

1 Changes to Gas System

In response to our experiences during the cosmic ray run we have modified the gas system to improve its performance and safety since the last HEEC review.

1. *Add outer cylinder flushing volume.*

A heavy sheet of mylar was wrapped around the outer cylinder prior to installation. This sheet has subsequently been sealed with tape and epoxy at both ends. Supply and return gas manifolds have been added at the rear end to permit the volume to be flushed with N₂ supplied from the gas hut. This ensures that no oxygen will leak into the chamber volume via the outer cylinder and that gas leaking from the chamber will not mix with air. The flush gas is vented to the atmosphere.

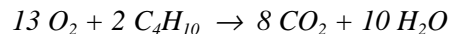
2. *Install gas gain monitoring chamber.*

The gas monitoring chamber that was proposed to HEEC in earlier reviews has been installed in the gas hut, atop of rack B636-06. The ⁵⁵Fe spectrum from this chamber will be used to indicate problems with the chamber gas and to test new bottles of isobutane. The 3000 Bq ⁵⁵Fe source located within the chamber produces 1.2 mrem/hour at the surface of the containment box. Warning labels are posted on the outside.

The outer surfaces of the gain chamber are flushed with nitrogen to ensure that there are no air leaks into the chamber.

3. *Install oxygen purifier.*

The original Zeolite filters were found to be inadequate. We have replaced them with a larger paladium catalyst system that was previously used by the NO-MAD experiment, which removes oxygen via the reaction:



The water is then removed using molecular sieves.

The system is located in a new rack in the gas hut, B636-07. There are two molecular sieves, which are renewed by heating and flushing with helium. Contingent on operational experience, our plan is to alternate between sieves every three months. The procedure for the regeneration is presented in the "Gas System Operations" chapter.

4. *Improve isobutane circuit.*

We have added a second regulator on the isobutane panel on the flammable gas pad so that both isobutane bottles will be pressure regulated. We have also installed a low-pressure line regulator between the interior isobutane panel and the gas rack, which has significantly improved the stability of the isobutane pressure.

The testing and calibration system has been improved by the addition of a second span gas input on the span gas regulator panel, and by a heating blanket for a third bottle of isobutane. This will allow for more rapid testing of new bottles of isobutane.