Tel-Aviv metro M2

ElectroMagnetic emission of metro systems

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Statements of NTA on EM Fields

- NTA's assumptions on power supply
- systems power supply = DC
- power is rectified from AC 50 Hz to DC
- rectification causes minor AC ripple
- magnitude of ripple current = 13.6 Amps
- causes magfield of 0.4 mG at 17 m distance
- does not hurt environment

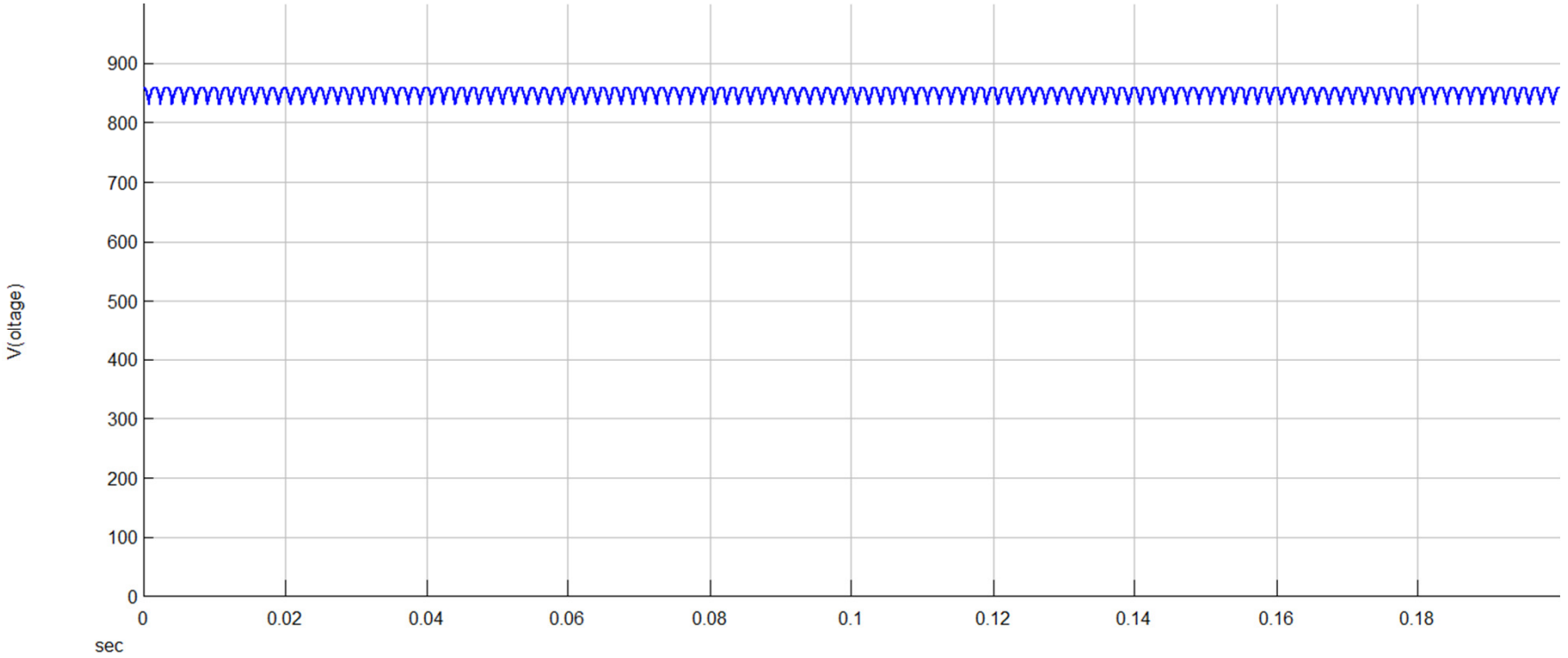
The basics of metro power supply

- Q1: are the calculations OK?
- Q2: are the input assumptions right?
- Murphy's lawbook: garbage in = garbage out
- A1: calculations are simplified OK
- A2: input assumptions are totally wrong !

Power supply and currents

- MagFields: look at currents not voltages
- PS Systems: called DC (no-load voltage)
- currents are not at all DC
- cause: behaviour of vehicles' drive systems
- electronic switching power converters
- currents vary by many Amps
- currents vary at extremely low frequencies
- makes University instruments disfunction!

The NTA image of traction power

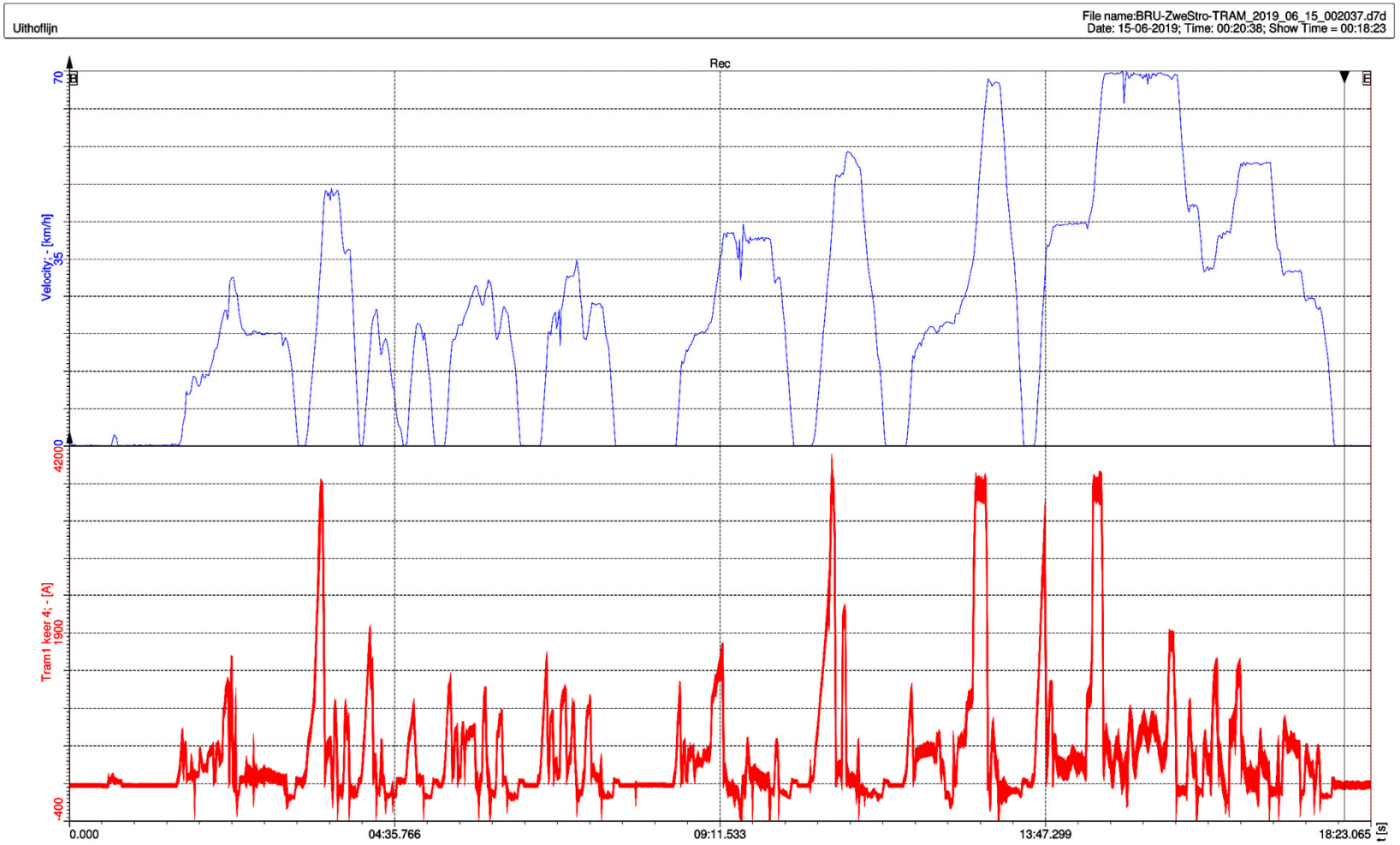


- DC 750 V system (840 V – no load voltage)
- 12 pulse rectifier – 600 Hz ripple

What is wrong with that?

- constant voltage ≠ constant current
- depends on behaviour of load (trains)
- load = drive systems
- with switching power electronics + motor
- load = auxiliaries
- with electronic converters
- etc., etc.

The hard reality: trains



Trains

- top graph: velocity over time
- bottom graph: current over time
- current changes dramatically
- from hundreds to many thousands of Amps
- in a matter of a couple of seconds
- generating associated changes of MagField
- remember: MagField is linear with current!

Measurements at University

- NTA's measurements on University sites
- present situation: not representative
- ambient MagField: not representative
- measurements above 30 Hz: useless
- levels compared to ICNIRP guidelines
- guidelines are for humans, not instruments
- measurements report supports calculations

Conclusions

- NTA misunderstands train electronics
- wrongly assumes constant (DC) current
- estimates Magfield much too low
- reality is 300 times worse than NTA figures
- recommendation: revise calculations
- recommendation: forget the measurements