Operational Readiness Clearance
LAraiT in MC7
21 Apr 2015

AUTHORIZATION FOR THE REMOTE OPERATION OF
LAraiT IN MC7

REVIEWED AND APPROVED BY:	**DATE**
Neutrino Division Head Comments/Exceptions:	4/22/15
Particle Physics Division Head Comments/Exceptions:	4/22/15
Paul C Garoupalo for Sergei Nagaitsev Accelerator Division Head Comments/Exceptions:	4/22/15
Accelerator Division Operations Department Head Comments/Exceptions:	4/22/2015
Accelerator Division Radiation Safety Officer Comments/Exceptions:	4/22/2015
13747N Particle Physics Senior Safety Officer Comments/Exceptions:	4/22/15
Committee Chair Comments/Exceptions:	4-22-2015
Ø3279N Fermilab Test Beam Coordinator Comments/Exceptions:	4/22/2015

Submitted By:

13400V Requester Jason St. John	4/22/2015

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: **David Mertz** mertz@fna .gov
Subject: Re: LArTPC HV pORC
Date: Apr 15, 2015 at 7:04 AM
To: Steve J Chappa chappa@fna .gov
Cc: Leo Be anton be anto@fna .gov, Mandy Kath een Rom nsky rom nsky@fna .gov, Eugene E Schm dt Jr jj@fna .gov, Kathy J Graden graden@fna .gov, Made yn Wo ter madd ew@fna .gov, James L. Pr est pr est@fna .gov, Ange a M Apar c o asands@fna .gov, Karen M Kephart karenk@fna .gov, Ter L Dykhu s dykhu s@fna .gov, Tug T Arkan arkan@fna .gov, Robert J Bushek bushek@fna .gov, Er c D McHugh emchugh@fna .gov, Russe A Ruc nsk ruc nsk @fna .gov, Gary L Lauten g auten@fna .gov, M chae G. Herr m chae .herr@sc ence.doe.gov, A an A Hahn ahahn@fna .gov, Sarah Lockw tz ockw tz@fna .gov

---

As usual, thank you Steve for writing these up. I concur with these comments.

David E. Mertz, P. E.
Electrical Safety Engineer & AHJ
Fermi Nat'l Accelerator Laboratory
P. O. Box 500, Batavia, IL 60510
Direct: 630.840.6322
Mobile: 630.352.7461

Sent from my PDA. Please forgive typos and abbrs.

On Apr 14, 2015, at 5:43 PM, Steve J Chappa <chappa@fnal.gov> wrote:

> Hi Dr. Leo,
>
> During the Orc review of the LArIAT HV Hardware Installation at FTBF and in MC7 this afternoon, I found:
>
> **In The MC7 control room (the HV Pot1 rack):**
>
> 1) A barrier (plexi-glass or similar material) is **required** to be placed/installed at the front of the rack to prevent unwanted manipulation of the HV equipment inside. Verify that a “Danger: High Voltage” sign is placed on this barrier.
>
> 2) **Restrain and dress** the HV feed cable (to Pot1) inside the rack and check the rear door closes without damaging this cable.
>
> 3) Since the HV power supply can set the limit of the output current and the knob to be locked down, **require** that this current limit be set at 1 mA with a label placed on the front panel indicating this set limit.
>
> 4) **Require** that the grounding braid attachment connections to the Pot1 and to the power supply be redone to provide a secure and low-impedance grounding connection. For the braid clamp on the Pot1 handle, place a solid 1-inch long copper rod, about a #8 AWG size, between the braid and the bonding bolt so the clamp will push down on this copper rod and not cut the braid strands. On the power supply, sandwich the braid between two flat washers.
>
> **On the Cryostat/vessel in MC-7:**
>
> 1) As Karen indicated, **police** any incidental grounding contact between the vessel and the other metal (building ground) components.
>
> 2) When the Pot2 is placed, using a large (2 AWG or larger) insulated grounding cable, **attach** the cable to the Pot2 handle and to the vessel support bracket using a lug and bolting hardware.

From: **Steve J Chappa** chappa@fna .gov
Subject: RE: Let s do the Second Pass Tuesday (today) at 2 PM
Date: Apr 21, 2015 at 5:00 PM
To: Leo Be anton be anto@fna .gov
Cc: Sarah Lockw tz ockw tz@fna .gov, Jason M chae St.John jasonstjohn@gma .com, A an A Hahn ahahn@fna .gov, Dav d Mertz mertz@fna .gov, Karen M Kephart karenk@fna .gov

---

Hi Dr. Leo, All,

We conducted the follow-up review of the LArIAT HV system this afternoon and this is what I found:

Within the control room:

1) The corrective actions required for the equipment within the HV rack, the restraint of the HV cables, the grounding connections, and the labeling, etc., were completed satisfactorily.

2) The equipment installed in the adjacent two racks appear to be AD equipment. Cables that came from a custom-built chassis did enter the cable tray and appeared to enter the MC-7 enclosure. There did not appear to be any glaring safety issues with this installed equipment.

Within the MC-7 enclosure:

1) As Karen noted, the area around the cryostat did appear to be "cleaned up" of metal that could cause incidental contact between the cryostat and metal attached to building ground. However, there needs to be caution regarding dangling connector ends on coax cables in and around the cryostat. These ends, if a HV cable and not being used, should be protected and the HV source disconnected or de-energized.

2) The corrective actions required for the Pot2 HV cables and labeling were completed satisfactorily.

3) We traced the HV cable between Pot1 and Pot2 along its route. For the most part, this routing looked OK with the exception that this cable, along with several other HV cables were attached to an AC distribution conduit. This bundle of cables were removed from this conduit and supported independent of the conduit as required by the NEC. Done during the review. --OK.

4) The six holes in the HV splitter chassis, mounted on the cryostat, were covered with tape. --OK.

5) An AC extension cord is being used for a pump placed under the cryostat. If this is to be more of a permanent installation, then this motor needs to be plugged into a permanent premise wiring outlet. However, OSHA requirements indicates that temporary wiring for experimental installations can remain as long as required of that installation. So, for this pump and for this installation the extension cord is OK to use.

With that said, I can recommend this HV installation be issued the pORC for operation.

Regards,
Steve

-----Original Message-----
From: Sarah Lockwitz
Sent: Tuesday, April 21, 2015 6:13 AM
To: Jason Michael St.John; Alan A Hahn; Steve J Chappa; Leo Bellantoni
Subject: Let's do the Second Pass Tuesday (today) at 2 PM

Dear All,

The first available time where we can have a quorum for the second pass of the safety walk through is today at 2 PM. Let's meet then at the FTBF.

Have a good morning,
Sarah

From: **Karen M Kephart** karenk@fna .gov
Subject: RE: LArTPC HV pORC
Date: Apr 15, 2015 at 7:17 AM
To: Steve J Chappa chappa@fna .gov, Leo Be anton be anto@fna .gov
Cc: Mandy Kath een Rom nsky rom nsky@fna .gov, Eugene E Schm dt Jr jj@fna .gov, Kathy J Graden graden@fna .gov, Made yn Wo ter madd ew@fna .gov, Dav d Mertz mertz@fna .gov, James L. Pr est pr est@fna .gov, Ange a M Apar c o asands@fna .gov, Ter L Dykhu s dykhu s@fna .gov, Tug T Arkan arkan@fna .gov, Robert J Bushek bushek@fna .gov, Er c D McHugh emchugh@fna .gov, Russe A Ruc nsk ruc nsk @fna .gov, Gary L Lauten g auten@fna .gov, M chae G. Herr m chae .herr@sc ence.doe.gov, A an A Hahn ahahn@fna .gov, Sarah Lockw tz ockw tz@fna .gov

---

Dear All:

Given that we found one instance of a main feed cable in a position where it could be abraded on the sharp edge of a cable tray, and that it was noted the experimenters had already adjusted one in the counting room area, it would be good to walk the route from the control room through to the 2nd pot to check that there are no others.

K.

Karen M Kephart
Technical Resource Coordinator
Fermi National Accelerator Laboratory
630-840-6625 office
630-485-0587 mobile
www.fnal.gov
karenk@fnal.gov

P Clean & Green: Please consider the environment before printing this e-mail

---

From: Steve J Chappa
Sent: Tuesday, April 14, 2015 5:44 PM
To: Leo Bellantoni
Cc: Mandy Kathleen Rominsky; Eugene E Schmidt Jr; Kathy J Graden; Madelyn Wolter; David Mertz; James L. Priest; Angela M Aparicio; Karen M Kephart; Teri L Dykhuis; Tug T Arkan; Robert J Bushek; Eric D McHugh; Russell A Rucinski; Gary L Lauten; Michael G. Herr; Alan A Hahn; Sarah Lockwitz
Subject: RE: LArTPC HV pORC

Hi Dr. Leo,

During the Orc review of the LArIAT HV Hardware Installation at FTBF and in MC7 this afternoon, I found:

In The MC7 control room (the HV Pot1 rack):

1) A barrier (plexi-glass or similar material) is **required** to be placed/installed at the front of the rack to prevent unwanted manipulation of the HV equipment inside. Verify that a “Danger: High Voltage” sign is placed on this barrier.

2) **Restrain and dress** the HV feed cable (to Pot1) inside the rack and check the rear door closes without damaging this cable.

3) Since the HV power supply can set the limit of the output current and the knob to be locked

3) Since the HV pot power supply can set the limit of the output current and the lines to be locked down, **require** that this current limit be set at 1 mA with a label placed on the front panel indicating this set limit.

4) **Require** that the grounding braid attachment connections to the Pot1 and to the power supply be redone to provide a secure and low-impedance grounding connection. For the braid clamp on the Pot1 handle, place a solid 1-inch long copper rod, about a #8 AWG size, between the braid and the bonding bolt so the clamp will push down on this copper rod and not cut the braid strands. On the power supply, sandwich the braid between two flat washers.

On the Cryostat/vessel in MC-7:

1) As Karen indicated, **police** any incidental grounding contact between the vessel and the other metal (building ground) components.

2) When the Pot2 is placed, using a large (2 AWG or larger) insulated grounding cable, **attach** the cable to the Pot2 handle and to the vessel support bracket using a lug and bolting hardware.

3) Also, after the pot is placed, **add restraint** to the feed and load HV cables to limit their movement and to protect them from damage.

4) **Reposition** the HV feed cable off of the sharp metal edge of the upper cable tray to prevent damage to the jacket or shield.

5) **Require** to place a “Danger: High Voltage” warning sign on all HV cable ends and on/near the Pot2 so it is visible from any approach.

6) On the TPC HV bias filter box, **require** to plug up or cover up those 6 extra holes in the HV chassis box, being mindful lf any connector labeling.

Once these corrective actions are completed, then a follow-up review will be required to verify these corrective actions prior to the issuance of the ORC.

Regards,
Steve

From: Leo Bellantoni
Sent: Tuesday, April 14, 2015 5:02 PM
To: Kathy J Graden; Steve J Chappa; Madelyn Wolter; David Mertz; James L. Priest; Angela M Aparicio; Karen M Kephart; Teri L Dykhuis; Tug T Arkan; Robert J Bushek; Eric D McHugh; Russell A Rucinski; Gary L Lauten; Michael G. Herr
Cc: Mandy Kathleen Rominsky; Eugene E Schmidt Jr
Subject: Re: LArTPC HV pORC

Dear LAriaT-ers,

My comments from this afternoon's walk through:

Units in relay racks in the control room, numbered 1RR061 an 1RR09D - we were told that these belong to AD. They do seem to contain custom electronics. We need to either have an AD person to assert that these units are indeed his and that they have been reviewed; or else we must review them ourselves.

And I include 1 recommendation from Karen Kephart, to save her from typing:

Be certain that you do not have items in incidental contact with the cryostat.

Further recommendations are expected from Jim Priest and Steve David Mertz-Chappa.

Re operations, the agreement is that the HV unit reviewed today is to remain disconnected and nonoperational until we sign-off on this ORC. Insofar as operation of the unit without LAr in the cryovessel will destroy the apparatus, a LOTO to ensure compliance here is deemed unnecessary. The existing ORC is considered sufficient for continued evening operation until the HV ORC is signed.

Thanks,

Leo

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

On Apr 10, 2015, at 12:15 PM, bellanto <bellanto@fnal.gov> wrote:

> Dear ORC members,
>
> We have a request (see below) for a walkthrough - I believe it is the last one - for LAriaT. This would cover the HV system for the TPC. Scheduling poll is at http://doodle.com/ghvhx2s35u3zydqk
>
> Thanks,
>
> *Leo*
>
> ---
>
> Dr. Leo Bellantoni
> (630)730-2155
> MS 357, Fermilab Batavia, IL 60510

Begin forwarded message:

From: "Jason St. John" <stjohn@fnal.gov>
Subject: LArTPC HV pORC
Date: April 10, 2015 at 11:21:01 AM CDT
To: Leo Bellantoni <bellanto@fnal.gov>
Cc: Sarah Lockwitz <lockwitz@fnal.gov>, Alan A Hahn <ahahn@fnal.gov>
Reply-To: <stjohn@fnal.gov>

Hi, Leo,

We'd like to request a partial ORC to approve our LArTPC high-voltage system for operation. Tuesday 4/14 is the earliest date we're asking for. Documentation attached.

Thanks!
-jmsj

From: bellanto <bellanto@fnal.gov>
Subject: Re: LArTPC HV pORC
Date: April 21, 2015 at 3:07:20 PM CDT
To: Jason St John <stjohn@fnal.gov>, Sarah Lockwitz <lockwitz@fnal.gov>, "Alan A Hahn" <ahahn@fnal.gov>
Cc: Mandy Rominsky <rominsky@fnal.gov>

Dear LAriaTers,

This is just to note that Steve Chappa and I examined these racks and concluded that they are indeed AD equipment; and so they should be outside the scope of this review.

Thanks,
Leo

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

On Apr 15, 2015, at 10:58 AM, bellanto <bellanto@fnal.gov> wrote:
Dear LAriaT-ers,

My comments from yesterday afternoon's walk through:

Units in relay racks in the control room, numbered 1RR061 an 1RR09D - we were told that these belong to AD. They do seem to contain custom electronics. We need to either have an AD person to assert that these units are indeed his and that they have been reviewed; or else we must review them ourselves.

And I include 1 recommendation from Karen Kephart, to save her from typing:

Be certain that you do not have items in incidental contact with the cryostat.

Further recommendations are expected from Jim Priest and Steve David Mertz-Chappa.

Re operations, the agreement is that the HV unit reviewed today is to remain disconnected and nonoperational until we sign-off on this ORC. Insofar as operation of the unit without LAr in the cryovessel will destroy the apparatus, a LOTO to ensure compliance here is deemed unnecessary. The existing ORC is considered sufficient for continued evening operation until the HV ORC is signed.

Thanks,

Thanks,
Leo

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

From: **bellanto** be anto@fna .gov
Subject: Re: prc LArTPC HV
Date: Apr 21, 2015 at 5:02 PM
To: J m Pr est pr est@fna .gov
Cc: Er c McHugh emchugh@fna .gov

Hl Jim,

I have verified that these things have been done.

Thanks,

Leo

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

On Apr 14, 2015, at 4:35 PM, James L. Priest <priest@fnal.gov> wrote:

1Pot needs to be moved off the rollers.
2 Ground needs to be tighten and one ground is not connected.
3Spill pads should be near each pad.
4. I do not see a plac with the experiment name and contacts.
Not related the cardboard in the back set of racks need to be removed. They can draw on a metal sheet if needed.
We should look at adding rack protection in HV racks in the future

James Priest PhD.
Strategist/Researcher/Pyroscientist

ESH&Q Section
Fermi National Accelerator Lab
PO Box 500, MS 119
Batavia, IL 60510
USA

630-840-4283 office
312-636-6259 mobile
www.fnal.gov
priest@fnal.gov

From: **bellanto** be anto@fna .gov
Subject: Fwd: LArTPC HV pORC
Date: Apr 10, 2015 at 12:15 PM
To: Kathy J Graden graden@fna .gov, Steve J Chappa chappa@fna .gov, Made yn Wo ter madd ew@fna .gov, Dav d Mertz mertz@fna .gov, James L. Pr est pr est@fna .gov, Ange a M Apar c o asands@fna .gov, Karen M Kephart karenk@fna .gov, Ter L Dykhu s dykhu s@fna .gov, Tug T Arkan arkan@fna .gov, Robert J Bushek bushek@fna .gov, Er c D McHugh emchugh@fna .gov, Russe A Ruc nsk ruc nsk @fna .gov, Gary L Lauten g auten@fna .gov, M chae G. Herr m chae .herr@sc ence.doe.gov
Cc: Mandy Kath een Rom nsky rom nsky@fna .gov, Eugene E Schm dt Jr jj@fna .gov

---

Dear ORC members,

We have a request (see below) for a walkthrough – I believe it is the last one – for LAriaT. This would cover the HV system for the TPC. Scheduling poll is at http://doodle.com/ghvhx2s35u3zydgk

Thanks,

Leo

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

Begin forwarded message:

> **From:** "Jason St. John" <st ohn@fna .gov>
> **Subject: LArTPC HV pORC**
> **Date:** Apr 10, 2015 at 11:21:01 AM CDT
> **To:** Leo Be anton <be anto@fna .gov>
> **Cc:** Sarah Lockw tz <ockw tz@fna .gov>, A an A Hahn <ahahn@fna .gov>
> **Reply-To:** <st ohn@fna .gov>
>
> Hi, Leo,
>
> We'd like to request a partial ORC to approve our LArTPC high-voltage system for operation. Tuesday 4/14 is the earliest date we're asking for. Documentation attached.
>
> Thanks!
> -jmsj

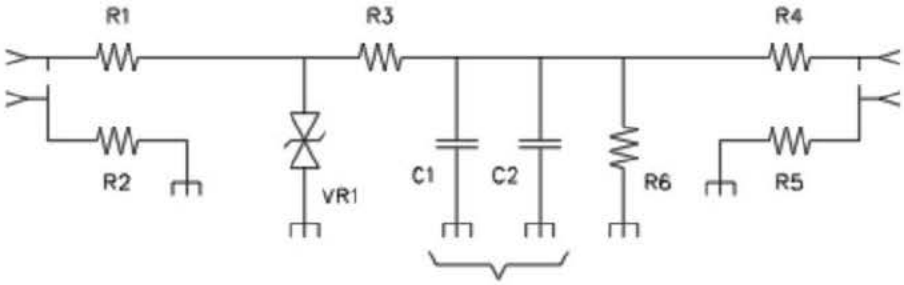
lariatHV.pdf

bias_voltage_filter_desc ription.pdf

T962 Wire Bias Voltage Input Filter

Wire Bias Voltage from the Supply Filter Input Insulated SHV Connector

Wire Bias Voltage to the Cryostat Filter Output Insulated SHV Connector (see note below)



Good Ground Connection
to the Filter Box and through
the Filter Mounting Bracket
to the Cryostat.

R1 20k Ohm	R6 100 Meg. Ohm
R2, R4, R5 200 Ohm	C1, C2 0.47 uFd 1000V
R3 50k Ohm	Varistor 600V

Each Bias Voltage Input Filter needs to be attached to a bracket that is welded onto the cryostat flange plate. This mounting is both for the mechanical support of the filter and to provide the main ground connection to the filter.

If the SHV cable run from the Output of the Bias Voltage Filter to the Bias Voltage Feedthrough is very short (small loop area) then R4 and R5 could be eliminated and the filter's SHV output connector could be mounted directy on the metal box that holds the filter.

If there is room in the box for a C3 and C4 it may be useful to double the amount of capacitance in the filter.

All ground symbols in this drawing are to a copper plate in the filter box that is well connected to the mounting bracket that both supports and grounds the filter.

Rev. 13-JAN-2008