LHC600A-40V

Move from UJ76 to TZ76

Yves THUREL
CERN

LHC600A-40V Not Rad. Hard

- *1 AC Rack input*
- *Water Rack input*

FGC Generic

CPLD, FPGA, memory, Mosfets, optocouplers …

+

PSU FGC

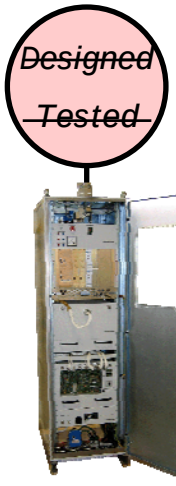
PWM, DC-DC, Power Mosfets, optocouplers

+

PSU DCCT

PWM, DC-DC, Power Mosfets, optocouplers

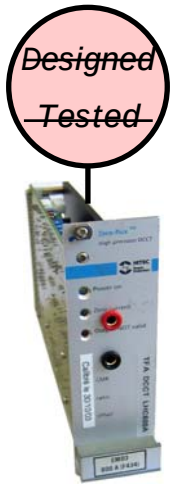
+



600A-40V VS Conv.

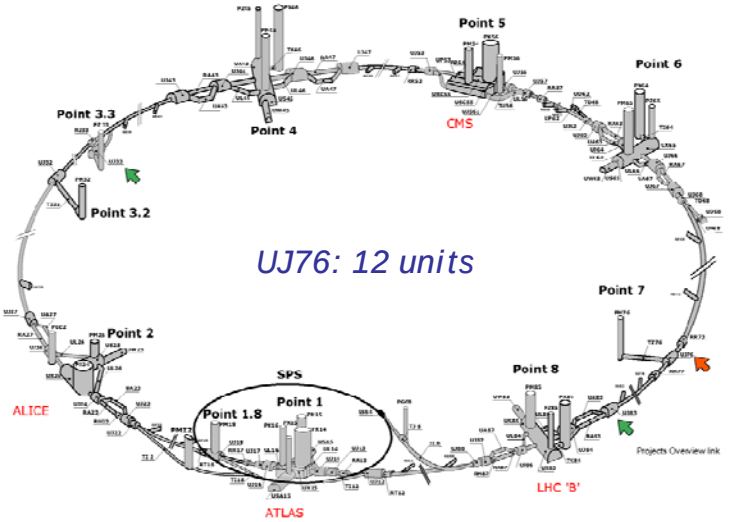
CPLD, LEM, PWM, DC-DC, High Voltage IGBTs, Power Mosfets, optocouplers, AC-DC

+



600A DCCT

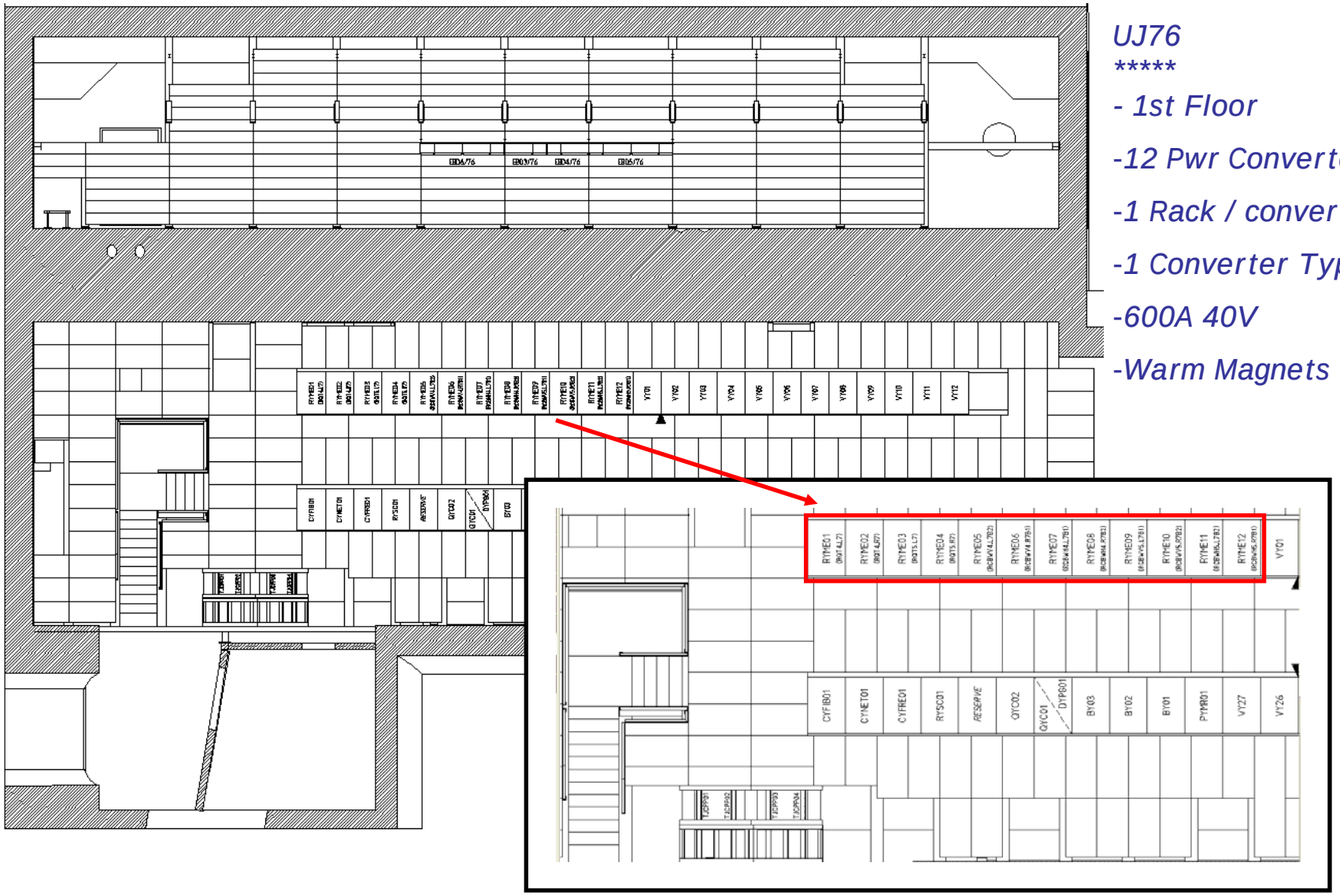
No critical cpts



UJ76: 12 units

LHC600A-40V Power Converter In UJ76

See below UJ76 Power converters location.



UJ76

*****

- 1st Floor

-12 Pwr Converters

-1 Rack / converter

-1 Converter Type

-600A 40V

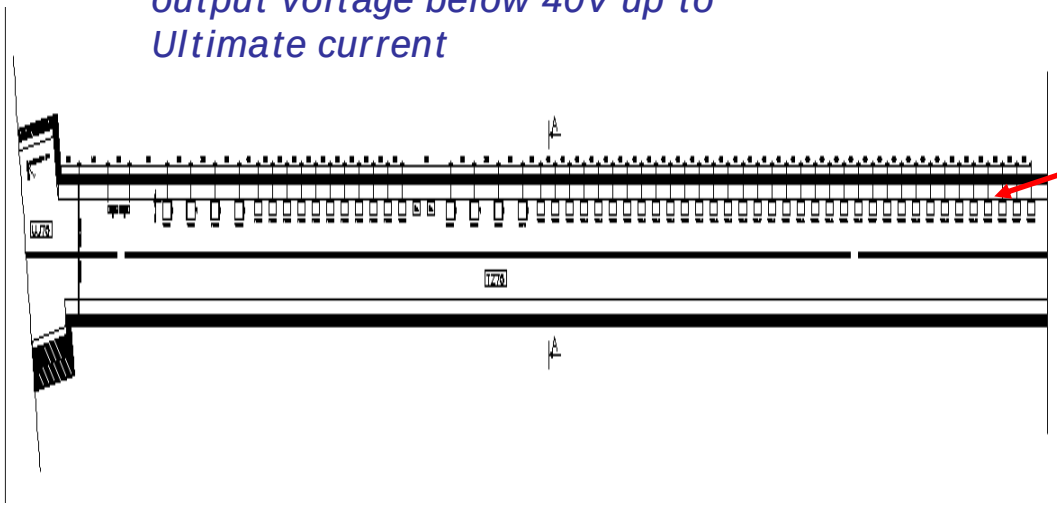
-Warm Magnets

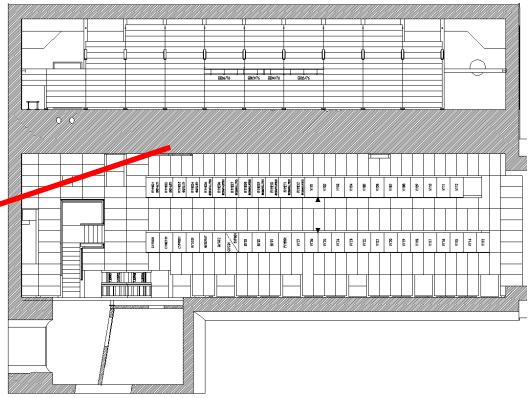
LHC600A-40V Power Converter Move from UJ76 to TZ76

Most important data concerning the study of a move from UJ76 to TZ76 is the DC cable length need for the “migration”.

What is critical is the DC Cables length needed for the move.

Converter is a 600A 40V type. Then additional cabling must keep the rack output voltage below 40V up to Ultimate current





LHC600A-40V Power Converter conventions

• LHC600A-40V output voltage	40V at the level of Rack top Busbars
• LHC600A-40V V_{MEAS} given to FGC	+/- 2% (IT2847) = +/- 1V **
• LHC600A-40V FGC Safe range	-39V…+39V (2% margin)
• Assumed voltage range for I.LOOP	+/- 1V *
➔ workable range for converter	-38V..38V giving 1V for I.LOOP

Then, a LHC600A-40V should not operate in conditions which requires that Rack output voltage is higher than 38V, and that in any condition

*** Value to be discussed since it depends on magnet type, inductance, type of rejection expected…on unexpected events…**

**** 0.8V + 0.2V for FGC conversion errors, to be validated by Q. King**

UJ76 Loads analyze / Is move possible and at which copper price?

All real data being measured in UJ76 were entered in table below to calculate additional cable data, so that power converter rack voltage is below the limit of 38V.

Don't Trust LHC Layout Data

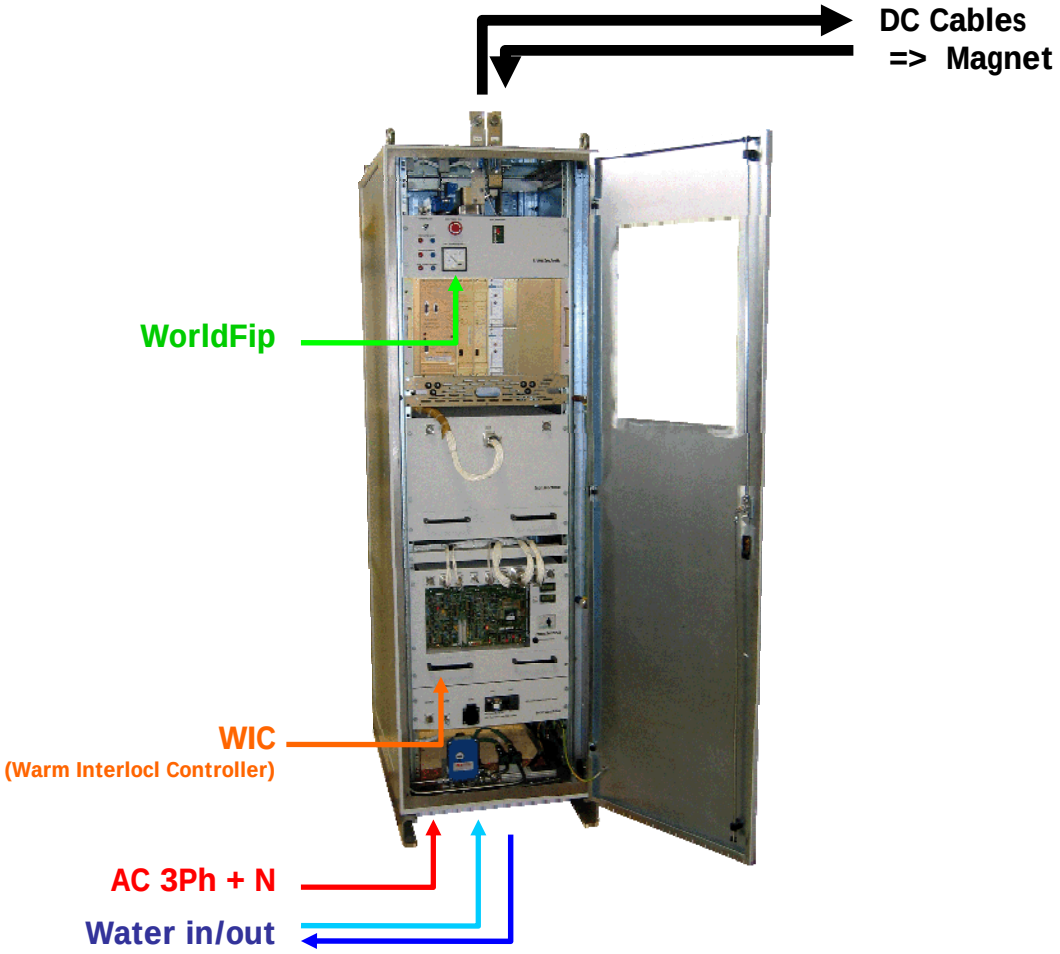
							UJ76				UJ76 => TZ76			
CIRCUIT NAME	MAX DI DT [A/s]	I NOMINAL [A]	I ULTIMATE [A]	T°C Max Cable + Magnet [°C]	L TOT Layout [H]	L TOT meas [H]	R TOTAL Layout [Ohm]	R TOTAL meas @ 25°C [Ohm]	U PEAK CIRC @ I.nom [V]	U PEAK CIRC @ I.ult [V]	R cable. UJ76=> TZ76 @ I.ult / 25°C [Ohms]	Length Cable UJ76 => TZ76 = Go+Return [m]	Copper Sectrion cable. UJ76=> TZ76 [mm²]	Practical Copper Sectrion cable. UJ76=> TZ76 [mm²]
RQT4.L7	5	600	600	70	~~0.028~~	0.05	~~0.044~~	0.0435	30.6	30.6	0.011	150	241	1 x 240
RQT4.R7	5	600	600	70	~~0.028~~	0.05	~~0.040~~	0.04	28.2	28.2	0.014	150	181	1 x 240
RQT5.L7	5	600	600	70	~~0.028~~	0.05	~~0.047~~	0.0465	32.7	32.7	0.008	150	337	1 x 400
RQT5.R7	5	600	600	70	~~0.028~~	0.05	~~0.044~~	0.043	30.3	30.3	0.011	150	230	1 x 240
RCBWV4.L7B2	1.556	500	600	70	~~0.02~~	0.062	~~0.031~~	0.0475	27.7	33.3	0.007	150	376	1 x 400
RCBWV4.R7B1	1.556	500	600	70	~~0.02~~	0.062	~~0.027~~	0.044	25.7	30.8	0.010	150	248	1 x 240
RCBWH4.L7B1	1.556	500	600	70	~~0.02~~	0.06	~~0.031~~	0.045	26.3	31.5	0.009	150	274	1 x 400
RCBWH4.R7B2	1.556	500	600	70	~~0.02~~	0.062	~~0.027~~	0.044	25.7	30.8	0.010	150	248	1 x 240
RCBWV5.L7B1	1.556	500	600	70	~~0.02~~	Missing	~~0.035~~	Missing	#VALUE!	#######	#VALUE!	150	#VALUE!	**#VALUE!**
RCBWV5.R7B2	1.556	500	600	70	~~0.02~~	0.05	~~0.031~~	0.047	27.4	32.9	0.007	150	349	1 x 400
RCBWH5.L7B2	1.556	500	600	70	~~0.02~~	0.062	~~0.034~~	0.05	29.2	35.0	0.004	150	595	3 x 240
RCBWH5.R7B1	1.556	500	600	70	~~0.02~~	0.05	~~0.030~~	0.048	28.0	33.6	0.006	150	404	1 x 400

UJ76 => TZ76
75m distance, i.e. 150m of additional cables

1 type critical

Moving a LHC600A-40V AND its dependencies

A LHC600A-40V power rack is connected to: mains network + DC Cables + WIC + WoldFip + Water network



LHC600A-40V Racks were modified to support up to 3 cables / polarity during UJ76 Installation.

PO Actions with regard to Future E.C.R

1. **Yves Thurel in charge of writing E.C.R**
2. **Christophe COUPAT (AB/PO) is in contact with all "services" groups to collect budget**

➔ **Distance from OLD rack location to NEW has to be known quite precisely (copper impact)**

➔ **ECR should be ready soon once point above clear.**

➔ **Most of work is dispatched on other groups than PO**

➔ **AB/PO needs 1-2 days for commissioning of TZ76-LHC600A-40V**

Annex

- An xls file is available here to play with parameters: cable resistance, temperature of copper, nominal and ultimate currents…
  EDMS N° 960173
  https://edms.cern.ch/document/960173/1
- LHC DATA used on 2008-09-01.