POWER SUPPLY

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Questionnaire

We started to send, recently, a questionnaire for trying to collect, for the moment, a minimal set of information.

People that received it are working with its compilation.

At the moment we received the feedback from 2 groups over the 5 to which it was sent.

DC/DC power Supply						
	V1	V2	V3	V4	V5	Comment, if any
Required Voltage level (V)						
Total power (W)						
Number of input connections/cables						
Current absorption per input cable						
Number of output connections/cables						
Current absorption per ouput cable						
Purpose (pre-regulation followed by linear regulator, final value, etc.)						
Power supply location (detector area, outside detecotr area)						
Maximum ripple (mV), or						
Maximum ripple (%)						

HV for detectors bias						
	V1	V2	V3	V4	V5	Comment, if any
Required Voltage level (V)						
Total power (W)						
Number of input connections/cables						
Number of output connections/cables						
Power supply location (detector area, outside detecotr area)						
pp noise (mV), or						
pp noise (%)						

Feedback from Cotta Ramusino

IFR BARREL

DC/DC power Supply			
	V1	V2	Comment, if any
Required Voltage level (V)	+ 5V	- 5V	
Total power (W)	1200	1200	**nominal** power dissipated by the analog front end
Total power (W)	**1728**	**1728**	**MAX** power dissipated by the analog front end; **safety factor 1,5X**
Number of input connections/cables			FOR THE DESIGNER TO CHOOSE
Current absorption per input cable			FOR THE DESIGNER TO CHOOSE
Number of output connections/cables	54 (+54 GND)	54 (+54 GND)	assuming one channel supplies all module of a layer
Current absorption per ouput cable	7,5 A (safety factor of ≥1,5 already included)	7,5 A (safety factor of ≥1,5 already included)	assuming one channel supplies all module of a layer
Number of output connections/cables	384 (+384 GND)	384 (+384 GND)	assuming one channel supplies just ONE module of a layer
Current absorption per ouput cable	0,9 A (safety factor of ≥1,5 already included)	0,9 A (safety factor of ≥1,5 already included)	assuming one channel supplies just ONE module of a layer
Purpose (pre-regulation followed by linear regulator, final value, etc.)	final value	final value	
Power supply location (detector area, outside detecotr area)	possibly, detector area	possibly, detector area	
Maximum ripple (mV), or	2mV r.m.s. 10mV pk/pk	2mV r.m.s. 10mV pk/pk	
Maximum ripple (%)			

HV for detectors bias			
	V1	V2	Comment, if any
Required Voltage level (V)	80	N.A.	
Total power (W)	17		**nominal** power dissipated by SiPMs inside the IRON
Total power (W)	**196,608**		**MAX** power dissipated by SiPMs inside the IRON **safety factor 10X**
Number of input connections/cables			FOR THE DESIGNER TO CHOOSE
Number of output connections/cables	384		assuming one HV channel supplies just ONE module of a layer
Current absorption per ouput cable **(mA)**	6,4		assuming one channel supplies all module of a layer. (**safety factor of ≥ 10 already included**)
Max power rating **for the HV channel (W)**	0,512		assuming one channel supplies all module of a layer. (**safety factor of ≥ 10 already included**)
Power supply location (detector area, outside detecotr area)	possibly, detector area		
pp noise (mV), or	2mV r.m.s. 10mV pk/pk		
pp noise (%)			

IFR ENDCAPS

DC/DC power Supply			
	V1	V2	Comment, if any
Required Voltage level (V)	+ 5V	- 5V	
Total power (W)	900	900	**nominal** power dissipated by the analog front end
Total power (W)	**1260**	**1260**	**MAX** power dissipated by the analog front end; **safety factor 1,5X**
Number of input connections/cables			FOR THE DESIGNER TO CHOOSE
Current absorption per input cable			FOR THE DESIGNER TO CHOOSE
Number of output connections/cables	72 (+72 GND)	72 (+72 GND)	assuming one channel supplies just ONE module of a layer
Current absorption per ouput cable	3,5A (safety factor of ≈1,5 already included)	3,5A (safety factor of ≈1,5 already included)	assuming one channel supplies just ONE module of a layer
Purpose (pre-regulation followed by linear regulator, final value, etc.)	final value	final value	
Power supply location (detector area, outside detecotr area)	possibly, detector area	possibly, detector area	
Maximum ripple (mV), or	2mV r.m.s. 10mV pk/pk	2mV r.m.s. 10mV pk/pk	
Maximum ripple (%)			

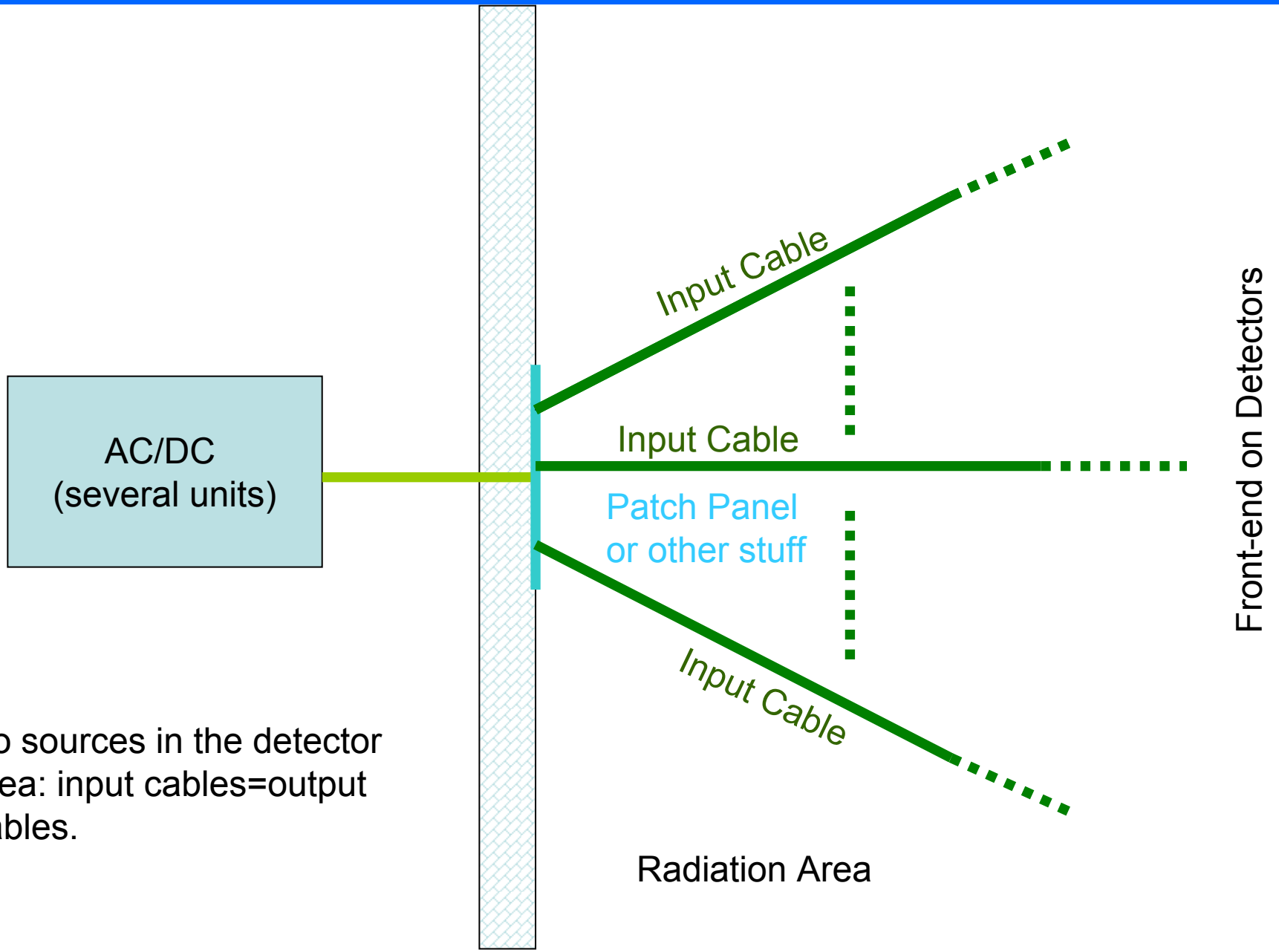
HV for detectors bias			
	V1	V2	Comment, if any
Required Voltage level (V)	80	N.A.	
Total power (W)	12		**nominal** power dissipated by SiPMs inside the IRON
Total power (W)	**135,936**		**MAX** power dissipated by SiPMs inside the IRON **safety factor 10X**
Number of input connections/cables			FOR THE DESIGNER TO CHOOSE
Number of output connections/cables	72		assuming one HV channel supplies just ONE module of a layer
Current absorption per ouput cable **(mA)**	23,6		assuming one channel supplies all module of a layer. (**safety factor of ≥ 10 already included**)
Max power rating **for the HV channel (W)**	1,888		assuming one channel supplies all module of a layer. (**safety factor of ≥ 10 already included**)
Power supply location (detector area, outside detecotr area)	possibly, detector area		
pp noise (mV), or	2mV r.m.s. 10mV pk/pk		
pp noise (%)			

Feedback from Villa

DC/DC power Supply						
	V1	V2	V3	V4	V5	Comment, if any
Required Voltage level (V)	3,3	3,3	1,2			
Total power (W)	726	792	80			
Number of input connections/cables	208	240	16			
Current absorption per input cable	about 1 A	about 1A	about 1 A			
Number of output connections/cables						
Current absorption per ouput cable						
Purpose (pre-regulation followed by linear regulator, final value, etc.)	tbd	tbd	tbd			
Power supply location (detector area, outside detecotr area)	just outside	just outside	just outside			
Maximum ripple (mV), or						
Maximum ripple (%)						

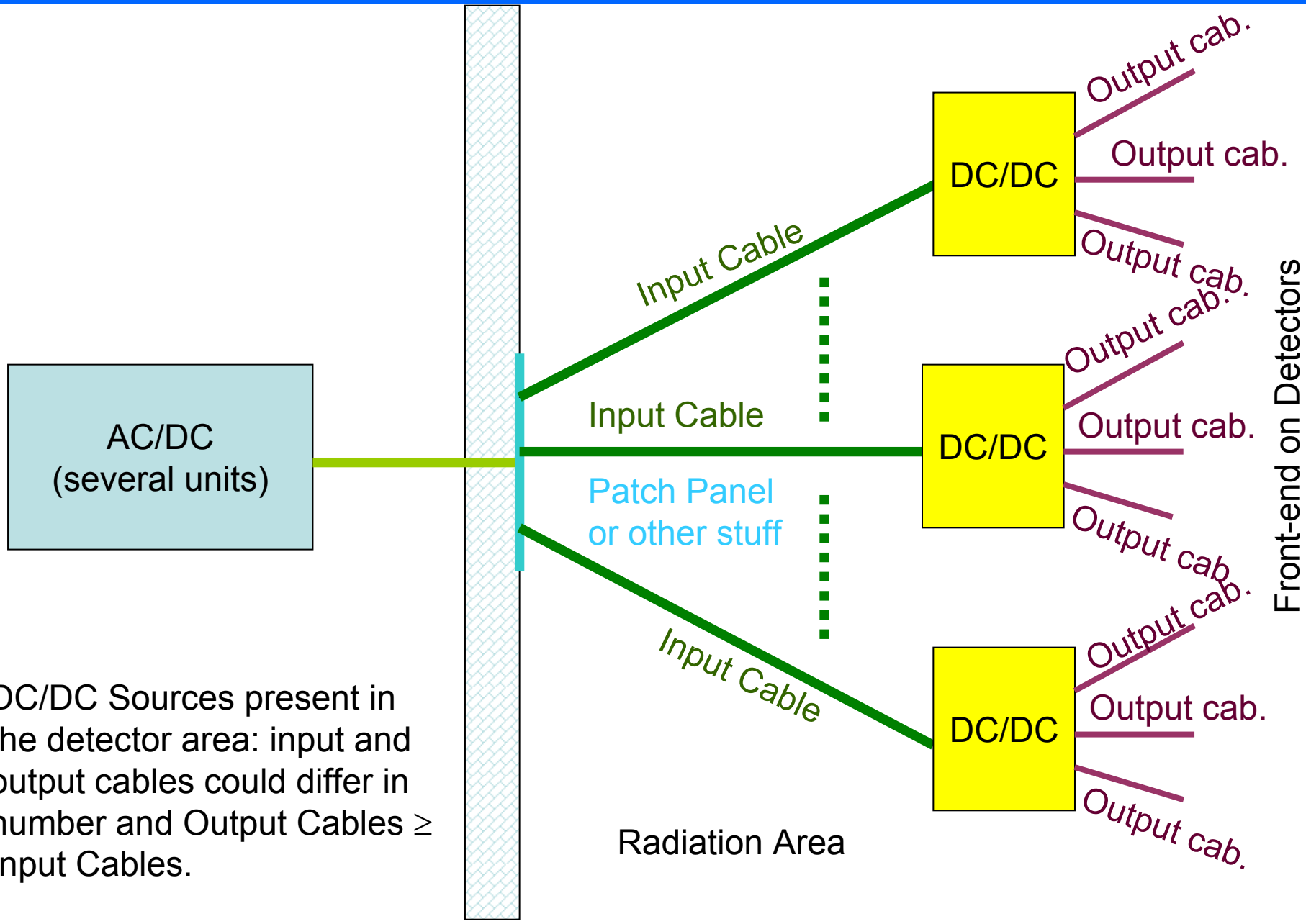
HV for detectors bias						
	V1	V2	V3	V4	V5	Comment, if any
Required Voltage level (V)	40					
Total power (W)	negligible					
Number of input connections/cables	208					
Number of output connections/cables						
Power supply location (detector area, outside detecotr area)	just outside					
pp noise (mV), or						
pp noise (%)						

Possible Configuration (1)



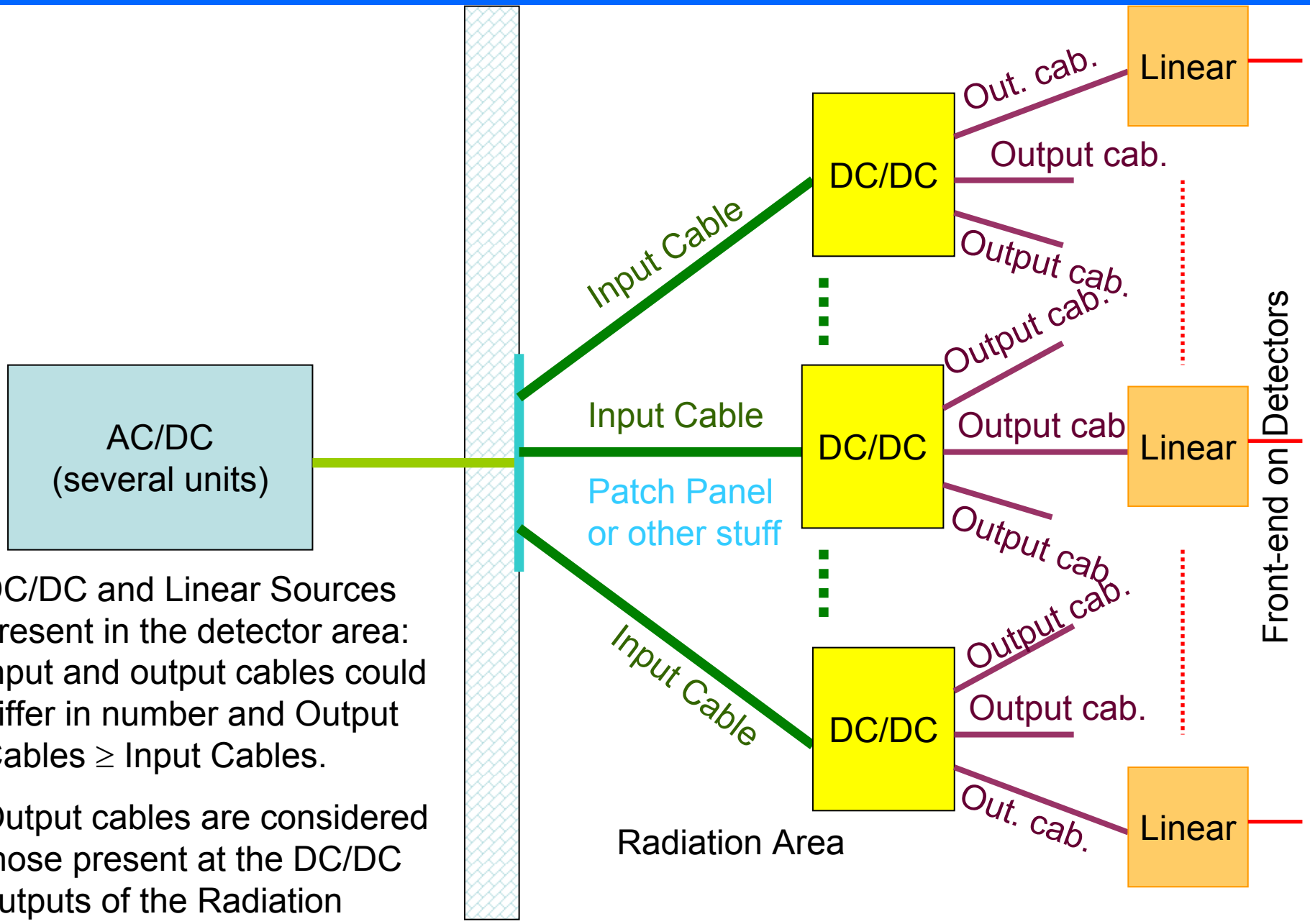
No sources in the detector area: input cables=output cables.

Possible Configuration (2)



DC/DC Sources present in the detector area: input and output cables could differ in number and Output Cables ≥ Input Cables.

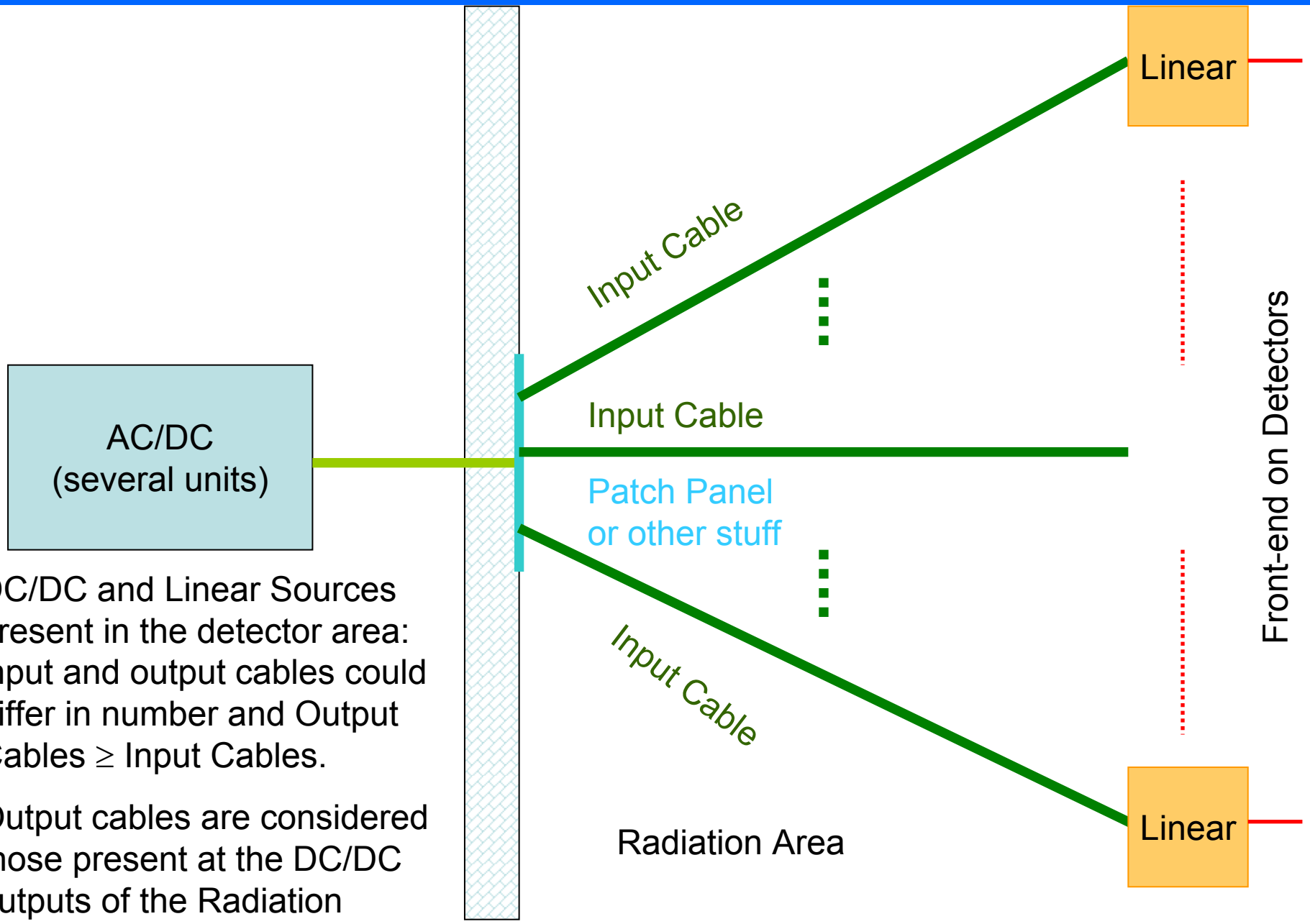
Possible Configuration (3)



DC/DC and Linear Sources present in the detector area: input and output cables could differ in number and Output Cables ≥ Input Cables.

Output cables are considered those present at the DC/DC outputs of the Radiation area.

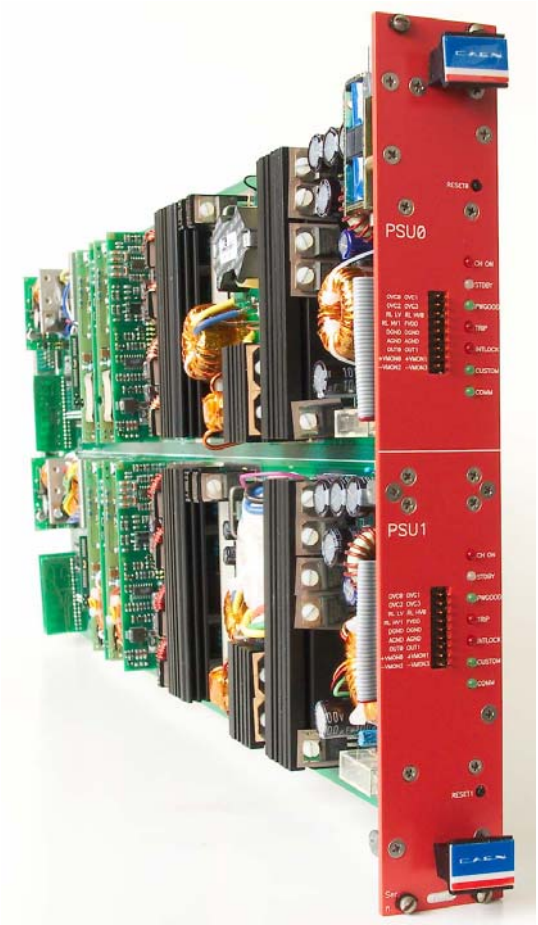
Possible Configuration (4)

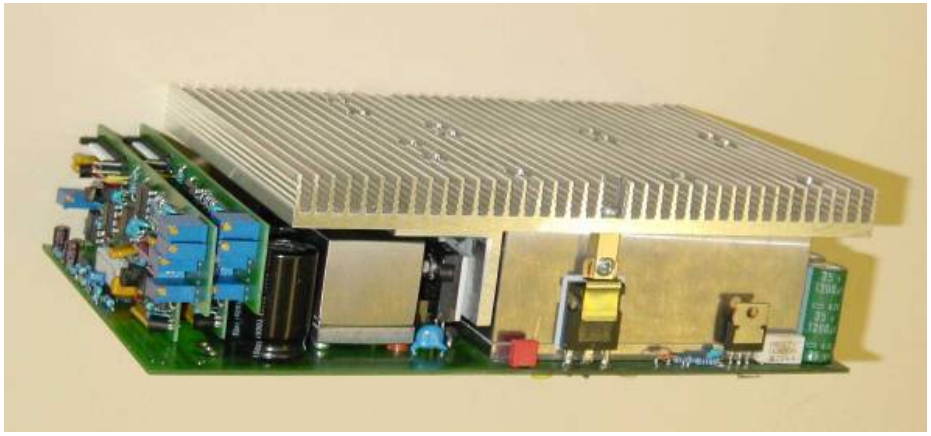


DC/DC and Linear Sources present in the detector area: input and output cables could differ in number and Output Cables ≥ Input Cables.

Output cables are considered those present at the DC/DC outputs of the Radiation area.

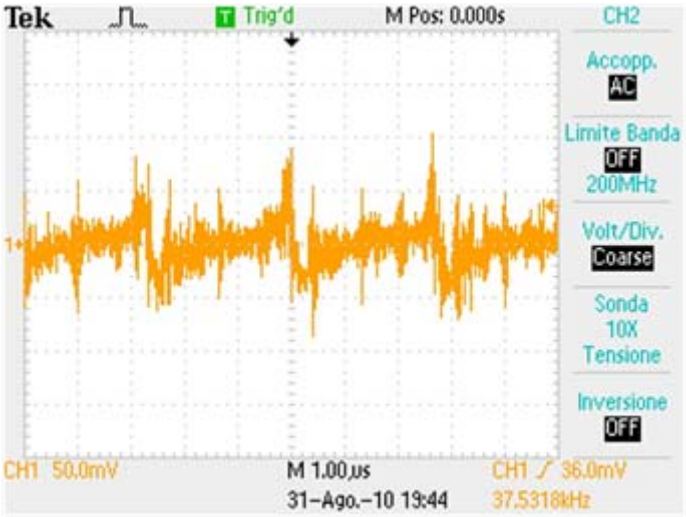
As far I now Caen and Wiener have experience in this field





An example of a Custom solution

Using half brick modules we optimize the switching noise from this level (tens of mV)…



…to less than a mVpp on 20 MHz BW at full load.

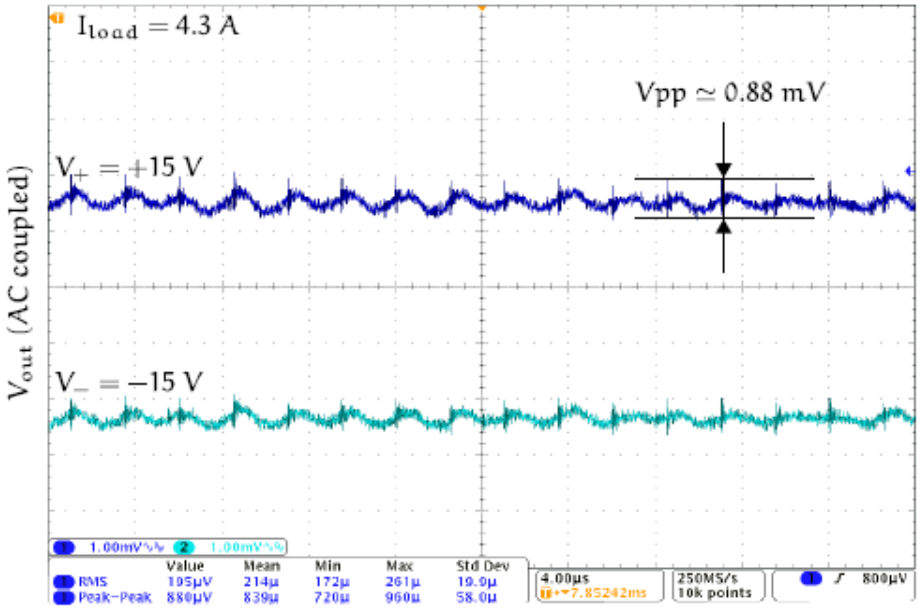


Fig. 6. Measurement of the output peak-to-peak noise with a load current $I_{LOAD} = 4.3$ A (Tektronix MSO 4032, 350 MHz, 2.5 GS/s)

Conclusion

We started and are working on…