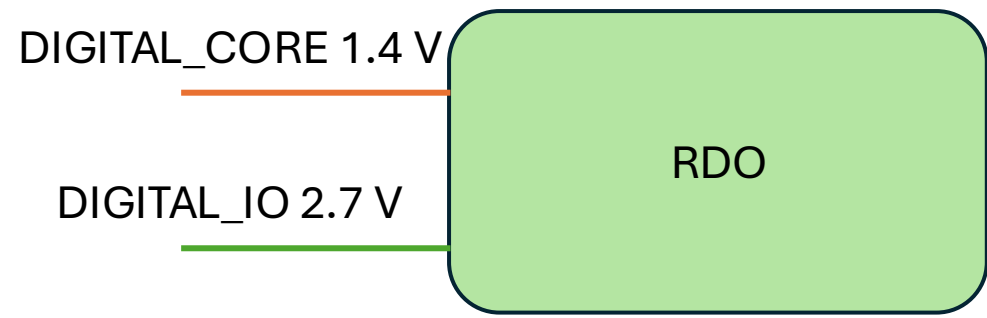
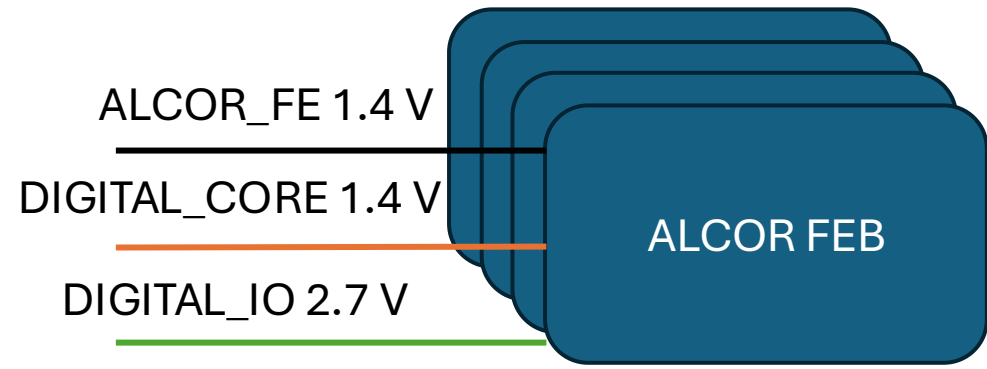
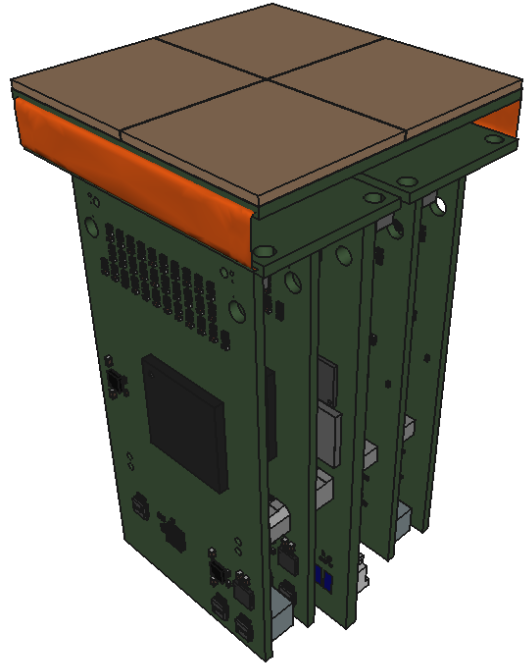


dRICH – LV Power supply scheme

Luigi Rignanese – dRICH team

PDU – Power scheme overview



Type	LDO
Quantity	4992
Vin (V)	1.4
Vout (V)	1.20
I (A)	0.400
Ploss (W)	0.080
TOTAL	
I (kA)	2.00

Type	LDO
Quantity	4992
Vin (V)	1.4
Vout (V)	1.20
I (A)	0.275
Ploss (W)	0.055
TOTAL	
I (kA)	1.37

Type	LDO
Quantity	4992
Vin (V)	2.7
Vout (V)	2.50
I (A)	0.068
Ploss (W)	0.014
TOTAL	
I (kA)	0.34

Type	LDO 3x
Quantity	1248
Vin (V)	1.4
Vout (V)	0.85
I (A)	1.653
Ploss (W)	0.909
Vout (V)	0.90
I (A)	0.043
Ploss (W)	0.022
Vout (V)	1.0
I (A)	0.258
Ploss (W)	0.103
TOTAL	
I (kA)	2.44

Type	LDO 3x
Quantity	1248
Vin (V)	2.7
Vout (V)	1.20
I (A)	0.122
Ploss (W)	0.183
Vout (V)	1.80
I (A)	1.048
Ploss (W)	0.943
Vout (V)	2.5
I (A)	0.215
Ploss (W)	0.043
TOTAL	
I (kA)	1.73

1248 PDUs in 6 sectors

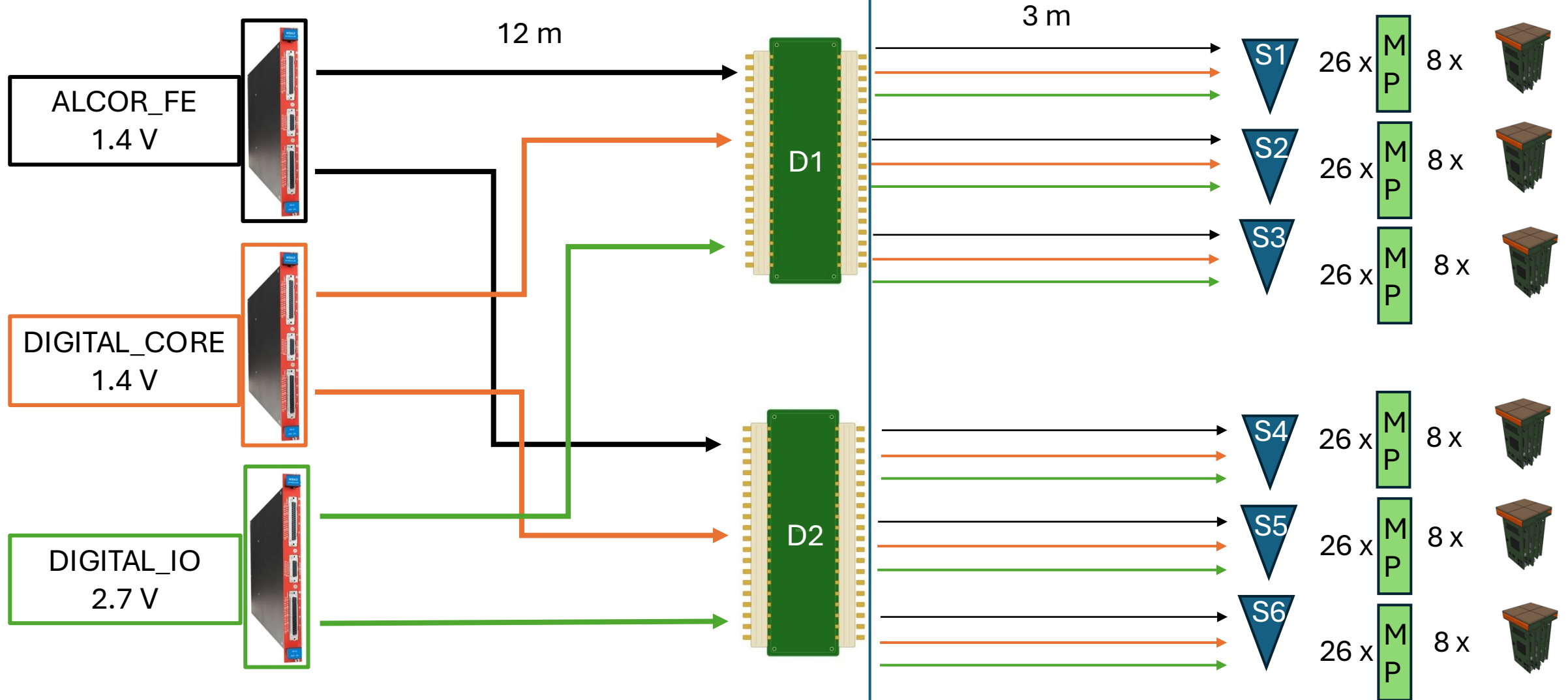
OFF-Detector

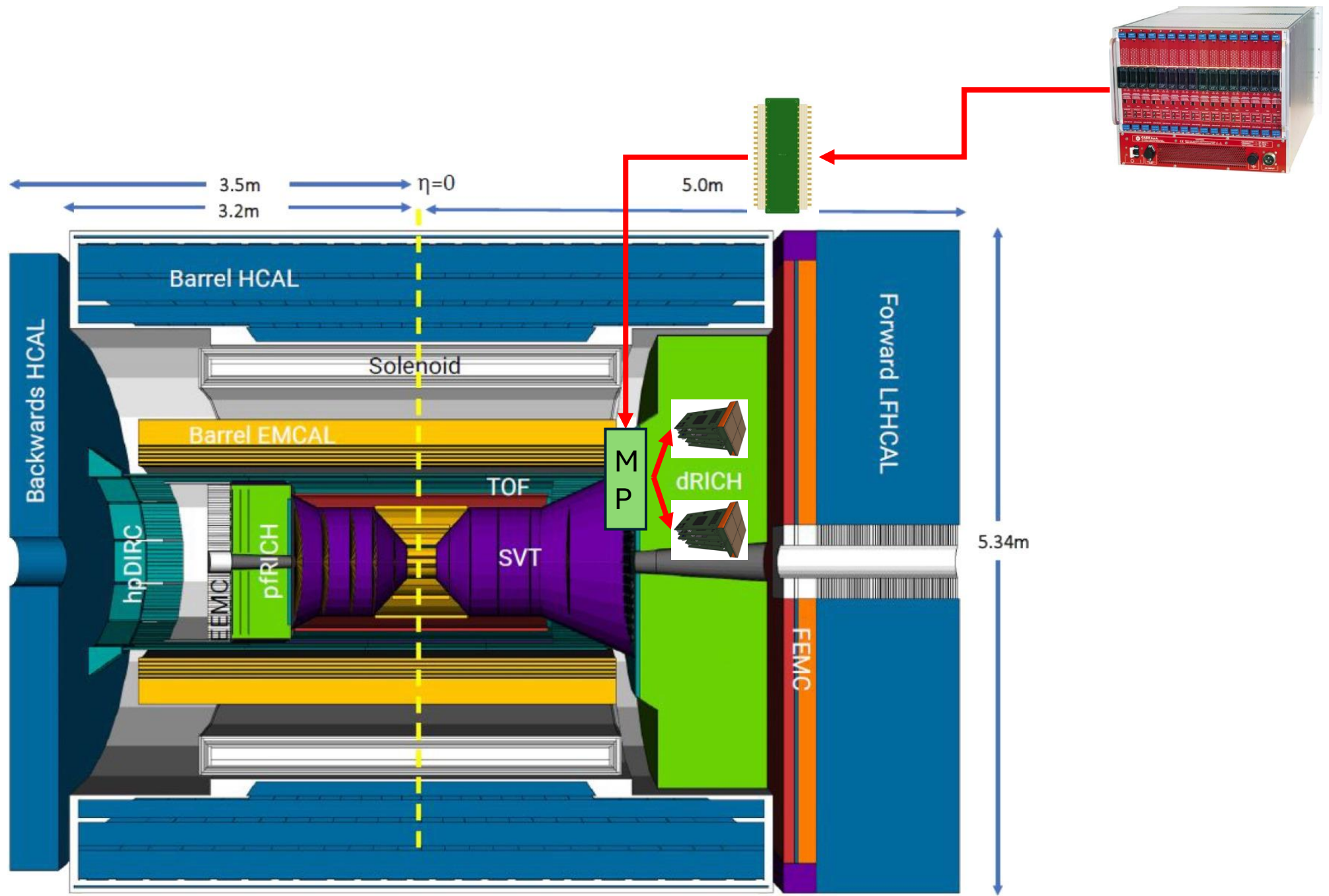
ON-Detector

Power Supplies

Distribution

dRICH sectors

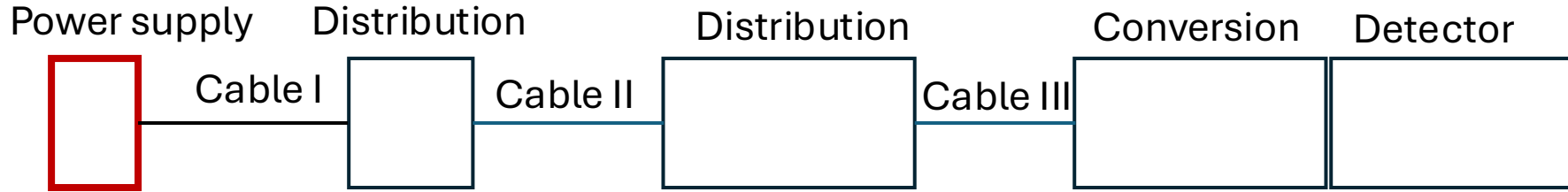




Power Distribution Tree

Sub-Detector: dRICH

Type: **ALCOR_FE**



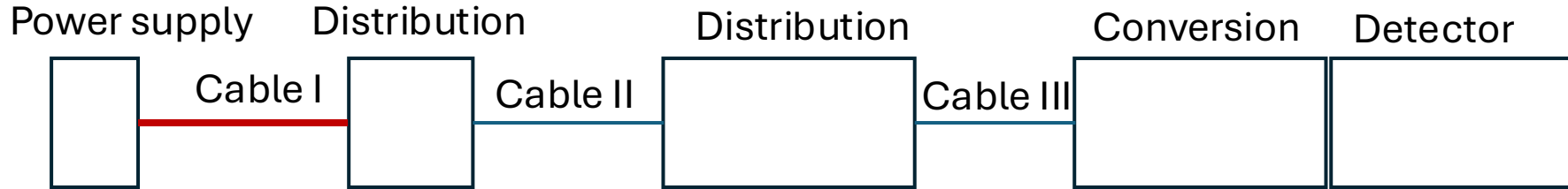
POWER SUPPLY	
Model	CAEN A2550
Quantity	20
N channels	8
Vmax (V)	5
I _{max} (A)	15
P _{max} (W)	60
TOTAL	
I _{max} (kA)	2.40
P _{max} (kW)	9.60



Power Distribution Tree

Sub-Detector: dRICH

Type: **ALCOR_FE**



CABLE	
AWG	8
N cond	4
Part n	Nexans 208386
R (Ω/km)	2.144
Length (m)	12
Quantity	78
Weight (kg/km)	547
Diameter (mm)	17.09
I (A)	12.8
ΔV (V)	0.659
Ploss (W)	8.431
TOTAL	
I (kA)	3.99
Ploss (kW)	0.66
Total weight (kg)	511.992



CONNECTOR	
Type	Hirose EnerBee
Model	DF60A-4EP-10.16C
Quantity	78



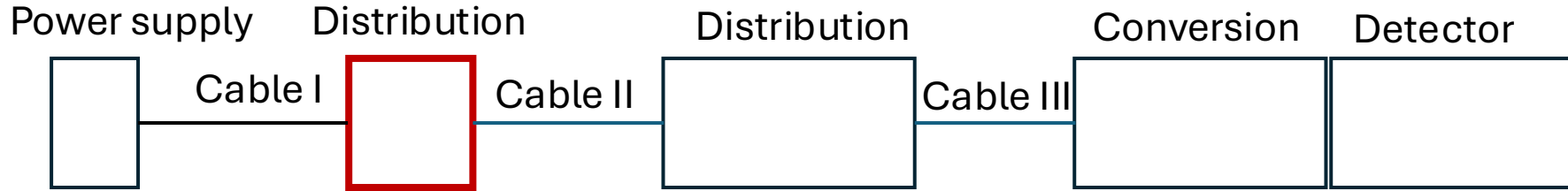
4x8 AWG

<https://www.nexans.co/.rest/catalog/v1/product/pdf/208386>

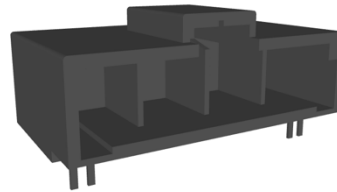
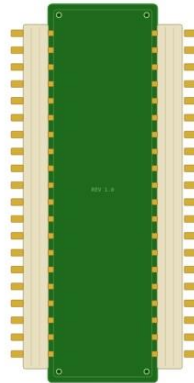
Power Distribution Tree

Sub-Detector: dRICH

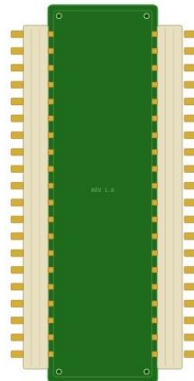
Type: **ALCOR_FE**



DISTRIBUTION	
Type	patch-panel
Quantity	2
N inputs	39
N outputs	78



IN CONNECTOR	
Type	Hirose EnerBee
Model	DF60- 4P -10.16DS
Quantity	39
dimension (mm)	42.68
Total (mm)	1664.52

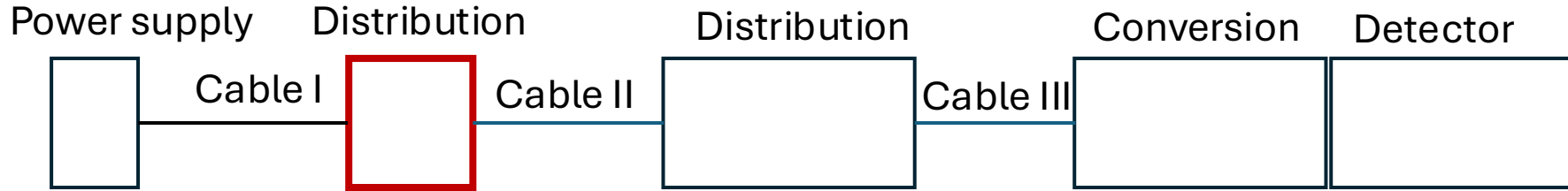


OUT CONNECTOR	
Type	Hirose EnerBee
Model	DF60- 2P -10.16DS
Quantity	78
dimension (mm)	22.36
Total (mm)	1744.08

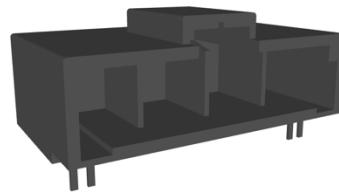
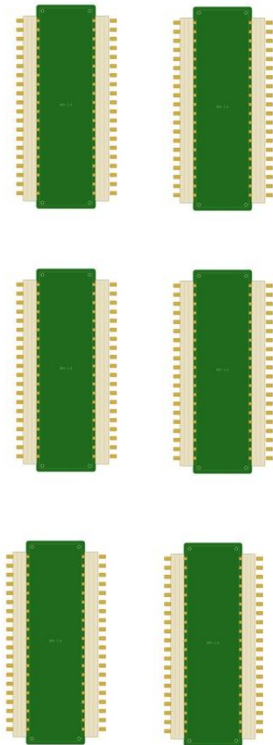
Power Distribution Tree

Sub-Detector: dRICH

Type: **ALCOR_FE**



DISTRIBUTION	
Type	patch-panel
Quantity	6
N inputs	13
N outputs	26



IN CONNECTOR	
Type	Hirose EnerBee
Model	DF60- 4P -10.16DS
Quantity	13
dimension (mm)	42.68
Total (mm)	554.84

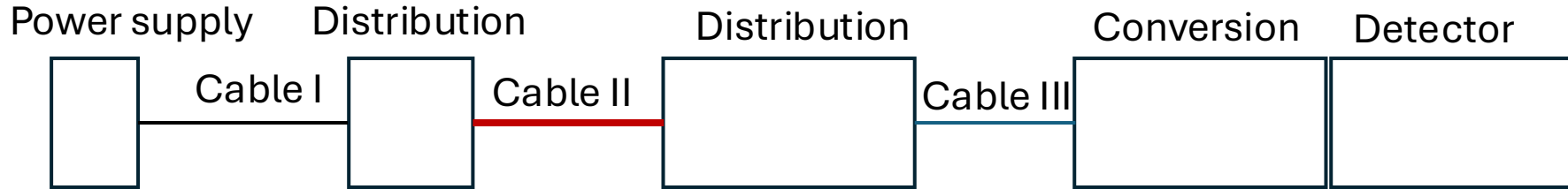


OUT CONNECTOR	
Type	Hirose EnerBee
Model	DF60- 2P -10.16DS
Quantity	26
dimension (mm)	22.36
Total (mm)	581.36

Power Distribution Tree

Sub-Detector: dRICH

Type: **ALCOR_FE**



CABLE	
AWG	10
N cond	2
Part n	Encore Wire HF382
R (Ω/km)	3.550
Length (m)	3
Quantity	156
Weight (kg/km)	51.58
Diameter (mm)	14.22
I (A)	12.8
ΔV (V)	0.273
Ploss (W)	3.490
TOTAL	
I (kA)	3.99
Ploss (kW)	0.54
Total weight (kg)	24.13944



2x10 AWG

CONNECTOR	
Type	Hirose EnerBee
Model	DF60F-2S-10.16C
Quantity	156

Power Distribution Tree

Sub-Detector: dRICH

Type: **ALCOR_FE**



DISTRIBUTION	
Type	master-panel
Quantity	156
n x sector	26
N inputs	1
N outputs	32



IN CONNECTOR	
Type	Hirose EnerBee
Model	DF60- 2P -10.16DS
Quantity	26
dimension (mm)	22.36
Total (mm)	581.36

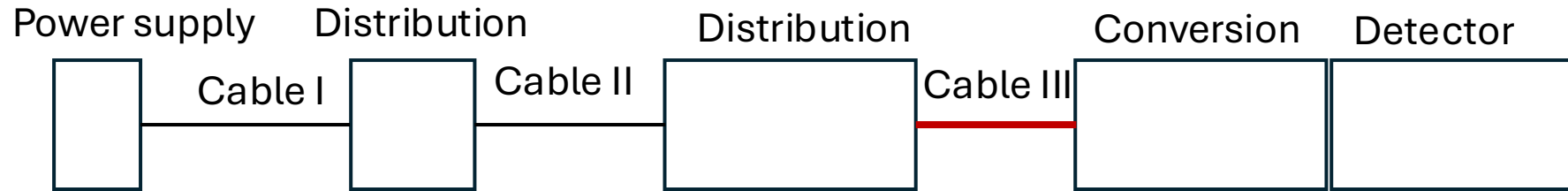
OUT CONNECTOR	
Type	TBD
Model	TBD
Quantity	32
dimension (mm)	TBD
Total (mm)	TBD

Passive 26 Master Panel x sector, serves 8 PDUs

Power Distribution Tree

Sub-Detector: dRICH

Type: **ALCOR_FE**

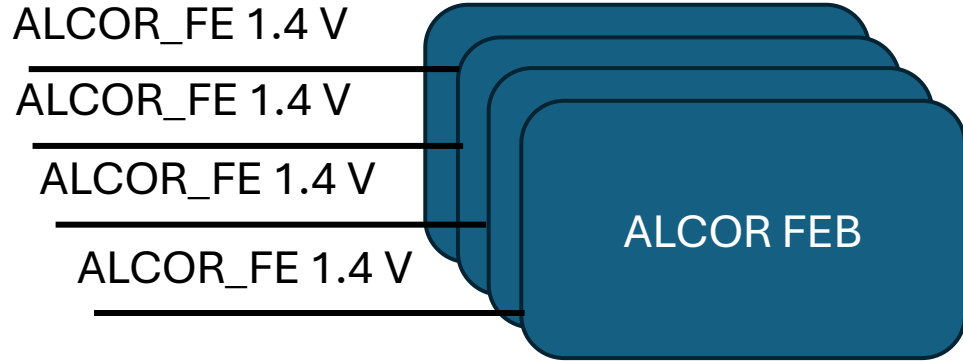
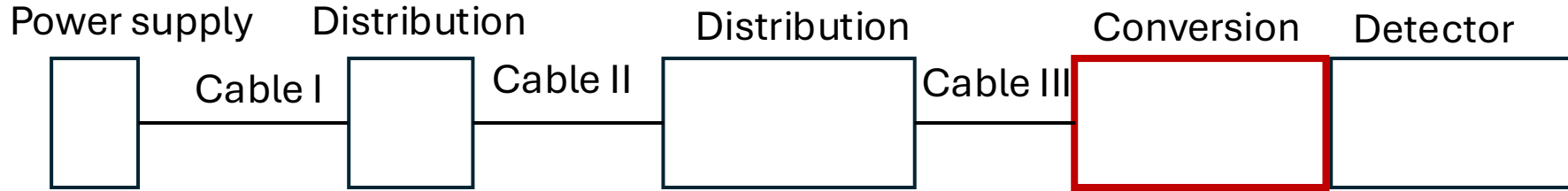


CABLE	
AWG	25
N cond	2
Part n	TBD
R (Ω /km)	106.174
Length (m)	0.5
Quantity	4992
Weight (kg/km)	TBD
Diameter (mm)	TBD
I (A)	0.400
ΔV (V)	0.042
Ploss (W)	0.017
TOTAL	
I (kA)	1996.8
Ploss (kW)	84.8
Total weight (kg)	#VALUE!

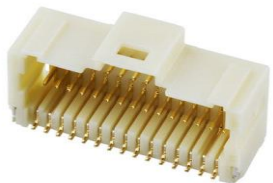
Power Distribution Tree

Sub-Detector: dRICH

Type: **ALCOR_FE**



CONVERSION	
Type	LDO
Quantity	4992
Vin (V)	1.4
Vout (V)	1.20
I (A)	0.400
Ploss (W)	0.080
TOTAL	
I (kA)	2.00
Ploss (kW)	0.40

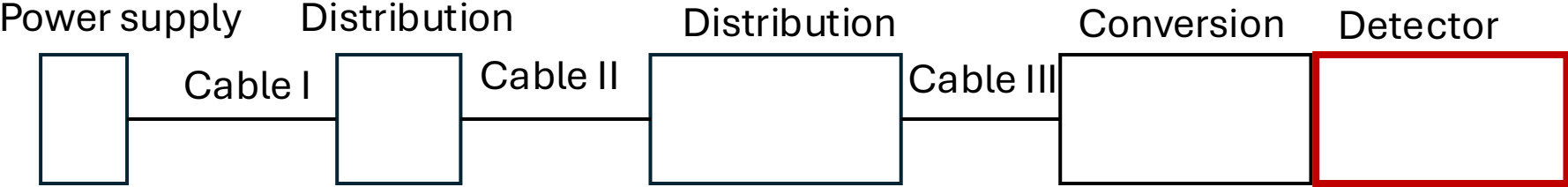


IN CONNECTOR	
Type	Molex
Model	2035663007
Quantity	4 (1/FEB)
dimension (mm)	18
Total (mm)	4992

Power Distribution Tree

Sub-Detector: dRICH

Type: **ALCOR_FE**



DETECTOR	
Name	ALCOR
Quantity	4992
Vin (V)	1.2
V (V)	1.20
I (A)	0.400
P (W)	0.480
TOTAL	
I (kA)	2.00
P (kW)	2.40

Power Distribution Tree

Sub-Detector: dRICH

Type: **ALCOR_FE**

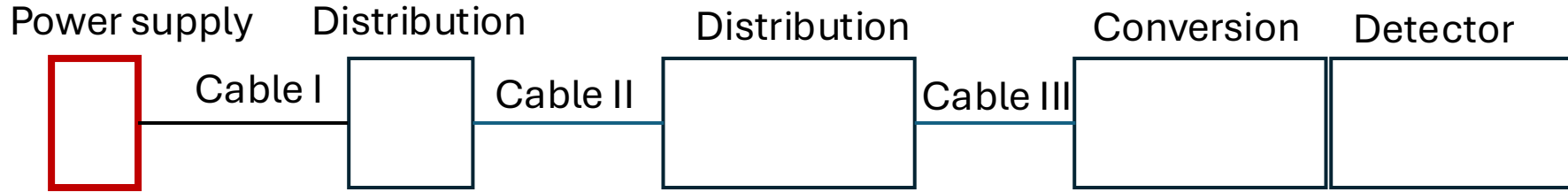


SUMMARY											
Nch	I (A)		P (W)					power fraction			
	total	channel	detector	losses		total	channel	board	detector	losses	
				convers.	cables					convers.	cables
156	1997	12.8	2396	399	1944	4740	30.4	243.1	51%	8%	41%

Power Distribution Tree

Sub-Detector: dRICH

Type: **DIGITAL_CORE**



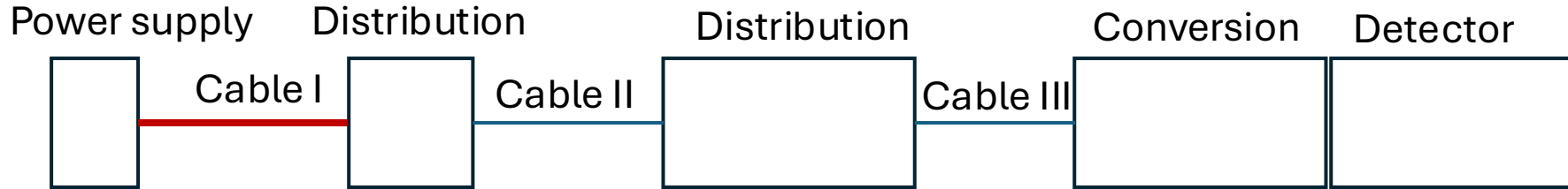
POWER SUPPLY	
Model	CAEN A2550
Quantity	39
N channels	8
Vmax (V)	5
I _{max} (A)	15
P _{max} (W)	60
TOTAL	
I _{max} (kA)	4.68
P _{max} (kW)	18.72



Power Distribution Tree

Sub-Detector: dRICH

Type: **DIGITAL_CORE**



CABLE	
AWG	8
N cond	4
Part n	Nexans 208386
R (Ω/km)	2.144
Length (m)	12
Quantity	156
Weight (kg/km)	547
Diameter (mm)	17.09
I (A)	12.2
ΔV (V)	0.629
Ploss (W)	7.679
TOTAL	
I (kA)	3.81
Ploss (kW)	2.40
Total weight (kg)	1023.984



CONNECTOR	
Type	Hirose EnerBee
Model	DF60A-4EP-10.16C
Quantity	156



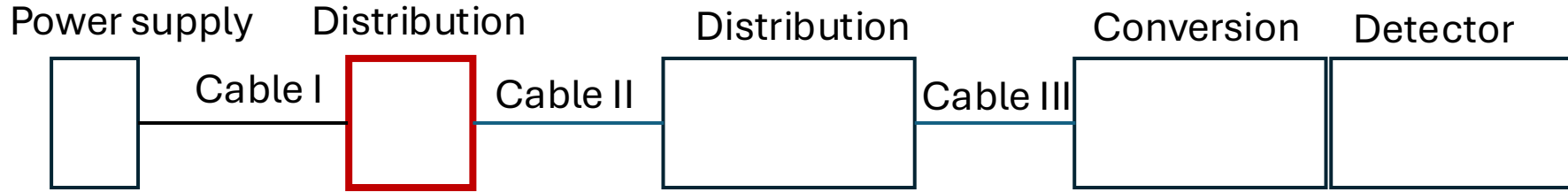
4x8 AWG

<https://www.nexans.co/.rest/catalog/v1/product/pdf/208386>

Power Distribution Tree

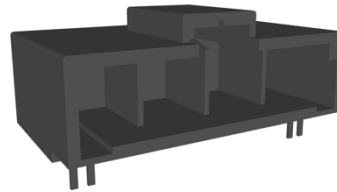
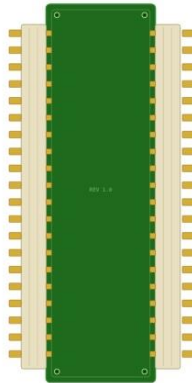
Sub-Detector: dRICH

Type: **DIGITAL_CORE**

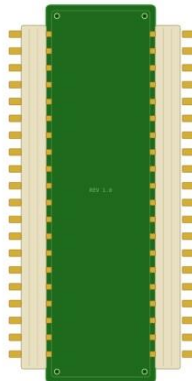


Parallel of 2 ch

DISTRIBUTION	
Type	patch-panel
Quantity	2
N inputs	78
N outputs	78



IN CONNECTOR	
Type	Hirose EnerBee
Model	DF60- 4P -10.16DS
Quantity	78
dimension (mm)	42.68
Total (mm)	1664.52

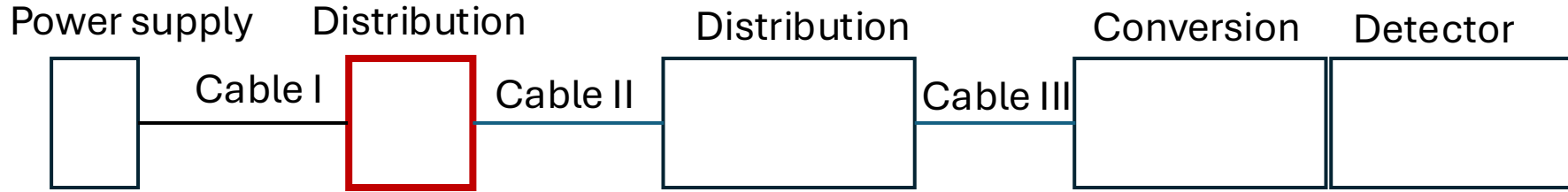


OUT CONNECTOR	
Type	Hirose EnerBee
Model	DF60- 2P -10.16DS
Quantity	78
dimension (mm)	22.36
Total (mm)	1744.08

Power Distribution Tree

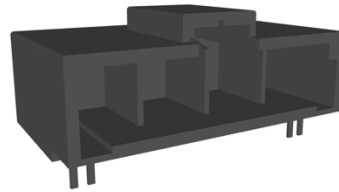
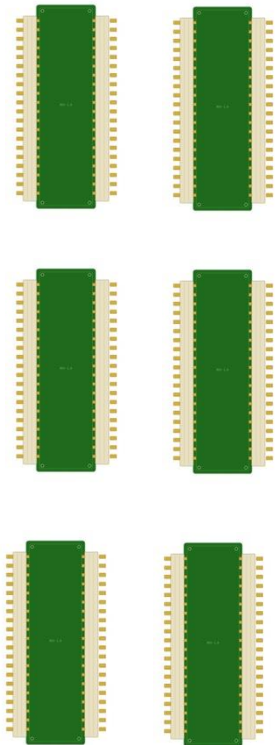
Sub-Detector: dRICH

Type: **DIGITAL_CORE**



Parallel of 2 ch

DISTRIBUTION	
Type	patch-panel
Quantity	6
N inputs	13
N outputs	26



IN CONNECTOR	
Type	Hirose EnerBee
Model	DF60-4P-10.16DS
Quantity	13
dimension (mm)	42.68
Total (mm)	554.84

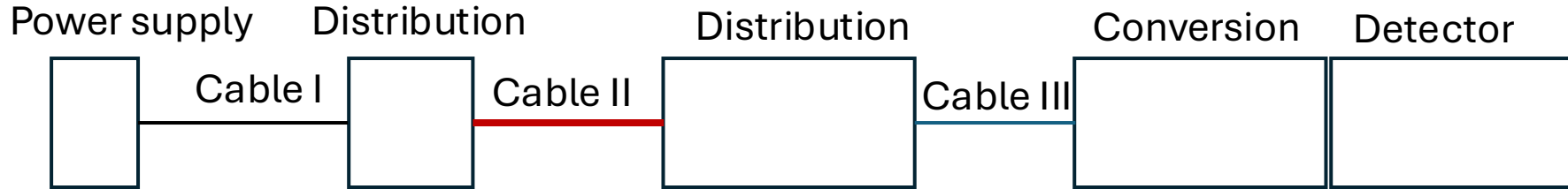


OUT CONNECTOR	
Type	Hirose EnerBee
Model	DF60-2P-10.16DS
Quantity	26
dimension (mm)	22.36
Total (mm)	581.36

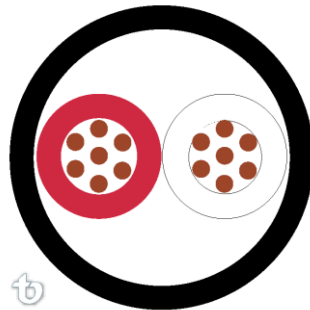
Power Distribution Tree

Sub-Detector: dRICH

Type: **DIGITAL_CORE**



CABLE	
AWG	8
N cond	2
Part n	teldor 8Q79HC2101
R (Ω /km)	2.300
Length (m)	3
Quantity	156
Weight (kg/km)	255
Diameter (mm)	12.4
I (A)	24.4
ΔV (V)	0.337
Ploss (W)	8.216
TOTAL	
I (kA)	3.81
Ploss (kW)	2.56
Total weight (kg)	119.34



CONNECTOR	
Type	Hirose EnerBee
Model	DF60F-2S-10.16C
Quantity	156

2x8 AWG

<https://www.teldor.com/product-page/59948>

Power Distribution Tree

Sub-Detector: dRICH

Type: **DIGITAL_CORE**



DISTRIBUTION	
Type	Master-panel
Quantity	156
n x sector	26
N inputs	1
N outputs (A)	32
N outputs (B)	8



IN CONNECTOR	
Type	Hirose EnerBee
Model	DF60-2P-10.16DS
Quantity	26
dimension (mm)	22.36
Total (mm)	581.36

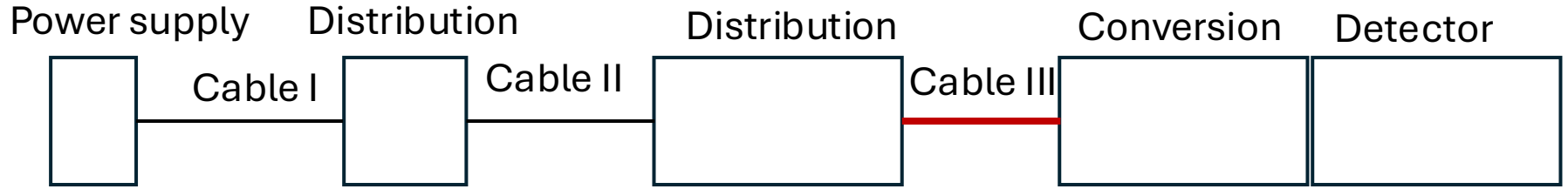
OUT CONNECTOR	
Type	TBD
Model	TBD
Quantity	32
dimension (mm)	TBD
Total (mm)	TBD

Passive 26 Master Panel x sector, serves 8 PDUs

Power Distribution Tree

Sub-Detector: dRICH

Type: **DIGITAL_CORE**



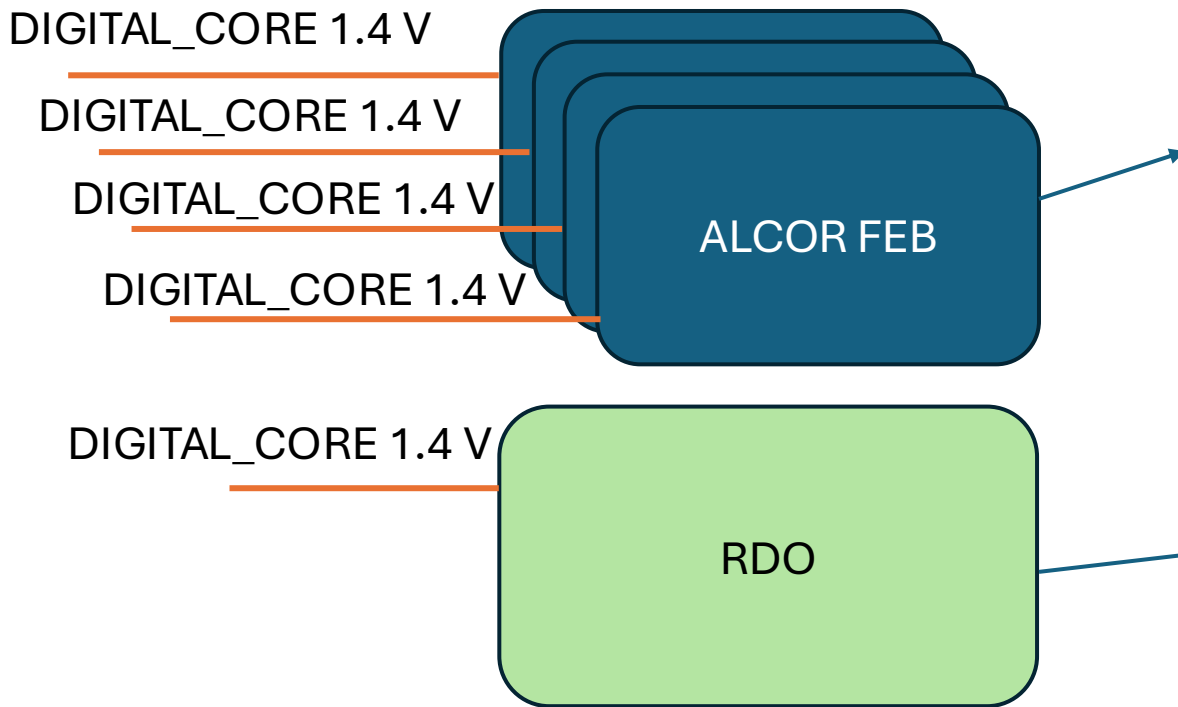
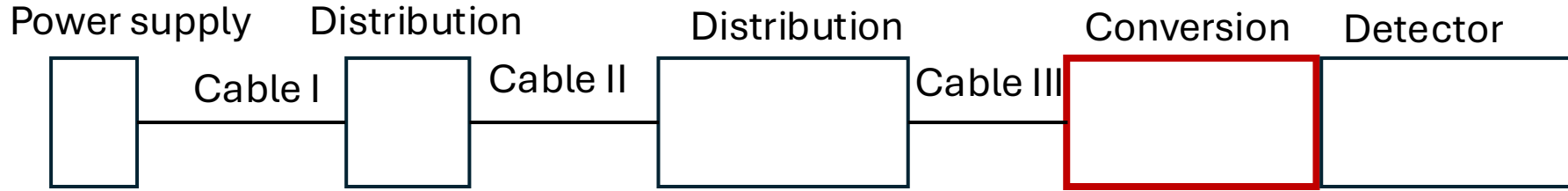
CABLE (A)	
AWG	25
N cond	2
Part n	TBD
R (Ω/km)	106.174
Length (m)	0.5
Quantity	4992
Weight (kg/km)	TBD
Diameter (mm)	TBD
I (A)	0.275
ΔV (V)	0.029
Ploss (W)	0.008
TOTAL	
I (kA)	1372.8
Ploss (kW)	40.1
Total weight (kg)	#VALUE!

CABLE (B)	
AWG	18
N cond	2
Part n	TBD
R (Ω/km)	20.943
Length (m)	0.5
Quantity	1248
Weight (kg/km)	TBD
Diameter (mm)	TBD
I (A)	1.954
ΔV (V)	0.041
Ploss (W)	0.080
TOTAL	
I (kA)	2438.6
Ploss (kW)	99.8
Total weight (kg)	#VALUE!

Power Distribution Tree

Sub-Detector: dRICH

Type: **DIGITAL_CORE**



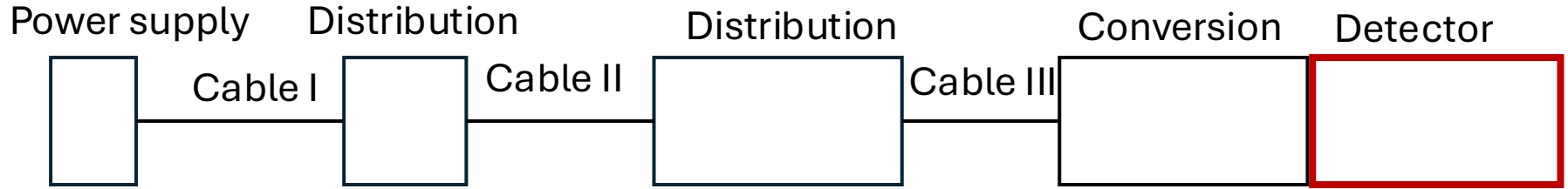
CONVERSION (A)	
Type	LDO
Quantity	4992
Vin (V)	1.4
Vout (V)	1.20
I (A)	0.275
Ploss (W)	0.055
TOTAL	
I (kA)	1.37
Ploss (kW)	0.27

CONVERSION (B)	
Type	LDO 3x
Quantity	1248
Vin (V)	1.4
Vout (V)	0.85
I (A)	1.653
Ploss (W)	0.909
Vout (V)	0.90
I (A)	0.043
Ploss (W)	0.022
Vout (V)	1.00
I (A)	0.258
Ploss (W)	0.103
TOTAL	
I (kA)	2.44
Ploss (kW)	1.29

Power Distribution Tree

Sub-Detector: dRICH

Type: **DIGITAL_CORE**



DETECTOR (A)	
Name	ALCOR
Quantity	4992
V (V)	1.20
I (A)	0.275
P (W)	0.330
TOTAL	
I (kA)	1.37
P (kW)	1.65

DETECTOR (B)	
Name	RDO
Quantity	1248
V (V)	0.85
I (A)	1.653
P (W)	1.405
V (V)	0.90
I (A)	0.043
P (W)	0.039
V (V)	1.00
I (A)	0.258
P (W)	0.258
TOTAL	
I (kA)	2.44
P (kW)	2.12

Power Distribution Tree

Sub-Detector: dRICH

Type: **DIGITAL_CORE**

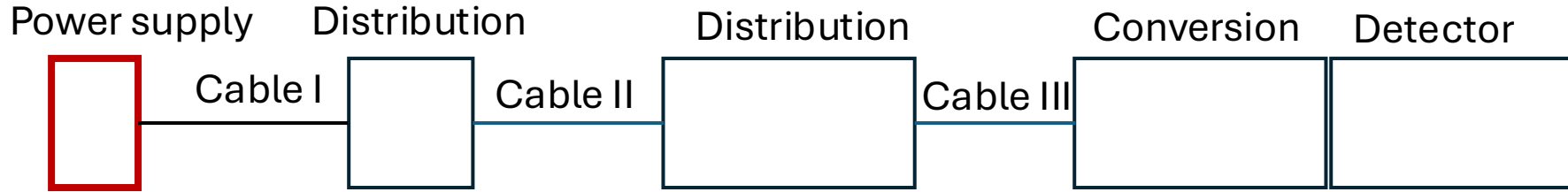


SUMMARY											
Nch	I (A)		P (W)						power fraction		
	total	channel	detector	losses		total	channel	board	detector	losses	
				convers.	cables					convers.	cables
312	3811	12.2	3771	1565	4999	10335	16.6	132.5	36%	15%	48%

Power Distribution Tree

Sub-Detector: dRICH

Type: **DIGITAL_IO**



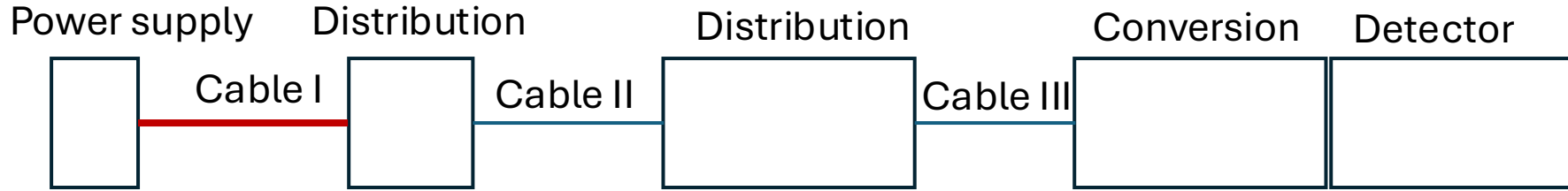
POWER SUPPLY	
Model	CAEN A2550
Quantity	20
N channels	8
Vmax (V)	5
I _{max} (A)	15
P _{max} (W)	60
TOTAL	
I _{max} (kA)	2.40
P _{max} (kW)	9.60



Power Distribution Tree

Sub-Detector: dRICH

Type: **DIGITAL_IO**



CABLE	
AWG	8
N cond	4
Part n	Nexans 208386
R (Ω/km)	2.144
Length (m)	12
Quantity	78
Weight (kg/km)	547
Diameter (mm)	17.09
I (A)	13.3
ΔV (V)	0.684
Ploss (W)	9.086
TOTAL	
I (kA)	2.07
Ploss (kW)	1.42
Total weight (kg)	511.992



CONNECTOR	
Type	Hirose EnerBee
Model	DF60A-4EP-10.16C
Quantity	78



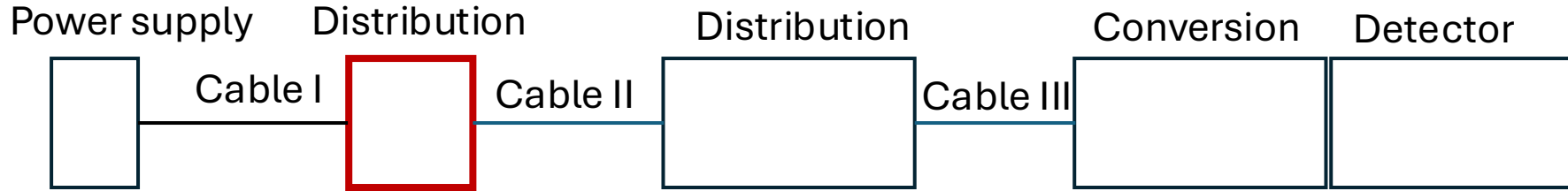
4x8 AWG

<https://www.nexans.co/.rest/catalog/v1/product/pdf/208386>

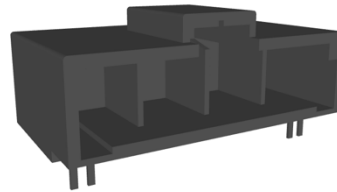
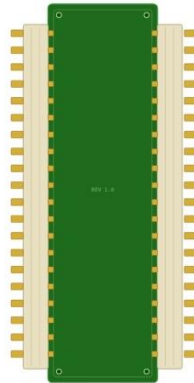
Power Distribution Tree

Sub-Detector: dRICH

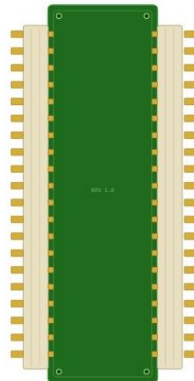
Type: **DIGITAL_IO**



DISTRIBUTION	
Type	patch-panel
Quantity	2
N inputs	39
N outputs	78



IN CONNECTOR	
Type	Hirose EnerBee
Model	DF60- 4P -10.16DS
Quantity	39
dimension (mm)	42.68
Total (mm)	1664.52

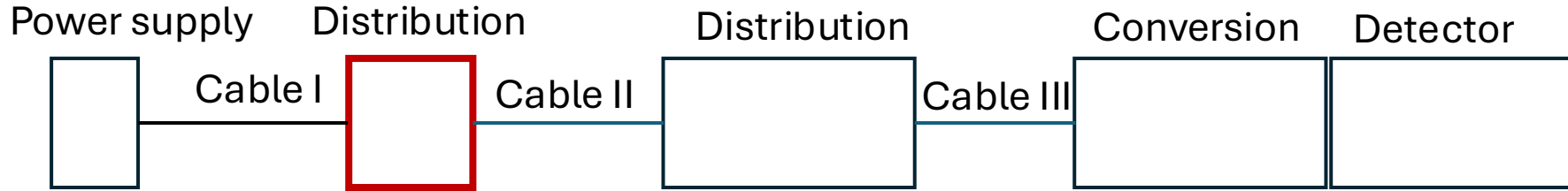


OUT CONNECTOR	
Type	Hirose EnerBee
Model	DF60- 2P -10.16DS
Quantity	78
dimension (mm)	22.36
Total (mm)	1744.08

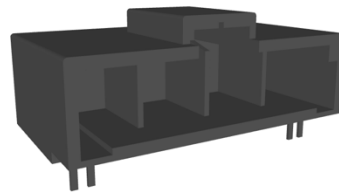
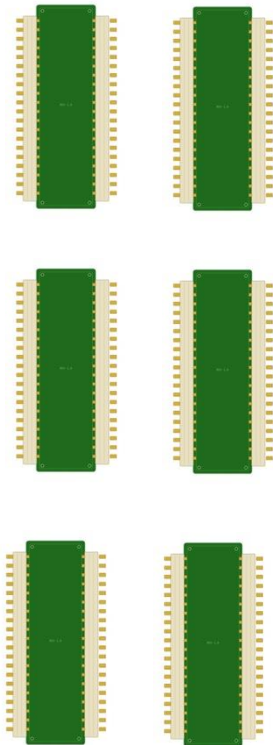
Power Distribution Tree

Sub-Detector: dRICH

Type: **DIGITAL_IO**



DISTRIBUTION	
Type	patch-panel
Quantity	6
N inputs	13
N outputs	26



IN CONNECTOR	
Type	Hirose EnerBee
Model	DF60-4P-10.16DS
Quantity	13
dimension (mm)	42.68
Total (mm)	554.84

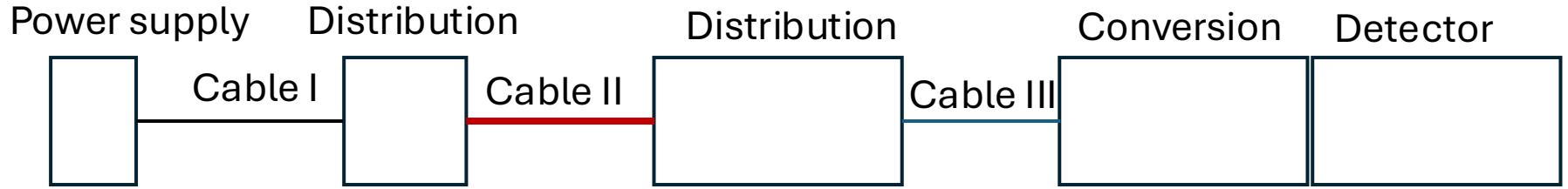


OUT CONNECTOR	
Type	Hirose EnerBee
Model	DF60-2P-10.16DS
Quantity	26
dimension (mm)	22.36
Total (mm)	581.36

Power Distribution Tree

Sub-Detector: dRICH

Type: **DIGITAL_IO**



CABLE	
AWG	10
N cond	2
Part n	Encore Wire HF382
R (Ω /km)	3.550
Length (m)	3
Quantity	156
Weight (kg/km)	51.58
Diameter (mm)	14.22
I (A)	12.8
ΔV (V)	0.273
Ploss (W)	3.490
TOTAL	
I (kA)	2.00
Ploss (kW)	1.09
Total weight (kg)	24.13944



2x10 AWG

CONNECTOR	
Type	Hirose EnerBee
Model	DF60F-2S-10.16C
Quantity	156

Power Distribution Tree

Sub-Detector: dRICH

Type: **DIGITAL_IO**



DISTRIBUTION	
Type	master-panel
Quantity	156
n x sector	26
N inputs	1
N outputs (A)	32
N outputs (B)	8



IN CONNECTOR	
Type	Hirose EnerBee
Model	DF60-2P-10.16DS
Quantity	26
dimension (mm)	22.36
Total (mm)	581.36

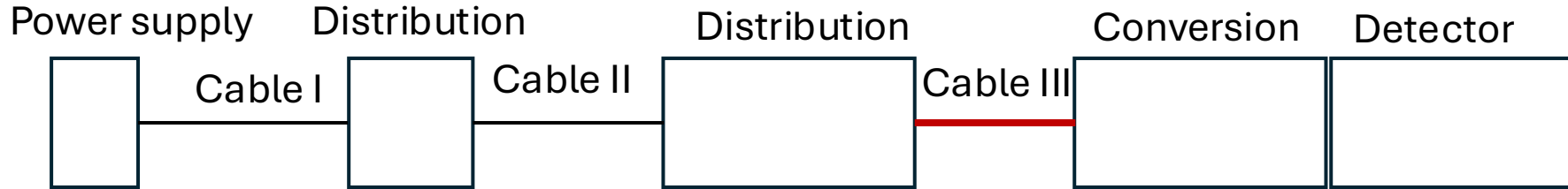
OUT CONNECTOR	
Type	TBD
Model	TBD
Quantity	32
dimension (mm)	TBD
Total (mm)	TBD

Passive 26 Master Panel x sector, serves 8 PDUs

Power Distribution Tree

Sub-Detector: dRICH

Type: **DIGITAL_IO**



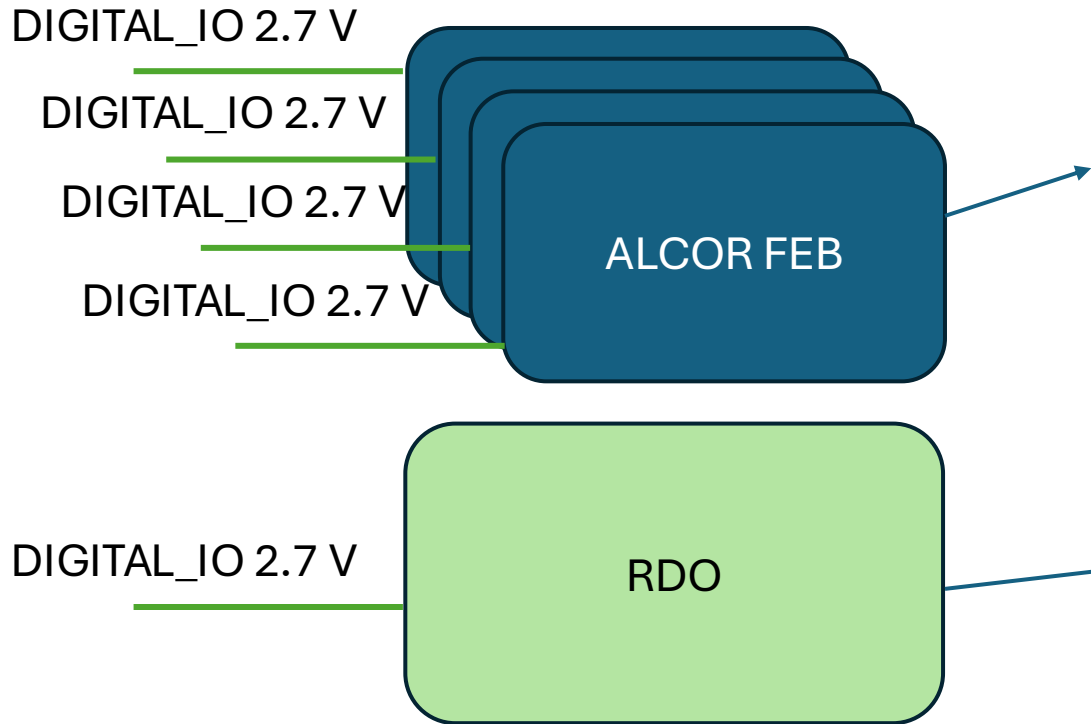
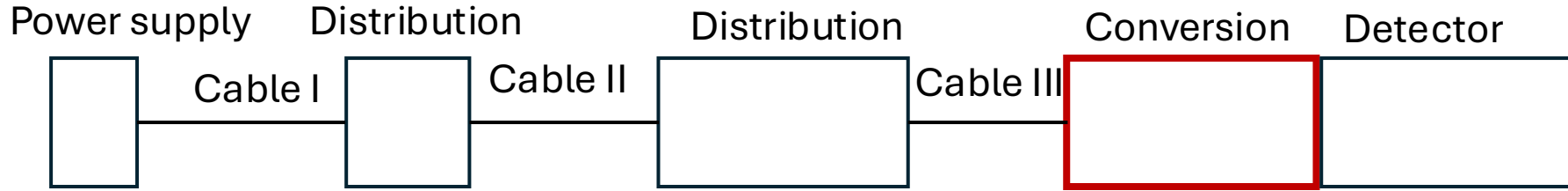
CABLE (A)	
AWG	25
N cond	2
Part n	TBD
R (Ω/km)	106.174
Length (m)	0.5
Quantity	4992
Weight (kg/km)	TBD
Diameter (mm)	TBD
I (A)	0.068
ΔV (V)	0.007
Ploss (W)	0.000
TOTAL	
I (kA)	339.5
Ploss (kW)	2.5
Total weight (kg)	#VALUE!

CABLE (B)	
AWG	25
N cond	2
Part n	TBD
R (Ω/km)	106.174
Length (m)	0.5
Quantity	4992
Weight (kg/km)	TBD
Diameter (mm)	TBD
I (A)	0.068
ΔV (V)	0.007
Ploss (W)	0.000
TOTAL	
I (kA)	339.5
Ploss (kW)	2.5
Total weight (kg)	#VALUE!

Power Distribution Tree

Sub-Detector: dRICH

Type: **DIGITAL_IO**



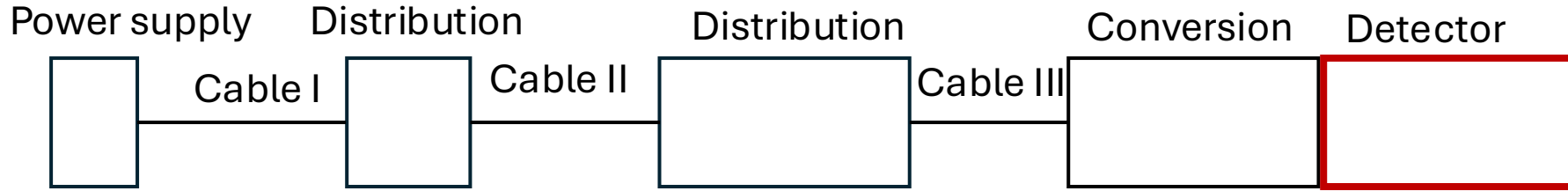
CONVERSION (A)	
Type	LDO
Quantity	4992
Vin (V)	2.7
Vout (V)	2.50
I (A)	0.068
Ploss (W)	0.014
TOTAL	
I (kA)	0.34
Ploss (kW)	0.07

CONVERSION (B)	
Type	LDO 3x
Quantity	1248
Vin (V)	2.7
Vout (V)	1.20
I (A)	0.122
Ploss (W)	0.183
Vout (V)	1.80
I (A)	1.048
Ploss (W)	0.943
Vout (V)	2.50
I (A)	0.215
Ploss (W)	0.043
TOTAL	
I (kA)	1.73
Ploss (kW)	1.46

Power Distribution Tree

Sub-Detector: dRICH

Type: **DIGITAL_IO**



DETECTOR (A)	
Name	ALCOR
Quantity	4992
V (V)	2.50
I (A)	0.068
P (W)	0.170
TOTAL	
I (kA)	0.34
P (kW)	0.85

DETECTOR (B)	
Name	RDO
Quantity	1248
V (V)	1.20
I (A)	0.122
P (W)	0.146
V (V)	1.80
I (A)	1.048
P (W)	1.886
V (V)	2.50
I (A)	0.215
P (W)	0.536
TOTAL	
I (kA)	1.73
P (kW)	3.21

Power Distribution Tree

Sub-Detector: dRICH

Type: **DIGITAL_IO**



SUMMARY											
Nch	I (A)		P (W)					power fraction			
	total	channel	detector	losses		total	channel	board	detector	losses	
				convers.	cables					convers.	cables
156	2073	13.3	4077	1526	2008	7611	48.8	390.3	54%	20%	26%

SUMMARY

Nch	I (A)		P (W)						power fraction			Codename
			detector	losses		total	channel	board	detector	losses		
	total	channel		conversions.	cables					conversions.	cables	
156	1997	12.8	2396	399	1944	4740	30.4	243.1	51%	8%	41%	ANALOG_FE
312	3811	12.2	3771	1565	4999	10335	16.6	132.5	36%	15%	48%	DIGITAL_CORE
156	2073	13.3	4077	1526	2008	7611	48.8	390.3	54%	20%	26%	DIGITAL_IO

