Operational Readiness Clearance (Non-beam operation)
E906 SeaQuest
24 Jan 2011

AUTHORIZATION TO PROCEED WITH THE UNATTENDED OPERATION OF KTeV ANALYSIS MAGNET FOR E906 (SeaQuest)

REVIEWED AND APPROVED BY: **DATE**

Particle Physics Division Head
Comments/Exceptions:

Particle Physics Senior Safety Officer
Comments/Exceptions:

Ivo Bellantoni 25 Jan 2011.
Committee Chair
Comments/Exceptions:

Submitted By:

Chas M Brown 02493N 1/25/11
Requester C. Brown

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: Douglas Jensen <djensen@fnal.gov>
Subject: **NM4AN Startup review**
Date: January 24, 2011 2:21:17 PM CST
To: Leo Bellantoni <bellanto@fnal.gov>
Cc: David Christian <dcc@fnal.gov>, Walter Jaskierny <waltj@fnal.gov>, Eric D McHugh <emchugh@fnal.gov>, David Huffman <huffman@fnal.gov>, "reimer@anl.gov Reimer" <reimer@anl.gov>, "lentz@fnal.gov" <lentz@fnal.gov>, Chuck Brown <chuckb@fnal.gov>

Leo
Having walked around the magnet and made a visual inspection and discussed the details with the people involved in running the magnet, I believe NM4AN ready to run again.
Douglas A. Jensen

From: David Huffman <huffman@fnal.gov>
Subject: **NM4AN Operations**
Date: January 24, 2011 2:58:14 PM CST
To: Leo Bellantoni <bellanto@fnal.gov>

Hello Leo,

I agree to allow attended operations of the magnet in the KTev hall.
I have review of the procedures and inspecting the
installation/operating area.

January 24th, 2011

Dave Huffman

E906 Spectrometer Magnet, NM4AN, Operational Procedures. CNB 1/24/11

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.

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. LOTO procedures must be followed at any time work is to be done on NM4AN.
5. 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. Remove the padlock on 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 Operations or EE personal from AD or PPD
3. The magnet will be operated at 2000 Amps, 340 Volts, for a central field of 0.3 Tesla.
4. The magnet will only be operated when a member of the E906 collaboration, who is physically present in the NM4 Hall or NM4 Control Room, has requested its operation, and is monitoring its operation.
5. After completion of any operating period, the E906 shift leader must notify Operations to breaker off and install configuration control padlocks on the NM4AN power supply.

From: bellanto <bellanto@fnal.gov>
Subject: **Re: Klixon**
Date: January 12, 2011 11:39:21 AM CST
To: Walter Jaskierny <waltj@fnal.gov>, David Huffman <huffman@fnal.gov>, Steve Chappa <chappa@fnal.gov>, Keith Schuh <schuh@fnal.gov>, Eric McHugh <emchugh@fnal.gov>
Cc: David Christian <dcc@fnal.gov>, Chuck Brown <chuckb@fnal.gov>, "Paul E. Reimer" <reimer@anl.gov>

Hi Walt,

Thanks for this detailed summary. I am still not 100% convinced that we know that heating of the magnet will cause the klixons to trip, but we can discuss this later. It will probably be easier to straighten out in person than via email or phone.

As we discussed this morning, the big to-do item in my notes from our last meeting on this was some sort of updated documentation re procedures. With that, I believe we are in firing range and should have one last get-together. If for some reason, updated documentation is hard to get, then we can look at some scenario with limited approval for the steps you outline in the 2nd paragraph of your email, followed by a full approval later. It's more paperwork and my sense is that general operating procedures for the magnet are not hard to generate, so I'd much prefer to do it all at once. But OK, the possibility exists if you guys need it.

Leo

Dr. Leo Bellantoni (630)730-2155
MS 357, Fermilab Batavia, IL 60510

On Jan 12, 2011, at 8:20 AM, Walter Jaskierny wrote:

> Hello Leo,
>
> The power supplies in NS7 for the MN4AN magnet had the AC control power turned on after the supplies were disabled so that it was not possible for a DC output from the supplies. It was then verified that the Magnet Interlocks (klixons and crash switches) had continuity to the power supplies and the Magnet Interlock status of the power supplies had been satisfied. Each crash switch was operated and it was verified that the Magnet Interlock of the power supplies dropped out for each switch operation. With the power supply interlocks reset and completed, the klixon string at the magnet was broken and it was verified that the Magnet Interlock at the power supply dropped out. The interlock wiring for the Magnet Imbalance Detector between the imbalance detector chassis to the power supplies was also opened and it was verified that the Magnet Imbalance Interlock of the power supplies was broken. Since the AC control power was on at the power supplies it was also possible to verify that the Magnet Energized Lights on both the East and West side of the magnet were operational.

The next set of testing after permission is granted will be to repeat these tests with the main contactor of the power supply energized and closed but the DC output of the power supplies set to zero and to make certain that the main contactor drops out when the magnet interlock string is broken at the magnet. After that test is completed the magnet would be run at a low current (200 to 400 Amps) and the Magnet Imbalance Detector Chassis will be tested for functionality and verify that it will break the interlock string of the power supplies and drop the main contactors. Also another test to perform at low currents is to operated the magnet reversing switch at NS7 for NM4AN magnet and to make certain that the DC output of the two power supplies is disabled or clamped during the reversing switch operation. Once these interlock tests are satisfied the power supplies, reversing switch and magnet will be ready for operational testing at higher currents to make certain that they are in good working order before operation of the equipment is turned over to other responsible individuals.

Walt Jaskierny

On Jan 11, 2011, at 3:41 PM, bellanto wrote:

> Hi Walt,
>
> What level of check-out have you given to the klixons?
>
> *Leo*
>
> ---
>
> Dr. Leo Bellantoni (630)730-2155
> MS 357, Fermilab Batavia, IL 60510

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.

1995

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 Trans-rexes in series.

Is this still true.

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.

who

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

who?

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.

Only authorized persons shall operate the magnet. KTeV will maintain a list of authorized persons. To become authorized, a person will be checked out in the operation of the magnet power supplies by the Power Systems Group in the EE department, or other appropriately designated (by the Power Systems Group) persons.

When the power supply is started:

1) Remove the padlock on the 480 V circuit breaker, close the circuit breakers, and verify that the warning lights on the magnet are operating.

2) If the power supply shuts down for any reason - e.g. interlock trips, have the interlocks cleared and the power supply restarted by operations or by appropriate EE personal.

3) The magnet will not be operated unattended.

4) The water pressure at the inlet and outlet should be monitored regularly, at least every half hour.

5. After completion of an operating period, open the power supplies 480V circuit breakers and reinstall the configuration control padlocks.

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.

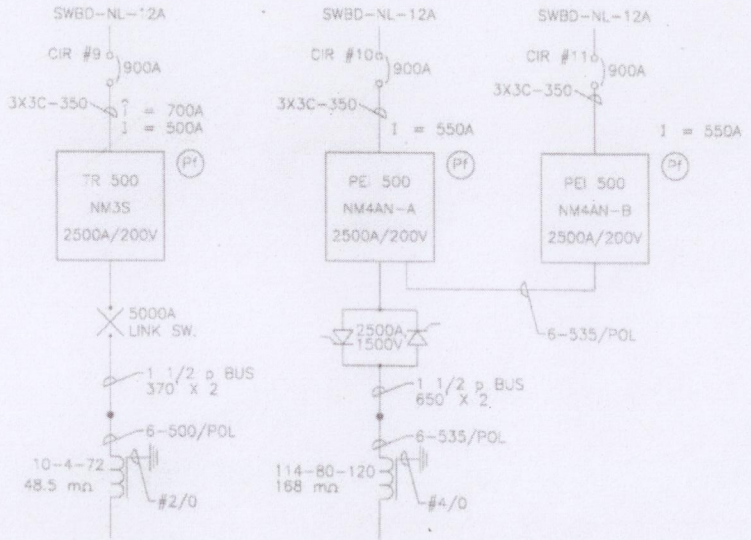
3) There are 44 klixons (90 Deg C) on the coils and coil jumpers that are interlocked to trip off the PS's if a thermal problem occurs.

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
ORIGINAL		3/26/93
REVISED		12/17/96



Î = 2500A
V̄ = 140V
I = 1750A

V̄ = 270V
I = 1600A

Now we need 2000 A @ ~ 25 V

Î = CURRENT @ FLATTOP
V̄ = 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	