Cost Reduction of Cables

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PDSG

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Pixel Detector

Voltage Drops

	Voltage		Current		Line Drop		Type I	Type II	Type III	Type IV	Type V	Pigtail
Power Supply	*Supply*	*AT FE*	*Supply*	*Expected*	*Allowed*	*Worst Case*	*Actual*	*Actual*	*Actual*	*Actual*	*Nominal*	*Nominal*
VDD	6.000	4	2	1.52	2	2.476	0.267	0.606	0.272	0.881	0.200	0.250
VDDA	6.000	3.5	1.2	1.08	2	2.597	0.446	0.431	0.303	0.967	0.200	0.250
VCCA	4.000	1.75	1.5	1.44	2	2.712	0.595	0.574	0.258	0.835	0.200	0.250
VVDC	-	4	-	0.18	-	2.379	0.373	1.344	0.051	0.161	0.200	0.250
VPIN	-	10	-	0.0005	-	-	-	-	-	-	-	-
ISET0	-	-	-	-	-	-	-	-	-	-	-	-
ISET1	-	-	-	-	-	-	-	-	-	-	-	-
RESET	-	-	-	-	-	-	-	-	-	-	-	-
VDET	-	700	0.004	-	-	-	-	-	-	-	-	-

- **Voltage drops for decrease of conductor cross section by one standard wire gauge**
- **Voltage at Chip (Supply Voltage)**
  - Vdd 6.47V
  - Vdda 6.097V
  - Vcca 4.48V
  - Vvdc 6.38V

Pixel Detector

Type	Style	Circuits	Description	QTY/SET	Cost/ft	Cost/ft/set			
III					**USD$**	**USD$**			
	1	HV and LP	7-#22 PE1kV	1	12.57	12.57			
			35-#26TP			0			
	2	HP #12 TP	7-#12 TP	2	9.32	18.64			
	2	HP #14 TP	7-#14 TP	2	6.89	13.78			
	3	Sense	42-#26 TP	1	7.58	7.58			
						Totals	**USD$/ft/Module**	**CHF/m/Module**	
						52.57	7.51	34.43	*As Designed*
						38.705	5.53	25.35	*Less sense and 1/2 HVLP*
						24.925	3.56	**16.33**	*As above less HP #14*
Type	**Style**	**Circuits**	**Description**	**QTY/SET**	**Cost/ft**	**Cost/ft/set**			
IV									
	1	HV and LP	7-#22 PE1kV	1	12.57	12.57			
			35-#26TP			0.00			
	2	HP #12 NT	14-#12	2	9.26	18.52			
	2	HP #10 NT	14-#10	2	10.43	20.86			
	3	Sense	42-#26 TP	1	7.58	7.58			
						Totals	**USD$/ft/Module**	**CHF/m/Module**	
						59.53	8.50	38.99	*As Designed*
						45.67	6.52	29.91	*Less sense and 1/2 HVLP*
						27.15	3.88	**17.78**	*As above less HP #12*

Description	**Pixel**	**SCT**	**Difference**
Power	2-#10 NTP	1-~#11TP	extra #10 pair
Power	2-#12 NTP	1-#14 TP	extra #12 pair, #12vs#14
Sense/Cont.	11-#26 TP	7->#26 TP	60% more
High Voltage	1-#22HV TP	1->#26HV TP	~equal
(lump with S/C)		3->#26 (single)	(lumped with Sense/Cont.)
Cost/Meter*	***~17CHF***	***~10CHF***	***for equivelant cables***
			Use above for Price Equiv.

Correction factors

- **Glenair Cost Summary.xls**
- **Correction Factors need to be Applied to our estimate to make for a more realistic assessment of Cost**
- **6/7 Modules**
  - Estimate was on 7-module bundles only
- **Length Corrections**
  - Bundle estimate was for 100m length
  - Average length is ~80m
- **Material/Aggressive discount**
  - Comparison of our cable cost to SCT cable cost yields a factor of 1.7
  - 70% could be from a combination of several things
    - Primarily Insulation and meeting IS41 standard
    - Chose high bidder-need bids from others, including European Market
    - Errors associated with quick estimation (ROM)

Performance Options

Cable	6way Corr	Length Corr	Material change or Aggressive Discount
Type III	$1,576,185.71	$1,313,488.10	$773,000.00
Type IV	$5,898,142.86	$4,718,514.29	$2,776,000.00
TOTAL	**$7,474,328.57**	**$6,032,002.38**	**$3,549,000.00**
Cable	**Delta Cost**	**Delta Cost**	**Delta Cost**
Sense	$1,012,971.43	$810,377.14	$477,000.00
Separate Ret.	$1,090,600.00	$872,480.00	$387,000.00
Delta V type III	$216,057.14	$180,047.62	$106,000.00
Delta V type IV	$720,100.00	$576,080.00	$339,000.00
		Adopt All	**$2,240,000.00**
	Taken From :		
Cost per meter breakdown.xls		**Discounted**	
Cable	**Cost/Meter**	**Cost/Meter**	
	CHF	**CHF**	
As Des.Type III	68,860	40,506	
As Des. Type IV	77,980	45,871	
Type III less Sense	50,700	29,824	
Type IV less Sense	59,820	35,188	
Type III less AWG	32,660	19,212	
Type IV less AWG	35,560	20,918	

- **Move to Higher Voltage Drops**
- **Reduce # reference lines**
- **Errors in Length are penalized at the rates below**
  - Depending accuracy and final cost
  - 20-40kchf/m
- **Moves to reduce average length**
  - Move to US 15 10-15m

Conclusions

- **Reduce Conductor Count/size**
  - Clearest avenue to cost reduction
- **Push on material Issues**
  - Capabilities of European vendors to meet CERN Spec is noted
  - CERN Spec is odd, and or needs better understanding of flexibility
  - Testing is likely necessary
  - Note: this is just to get the cost down to corrected value
- **Seek European Vendors**
  - Better interface to TIS and Euro Standards
  - Need someone here (CERN) to follow up on vendor contact