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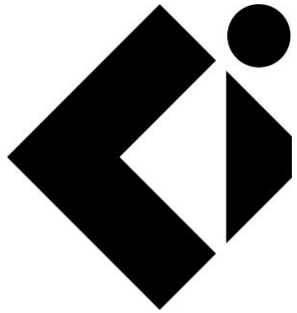

Ki Cordless Kitchen implementation aspects

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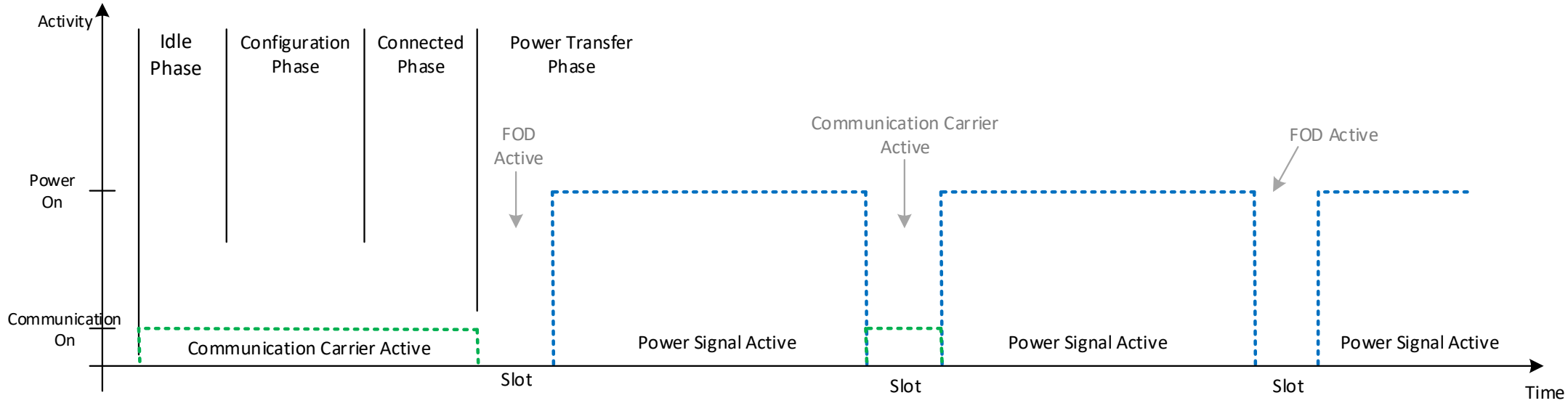
Content

- Slots during connected phase
- Pre-power system characterization
- Power mode storage
- Proposals for KWG and MP/Kitchen specification editing team

Slots during connected phase

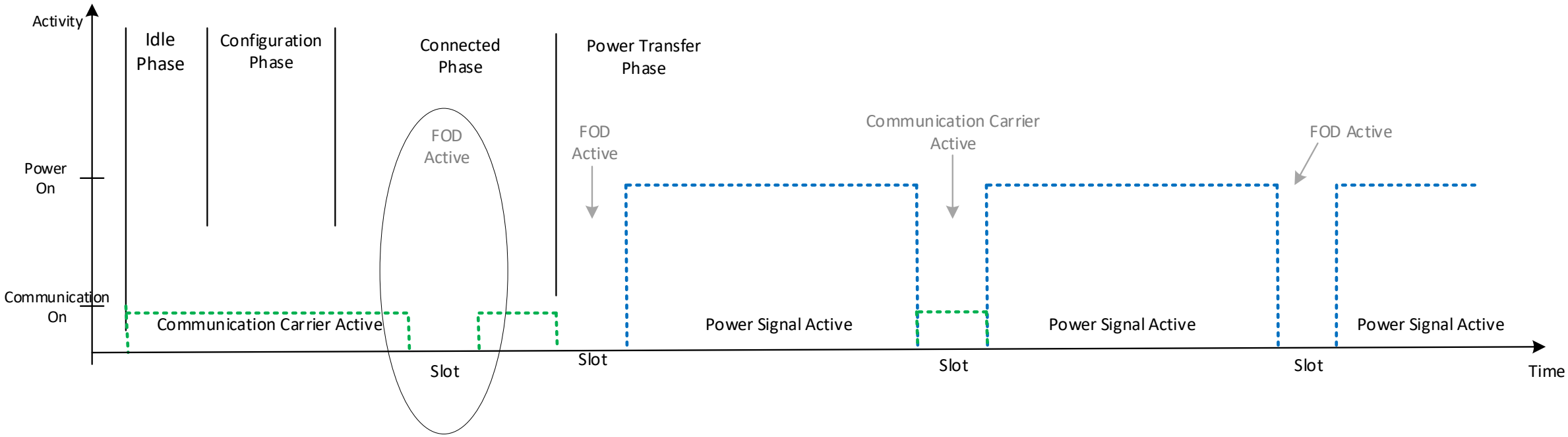
Slots in connected phase – problem statement

- The user can activate the kitchen appliance a long time after the appliance placed on the cooktop
- During waiting for activation, the system is in the connected phase
- No FOD is performed in connected phase
- In current configuration, user is not aware of FO presentence before appliance activation



Slots in connected phase - solution

- Communication signal interruption during the Connected phase for FOD
- Periodical slots during the connected phase give real-time feedback of FOD presence to the user



Pre-power system characterization

Startup power – the problem statement

Different startup conditions are required:

- Wide range of supported appliance (Juicer 20W , Airfryer 1000W, Water kettle 2200W)
- Wide range of coil inductances
- Wide range of coupling factors

In which operating point should the inverter start?

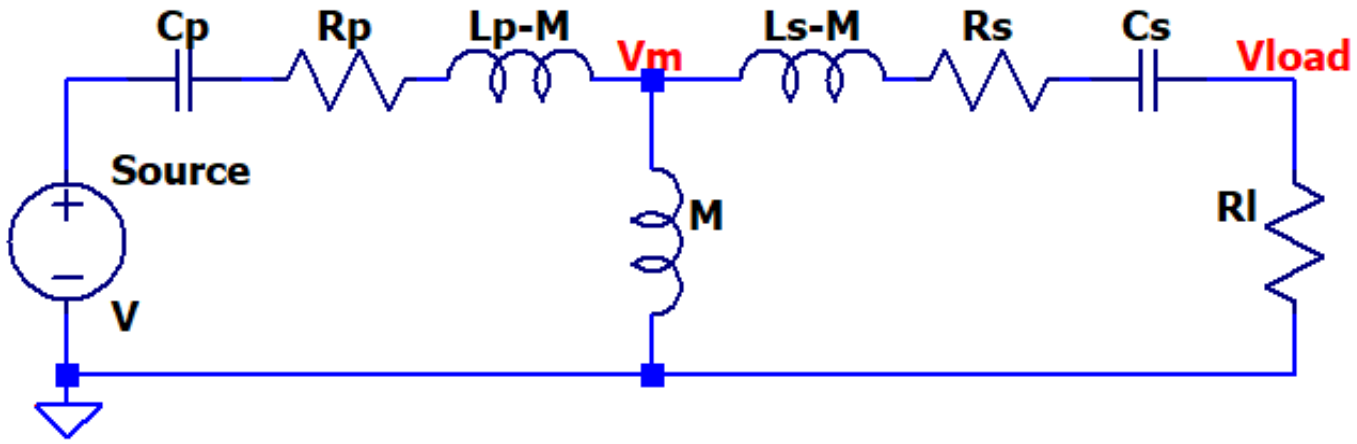
- Which frequency, voltage, duty-cycle, burst-mode
- Enough power should immediately be delivered to the receiver
- Control error is only relative value

System characterization – Modeling

Parameters to estimate operating point:

Static data:

- Frequency range
- Inductance values
- Resonant frequency
- Startup load/power/current/voltage



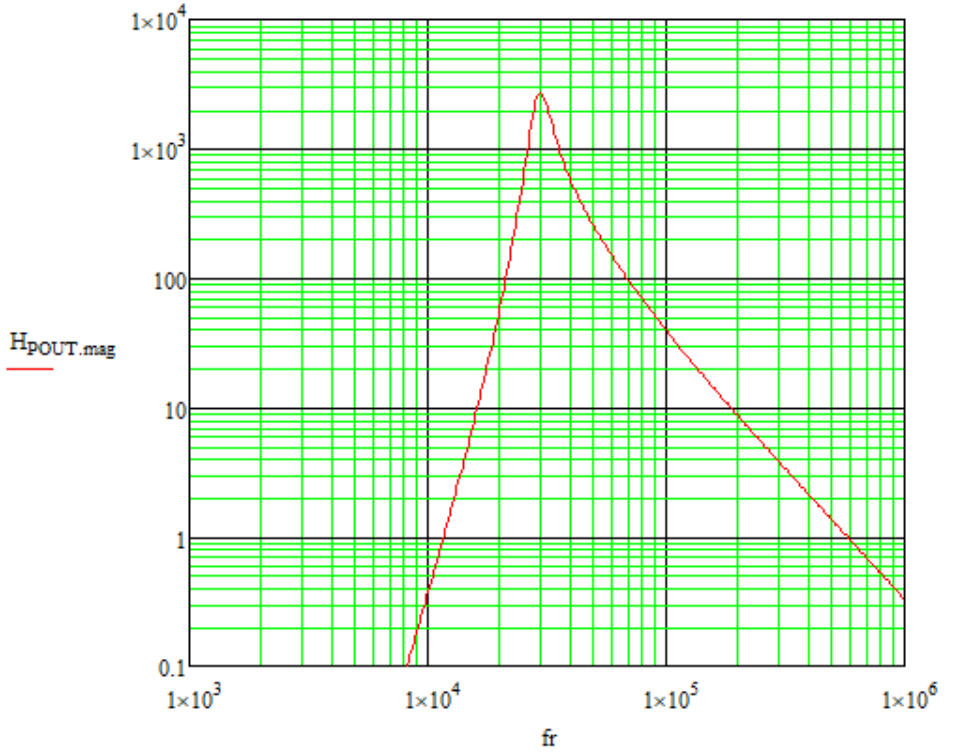
Most parameters are known!

Measured or estimated:

- Coupling factor / Z-distance

System characterization – Proposal

- Before power transfer:
  - PRx sends static parameter and desired startup power level to PTx
  - PTx determines residual parameters
  - PTx calculates optimal operating point
- PTx starts a power transfer with calculated control parameters
- Normal control loop takes over



Example power transfer function

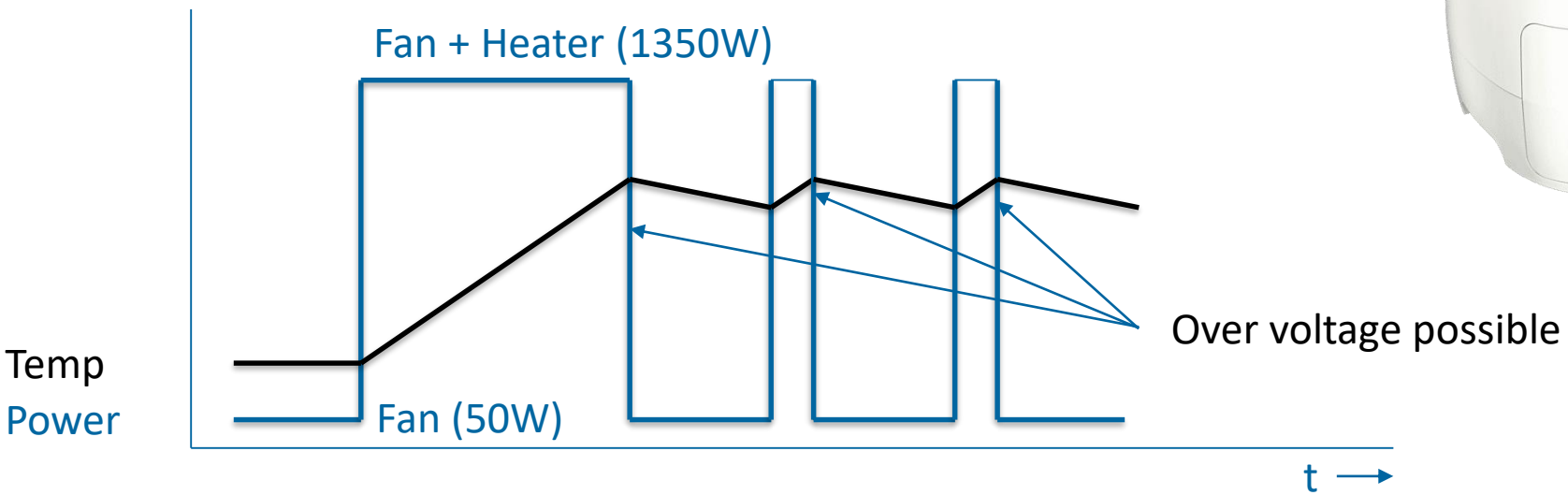
Power mode storage

From WPC1901: Power mode storage

PRx devices that generate big load changes (e.g. switching on/off loads) will generate under or over voltages at the PRx. Under voltages are typically handled well, but overvoltage situations can cause problems.

To overcome these problems the PRx can save (in the PTx) a specific power setting of the PTx without knowing the details.

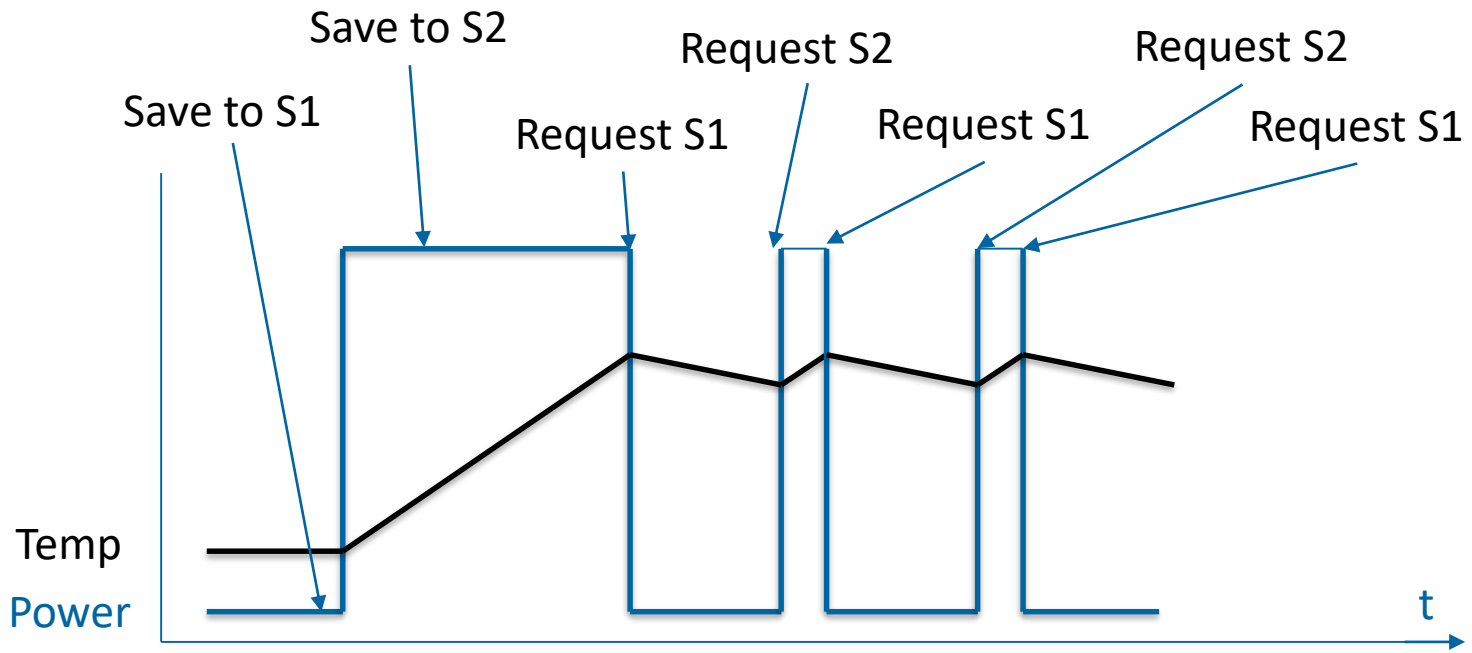
As an example we take PRx device with a fan and a heating element:



Power mode storage – the solution

1) PRx regulates the power to sustainable power level
2) PRx sends a request to store the power mode to PTx
3) PRx sends a request to PTx to restore a previous stored operating mode
4) PTx acknowledges the power setting and changes to the requested operating point
5) After power mode is changed, the control loop takes over

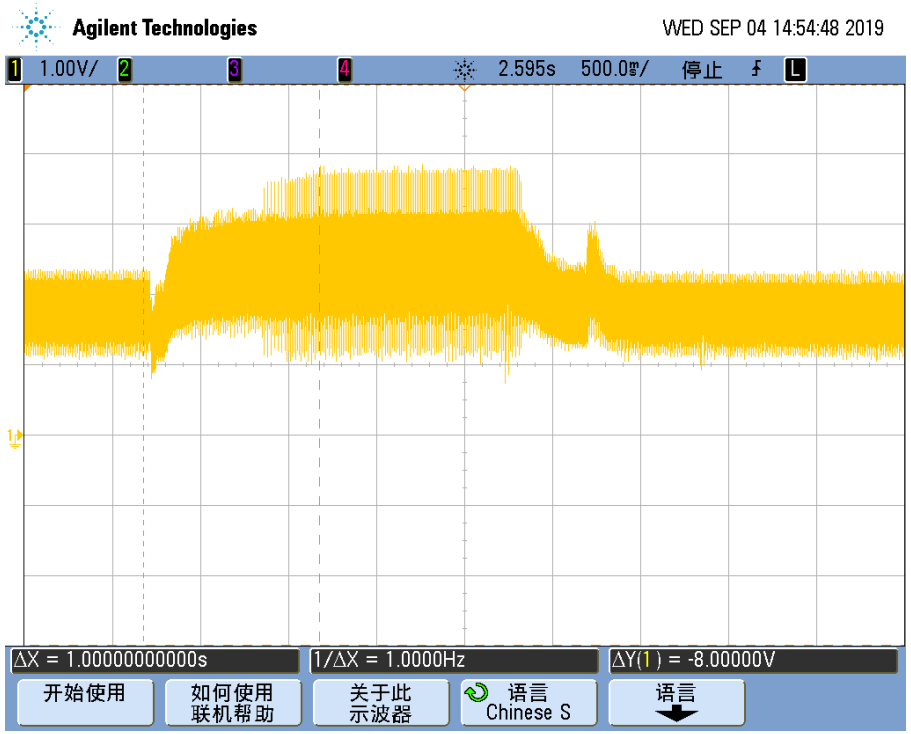
SRQS message presented @WPC1901 was implemented



Power mode storage – Implementation

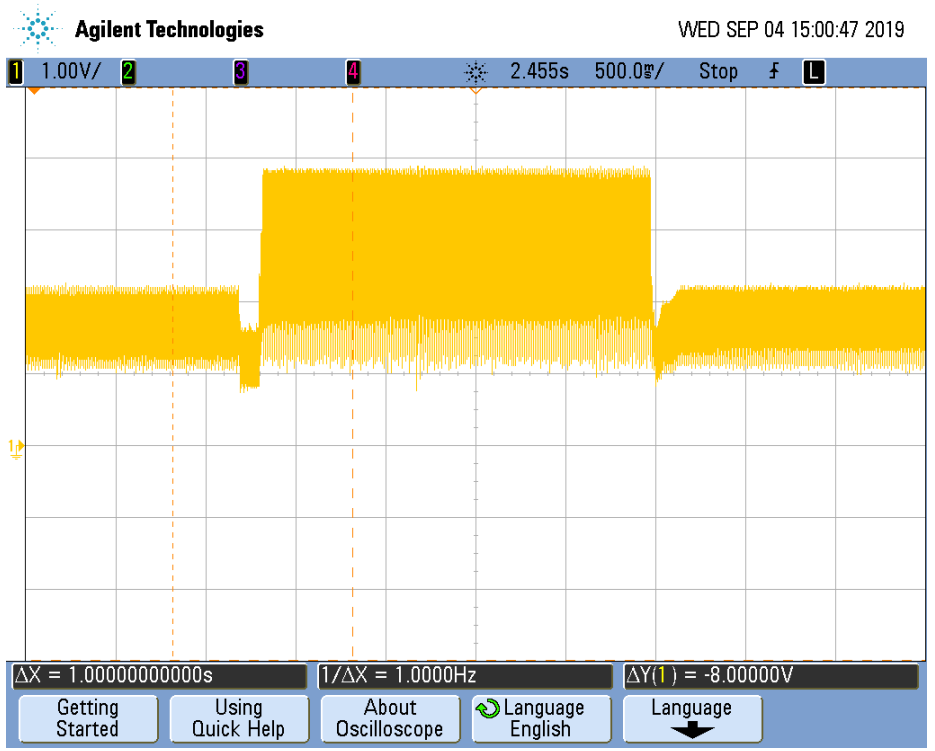
Control without SRQS command:

- Slow transition between load steps
- Overvoltage or overcurrent can occur



Control with SRQS command:

- Fast transition between load steps
- The voltage error is greatly reduced



Proposals for KWG and MP/Kitchen specification editing team

Proposal for KWG

Discus implementation of “Initial operating point estimation”

Proposal for MP/Kitchen spec editing team

Implement:

- Pre-power slot during connected phase
- SRQS message in Chapter 6 of MP/Kitchen
- “Power state record” and “Power state restoring” to Chapter 7 of MP/Kitchen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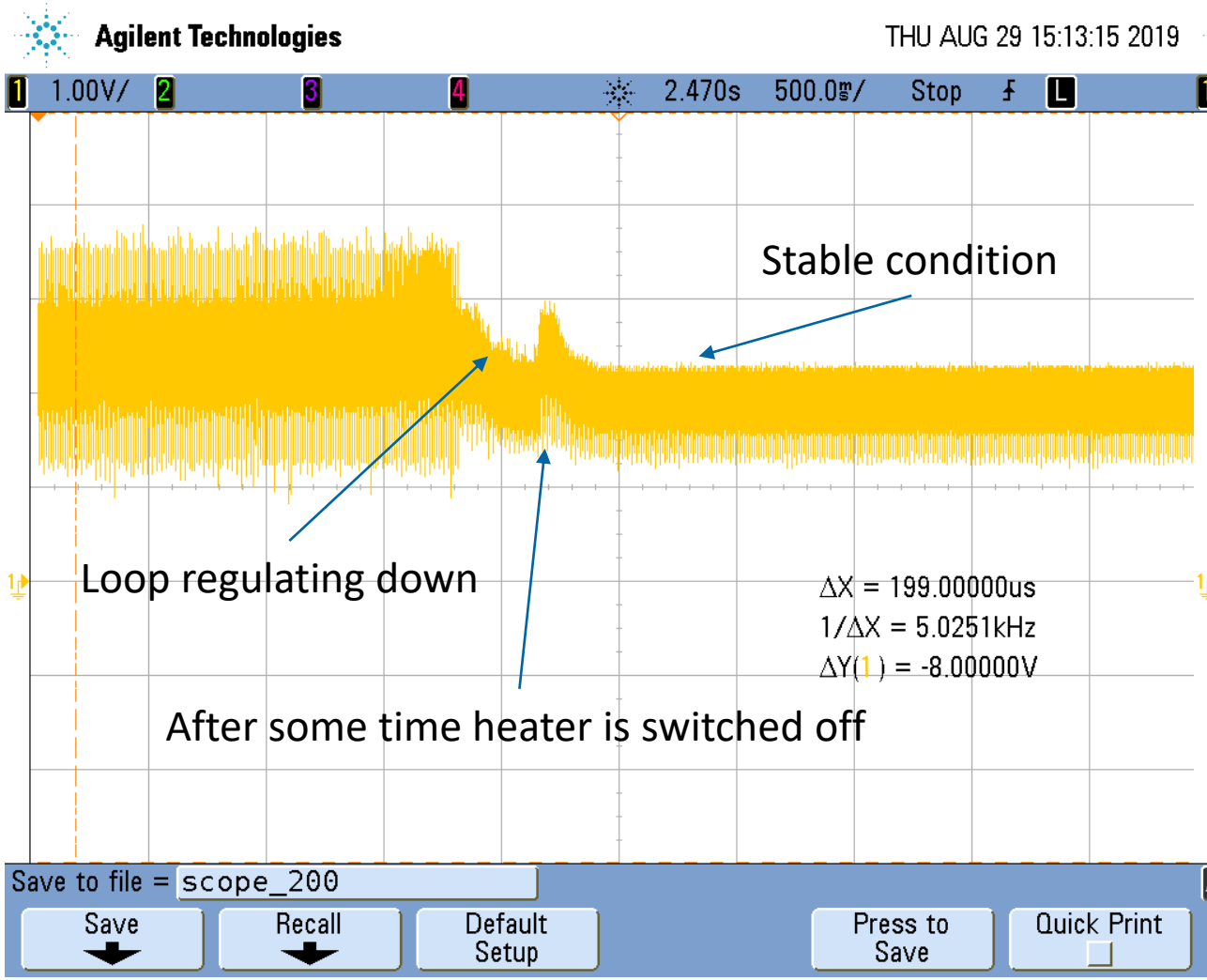
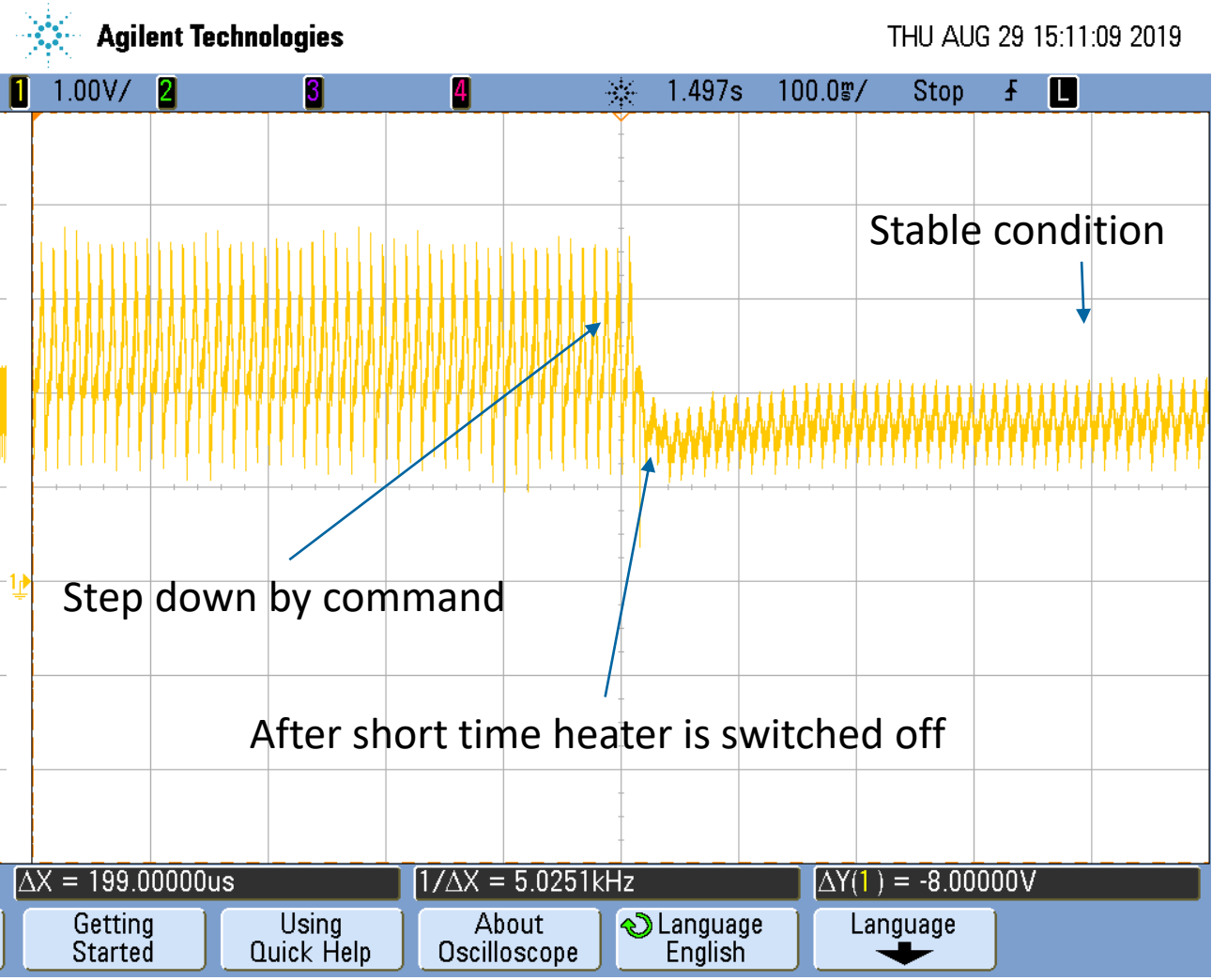
Power mode storage – Implementation details





Power mode storage – Implementation details