

MAR -6 2014

FSO Hersemann/jp <i>RH RH</i>
2/25/14
FSO Scott <i>JS</i>
2/25/14
FSO Bollinger
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FSO Weis <i>MJW</i>
3/6/14

Ms. Victoria A. White
Chief Operating Officer
Fermilab
P.O. Box 500
Batavia, IL 60510

Dear Ms. White:

SUBJECT: NATIONAL ENVIRONMENTAL POLICY ACT DETERMINATION AT FERMI
NATIONAL ACCELERATOR LABORATORY – ATLAS LARGE SCALE THIN
GAP CHAMBERS TESTING

Reference: Letter, from V. White to M. Weis, dated February 20, 2014, Subject: National
Environmental Policy Act Environmental Evaluation Notification Form for ATLAS
Large Scale Thin Gap Chambers Testing

I have reviewed the National Environmental Policy Act (NEPA) Environmental Evaluation
Notification Form (EENF) for the ATLAS Large Scale Thin Gap Chambers Testing. Based on
the information provided in the EENF, I have approved the following categorical exclusion (CX):

<u>Project Name</u>	<u>Approved</u>	<u>CX</u>
ATLAS Large Scale Thin Gap Chambers Testing	2/24/2014	B3.6

I am returning a signed copy of the EENF for your records. No further NEPA review is required.
This project falls under categorical exclusions provided in 10 CFR 1021, as amended in
November 2011.

Sincerely,


Michael J. Weis
Site Manager

Enclosure:
As Stated

cc: N. Lockyer, w/o encl.
M. Michels, w/encl.
A. Kenney, w/o encl.
T. Dykhuis, w/encl.

bc: J. Scott, w/o encl.
R. Hersemann, w/encl.

S: CX- ATLAS Large Scale Thin Gap Chambers Testing 022414.rh

File:

**FERMILAB ENVIRONMENTAL EVALUATION NOTIFICATION FORM
(EENF) for documenting compliance with the National Environmental Policy
Act (NEPA), DOE NEPA Implementing Regulations, and the DOE NEPA
Compliance Program of DOE Order 451.1B**

Project/Activity Title: ATLAS Large Scale Thin Gap Chambers Testing
ES&H Tracking Number: 01121

I hereby verify, via my signature, the accuracy of information in the area of my contribution for this document and that every effort would be made throughout this action to comply with the commitments made in this document and to pursue cost-effective pollution prevention opportunities. Pollution prevention (source reduction and other practices that eliminate or reduce the creation of pollutants) is recognized as a good business practice which would enhance site operations thereby enabling Fermilab to accomplish its mission, achieve environmental compliance, reduce risks to health and the environment, and prevent or minimize future Department of Energy (DOE) legacy wastes.

Fermilab Action Owner: Aria Soha (X4463)

Signature and Date  2/18/14

Fermilab ES&H Officer: Angela Aparicio (X3701)

Signature and Date  2/18/14

I. Description of the Proposed Action and Need

Purpose and Need:

The luminosity upgrade of the 'Large Hadron Collider' (LHC, which is the most powerful particle accelerator ever built and based at the European particle physics laboratory CERN [the European Organization for Nuclear Research], near Geneva in Switzerland) is to accurately study the Higgs boson branching ratios, as well as to extend the sensitivity to new physics into the multi tera electron volt (TeV) energy region. For the 'A Toroidal LHC Apparatus' (ATLAS, which is one of the seven particle detector experiments constructed at the LHC; the experiment is designed to take advantage of the unprecedented energy available at the LHC and observe phenomena that involve highly massive particles which were not observable using earlier lower-energy accelerators. It might shed light on new theories of particle physics beyond the Standard Model) Muon Spectrometer to be able to trigger on low energy photons and neutrons, it will require the replacement of the forward muon-tracking region with new detectors capable of tracking and triggering simultaneously; reducing the fake triggering rate. Small Thin Gap Chambers (sTGC) have been selected as one of the two technologies for the ATLAS upgrade.

Since the requirements on precision for such devices are very hard to achieve, a test-beam is needed to qualify the assembly procedure, in order to ensure that one can proceed to the production of the final devices. Utilizing a proposed test beam at the Fermilab Test Beam Facility (FTBF) would permit scientists to perform a scan of these pre-series detectors to confirm that required relative and absolute precision has been achieved.

Proposed Action:

The sTGC quadruplet consists of four narrow drift gaps, approximately 3 millimeters (mm) wide, separated from each other by approximately 5mm honeycomb spacers for a total thickness of approximately 70mm once the enclosing frame is included. A 2.8 kilovolt (kV) voltage would be applied across the gap. The gap planes serve as the cathodes and are made of FR-4 boards (a grade of printed circuit boards) whose interior surface is coated with graphite while the exterior one has either precisely machined copper strips with 3.2 mm pitch or a pattern of etched copper pads. Sandwiched in the middle of the two cathode boards at a distance of 1.4 mm from either is the anode plane made of 50 micrometer (um) tungsten wires at 1.8 mm pitch. The signals from the pads, strips and wires are read out and they are used for reconstructing charged-particle track patterns along the quadruplet both for online triggering and for precision position readout. Each of the four gaps in the quadruplet would be filled with a 55% +

45% mixture of CO₂ + n-pentane that provides the ionization signal. To create and maintain the proper mixture of gases a dedicated gas handling system would be provided. The gas mixture would have a flow rate of 10-50 cubic centimeters per minute.

This activity would take place in the FTBF and is scheduled to run from May 7 through May 27, 2014.

Alternatives Considered:

The FTBF is one of two test facilities in the world (the other is at CERN) that provide versatile test beams for experimenters to test their detectors and instrumentation. CERN is currently shutdown, leaving the FTBF as the only facility currently operating.

Alternative gases considered:

There were two candidates of gas mixtures for ATLAS; CO₂/n-pentane (55: 45) and CF/isobutane (80: 20). Time jitter is very small and detection efficiency is high with both gases. The signal-to- background ratio is better with CO₂/n- pentane and has been chosen for operation of the Thin Gap Chambers (TGC) at ATLAS.

It should be noted that the CO₂/n-pentane gas mixture has been in use at ATLAS for the past 3 years, and the same mixture has been chosen for the upgraded chambers, which are to be tested at Fermilab.

II. Description of the Affected Environment

See Section IV for details.

III. Potential Environmental Effects (If the answer to the questions below is “yes”, provide comments for each checked item and where clarification is necessary.)

A. Sensitive Resources: Would the proposed action result in changes and/or disturbances to any of the following resources?

- Threatened or endangered species
- Other protected species
- Wetland/Floodplains
- Archaeological or historical resources
- Non-attainment areas

B. Regulated Substances/Activities: Would the proposed action involve any of the following regulated substances or activities?

- Clearing or Excavation
- Demolition or decommissioning
- Asbestos removal
- PCBs
- Chemical use or storage
- Pesticides
- Air emissions
- Liquid effluents
- Underground storage tanks
- Hazardous or other regulated waste (including radioactive or mixed)
- Radioactive exposures or radioactive emissions
- Radioactivation of soil or groundwater

C. Other Relevant Disclosures: Would the proposed action involve any of the following actions/disclosures?

- Threatened violation of ES&H permit requirements
- Siting/construction/major modification of waste recovery or TSD facilities

- Disturbance of pre-existing contamination
- New or modified permits
- Public controversy
- Action/involvement of another federal agency
- Public utilities/services
- Depletion of a non-renewable resource

IV. Comments on checked items in section III.

Air Emissions

Emissions of n-pentane would be less than 0.44 tons per year, meeting the exemption for permitting found at 35 Illinois Administrative Code 201.146(jjj)(1)(A). Carbon dioxide emissions would be tracked for greenhouse gas reporting.

Radioactive exposures or radioactive emissions

The quadruplet would be placed within an existing beamline, which could potentially activate portions of the detector. As Low As Reasonably Achievable (ALARA) principles would be followed, along with established procedures and training to minimize exposure to workers.

V. NEPA Recommendation

Fermilab staff has reviewed this proposed action and believe a Categorical Exclusion is appropriate. It is believed that the proposed action meets the description found in DOE's NEPA Implementation Procedures, 10 CFR 1021, Subpart D, Appendix B3.6 which states:

B3.6 "Siting, construction, modification, operation and decommissioning of facilities for small-scale research and development projects; conventional laboratory operations (such as preparation of chemical standards and sample analysis); and small-scale pilot projects (generally less than 2 years) frequently conducted to verify a concept before demonstration actions provided that construction or modification would be within or contiguous to a previously disturbed or developed area (where active utilities and currently used roads are readily accessible). Not included in this category are demonstration actions, meaning actions that are undertaken at a scale to show whether a technology would be viable on a larger scale and suitable for commercial deployment."

Fermilab NEPA Program Manager: Teri L. Dykhuis

Signature and Date

Teri L. Dykhuis 2/20/2014

VI. DOE/FSO NEPA Coordinator Review

Concurrence with the recommendation for determination:

Fermi Site Office (FSO) Manager: Michael J. Weis

Signature and Date

Michael J. Weis 3/10/2014

FSO NEPA Coordinator: Rick Hersemann

Signature and Date

Rick Hersemann 2/24/2014

VII. Attachment – Map indicating location of Fermilab Test Beam Facility

