radiological area classifications shall be in accord with requirements in the BNL Radiation Control Manual.

Particle Accelerator Safety System (PASS)

3.6. The Access Controls System shall be functional during operations with beam.

3.7. Area radiation monitors that are interfaced with the Access Controls System shall be within their calibration date.

3.8. High intensity proton beam is to be prevented from the W line either by the Access Controls System or by lock out / tag out of appropriate critical devices.

3.9. The locations of area radiation monitors interfaced with PASS are to be configuration controlled.

Oxygen Deficiency Hazard (ODH) Control

Note: Only ODH 1 trained and qualified individuals may perform work in ODH 1 designated areas

3.10. If the temperature of helium in the Refrigerator Building is less than 50K, then personnel entering the area shall be ODH 1 trained or escorted by an ODH 1 trained individual.

3.11. If the temperature of helium in an ODH area other than the Refrigerator Building is less than 50K, then personnel entering the area shall be ODH 1 trained or escorted by an ODH 1 trained individual IF:

3.11.1. Either any PASS ODH oxygen sensor in the area is inoperable OR if the number of operable ODH exhaust fans in the area to be entered is less than as specified below:

a) Three in any Tunnel Sextant (see NOTE)
b) One in a Collider Support Building
c) Three in the Compressor Building

NOTE: tunnel sextant 1 is from 12 o'clock to 2 o'clock; tunnel sextant 3 is from 2 o'clock to 4 o'clock, etc. Sextants 5 and 7 do not include the STAR IR and sextants 7 and 9 do not include the PHENIX IR.

Fire Protection

3.12. Appropriate action shall be taken if fire detection/protection systems are impaired. These actions may either be to prohibit personnel from working in a specific area and/or to de-energize equipment.

3.13. Collider magnets and power supplies may be energized if the smoke detection system for the energized area can transmit an alarm to summon the BNL Fire/Rescue Group. Transmittal may be automatic or via a fire watch.

3.14. Personnel may occupy the tunnel if the exhaust fans can be activated manually or automatically.

STAR Experiment

3.15. The following are required whenever flammable gas is in the integrated detector positioned in the intersecting region (IR):

3.15.1. Flammable gas detection systems, both STAR and PASS, shall be operational.

3.15.2. If the SVT is operational, then the detector ventilation system shall be delivering flow.

3.15.3. At least one of the two emergency exhaust fans that are connected to PASS shall be operable.

3.15.4. A quantity of purge gas shall be maintained to dilute the detector flammable gas volumes below 25% of the Lower Explosive Limit.

3.15.5. Purge gas operational requirements shall be defined in approved STAR Operating Procedures for the detector.

3.15.6. The TPC gas used in the detector shall be P-10 or equivalent hazard. The Collider-Accelerator Department shall approve equivalent hazardous gases prior to use.

3.15.7. When the TPC is in operation, no more than 80 cubic meters of methane gas at STP shall be attached to the gas mixing system.

3.16. When electronics are powered in the integrated detector in or out of the IR the Highly Sensitive Smoke Detection (HSSD) system on the detector or the ceiling-level HSSD system shall be operational.

PHENIX Experiment

3.17. The following are required whenever flammable gas is in the integrated detector positioned in the intersecting region (IR):

3.17.1. Flammable gas detection systems, both PHENIX and PASS, shall be operational.

3.17.2. At least one of the two emergency exhaust fans that are connected to PASS shall be operable OR the building HVAC ventilation shall be delivering flow.

3.17.3. A quantity of purge gas shall be available to dilute the detector flammable gas volumes below 25% of the Lower Explosive Limit.

3.17.4. Purge gas operational requirements shall be defined in the approved PHENIX Operating Procedures for the detector.

3.17.5. The detector and ceiling level HSSD systems shall be operational. Alternatively, ASE 3.12 may be used.

3.17.6. The PHENIX High Capacity Ventilation System shall be operational before introduction of flammable gas into the RICH.

3.17.7. The interstitial space between the RICH and the Pad Chamber FEE shall be inerted when introduction of flammable gas is in the RICH.

3.18. Whenever electronics are powered in the integrated detector in or out of the IR:

3.18.1. The electronics racks interlocks in the IR shall be operational.

3.18.2. The Highly Sensitive Smoke Detection (HSSD) system on the detector or the ceiling-level HSSD system shall be operational.

3.19. If the IR is occupied by personnel after flammable gas is present, then both the personnel plug door and the emergency escape labyrinth shall be available for egress.

Section 4: Engineered Safety Systems Requiring Calibration, Testing, Maintenance, and Inspection

The systems and requirements for calibration, testing, maintenance, accuracy or inspection necessary to ensure the operational integrity of the Collider Safety Envelope Parameters in Section 3 are:

4.1. Particle Accelerator Safety System (PASS) shall be functionally tested in accordance with requirements in the requirements in the BNL Radiation Control Manual.

4.2. ODH ventilation fans and air inlet louvers that are signaled by the PASS shall be functionally tested before the running period. Accessible fans and air inlet louvers shall be manually tested semiannually (not to exceed 8 months) or within one month of accessibility

4.3. STAR Highly Sensitive Smoke Detection (HSSD) systems shall undergo annual testing (not to exceed 15 months).

4.4. STAR Flammable Gas Detection System shall undergo annual testing (not to exceed 15 months).

4.5. STAR emergency exhaust fans shall undergo annual testing (not to exceed 15 months).

4.6. Collider fire protection shall undergo annual testing (not to exceed 15 months).

4.7. PHENIX Highly Sensitive Smoke Detection (HSSD) systems shall undergo annual testing (not to exceed 15 months).

4.8. PHENIX Flammable Gas Detection System shall undergo annual testing (not to exceed 15 months).

4.9. PHENIX emergency exhaust-fans shall undergo annual testing (not to exceed 15 months).

4.10. PHENIX High Capacity Ventilation System shall undergo annual testing (not to exceed 15 months).

4.11. PHENIX electronics racks interlocks in the IR shall undergo annual testing (not to exceed 15 months).

4.12. Area radiation monitors shall undergo annual testing (not to exceed 15 months).

4.13. Radiological barriers shall undergo annual visual inspection (not to exceed 15 months).

4.14. Rainwater barriers for activated soil shall undergo annual visual inspection (not to exceed 15 months).

Section 5: Administrative Controls

Administrative controls necessary to ensure the operational integrity of the Collider Safety Envelope Parameters described in Section 3 are:

5.1. Minimum Main Control Room Staffing

5.1.1. C-A Main Control Room: one Operations Coordinator and one Operator shall be on duty when beam is in operation. During normal operations, one of the two must remain in the Main Control Room at all times.

5.2. Cryogenic Control Room Staffing

5.2.1. Cryogenic Control Room: one Cryogenic Shift Supervisor or designee and one qualified Cryogenic Operator shall be on watch when the refrigerator is in operation. One of the two must remain in the Cryogenic Control Room at all times unless controls in the Cryogenic Control Room are relocated to the Main Control Room or unless emergency conditions require actions to be taken by all cryogenic watch standers.

5.3. STAR and PHENIX Staffing

5.3.1. Watch: a qualified local watch is required when flammable gas is in the PHENIX detector in the IR.

5.3.2. Watch: a qualified local watch is required when flammable gas is in the STAR detector in the IR.

5.3.3. PHENIX Experimental Area: one Experiment Shift Leader is required for experimental operations with beam.

5.3.4. STAR Experimental Area: one Experiment Shift Leader is required for experimental operations with beam

5.4. Operations staff shall be trained and qualified on their safety, operational and emergency responsibilities. Records of training and qualification shall be maintained on the Brookhaven Training Management System, (BTMS).

5.5. Work planning and control systems shall comply with the requirements in the C-A Operations Procedure Manual.

5.6. Environmental management shall comply with the requirements in with the requirements in the C-A Operations Procedure Manual.

5.7. Experiment modification and review shall comply with the requirements in with the requirements in the C-A Operations Procedure Manual.