Operational Readiness Clearance (Non-beam operation)
E906 SeaQuest Magnest
23 May 2011

AUTHORIZATION TO PROCEED WITH THE UNATTENDED OPERATION OF KTeV ANALYSIS AND SWEEPER MAGNETS FOR E906 (SeaQuest)

REVIEWED AND APPROVED BY: **DATE**

Particle Physics Division Head — 5/26/2011
Comments/Exceptions:

Particle Physics Senior Safety Officer — 26 May 11
Comments/Exceptions:

Committee Chair — 23 May 2011
Comments/Exceptions:
Supercedes and expands ORC of 24 Jan 2011
Not valid for use with beam.

Submitted By:

Requester P. Reimer/C. Brown — 26 May 11

Electronic approvals for this form are acceptable. Please forward your responses to all recipients. A signed paper form (copy) of this document will exist in the Particle Physics Division Office. The original signed document will stay with the experiment requesting clearance.

Rev Aug 2008

From: "Paul E. Reimer" <reimer@anl.gov>
Subject: **Re: Magnet operation Re: E-906 Hodoscope Unattended Operation**
Date: May 16, 2011 4:58:23 PM CDT
To: Leo Bellantoni <bellanto@fnal.gov>
Cc: Eric D McHugh <emchugh@fnal.gov>
Reply-To: "reimer@anl.gov" <reimer@anl.gov>
Security: Signed (reimer@anl.gov)
1 Attachment, 0.3 KB

I would say that we should start with the ORC for FMag at full current so that we can run something.

Then, I would do a magnet off simulation and claim that those two simulations cover everything in between and follow this up with an ORC for that. I don't believe that KMag was in the simulations.

Paul

On 5/16/11 4:12 PM, bellanto wrote:

> OK so I think we need to decide how to procede vis-a-vis which ORCs to create.
>
> Without the rad safety study we can't proceed to a generic with-beam ORC.
> With a rad simulation for a specific current setting, then we can go to a with-beam ORC that covers only those settings.
> Or, once we get the drawings updated, we can write and ORC for no-beam. But I'm not sure that is a useful enough piece of paper to bother making.
>
> *Leo*
>
> ---
> Dr. Leo Bellantoni
> (630)730-2155
> MS 357, Fermilab Batavia, IL 60510

On May 16, 2011, at 3:59 PM, Paul E. Reimer wrote:

> Hello Leo,
>
> We will definitely want to run with at least one of the magnets off for some of the time (both FMag off, KMag on and FMag on, KMag off). There is a significant chance that we will want to run with both of the magnets off for special test runs, at lower intensity. What are the implications of this for radiation safety? I suspect that we need to request that a simulation be done. I guess that the easiest would be to have a simulation done with both magnets off, and make a decision based on that.
>
> As for (c) I'll add that to the general to do list.
>
> Paul
>
> On 5/16/11 3:21 PM, bellanto wrote:
>
> > A-hah! We want the PURPLE ones! http://www.youtube.com/watch?v=Rx47qrH1GRs&feature=related
> > Well I should have known.
> >
> > Now another item as I dust off my files is that we never closed the loop on Fmag. One part of that is that we wanted an updated version of drawing 2231-EB-173223 SH. 27; Keith said he'd get it made but he hadn't. I'll ping him again and cc: you. The other part of it is that I spoke with Dan Johnson, (d_johnson@fnal.gov, 840-2074) back some time ago now and he asked the following questions:
> > (a) What would be other possible sweeper settings other than 2000A that would be possibly used?
> > (b) And what would be their radiological implications?
> > (c) What is the procedure for controlled access?
> >
> > I think that we have to add (c) as part of the list of items that are needed for final overall experimental ORC. What is the story vis-a-vis (a) and (b)?

E906 Spectrometer Magnet, NM4AN, Operational Procedures.

WJ, KS, LB, CNB 4/5/11

Foreword:

The NM4AN magnet has been moved north by 10 feet for E906. All other aspects of its operation are almost identical to its operation for the KTeV experiment; see attached documentation from KTeV.

The NM4AN analysis magnet and power supply interlocks, as listed in the attached KTeV note from L. Beverly to D. Jensen, were reinstalled and tested by Walt Jaskierny and Julius Lentz..

LOTO (FES&HM 5120) procedures must be followed at any time work is to be done on NM4AN.

Operation Procedure for NM4AN (sometimes called KMAG by E906):

Each time the magnet is to be energized the following procedures must be followed:

1. The E906 shift leader must search NM4 and remove any loose magnetic materials that lie closer than 30 feet to the upstream or downstream end of NM4AN or that lie within 10 feet of the sides of NM4AN and then inform Operations.
2. Caution High Magnetic Field signs must be suspended in such a way to inhibit access to either end of NM4AN (the fringe fields in these regions can exceed 200 gauss).
3. The NM4 building must be posted with Caution Magnetic Fields Present signage.
4. The NM4 crane shall be locked out and the key held by the E906 shift leader.

Procedure to enable current to the NM4AN magnet:

1. MCR Operations staff remove their configuration control padlock from the 480 V circuit breaker, close the circuit breaker, and verify that the warning light on the magnet is illuminated.
2. If the NM4AN power supply trips for any reason, the supply can only be restarted by MCR Operations or EE/Power Supply personal from AD or PPD.
3. The magnet will only be operated when an E906 Spokesman or Run Manager who is physically present in the NM4 Hall or NM4 Control Room has requested its operation and is monitoring its operation.

4. At the completion of any beam-on operating period, the E906 shift leader or Run Coordinator must notify Operations to breaker off and install configuration control padlocks on the NM4AN power supply.

Attachments

1. KTeV era (1995) initial test results and startup procedures
2. SeaQuest era (2011) initial test results
3. KTeV era summary of safety provisions (still applicable)
4. Electrical Drawing

To: KTeV et. al.
From: Douglas Jensen
Re: KTeV Spectrometer Magnet Operational Procedures
Date: June 26, 1995

The fabrication and commissioning of the KTeV spectrometer magnet is complete. The procedures for running of the magnet in NMS for ziptracking and other testing are defined her e.

The initial startup and testing was done by the EE department. The magnet was run at the maximum current that could be obtained from the two power supplies connected in series - 2374 A. The voltage was 196 V per power supply. Since this current was limited by the output from the supplies, no operational limitations are placed on the magnet in terms of current or voltage with the setup consisting of two 500 KW Transrexes in series.

A temperature rise of approximately 50 deg. F was observed when running the magnet at maximum power and with 100 psi drop in cooling water pressure across the magnet. The pressure drop across the magnet should be maintained at at least 100 psi. If the pressure is less than 100 psi, the pressure should be increased. Operations, or other appropriate service personal will be called of an LCW pressure adjustment is necessary.

Before powering the magnet - each time the magnet is to be powered - the following procedures are to be followed;

1. The area must be checked for magnetic materials near the magnet. No loose magnetic object may be anywhere within the fenced area 10 feet of the side or 30 feet of the end of the magnet..

2. The fence as currently installed must be in place. (This fence will be opened from time to time to allow access to material stored south of the CCM.)

3. Signs must be placed at the entrance to the lower level of the hall and on fence blocking easy access to the south end of NMS around the CCM stating that there may be high magnetic fields present, and that these fields provide a hazard to credit cards, watches, and possibly other personal items.

4. There will be a sign placed near the south end of NMS noting that no moving of magnetic objects and no rigging is to be done south of the south end of the CCM while the magnet is energized.

5. If at any time work must be done on the magnet, appropriate lock-out-tag-out procedures (LOTO, ES&H 5120) will be followed.

From: Walter Jaskierny <waltj@fnal.gov>
Subject: **Powering NM3S and NM4AN for SeaQuest**
Date: March 24, 2011 3:23:32 PM CDT
To: Leo Bellantoni <bellanto@fnal.gov>
Cc: Chuck Brown <chuckb@fnal.gov>, "Paul E. Reimer" <reimer@anl.gov>, Dave Christian <dcc@fnal.gov>

Hello Leo,

During testing last week I confirmed that the magnet interlocks/crash buttons in NM4 would drop out the main DC contactor and remove power from the power supply/s that was powering each magnet. The reversing switch for NM4AN was operated the magnet powered and it did clamp the DC output of the power supplies and reverse polarity correctly. Today we ran both the NM3S and NM4AN at full power for 1/2 hour or more. NBM3S was run at 1500 Amps and NM4AN was run at 2000 Amps without any problems. The magnet imbalance detector for NM4AN was checked out and is currently set to trip for a 250 mV imbalance across the magnet that is normally run with 350 Volts total across the coil. At this time I am satisfied with the operational condition of this equipment. Once the ORC is issued for these magnets I will make arrangements to remove my locks from the power supplies and have the Main Control Room install their locks on the power supplies.

Walter Jaskierny

11-4-95

To: Doug Jensen

From: L. Beverly LB

Subject: KTeV Analysis Magnet Safety Review

Doug, this is a re-issue of the safety provisions related to the analysis magnet. However, since the magnet is now in the KTeV experimental hall. I have attached drawings that show the power supply location (NS7), the routing of the DC power from the service building to the magnet and a single line diagram of the PS/magnet system.

Listed below are the magnet and personnel protection devices associated with the KTeV analysis magnet system.

1) The LCW cooling pumps are interlocked to trip off the PS's if the pumps trip off.

2) A ground fault detector circuit, located in the power supply, is interlocked to trip off the PS's if an electrical short from coil to ground occurs.

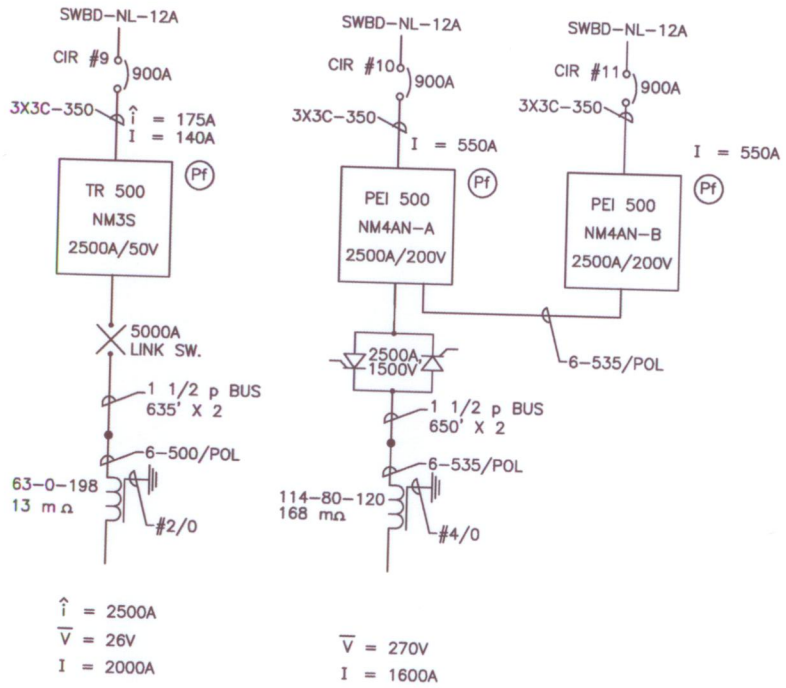
3) There are 44 klixons (90 Deg C) on the coils and coil jumpers that are interlocked to trip off the PS's if a thermal problem occurs.

4) A Magnet Imbalance Detector is used to detect inner coil shorts. If any shorts occur, the detector will trip off the PS's.

5) Emergency Shutdown Switches have been installed on the east and west sides of the magnet for easy access to a rapid shutoff.

6) Danger Magnet Energized warning lights and signs have been mounted on both sides of the magnet for high visibility.

	DESCRIPTION	REV.	DATE
A	ORIGINAL		3/26/93
B	REVISED		12/17/96
C	Revised/Calculations for Cir #9	PML	5/23/2011



$\hat{I}$ = 2500A
$\overline{V}$ = 26V
I = 2000A

$\overline{V}$ = 270V
I = 1600A

$\hat{I}$ = CURRENT @ FLATTOP
$\overline{V}$ = VOLTAGE @ FLATTOP
I = RMS CURRENT

FERMI NATIONAL ACCELERATOR LABORATORY
UNITED STATES DEPARTMENT OF ENERGY

PARTICLE PHYSICS DIVISION
NM BEAM
NM3 & NM4

ORIGINATOR	BEVERLY	DRAWING NUMBER	REV.
DRAWN	CUNY	2231-EB-173223 SH. 27	C

E906 Beam Dump Magnet, NM3S, Operational Procedures.

WJ, KS, LB, CNB 4/5/11

Foreword:

The NM3S beam dump magnet has been constructed from iron blocks and aluminum coils recovered from the E866 experiment in MWest. The normal excitation of the magnet will be 2000 Amps at about 25 Volts, a 50 kW load. The operation of this magnet will typically be accompanied by the simultaneous excitation of the E906 analysis magnet, NM4AN (see the NM4AN procedures).

The NM3S analysis magnet, power supply, and electrical and cooling water interlocks, were installed and tested by Walt Jaskierny and Julius Lentz.

LOTO (FES&HM 5120) procedures must be followed at any time work is to be done on NM3S.

Operation Procedure for NM3S (sometimes called FMAG by E906):

Each time the magnet is to be energized the following procedures must be followed:

1. The E906 shift leader must search NM3 and NM4 and remove any loose magnetic materials that lie closer than 20 feet to the upstream or downstream end of NM3S.
2. Caution High Magnetic Field signs must be suspended in such a way to inhibit access to the downstream end of NM3S (the fringe fields in this region can exceed 200 gauss). The sides of NM3S are inaccessible because of concrete radiation shielding. Due to residual radiation problems, access to the upstream end of NM3S is restricted by an RSO lock during operation.
3. The NM4 building must be posted with Caution Magnetic Fields Present signage.

Procedure to enable current to the NM3S magnet:

1. MCR Operations staff remove their configuration control padlock from the 480V circuit breaker, close the circuit breaker, and verify that the warning light on the magnet is illuminated.
2. If the NM3S power supply trips for any reason, the supply can only be restarted by MCR Operations or EE/Power Supply personal from AD or PPD.
3. The magnet will only be operated when an E906 Spokesman or Run Manager who is physically present in the NM4 Hall or NM4 Control Room has requested its operation and is monitoring its operation.
4. At the completion of any beam-on operating period, the E906 shift leader or Run Coordinator must notify Operations to breaker off and install configuration control padlocks on the NM3S power supply.

Attachments

1. SeaQuest era (2011) initial test results
2. Summary of safety provisions
3. Electrical Drawing