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Developing Testing Facilities for Power Supply Interface Tests According to EN 300 132 Standards

Project schedule

1. Planning: Spring 2003
2. Developing the test methods: Summer & autumn 2003
3. Actual testing (pilot projects): October 2003
4. Reporting: Spring 2004

Contribution of the author:

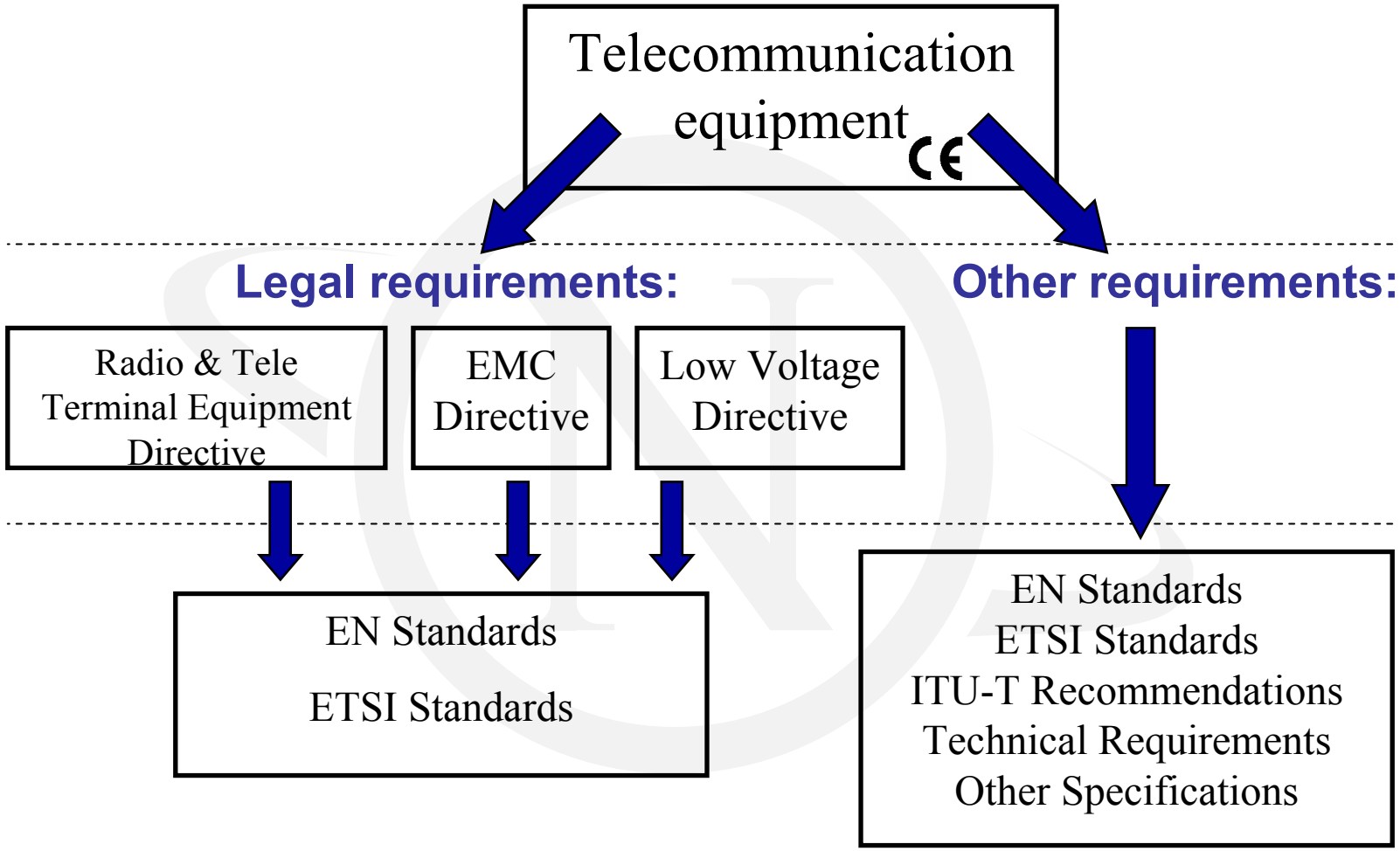
Almost everything has been performed by the author

Only some help from Nemko colleagues

Objectives of the study

1. Detail the appropriate requirements according to ETSI EN 300 132-2 V2.1.2 (2003) and ETSI EN 300 132-3 V1.2.1 (2003).
2. Develop the test methods and define the investments needed to perform all tests according to ETSI EN 300 132-2 V2.1.2 and ETSI EN 300 132-3 V1.2.1.
3. Conduct the testing in practice for one DC and AC equipment.

Requirements



ETSI EN 300 132 Standards

- Several different national network operator's requirements existed to ensure ability of telecommunication equipment to operate in telecommunication centres
- ETSI EN 300 132 series standards establish common requirements for Member States of EU
- Most Member States have endorsed EN 300 132 series standards

ETSI EN 300 132 Standards

Requirements for power supply interface at the input to telecommunications equipment:

- **ETS 300 132-1, September 1996**

  Operated by alternating current (AC) derived from direct current (DC) sources

- **ETSI EN 300 132-2 V2.1.2 (2003-09)**

  Operated by direct current (DC)

- **ETSI EN 300 132-3 V1.2.1 (2003-08)**

  Operated by rectified current, AC or DC source up to 400V

ETSI EN 300 132 Standards

Requirement	Part 1	Part 2	Part 3
Nominal voltage / frequency	X	X	X
Normal service voltage range	X	X	X
Abnormal serv. voltage range	X	X	X
Voltage changes due to regulation of PSU / voltage	X	X	–
Supply protection	X	X	X
Maximum current drain	–	X	X
Surge current on connection of interface	X	X	X
Conducted immunity requirements	–	X	–
Conducted emission requirements	–	X	–

X = Applicable

– = Not applicable

Developing testing facilities

- **Nemko Oy had already the most expensive measuring equipment, e.g. measuring receiver, audio analyzer, digital oscilloscope and signal generator**
- **Some investments and components were missing and they had to be acquired or constructed**

Developing testing facilities

- **Normal service voltage range:**

  -40.5 … -57.0V DC (ETSI EN 300 132-2)

  188Vrms … 375Vp (ETSI EN 300 132-3)

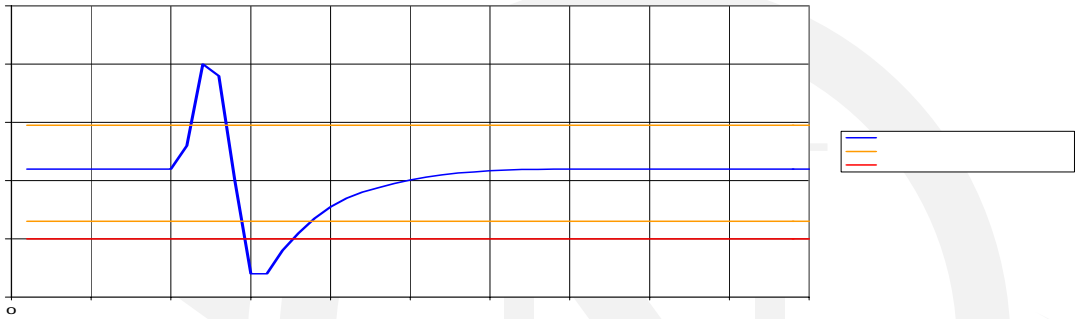
- **Abnormal service voltage range:**

  0 … -40.5V DC, -57.0 … -60.0V DC (ETSI EN 300 132-2)

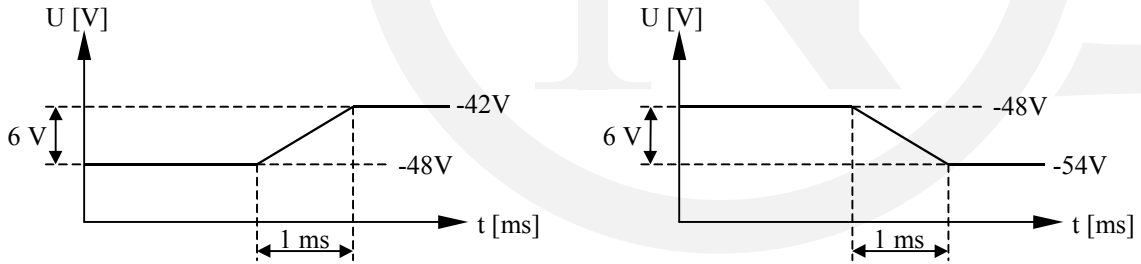
  0 … 188Vrms (ETSI EN 300 132-3)

Developing testing facilities

- **Voltage transients (ETSI EN 300 132-2)**

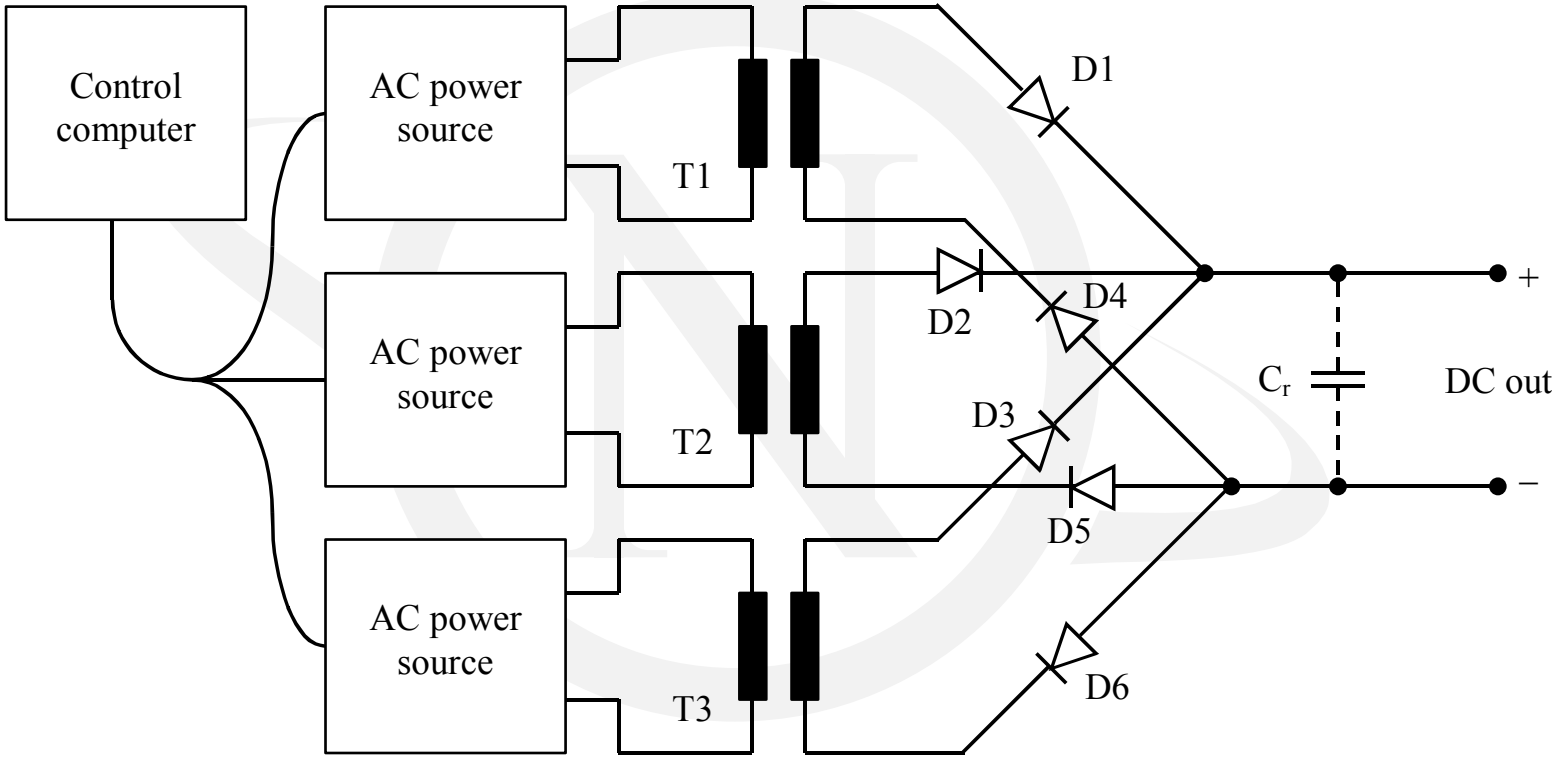


- **Voltage changes due to regulation of the PSU**



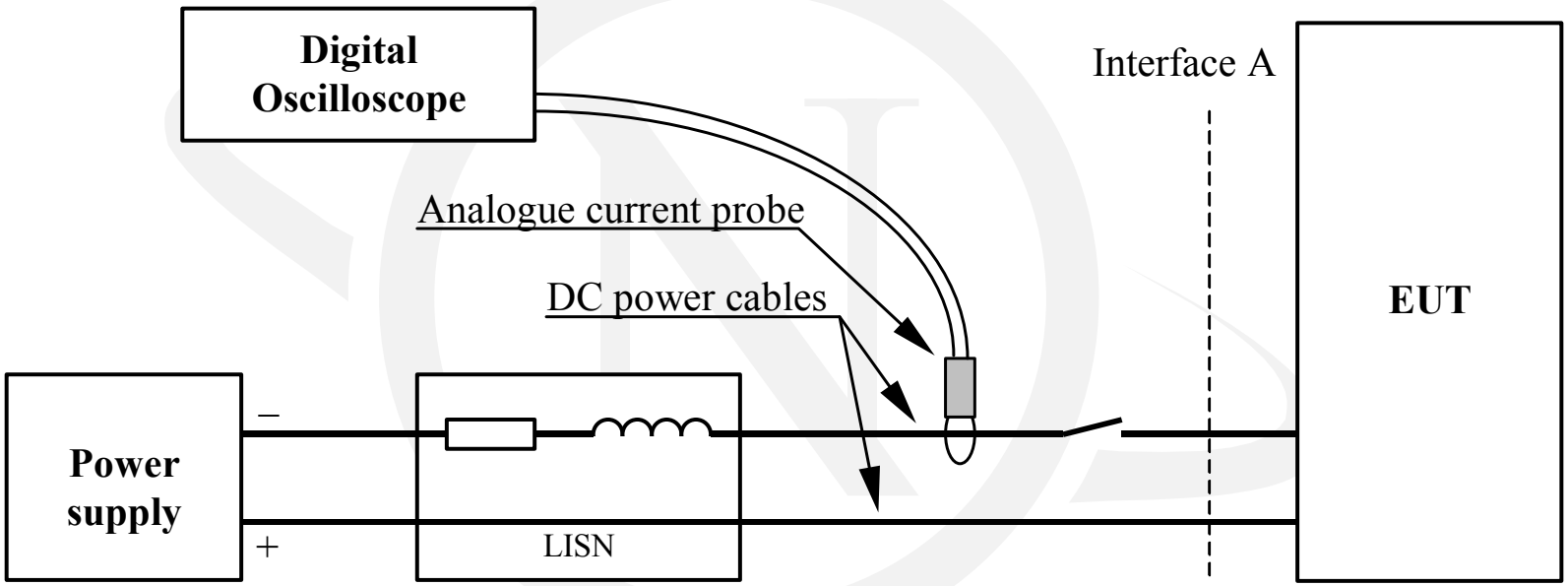
Developing testing facilities

- **AC/DC 6-pulse diode rectifier:**



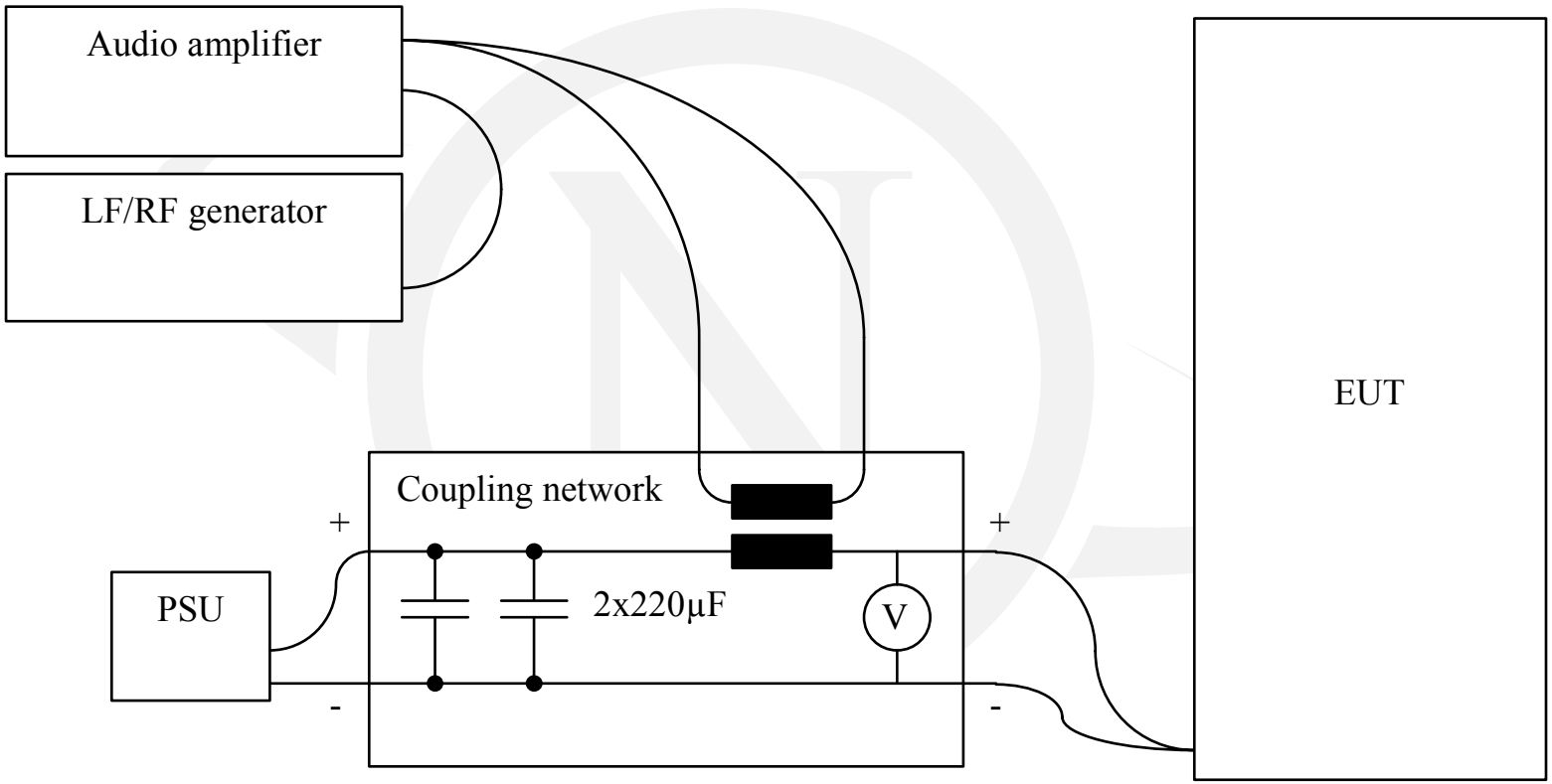
Developing testing facilities

- **(Maximum current drain) and surge current on connection:**



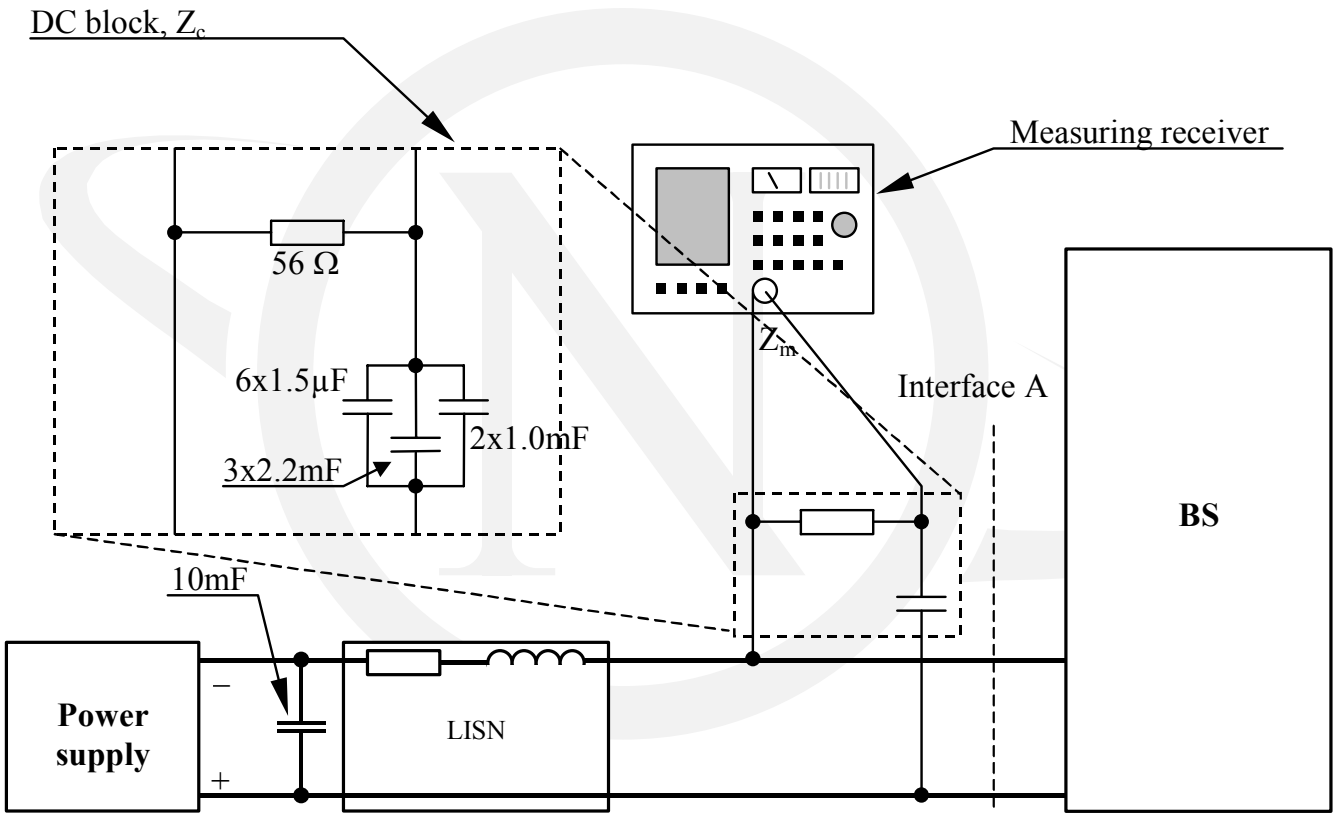
Developing testing facilities

- **Conducted immunity**



Developing testing facilities

- **Conducted emissions**



Pilot projects

- **One AC and one DC powered equipment was tested**
- The equipment under test (EUT) was a 3G Base Station
- The rated current for the DC powered option (-48 V) was 80 A DC
- The rated current for the AC powered option (230 V) was 20 Arms

Conclusions

- **Requirements from standards were quite clear, however, some issues were missing**
- Duration and magnitude of voltage transients are not defined and they were not found anywhere
- Exact values of limits for surge current on connection were not found; only graphs from stds were available

Conclusions

- **Needed investments ~2000 EUR**
- Six-pulse rectifier
- RF (BNC-, N-type) connectors
- Passive components, DC connectors, conductors, circuit board
- Fuses (100A, 160A & 200A)

Conclusions

- **Testing facilities & methods were developed, with a good success**
- Too low change speed in voltage changes (DC)
- Too high voltage drop in surge current on connection, when testing the DC powered BS
- Too high test level in conducted immunity test

Conclusions

- **Both AC and DC powered BSs were tested**
- AC powered BS passed all tests
- DC powered BS passed all tests except conducted emissions of broadband noise
- It has been argued, that the slight deviations in testing methods do not affect the test result

Further areas of study

- Command order for the programmable power sources needs to be changed ➔ higher change speed of DC
- Considering alternative power feeding applications
- More accurate test arrangement for conducted immunity testing. More accurate measuring of disturbing signal, feedback and control of the signal level is needed.

Thank you for your attention !

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