Connection to the CERN Power System of the TT2 mercury target project

by

Karsten KAHLE
(TS-EL)

Characteristics of the load

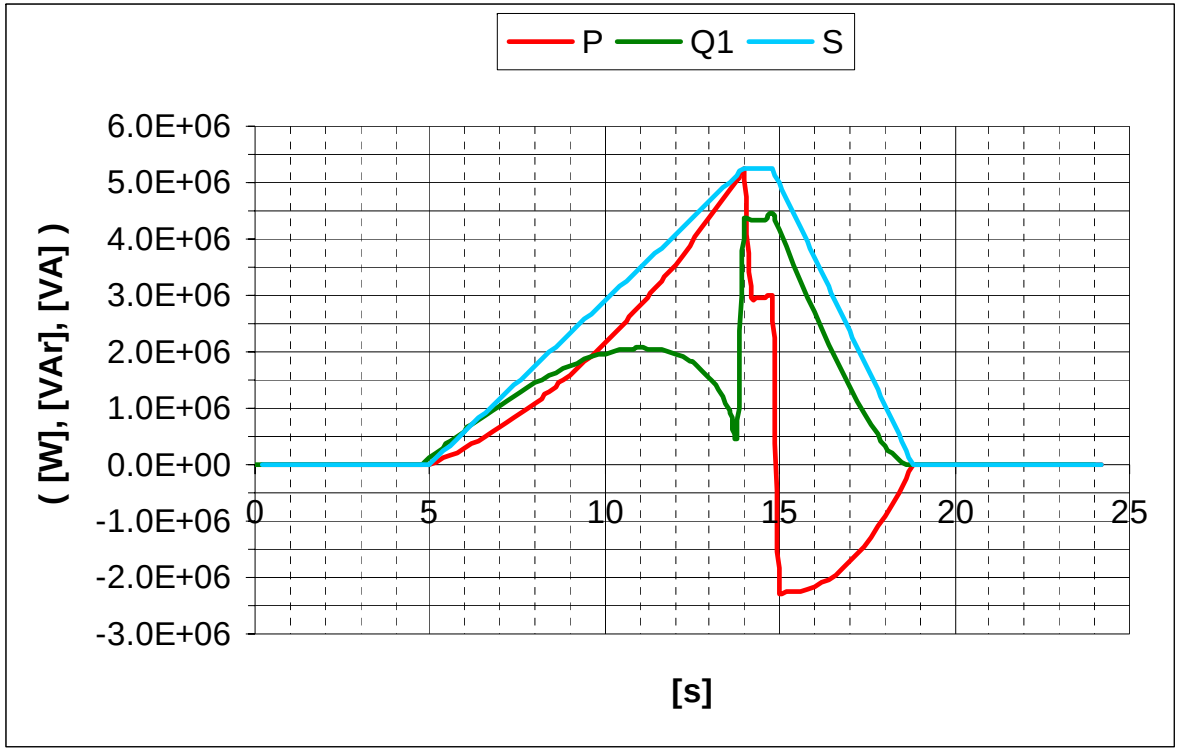
- ***repetitive Voltage Disturbances on 18 kV level***
  - due to pulsating load
  - related to reactive power consumption
  - disturbances seen by other users at CERN

- ***Reactive Power consumption (130 kV and 400 kV networks)***
  - impact on power losses
  - impact on rating of electrical equipment
  - impact on CERN electricity costs

- ***Harmonics***
  - power converters have a specific harmonic spectrum
  - disturbing the sine-wave of 18kV bus voltage at CERN
  - disturbances seen by other users at CERN

Characteristics of the load

- power pulses (1 pulse every 30 min)



P – active power

Q – reactive power

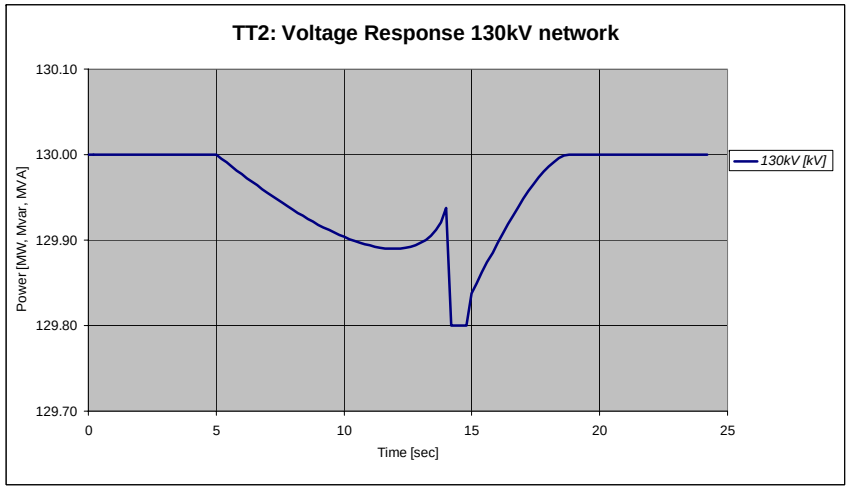
S – apparent power

Peak value = 5.5 MVA, RMS = 0.5 MVA (thermal rating)

Characteristics of the load

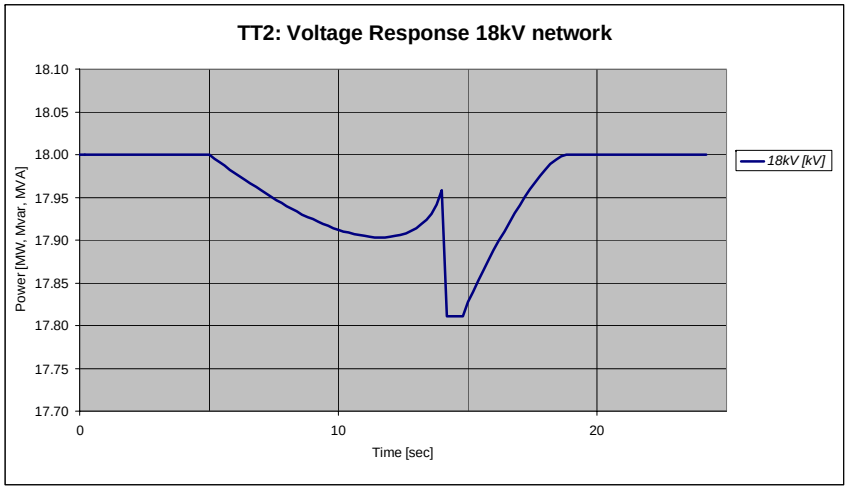
- voltage disturbances (once every 30 min)

130 kV: delta U = 0.15 %



OK

18 kV: delta U = 1.1 %



OK (once every 30min)

- ***Commissioning period***
- ***Operation***

- ***during commissioning:***
  pulses 50% once every 10 min

Characteristics of the load

- Reactive Power Consumption

- no reactive power compensation (comes from 130 kV / 400 kV network)
- RMS value is low (one pulse every 30 min)
- short duration of the experiment (2 years): no counter measures
- our energy contract is adapted (we pay nothing for reactive power)
- if no compensation: AC equipment rating needs to be 150 %
- if no compensation: power losses increase slightly

Conclusion: No Problem.

Characteristics of the load

- Harmonics

- 12-pulse power converters
- typical harmonics 550, 650, 1150 and 1250 Hz
- low harmonic distortion
- in addition: harmonic filtering for Meyrin at JURA substation

Conclusion: No Problem.

Building 193 (18 kV station ME49)

Existing 18 kV cubicle

Existing transformer pit

TS-EL work

Scope of supply and budget

-18 kV cubicle (cubicle existing, but new protection)	*10 kCHF*
-18 kV AC cabling	*10 kCHF*
- LV AC cabling	*20 kCHF*
- DC cabling (cable routing difficult)	*40 kCHF*
- Engineering and Documentation	*15 kCHF*
SUBTOTAL (TS-EL):	*95 kCHF*
SUBTOTAL (AB-PO):	*110 kCHF*
TOTAL:	**205 kCHF**

Muon Collaboration

CERN

Questions?