

Cable Lengths & Rack Configuration

Howard Budd, University of Rochester

ArgonCube 2 by 2 Meeting

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Determining Cable lengths



- The cable lengths in the excel files were “designed” cable lengths, not “as is” cable lengths
- The MINERvA assembly crew cut the cables to fit.
 - Sometimes, it’s helpful if you record what you actually did.
- The 2x2 MINERvA design I did used the “designed” lengths, but they were wrong, for previous design see:

<https://docs.dunescience.org/cgi-bin/sso/ShowDocument?docid=23103>

- So we, mainly Everardo, Rowan and Faiza, set to measure all the power and cat5 cables we could find.
- I wrote code which calculates the cable lengths given the rack position
 - distance MS11 PMT mount is from where cables come out of rack.
- We still need to find some cables to measure especially MS-1 to MS 4 power cables



Power & CAT6 Cables



2*2	Scale Gary's numbers			From Columns 2-4	Power		Cat6 cables				Scaled from MINERVA	Power		Cat6 Cables			
	RO_West	RO_Top	RO_East		W	E	W	W	E	E		W	E	W	W	E	E
MS1	29.1	36.4	43.7	MS1	45	32	44	38	38	32	MS1						
MS2	28.53	35.83	43.13	MS2	45	32	44	38	38	32	MS2						
MS3	27.96	35.26	42.56	MS3	45	32	44	38	38	32	MS3						
MS4	16.33	23.58	30.83	MS11	41	28	40	36	34	28	MS8	43	30	42	36	36	30
MS5	15.74	22.99	30.24	MS12	41	28	40	34	34	28	MS9	43	30	42	36	36	30
MS6	15.15	22.4	29.65	MS13	41	28	40	34	34	28	MS10	43	30	42	36	36	30
MS7	14.56	21.81	29.06	MS14	41	28	40	34	34	28	MS14						
MS8	13.97	21.22	28.47	MS15	41	28	40	34	34	28	MS15						
MS9	13.38	20.63	27.88	MS16	41	28	40	34	34	28	MS16						
MS10	12.79	20.04	27.29	MS17	41	28	40	34	34	28	MS17						
MS11	12.2	19.45	26.7	MS18	41	28	40	34	34	28	MS18						

Dist rack from MS11 = 0 Additional Height = 0

MS	PO-West	PO-TOP	PO-East
11	12.2	19.45	26.7
10	12.813	20.063	27.313
9	13.426	20.676	27.926
8	14.039	21.289	28.539
7	14.61	21.86	29.11
6	15.181	22.431	29.681
5	15.752	23.002	30.252
4	16.323	23.573	30.823
3	28.624	35.874	43.124
2	29.195	36.445	43.695
1	29.766	37.016	44.266

- Above is the file in the docdb with rack at MS 11
- Calculation given to the left
- Above I made mistake not putting in steel between MS 3 & MS 4, but other than that they agree.



Calibrating Calculation



- This used Gary's calculation which routed the cables in a way I suggested
- However, they are not exactly routed that way.
- Abbey and I routed one cable MS18W (old MINERvA) for MS11E.
- The cable was measured to be 26.4'
- It was ~ 1 foot short, but there was a problem with how the cable was routed, and I'm not sure how much it matters. Its hard to get this length exact.
- To shorten the run we plan on rotating the electronics rack 180 degrees and the power cables will come out of the rack next to the cable tray.
 - This might make the CAT5 cables slightly longer.
- I tried to determine the exact number to put in for MS 11W using the power cable we routed and I got the same number from Gary's calculation. This included the 180 degree rotation of the electronics rack, but again there is probably some error in the calculation.



Power cables



	CAT: side(color) [feet]				Power Cables [feet]	
	E(B)	W(B)	E(Y)	W(Y)	E	W
MS-1					25.000	38.000
MS0					????	31.833
MS1					22.917	36.000
MS2					21.083	35.000
MS3					20.583	34.417
MS4						
MS5	18.920	26.330	25.500	33.170	19.500	32.583
MS6	18.830	25.920	25.170	32.830	19.333	32.583
MS7	19.580	19.170	25.920	33.920	19.000	32.333
MS8	19.170	25.500	25.250	32.670	18.750	32.500
MS9	20.330	27.920	26.330	34.080	18.333	31.667
MS10	19.580	25.920	25.330	33.170	17.583	30.833
MS11	18.580	25.750	24.420	32.080	15.500	28.333
MS12	15.330	22.670	21.170	29.080	14.250	28.000
MS13	15.000	22.500	20.830	29.250	14.333	28.083
MS14	15.170	22.750	21.580	29.580		
MS15	16.250	24.170	23.500	30.170		
MS16	16.667	24.167	22.500	30.417		
MS17	16.667	24.333	23.000	31.000	17.583	34.417
MS18					26.400	16.600
MS19	18.500	26.500	25.080	32.580	17.583	34.333
MS20	19.000	27.080	25.330	33.520		
MS21	18.330	25.863	24.500	32.500	17.917	31.167
MS22	18.750	26.420	24.920	32.920	20.000	31.500
MS23	20.150	27.750	26.250	34.500		
MS24	20.750	28.330	26.660	35.500	19.917	33.667
MS25	22.920	30.420	28.920	36.830	20.667	35.000
MS26	22.250	30.170	28.330	36.830	21.750	36.083
MS27					23.083	37.250

Dist rack from MS11 = 7.33 Additional Height = 0

MS Po-West Po-TOP Po-East

11	19.53	26.78	34.03
10	18.917	26.167	33.417
9	18.304	25.554	32.804
8	17.691	24.941	32.191
7	17.12	24.37	31.62
6	16.549	23.799	31.049
5	15.978	23.228	30.478
4	15.407	22.657	29.907
3	21.294	28.544	35.794
2	21.865	29.115	36.365
1	22.436	29.686	36.936

- Above, calculation with offset 7'4"
- Left, measurement of cables we found
- Looks like MS-1 cable looks might work for 2x2 MINERvA MS 1
 - Not much tolerance
 - Discussed later.
 - Need to check MS0 cable
- It also looks like we can find cables for the rest of the detector



CAT 5 cables



	CAT: side(color) [feet]				Power Cables [feet]	
	E(B)	W(B)	E(Y)	W(Y)	E	W
MS-1					25.000	38.000
MS0					????	31.833
MS1					22.917	36.000
MS2					21.083	35.000
MS3					20.583	34.417
MS4						
MS5	18.920	26.330	25.500	33.170	19.500	32.583
MS6	18.830	25.920	25.170	32.830	19.333	32.583
MS7	19.580	19.170	25.920	33.920	19.000	32.333
MS8	19.170	25.500	25.250	32.670	18.750	32.500
MS9	20.330	27.920	26.330	34.080	18.333	31.667
MS10	19.580	25.920	25.330	33.170	17.583	30.833
MS11	18.580	25.750	24.420	32.080	15.500	28.333
MS12	15.330	22.670	21.170	29.080	14.250	28.000
MS13	15.000	22.500	20.830	29.250	14.333	28.083
MS14	15.170	22.750	21.580	29.580		
MS15	16.250	24.170	23.500	30.170		
MS16	16.667	24.167	22.500	30.417		
MS17	16.667	24.333	23.000	31.000	17.583	34.417
MS18					26.400	16.600
MS19	18.500	26.500	25.080	32.580	17.583	34.333
MS20	19.000	27.080	25.330	33.520		
MS21	18.330	25.863	24.500	32.500	17.917	31.167
MS22	18.750	26.420	24.920	32.920	20.000	31.500
MS23	20.150	27.750	26.250	34.500		
MS24	20.750	28.330	26.660	35.500	19.917	33.667
MS25	22.920	30.420	28.920	36.830	20.667	35.000
MS26	22.250	30.170	28.330	36.830	21.750	36.083
MS27					23.083	37.250

Dist rack from MS11 = 7.33 Additional Height = 0

MS Po-West Po-TOP Po-East

11	19.53	26.78	34.03
10	18.917	26.167	33.417
9	18.304	25.554	32.804
8	17.691	24.941	32.191
7	17.12	24.37	31.62
6	16.549	23.799	31.049
5	15.978	23.228	30.478
4	15.407	22.657	29.907
3	21.294	28.544	35.794
2	21.865	29.115	36.365
1	22.436	29.686	36.936

- Same calculation as previous page
- The lengths for the CAT 5 cables are ~foot longer on the detector, but shorter on the rack, so probably about the same as power cables. I haven't tried to get the exact difference.
- We see the Minerva CAT 5 cables are the same length to a bit longer than the power cables
- Still need to find the CAT5 cables for MS-1 to MS 4



Linda's Excel file

LI should be correct



MS, E & W	LI		Power		CAT6			
	W	E	W	E	W	W	E	E
-1	44,48	38,42	45	45	44	38	38	32
0	44,48	38,42	45	45	44	38	38	32
1	44,48	38,42	45	32	44	38	38	32
2	44,48	38,42	45	32	44	38	38	32
3	42,46	38,38	45	32	44	38	38	32
4	42,46	38,38	45	32	44	38	38	32
5	42,46	34,38	45	32	44	38	38	32
6	42,46	34,38	45	32	44	38	38	32
7	42,46	34,38	43	30	42	36	36	30
8	42,46	34,38	43	30	42	36	36	30
9	38,42	34,38	43	30	42	36	36	30
10	38,42	34,34	43	30	42	36	36	30
11	38,42	34,34	41	28	40	36	34	28
12	38,42	34,34	41	28	40	34	34	28
13	38,42	34,34	41	28	40	34	34	28
14	38,42	34,34	41	28	40	34	34	28
15	38,42	34,34	41	28	40	34	34	28
16	38,38	34,34	41	28	40	34	34	28
17	38,38	26,30	41	28	40	34	34	28
18	34,38	26,30	41	28	40	34	34	28
19	34,38	26,30	43	30	42	36	36	30
20	34,38	24,28	43	30	42	36	36	30
21	34,38	24,28	43	30	42	36	36	30
22	34,34	24,28	45	32	42	36	36	30
23_24	34,38	24,28						
24_25_26W, 25E	34,38	24,28						
26_27	38,38	26,30						
23 to 27 all the same			45	32	44	38	38	32

Dist rack from MS11 = 1.5 Additional Height = 0

MS Po-West Po-TOP Po-East

11	13.7	20.95	28.2
10	13.087	20.337	27.587
9	12.474	19.724	26.974
8	12.539	19.789	27.039
7	13.11	20.36	27.61
6	13.681	20.931	28.181
5	14.252	21.502	28.752
4	14.823	22.073	29.323
3	27.124	34.374	41.624
2	27.695	34.945	42.195
1	28.266	35.516	42.766

- Put LI rack 1.5' upstream of MS11
- Space between LI and electronics rack 40"
- Same calculation as power cable, there are some differences not put into the calculation.
- Left, from old presentation, LI should be correct
- It looks like using the 42, 46 cables we should be able to cover MS 1 with fiber to spare.
- Looks like we can start with the 26,30 cables on East side.



Getting a bit more length



- There is not much tolerance in the power cables which go to 2x2 MS 1,2,3.
- Pictures of the electronics rack.
- We can get more tolerance if we move the DC power hardware up. It could probably be moved up 9" to 12"
- So, I suggest doing this.

Figure 2: Front view

Rear View



Conclusion



- It looks like by switching the racks and rotating the racks by 180 degrees will enable all the cables to reach.
 - Preliminary DAQ rack 7' 4" upstream of MS 11
 - Preliminary LI rack 1.5' upstream of MS 11
 - Probably want to move DC power hardware up in electronics rack
 - Also need to find and measure CAT5 MS-1 to MS4
- Although looking at these files we can decide what to use for MS 11.
- We will need to position the rack, and start by routing the power cable to see that its length agrees with the calculated length.
 - We will then need to do it with the CAT5 cables.
 - Then run the suggested LI cables, is the length what we expect?
 - This will determine that the configuration works.
- To do this we had to bring over a lot of the wire cables, which we did not plan on doing. This made MINOS lab a bit of a mess.
- I'm on ICARUS shift Fri-Sunday, so I can't work on this until Monday