LASER INTERFEROMETER GRAVITATIONAL WAVE OBSERVATORY
- LIGO -

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Proposal for CDS Rack Relocation At Livingston and Hanford

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1.0 Overview

The EMI/RFI retrofit gives us the opportunity to improve many aspects of the Control & Data System. Although the original design was successful, it was modular and based on many unknowns. With a clearer picture of the successes and shortcomings of the design as it is now, we propose to relocate the Control & Data System racks from their current location on the technical slab.

By moving the racks, we will be removing the vibration and acoustical issues associated with them (i.e. VME crates, power supplies, etc.) from the technical slab. We will be able to purchase standard and less expensive EMI/RFI enclosures by removing the wiring cross connects from the control racks. We will have many more options for cooling the racks. We will have the ability to work with the electronics in a laser safe condition and without having to be on the technical slab.

To take advantage of these opportunities, we have chosen the Clean Storage Room as the location to build the new control system for the 4k interferometers at both Hanford and Livingston. The 2k is discussed in Section 9.

2.0 Clean Storage Room

Although the Clean Storage Room served its purpose well during installation, we feel it is an area that can now be better utilized as we continue to improve the sensitivity of the instrument. Since both sites now have better storage facilities than were available during construction, we feel that this relocation will have minimal impact.

The room has approximately 100 feet of wall space. 27 feet are unusable due to doors and columns. We propose to use 46 feet for CDS. This leaves approximately 27 for other uses. The ceiling height is 20 feet, which provides over 400 square feet that can potentially be used to store equipment that is regularly used but cannot be kept in the LVEA. See Figure 2.0 for the proposed layout.

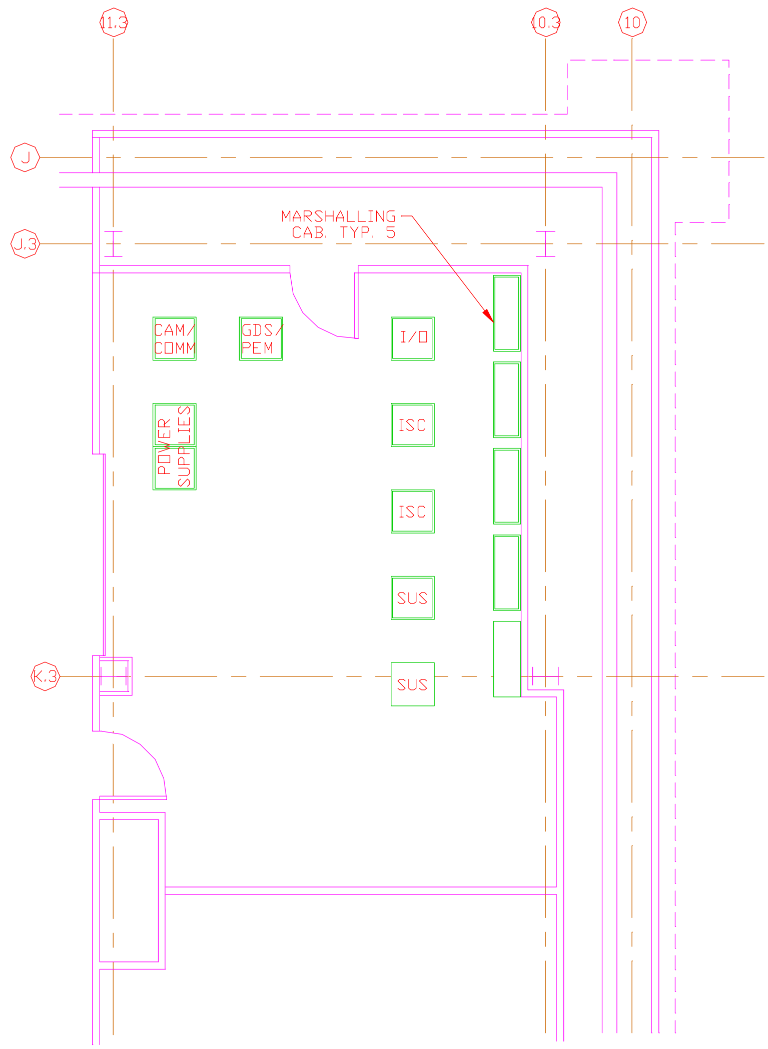

FIGURE 2.0
NOT TO SCALE

3.0 Routing of Cables

3.1 New Cable Tray

Figure 3.0 shows the proposed cable tray layout in the Clean Storage Room and the proposed cable tray layout in the LVEA. The tray shall be 2 feet wide with 4 inch flanges. It will be connected at one end to the existing tray. A barrier will be installed, in the tray, to maintain signal type separation. The LVEA tray will be discontinuous from the tray in the Clean Storage Room, to prevent short-circuiting the gap between the technical slab and the OSB. Wall penetration shall be closed with stainless steel panels. Soft foam adjustable clamps shall be installed on the panels to seal around the cables. The tunnel through the shall be framed and sheetrocked.

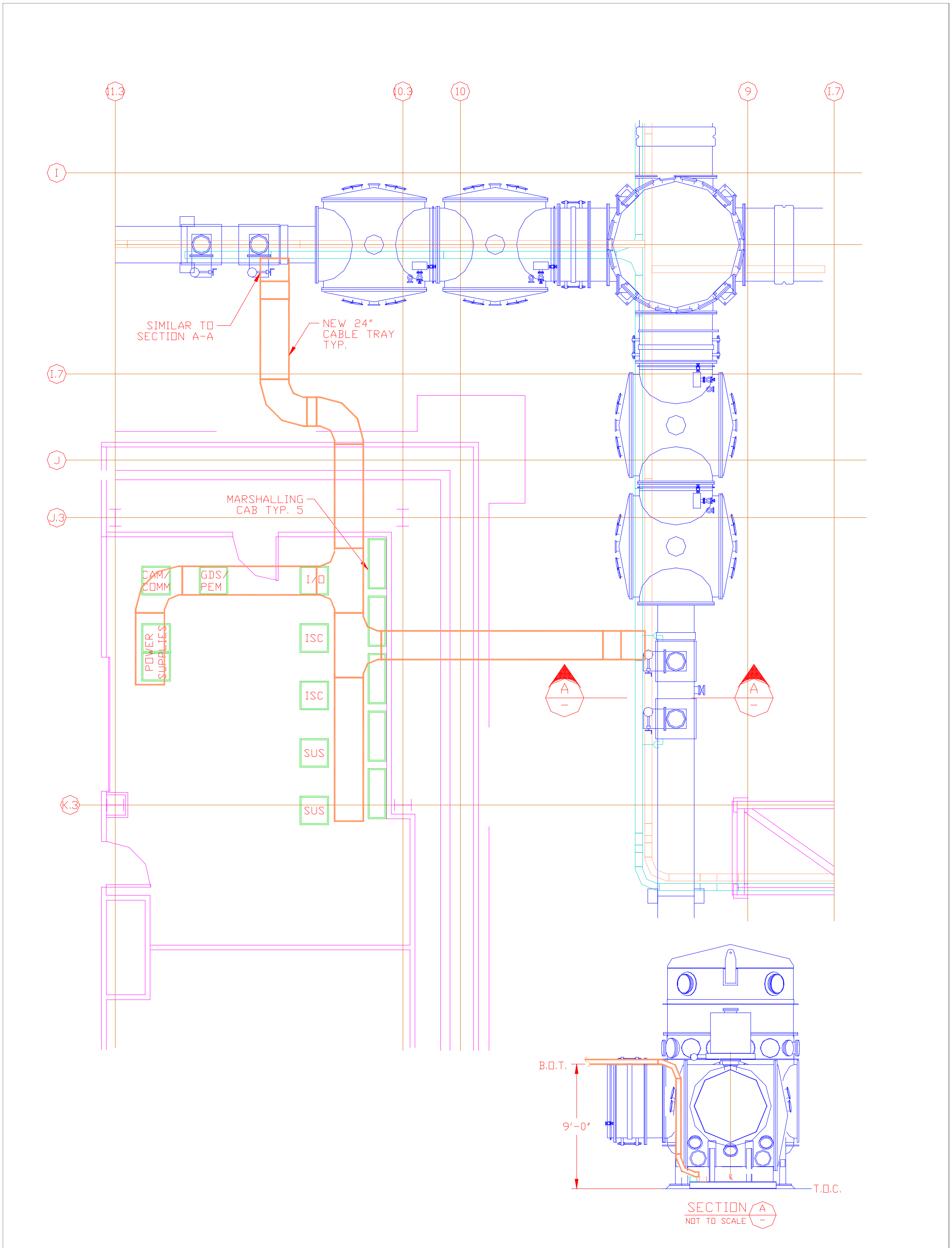

FIGURE 3.0
NOT TO SCALE

3.2 New Cable Lengths

Table 1 shows the critical field cables that will be relocated. The current length and proposed new length are identified in columns 2 and 3 respectively. We will also be taking this opportunity to upgrade to lower-loss RF signal coax and change connector styles where we have troubles in the past (in particular, with cables that have no strain relief). The cost and time to replace cables is significant but will be incurred regardless of the location of the racks.

Table 1: Field Cable Lengths for Old and New Configurations

Cable #	Old	New	Cable Type	Subsystem
CAB_L1:IO-AUX_35	50	95	2-Twisted Pair Power	IO AUX/New Focus PD
CAB_L1:LSC-AUX_33	85	115	2-Twisted Pair Power	LSC AUX/New Focus PD
CAB_L1:LSC-AUX_34	85	115	2-Twisted Pair Power	LSC AUX/New Focus PD
CAB_L1:LSC-AUX_35	85	115	2-Twisted Pair Power	LSC AUX/New Focus PD
CAB_L1:IO-AUX_4	50	95	AC-Coax	IO AUX/New Focus PD
CAB_L1:LSC-AUX_15	85	115	AC-Coax	LSC AUX/New Focus PD
CAB_L1:LSC-AUX_17	85	115	AC-Coax	LSC AUX/New Focus PD
CAB_L1:LSC-AUX_40	85	115	AC-Coax	LSC AUX/New Focus PD
CAB_L1:DAQ-IOO_001	5	15	COAX	IOO/DAQ
CAB_L1:DAQ-IOO_002	5	15	COAX	IOO/DAQ
CAB_L1:DAQ-IOO_003	5	15	COAX	IOO/DAQ
CAB_L1:DAQ-IOO_004	5	15	COAX	IOO/DAQ
CAB_L1:DAQ-IOO_005	5	15	COAX	IOO/DAQ
CAB_L1:DAQ-IOO_006	5	15	COAX	IOO/DAQ
CAB_L1:DAQ-IOO_007	5	15	COAX	IOO/DAQ
CAB_L1:DAQ-IOO_008	5	15	COAX	IOO/DAQ
CAB_L1:PEM-ACC_101	65	110	COAX	DAQ/ACC
CAB_L1:PEM-ACC_102	65	110	COAX	DAQ/ACC
CAB_L1:PEM-ACC_103	65	110	COAX	DAQ/ACC
CAB_L1:PEM-ACC_104	55	95	COAX	DAQ/ACC
CAB_L1:PEM-ACC_105	55	95	COAX	DAQ/ACC
CAB_L1:PEM-ACC_106	55	95	COAX	DAQ/ACC
CAB_L1:PEM-ACC_107	60	55	COAX	DAQ/ACC
CAB_L1:PEM-ACC_108	60	55	COAX	DAQ/ACC
CAB_L1:PEM-ACC_109	60	55	COAX	DAQ/ACC
CAB_L1:PEM-ACC_110	75	65	COAX	DAQ/ACC
CAB_L1:PEM-ACC_111	75	65	COAX	DAQ/ACC
CAB_L1:PEM-ACC_112	75	65	COAX	DAQ/ACC
CAB_L1:PEM-ACC_113	115	55	COAX	DAQ/ACC
CAB_L1:PEM-ACC_114	115	55	COAX	DAQ/ACC
CAB_L1:PEM-ACC_115	115	55	COAX	DAQ/ACC
CAB_L1:PEM-ACC_116	80	65	COAX	DAQ/ACC
CAB_L1:PEM-ACC_117	80	65	COAX	DAQ/ACC
CAB_L1:PEM-ACC_118	80	65	COAX	DAQ/ACC
CAB_L1:PEM-ACC_119	110	75	COAX	DAQ/ACC
CAB_L1:PEM-ACC_120	110	75	COAX	DAQ/ACC

CAB_L1:PEM-ACC_121	110	75	COAX	DAQ/ACC
CAB_L1:PEM-ACC_122	110	75	COAX	DAQ/ACC
CAB_L1:PEM-ACC_123	110	75	COAX	DAQ/ACC
CAB_L1:PEM-ACC_124	110	75	COAX	DAQ/ACC
CAB_L1:PEM-ACC_125	110	75	COAX	DAQ/ACC
CAB_L1:PEM-ACC_126	110	75	COAX	DAQ/ACC
CAB_L1:PEM-ACC_127	110	75	COAX	DAQ/ACC
CAB_L1:PEM-SEIS_41	110	75	COAX	DAQ/SEI
CAB_L1:PEM-SEIS_42	110	75	COAX	DAQ/SEI
CAB_L1:IO-LSC_0007	75	75	Coax INVESTIGATE	IO LSC/PD
ARE MISSING	105	110	COAX/HELIAX	FREQUENCY DIST
CABLE NUMBERS	105	110	COAX/HELIAX	FREQUENCY DIST
FOR THESE 3	40	110	COAX/HELIAX	FREQUENCY DIST
CAB_L1:IO-AUX_5	50	95	DC-Coax	IO AUX/New Focus PD
CAB_L1:IO-AUX_7	50	95	DC-Coax	IO AUX/Shutter
CAB_L1:IO-AUX_8	50	95	DC-Coax	IO AUX/Shutter
CAB_L1:LSC-AUX_16	85	115	DC-Coax	LSC AUX/New Focus PD
CAB_L1:LSC-AUX_18	85	115	DC-Coax	LSC AUX/New Focus PD
CAB_L1:LSC-AUX_41	85	115	DC-Coax	LSC AUX/New Focus PD
CAB_L1:ASC-WFS_12	90	55	RF-Coax	ASC/WFS
CAB_L1:ASC-WFS_13	90	55	RF-Coax	ASC/WFS
CAB_L1:ASC-WFS_14	90	55	RF-Coax	ASC/WFS
CAB_L1:ASC-WFS_15	90	55	RF-Coax	ASC/WFS
CAB_L1:ASC-WFS_17	90	115	RF-Coax	ASC/WFS
CAB_L1:ASC-WFS_18	90	115	RF-Coax	ASC/WFS
CAB_L1:ASC-WFS_19	90	115	RF-Coax	ASC/WFS
CAB_L1:ASC-WFS_20	90	115	RF-Coax	ASC/WFS
CAB_L1:ASC-WFS_24	90	115	RF-Coax	ASC/WFS
CAB_L1:ASC-WFS_25	90	115	RF-Coax	ASC/WFS
CAB_L1:ASC-WFS_26	90	115	RF-Coax	ASC/WFS
CAB_L1:ASC-WFS_27	90	115	RF-Coax	ASC/WFS
CAB_L1:ASC-WFS_29	90	115	RF-Coax	ASC/WFS
CAB_L1:ASC-WFS_30	90	115	RF-Coax	ASC/WFS
CAB_L1:ASC-WFS_31	90	115	RF-Coax	ASC/WFS
CAB_L1:ASC-WFS_32	90	115	RF-Coax	ASC/WFS
CAB_L1:ASC-WFS_36	90	55	RF-Coax	ASC/WFS
CAB_L1:ASC-WFS_37	90	55	RF-Coax	ASC/WFS
CAB_L1:ASC-WFS_38	90	55	RF-Coax	ASC/WFS
CAB_L1:ASC-WFS_39	90	55	RF-Coax	ASC/WFS
CAB_L1:IO-ASC_001	50	95	RF-Coax	IO ASC/WFS
CAB_L1:IO-ASC_002	50	95	RF-Coax	IO ASC/WFS
CAB_L1:IO-ASC_003	50	95	RF-Coax	IO ASC/WFS
CAB_L1:IO-ASC_004	50	95	RF-Coax	IO ASC/WFS
CAB_L1:IO-ASC_007	50	95	RF-Coax	IO ASC/WFS
CAB_L1:IO-ASC_008	50	95	RF-Coax	IO ASC/WFS
CAB_L1:IO-ASC_009	50	95	RF-Coax	IO ASC/WFS
CAB_L1:IO-ASC_010	50	95	RF-Coax	IO ASC/WFS
CAB_L1:IO-ASC_014	50	95	RF-Coax	IO ASC/PZT MIRROR

CAB_L1:IO-ASC_015	50	95	RF-Coax	IO ASC/PZT MIRROR
CAB_L1:IO-ASC_016	50	95	RF-Coax	IO ASC/PZT MIRROR
CAB_L1:IO-ASC_017	50	95	RF-Coax	IO ASC/PZT MIRROR
CAB_L1:IO-ASC_018	50	95	RF-Coax	IO ASC/PZT MIRROR
CAB_L1:IO-ASC_019	50	95	RF-Coax	IO ASC/PZT MIRROR
CAB_L1:IO-LSC_0001	75	75	RF-Coax	IO LSC/PD
CAB_L1:LSC-ASPD1_02	90	55	RF-Coax	LSC
CAB_L1:LSC-ASPD2_02	90	55	RF-Coax	LSC
CAB_L1:LSC-ASPD3_02	90	55	RF-Coax	LSC
CAB_L1:LSC-ASPD4_02	90	55	RF-Coax	LSC
CAB_L1:LSC-BSPD_02	90	105	RF-Coax	LSC
CAB_L1:LSC-POYPD_02	90	55	RF-Coax	LSC
CAB_L1:LSC-RefPD_02	85	105	RF-Coax	LSC
CAB_L1:ASC-WFS_1	90	55	Rolled Ribbon DC/Power	ASC/WFS
CAB_L1:ASC-WFS_2	90	115	Rolled Ribbon DC/Power	ASC/WFS
CAB_L1:ASC-WFS_3	90	115	Rolled Ribbon DC/Power	ASC/WFS
CAB_L1:ASC-WFS_4	90	115	Rolled Ribbon DC/Power	ASC/WFS
CAB_L1:ASC-WFS_5	90	55	Rolled Ribbon DC/Power	ASC/WFS
CAB_L1:IO-ASC_005	50	95	Rolled Ribbon DC/Power	IO ASC/WFS
CAB_L1:IO-ASC_011	50	95	Rolled Ribbon DC/Power	IO ASC/WFS
CAB_L1:IO-ASC_OL1	50	55	Rolled Ribbon DC/Power	SUS/Opt Lever MMT3
CAB_L1:IO-ASC_OL2	70	70	Rolled Ribbon DC/Power	SUS/Opt Lever MMT3
CAB_L1:IO-ASC_OL3	175	180	Rolled Ribbon DC/Power	SUS/Opt Lever MMT3
CAB_L1:IO-ASC_OL4	175	180	Rolled Ribbon DC/Power	SUS/Opt Lever MMT3
CAB_L1:IO-ASC_OL5	50	75	Rolled Ribbon DC/Power	SUS/Opt Lever MMT3
CAB_L1:IO-AUX_1	50	95	Rolled Ribbon DC/Power	IO AUX/EOShutter
CAB_L1:IO-LSC_0005	75	75	Rolled Ribbon DC/Power	IO LSC/RFAM
CAB_L1:IO-LSC_0006	75	75	Rolled Ribbon DC/Power	IO LSC/PD
CAB_L1:IO-SUS_03	45	70	Rolled Ribbon DC/Power	SUS/SOS MC1
CAB_L1:IO-SUS_06	50	55	Rolled Ribbon DC/Power	SUS/SOS MC2
CAB_L1:IO-SUS_09	45	70	Rolled Ribbon DC/Power	SUS/SOS MC3
CAB_L1:IO-SUS_12	45	70	Rolled Ribbon DC/Power	SUS/SOS SM1
CAB_L1:IO-SUS_15	45	70	Rolled Ribbon DC/Power	SUS/SOS MMT1
CAB_L1:IO-SUS_21	50	70	Rolled Ribbon DC/Power	SUS/SOS MMT2
CAB_L1:IO-SUS_24	45	55	Rolled Ribbon DC/Power	SUS/SOS MMT3
CAB_L1:LSC-ASPD1_01	90	55	Rolled Ribbon DC/Power	LSC
CAB_L1:LSC-ASPD2_01	90	55	Rolled Ribbon DC/Power	LSC
CAB_L1:LSC-ASPD3_01	90	55	Rolled Ribbon DC/Power	LSC
CAB_L1:LSC-ASPD4_01	90	55	Rolled Ribbon DC/Power	LSC
CAB_L1:LSC-AUX_38	85	115	Rolled Ribbon DC/Power	LSC AUX/EOShutter
CAB_L1:LSC-AUX_39	90	55	Rolled Ribbon DC/Power	LSC AUX/EOShutter
CAB_L1:LSC-BSPD_01	85	105	Rolled Ribbon DC/Power	LSC
CAB_L1:LSC-POYPD_01	90	55	Rolled Ribbon DC/Power	LSC
CAB_L1:LSC-RefPD_01	85	105	Rolled Ribbon DC/Power	LSC
CAB_L1:SUS_0003	50	65	Rolled Ribbon DC/Power	SUS/LOS RM
CAB_L1:SUS_0006	70	60	Rolled Ribbon DC/Power	SUS/LOS BS

CAB_L1:SUS_0009	100	75	Rolled Ribbon DC/Power	SUS/LOS ITMX
CAB_L1:SUS_0012	100	75	Rolled Ribbon DC/Power	SUS/LOS ITMY
CAB_L1:BS-LSC-Input	30	30	Twisted Pair	LSC
CAB_L1:ITMX-LSC-Input	30	30	Twisted Pair	LSC
CAB_L1:ITMY-LSC-Input	30	30	Twisted Pair	LSC
CAB_L1:PEM-MIC_101	70	110	twisted Pair	DAQ/MIC
CAB_L1:PEM-MIC_102	55	95	twisted Pair	DAQ/MIC
CAB_L1:PEM-MIC_103	60	55	twisted Pair	DAQ/MIC
CAB_L1:PEM-MIC_104	75	65	twisted Pair	DAQ/MIC
CAB_L1:PEM-MIC_105	115	55	twisted Pair	DAQ/MIC
CAB_L1:PEM-MIC_106	80	65	twisted Pair	DAQ/MIC
CAB_L1:PEM-MIC_107	110	75	twisted Pair	DAQ/MIC
CAB_L1:PEM-TILT_41	110	75	twisted Pair	DAQ/MIC
CAB_L1:PEM-TILT_42	110	75	twisted Pair	DAQ/MIC
CAB_L1:RCM-LSC-Input	30	30	Twisted Pair	LSC
CAB_L1:DAQ-ASC_1	40	40	twisted Pair DC	ASC/WFS-DAQ
CAB_L1:DAQ-ASC_12	40	40	twisted Pair DC	ASC/WFS-DAQ
CAB_L1:DAQ-ASC_13	40	40	twisted Pair DC	ASC/WFS-DAQ
CAB_L1:DAQ-ASC_18	40	40	twisted Pair DC	ASC/WFS-DAQ
CAB_L1:DAQ-ASC_7	40	40	twisted Pair DC	ASC/WFS-DAQ
CAB_L1:DAQ-PSL_001	75	110	twisted Pair DC	PSL/DAQ
CAB_L1:DAQ-PSL_002	75	110	twisted Pair DC	PSL/DAQ
CAB_L1:DAQ-PSL_003	75	110	twisted Pair DC	PSL/DAQ
CAB_L1:DAQ-PSL_004	75	110	twisted Pair DC	PSL/DAQ
CAB_L1:DAQ-PSL_005	75	110	twisted Pair DC	PSL/DAQ
CAB_L1:DAQ-PSL_006	75	110	twisted Pair DC	PSL/DAQ
CAB_L1:DAQ-PSL_006	75	110	twisted Pair DC	PSL/DAQ
CAB_L1:IO-AUX_21	50	95	Twisted Pair Power	IO AUX/ILLUMINATOR
CAB_L1:IO-AUX_22	60	55	Twisted Pair Power	IO AUX/ILLUMINATOR
CAB_L1:IO-AUX_23	50	95	Twisted Pair Power	IO AUX/CCD
CAB_L1:IO-AUX_24	60	55	Twisted Pair Power	IO AUX/CCD
CAB_L1:IO-AUX_25	50	95	Twisted Pair Power	IO AUX/CCD
CAB_L1:IO-AUX_26	50	95	Twisted Pair Power	IO AUX/CCD
CAB_L1:IO-AUX_27	75	65	Twisted Pair Power	IO AUX/ILLUMINATOR
CAB_L1:IO-AUX_28	85	65	Twisted Pair Power	IO AUX/ILLUMINATOR
CAB_L1:IO-AUX_29	115	75	Twisted Pair Power	IO AUX/ILLUMINATOR
CAB_L1:IO-AUX_30	115	75	Twisted Pair Power	IO AUX/ILLUMINATOR
CAB_L1:IO-AUX_31	75	65	Twisted Pair Power	IO AUX/CCD
CAB_L1:IO-AUX_32	85	65	Twisted Pair Power	IO AUX/CCD
CAB_L1:IO-AUX_33	115	75	Twisted Pair Power	IO AUX/CCD
CAB_L1:IO-AUX_34	115	75	Twisted Pair Power	IO AUX/CCD
CAB_L1:LSC-AUX_29	85	115	Twisted Pair Power	LSC/CCD
CAB_L1:LSC-AUX_30	75	70	Twisted Pair Power	LSC/CCD
CAB_L1:LSC-AUX_31	90	55	Twisted Pair Power	LSC/CCD
CAB_L1:LSC-AUX_32	90	55	Twisted Pair Power	LSC/CCD
CAB_L1:LSC-AUX_49	90	55	Twisted Pair Power	LSC/CCD
CAB_L1:IO-AUX_13	50	95	Video-Coax	IO AUX/CCD

CAB_L1:IO-AUX_14	50	95	Video-Coax	IO AUX/CCD
CAB_L1:IO-AUX_17	75	65	Video-Coax	IO AUX/CCD
CAB_L1:IO-AUX_18	85	65	Video-Coax	IO AUX/CCD
CAB_L1:IO-AUX_19	115	75	Video-Coax	IO AUX/CCD
CAB_L1:IO-AUX_2	50	95	Video-Coax	IO AUX/CCD
CAB_L1:IO-AUX_20	115	75	Video-Coax	IO AUX/CCD
CAB_L1:IO-AUX_3	60	55	Video-Coax	IO AUX/CCD
CAB_L1:LSC-AUX_42	85	115	Video-Coax	LSC/CCD
CAB_L1:LSC-AUX_43	75	70	Video-Coax	LSC/CCD
CAB_L1:LSC-AUX_44	90	55	Video-Coax	LSC/CCD
CAB_L1:LSC-AUX_45	90	55	Video-Coax	LSC/CCD
CAB_L1:LSC-AUX_48	90	55	Video-Coax	LSC/CCD

4.0 New Racks and Cross Connects

Although we have quoted and tested EMI/RFI racks of similar size to our existing racks, we propose to put the cross connects in separate EMI/RFI marshalling racks and install standard size EMI/RFI control racks to house the VME and eurocard crates. Refer to Figure 2.0 for the location of the marshalling racks. The control racks shall be 24 x 24 x 84. The marshalling racks shall be 42 x 15 x 84. The new wiring cross connects shall be built using shielded twisted pairs. Figure 4.0 is a schematic that shows the rack arrangement for the ASC and LSC systems on the 40 Meter at Caltech. This system is similar to that required for the LIGO Interferometers and is in compliance with E020986-01-D LIGO Interferometer Electronics EMC Requirements. In this configuration the analog electronics and the VME electronics for the system have been enclosed in separate shielded EMI racks. All connections to and from the electronics pass through EMI feedthroughs.

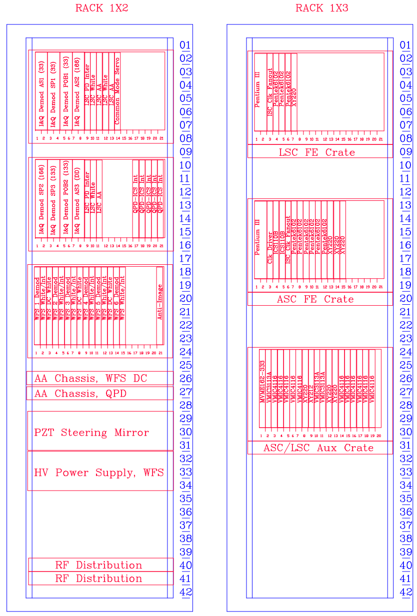

Figure 4: Representative Rack Layout for ISC

Similar rearrangements of the analog and digital electronics for each subsystem will be completed and reviewed prior to installation.

5.0 Cooling

Since we are moving an existing heat load from one area to another, there will be no additional load on the chillers. There does exist climate control for the Clean Storage Room. Additional ductwork would need to be installed at a cost of $5k per site. By moving the racks to the OSB, we are presented with many options for cooling the control racks. These options include but are not limited to electric fans, existing instrument air or air driven fans.

6.0 Miscellaneous

6.1 Communications

The existing 24 strand multimode fiber that runs from the Mass Storage Room to the LVEA shall be removed. In Livingston, we are using 22 of the 24 strands. Therefore, a new 48 strand multimode fiber shall be installed between the Mass Storage Room and Clean Storage Room.

The existing 12 strand single mode fiber that runs from the Mass Storage Room to the LVEA shall be removed and installed between Mass Storage Room and the Clean Storage Room. If the integrity of the cable is compromised, it shall be replaced.

6.2 Cameras

All camera cables and associated equipment shall be relocated to a rack that is common with the communications equipment.

6.3 GDS/PEM

GDS and PEM equipment shall be relocated to the Clean Storage Room with no significant changes.

6.4 GPS Antenna

Livingston: The GPS antenna, which currently feeds the timing system in the LVEA, shall be relocated to the northeast roof of the LVEA. The RG-11 cable associated with this antenna currently exceeds manufacturers recommendations. We will be reducing the length from 200 feet to approximately 50 feet.

Hanford: Changes can be made as required.

6.5 Power and Grounding

120 VAC power for CDS can be fed from a variety of “clean transformers”. We will most likely lengthen the existing power feeds. The grounding will be evaluated after the Livingston Observatory grounding is brought up to code.

6.6 Signal Test Panels

We propose to install patch panels at various locations in the LVEA. These panels would be used for signal testing on or near the ISC tables and will be required regardless of rack location since our RFI racks are completely sealed. Looking at signals inside the racks will require opening the door and violating the EMI enclosure. This is probably fine for 90% of our operations. The proposed solution is a set of patch panels or analog distribution system that runs from the storage room to the other side of the wall inside the LVEA. Additional patch panels would be located at or individual cables would be routed to the optical tables. When monitoring of the signals is completed, the cables would be disconnected from racks and the racks would be closed and sealed. Cables connected to devices on the optical tables would also be disconnected and removed prior to interferometer operation.

7.0 PSL

The PSL racks will be replaced with new EMI/RFI racks but not relocated. This is due to calibrated cable lengths and the length of the laser umbilical cable. We may be able to move the VME portion of the PSL controls to the storage room, but we run into one significant issue. The cables from the analog modules to the VME modules and the cross connects far outnumber the field cables. There are many of these cables that would now be of the order of 100 feet long instead of 6 feet.

8.0 Mid and End Stations

Control and Data System racks at the Mid and End Stations shall be relocated consistent with the plan described above.

9.0 2k Interferometer

The 2k interferometer presents some more complicated problems. The plan for the 2k is to build an enclosure in the LVEA and put the CDS racks inside. The enclosure will be located where the 3rd IFO would have gone. The cable lengths will remain about the same. There will be a need for additional cable tray. We also feel that any work done on the 2k should be deferred until after the work on both 4k interferometers is complete.

10.0 Vacuum System

The vacuum racks will be included in the move. Moving the vacuum equipment is not considered a significant technical challenge or risk. Cable lengths are not foreseen to be an issue. Complete designs will be done as part of the upgrade.

11.0 Implementation

In order to implement the EMI/RFI mitigation plan, rebuilding the control system is imminent. We propose to build the new control system while commissioning/science run activities continue. Since we will be building in parallel with the existing controls, we will be able to build and test without disrupting other work. Once testing is complete, we will then move the field cables and begin testing with the instrument. This will minimize down time as opposed to tearing down the control system in place and rebuilding at the current location. Although there will be an initial investment, after the first instrument is complete, we will have the material to build the second.

July 1 – September 30

Order and receive new racks and other associated materials

October 1 – December 31

Build and test new CDS control racks in Clean Storage

January 1 – March 1

Move field cables and test with instrument

Schedule is subject to change if EPI installation is pushed back.