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Power Requirements and Developments for Calorimeters

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Power System Design for Calorimetry

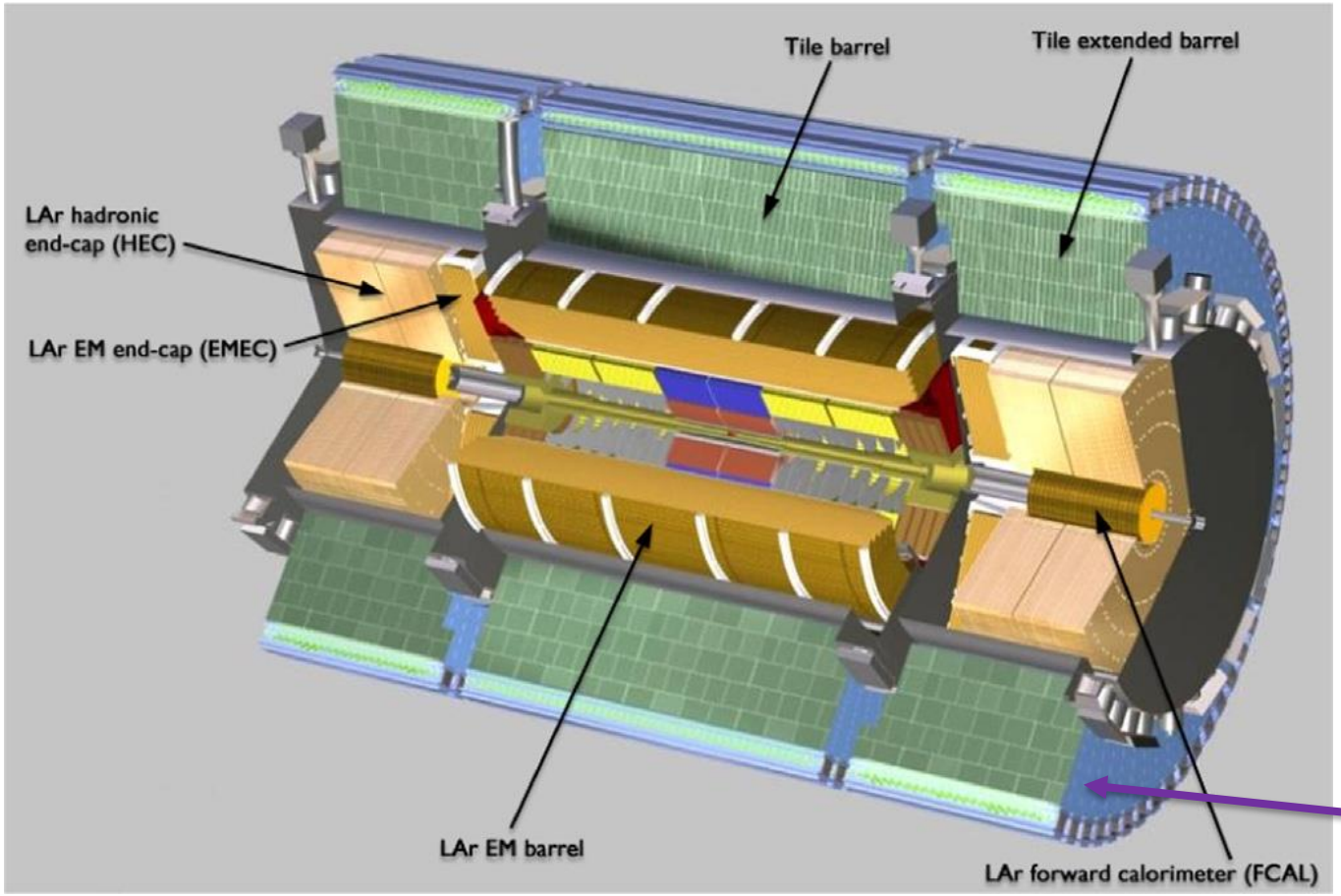
Common concerns for power system design:

- B-field and radiation tolerance
- Distribution architecture
- Redundancy
- Behavior during a power cut
- Reliability and access
- Cooling
- etc ..

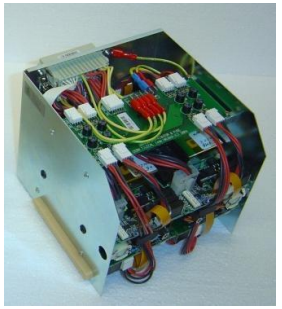
ATLAS & CMS calorimeter power systems:

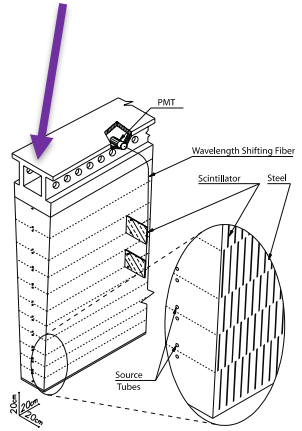
- Very different realizations of LV systems
- Architecture is remarkably similar

ATLAS Calorimetry



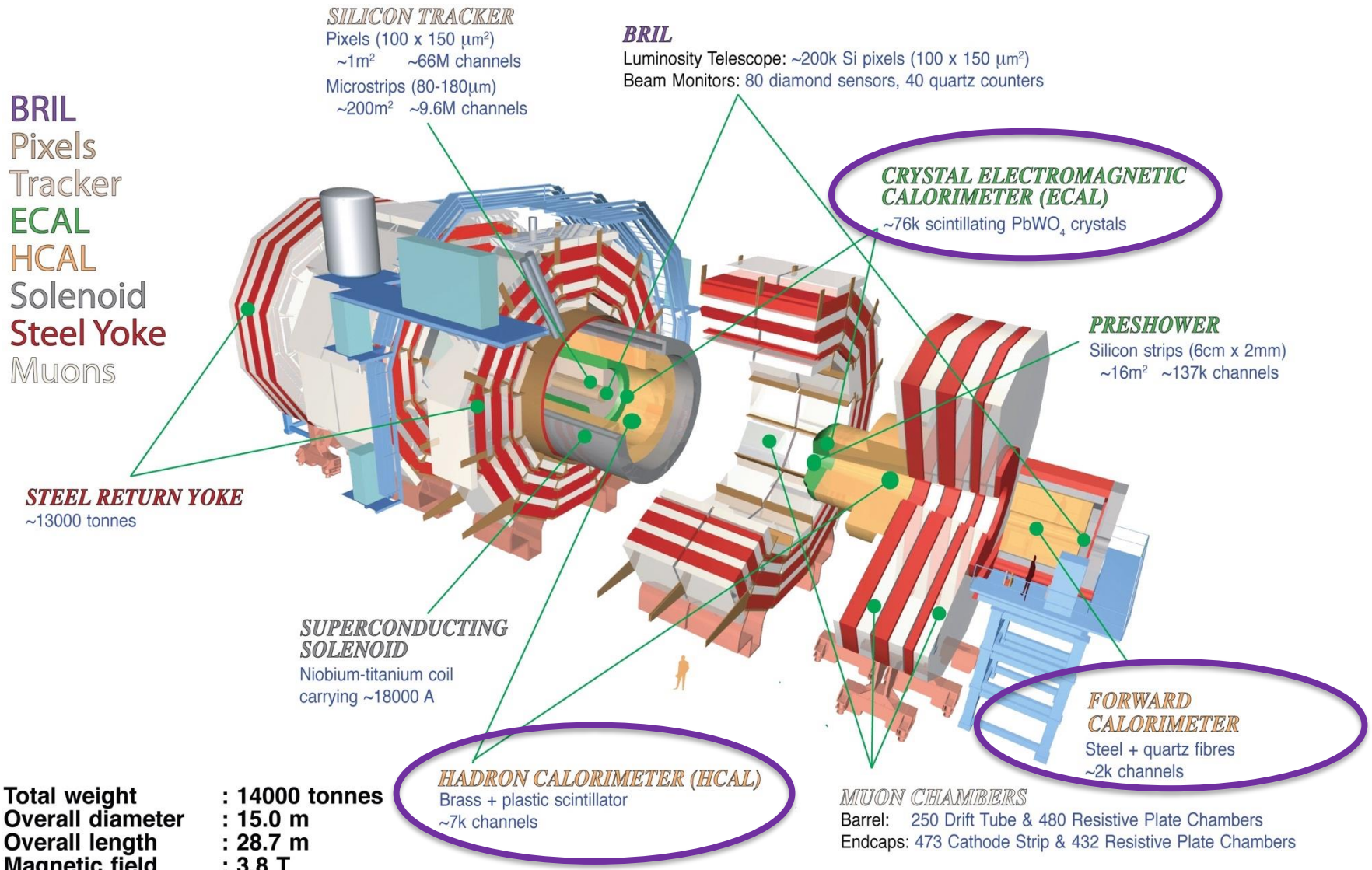
Finger LVPS



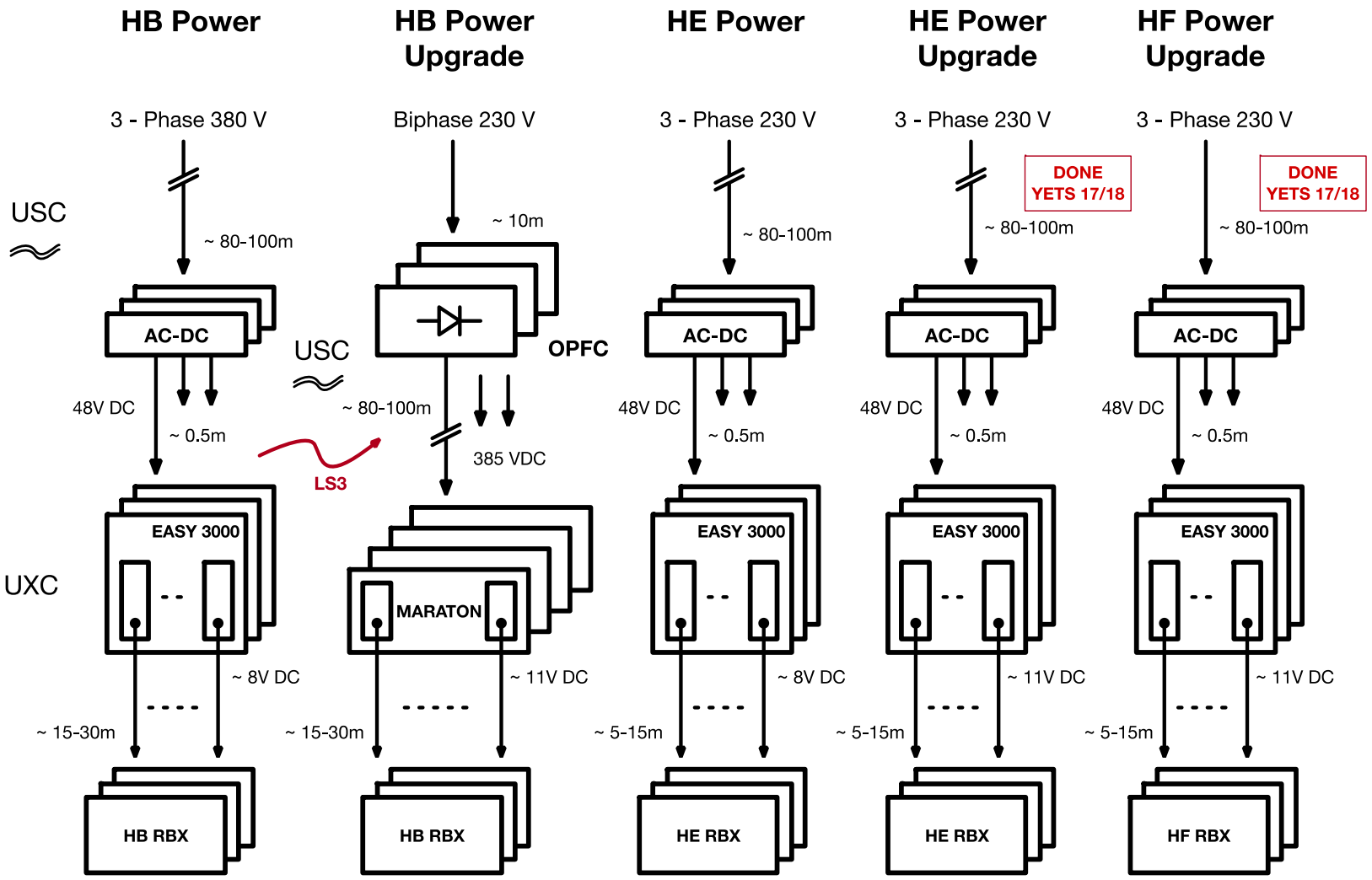


Tile Calorimeter Wedge

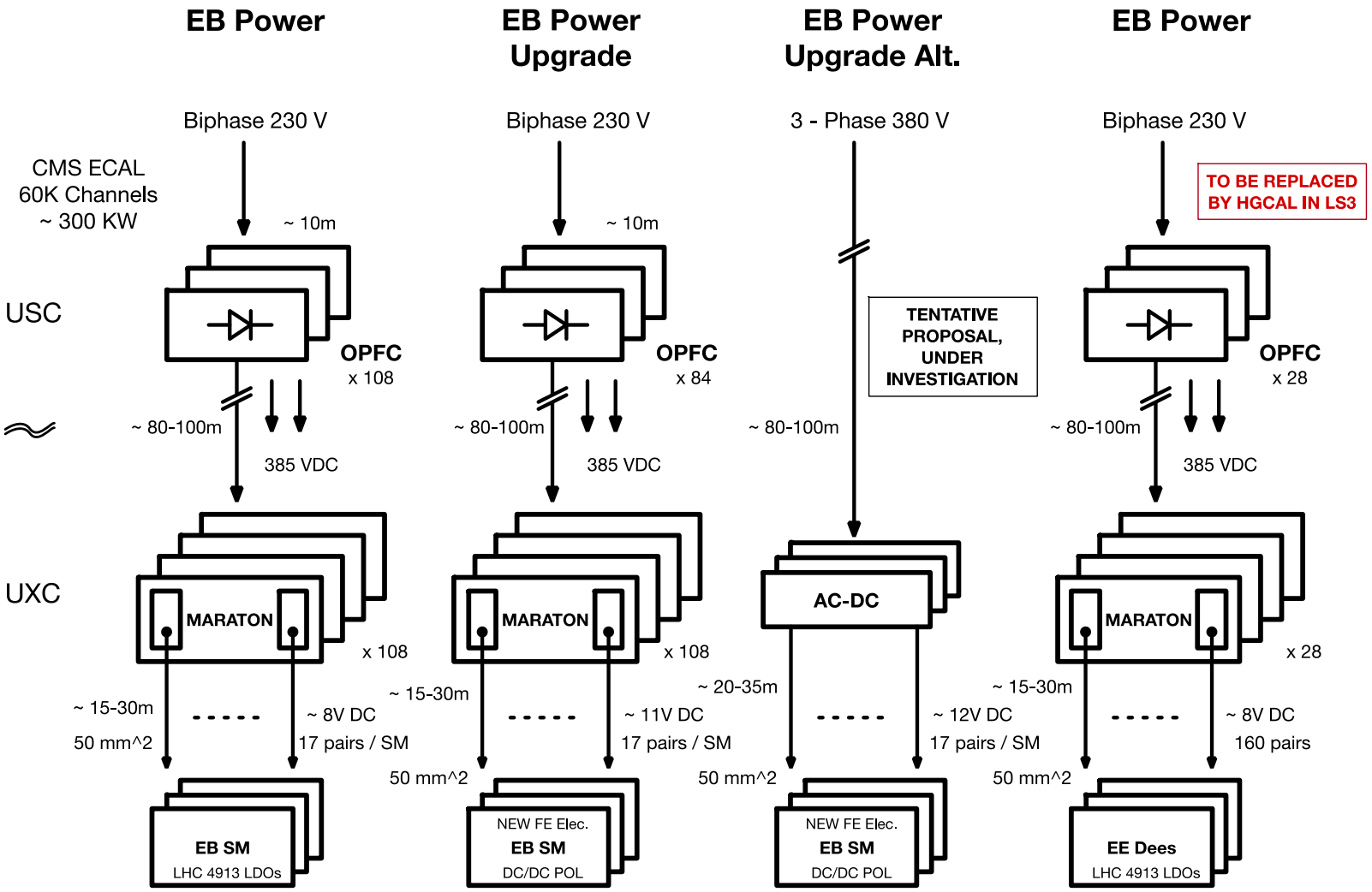
CMS Calorimetry



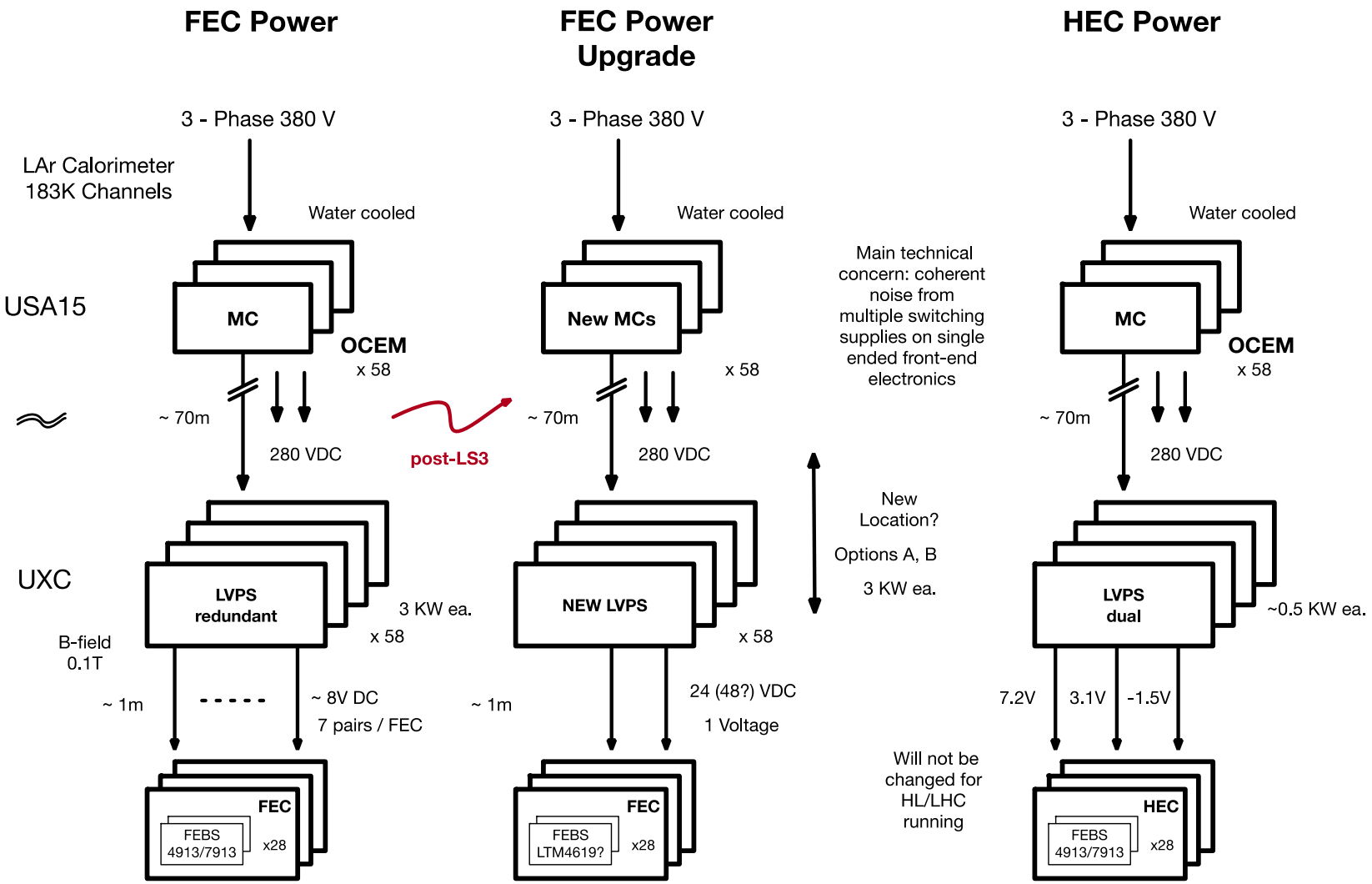
CMS HCAL


HB Power
HB Power Upgrade
HE Power
HE Power Upgrade
HF Power Upgrade
3 - Phase 380 V
Biphase 230 V
3 - Phase 230 V
3 - Phase 230 V
3 - Phase 230 V
DONE YETS 17/18
DONE YETS 17/18
USC
~ 80-100m
~ 10m
~ 80-100m
~ 80-100m
~ 80-100m
AC-DC
OPFC
48V DC
~ 0.5m
~ 80-100m
385 VDC
LS3
EASY 3000
MARATON
UXC
~ 8V DC
~ 11V DC
~ 15-30m
~ 15-30m
~ 5-15m
~ 5-15m
~ 11V DC
HB RBX
HB RBX
HE RBX
HE RBX
HF RBX

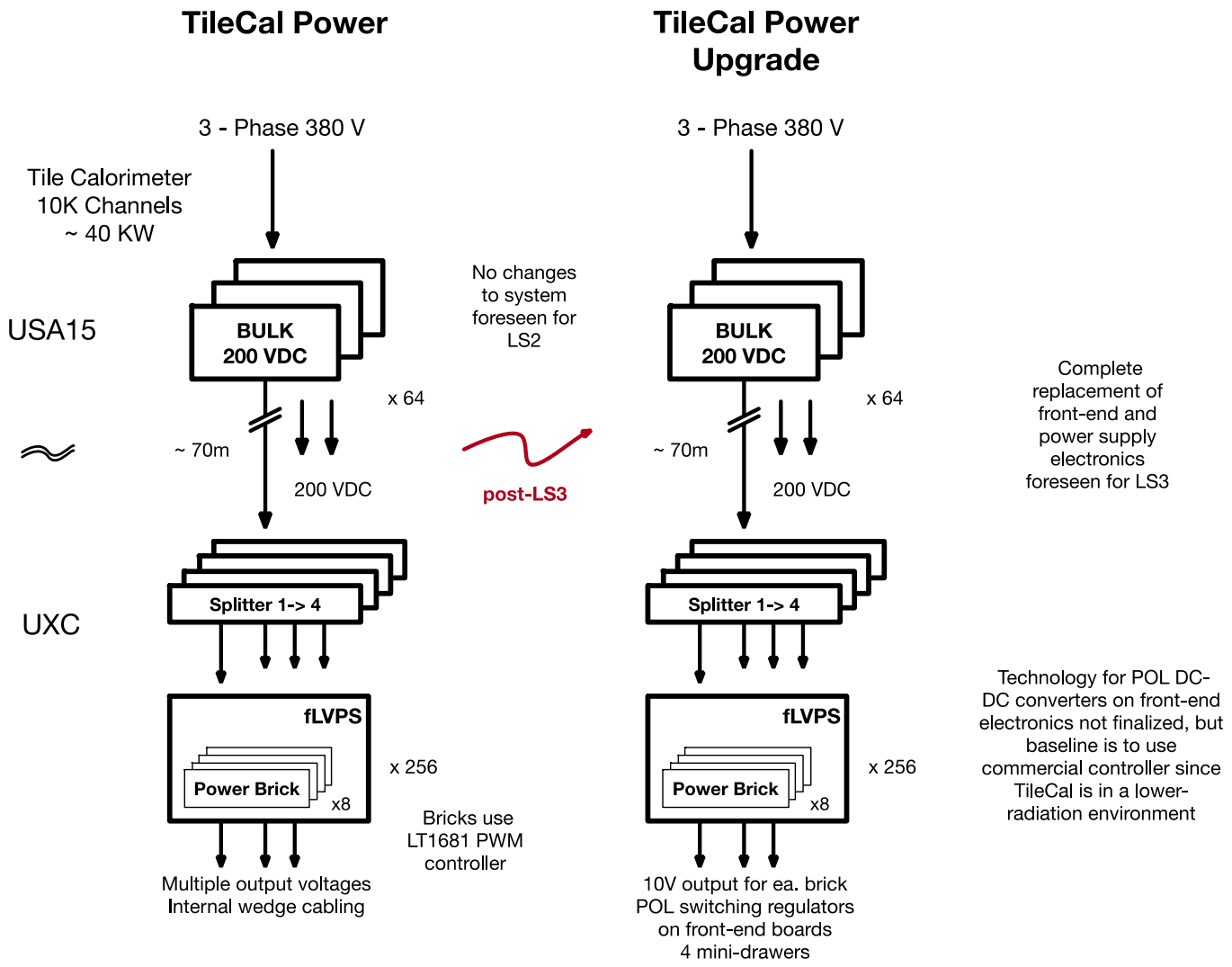
CMS ECAL


EB Power
EB Power Upgrade
EB Power Upgrade Alt.
EB Power
Biphase 230 V
Biphase 230 V
3 - Phase 380 V
Biphase 230 V
CMS ECAL
60K Channels
~ 300 KW
TO BE REPLACED BY HGCAL IN LS3
~ 10m
~ 10m
USC
OPFC
x 108
OPFC
x 84
TENTATIVE PROPOSAL, UNDER INVESTIGATION
OPFC
x 28
~ 80-100m
~ 80-100m
~ 80-100m
~ 80-100m
385 VDC
385 VDC
385 VDC
UXC
MARATON
x 108
MARATON
x 108
AC-DC
MARATON
x 28
~ 15-30m
~ 8V DC
50 mm^2
17 pairs / SM
~ 15-30m
~ 11V DC
50 mm^2
17 pairs / SM
~ 20-35m
~ 12V DC
50 mm^2
17 pairs / SM
~ 15-30m
~ 8V DC
50 mm^2
160 pairs
EB SM
LHC 4913 LDOs
NEW FE Elec.
EB SM
DC/DC POL
NEW FE Elec.
EB SM
DC/DC POL
EE Dees
LHC 4913 LDOs

ATLAS LAr Calorimeter



ATLAS Tile Calorimeter



Summary …

ATLAS & CMS power distribution architecture is quite similar, but hardware is very different

- ATLAS LAr: custom-made LV supplies, fit into detector gaps on the calorimeter
- ATLAS TileCal: custom-made LV supplies, fit into end of drawer at edge of each calorimeter wedge
- CMS ECAL & HCAL: commercial electronics mounted in racks on periphery of detector

DC-DC converters on front-end electronics are a repeating theme in upgrade plans

- Access to DC-DC converters will be even more difficult than for current LAr and TileCal LV supplies
- Guaranteeing DC-DC converter reliability is essential for success of HL-LHC data-taking