Smoothing of the boundary conditions for OECD benchmarks of void- and transition boiling transients

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1. Void transients

The subject of this section is to provide smoothed boundary conditions for the following two experiments: Turbine trip without bypass and Recirculation pump trip. The 3000 experimental data points are transferred in other 3000 points by smoothing of 10 points with quadratic interpolation using ORIGIN software. The smoothed curves are presented below with red and the original data with black. The inlet temperatures are first smoothed by analytical function. The representative functions are also plotted with red.

List of the files:

Turb_trip_in_vel_smoothed.dat	Fig. 1 Time in s, inlet liquid velocity in m/s based on inlet cross section 9.464018364518E-03m².
Turb_trip_rel_power_smoothed.dat	Fig. 2 Time in s, Relative power, dimensionless based on 4.53MW.
Turb_trip_p_in_smoothed.dat	Fig. 3 Time in s, Inlet pressure in Pa.
Turb_trip_p_out_smoothed.dat	Fig. 4 Time in s, Outlet pressure in Pa.
Turb_trip_T_in_smoothed.dat	Fig. 5 Time in s, Inlet water temperature in K.
Pump_trip_in_vel_smoothed.dat	Fig. 6 Time in s, Inlet liquid velocity in m/s based on inlet cross section 9.464018364518E-03m².
Pump_trip_rel_power_smoothed.dat	Fig. 7 Time in s, Relative power, dimensionless based on 4.53MW.
Pump_trip_p_in_smoothed.dat	Fig. 8 Time in s, Inlet pressure in Pa.
Pump_trip_p_out_smoothed.dat	Fig. 9 Time in s, Outlet pressure in Pa.
Pump_trip_T_in_smoothed.dat	Fig. 10 Time in s, Inlet water temperature in K.

1.1 Void transients 4102-001~009, 4: Turbine trip without bypass

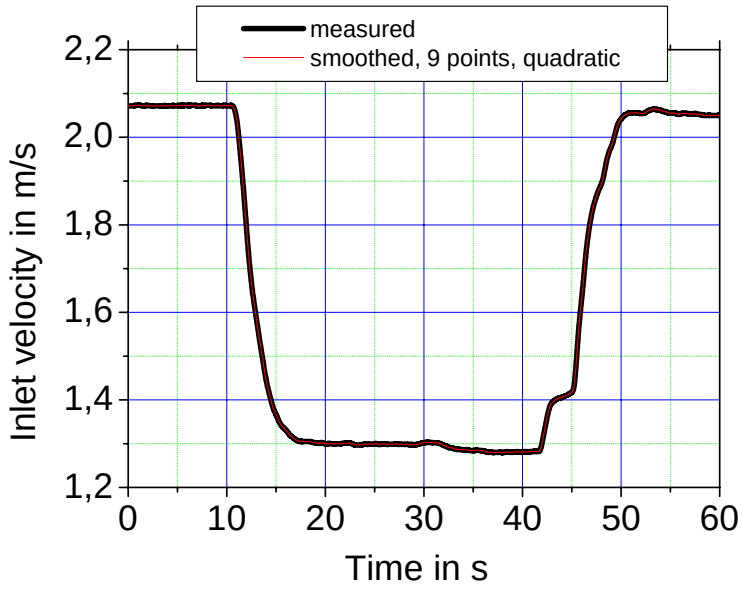

Fig. 1. Void transients 4102-001~009, 4: Inlet bundle velocity as a function of time.

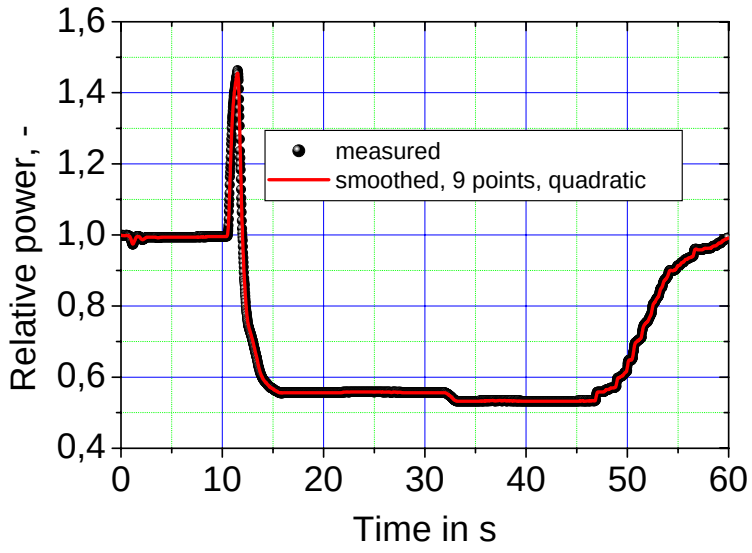

Fig. 2. Void transients 4102-001~009, 4: Relative power as a function of time

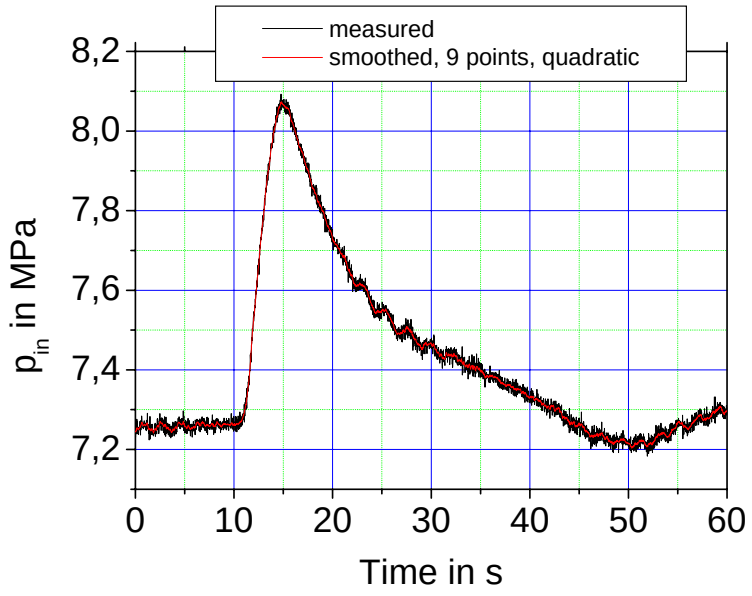

Fig. 3. Void transients 4102-001~009, 4: Inlet pressure as a function of time

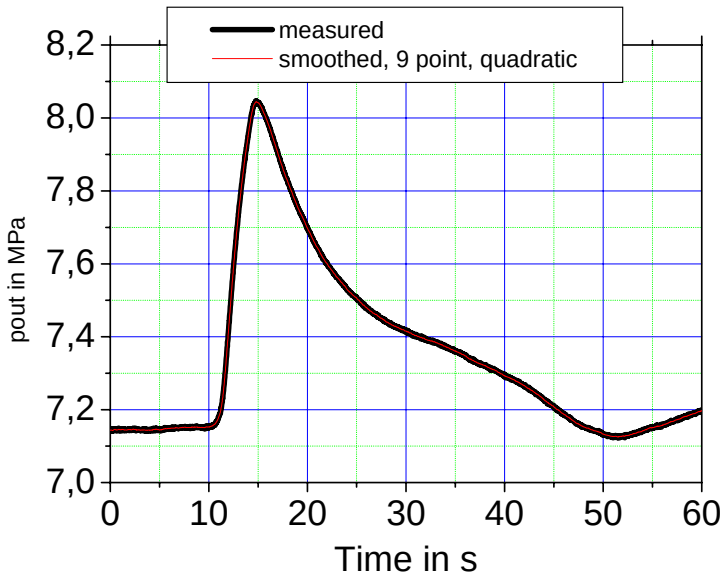

Fig. 4. Void transients 4102-001~009, 4: Outlet pressure as a function of time

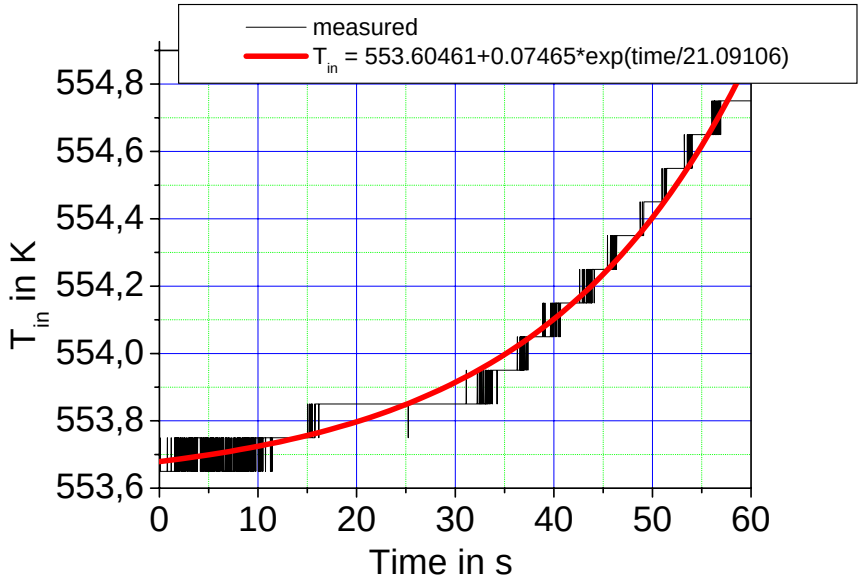

Fig. 5. Void transients 4102-001~009, 4: Inlet water temperature as a function of time

1.2 Void transients 4119-001~027, 4: Recirculation pump trip

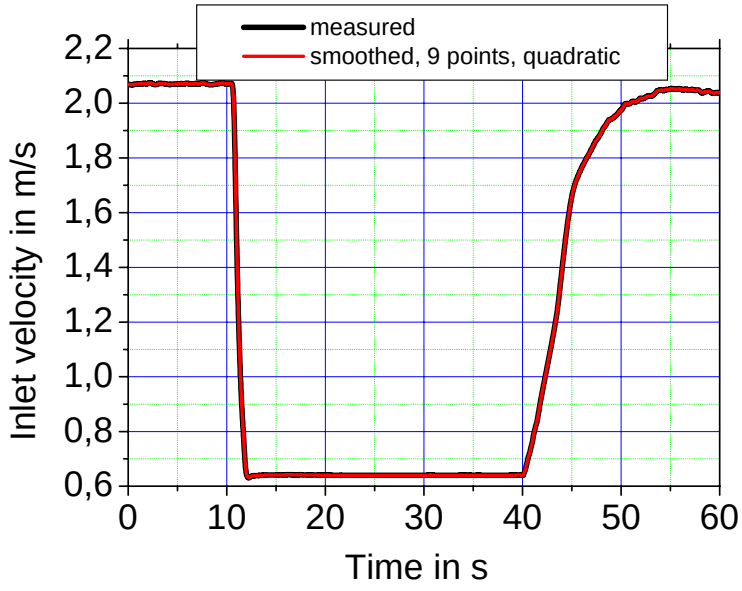

Fig. 6. Void transients 4119-001~027, 4: Inlet bundle velocity as a function of time.

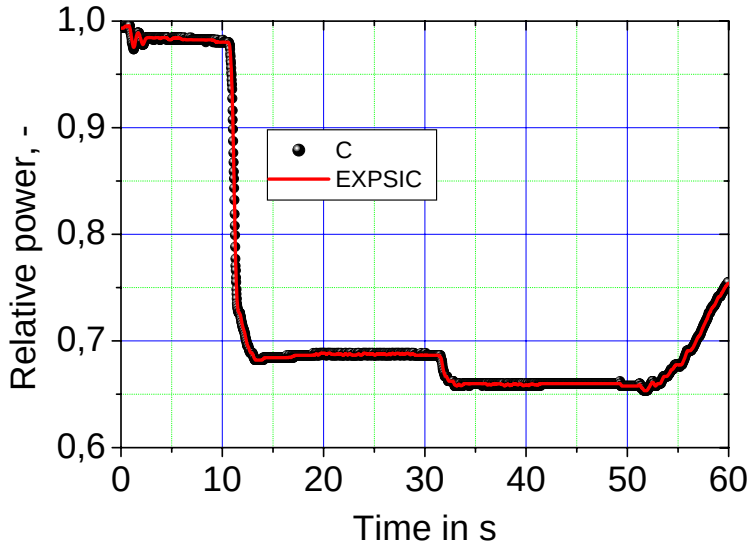

Fig. 7. Void transients 4119-001~027, 4: Relative power as a function of time

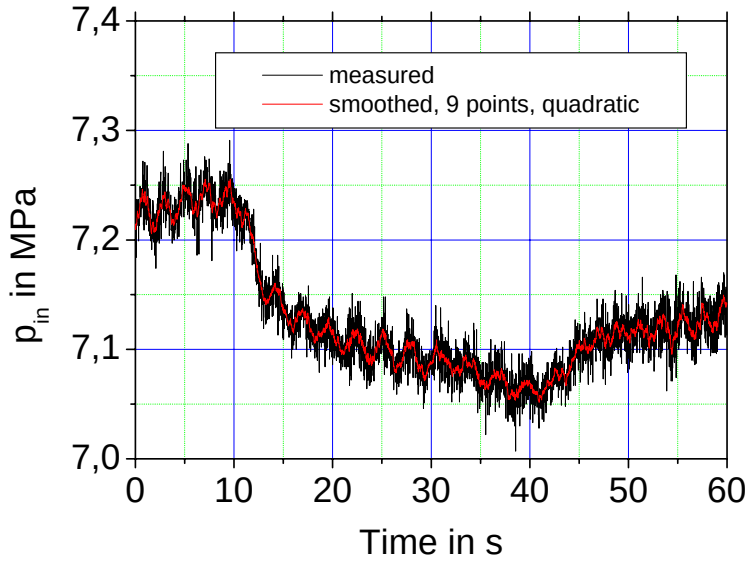

Fig. 8. Void transients 4119-001~027, 4: Inlet pressure as a function of time

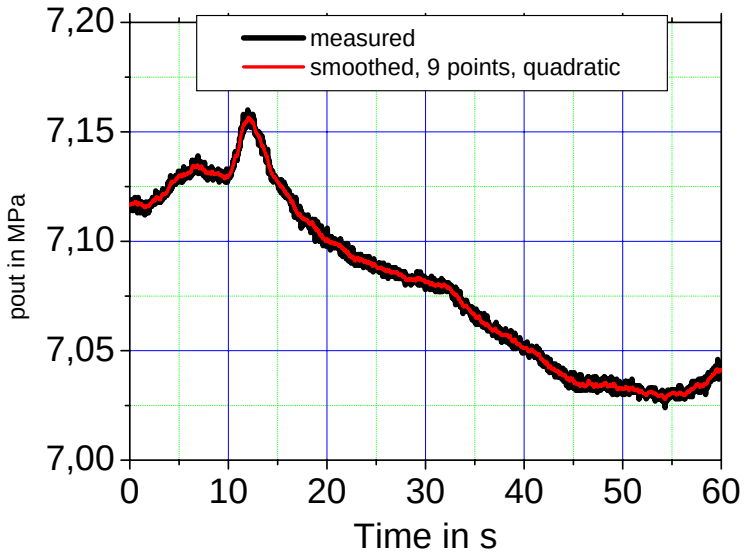

Fig. 9. Void transients 4119-001~027, 4: Outlet pressure as a function of time

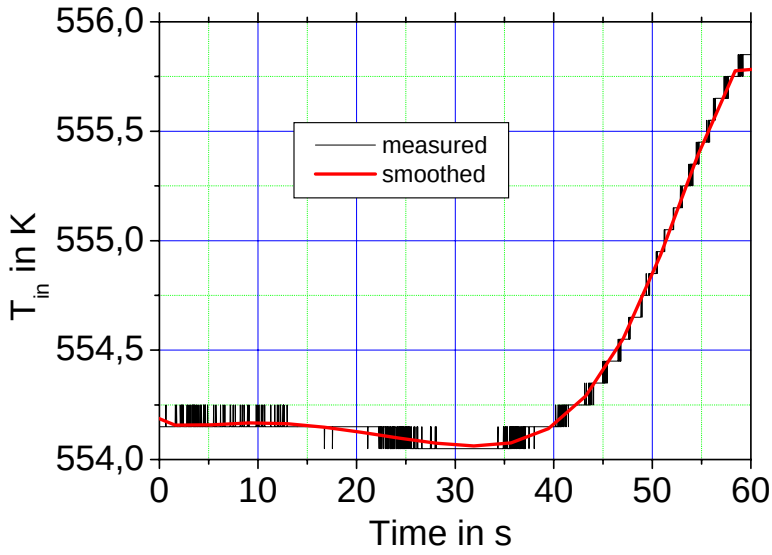

Fig. 10. Void transients 4119-001~027, 4: Inlet water temperature as a function of time

$$Y = A + B1*X + B2*X^2 + B3*X^3 + B4*X^4 + B5*X^5 + B6*X^6 + B7*X^7$$

A	554,17211
B1	-0,01447
B2	0,00386
B3	-3,97207E-4
B4	1,99305E-5
B5	-5,48544E-7
B6	7,88051E-9
B7	-4,46389E-11

2. Boiling transition

The subject of this section is to provide smoothed boundary conditions for the following four experiments: Turbine trip without bypass TGA10008, C2A; Recirculation pump trip TRA10012, C2A; Turbine trip without bypass TGC10018, C3; Recirculation pump trip TIC10012, C3. The experimental data points are smoothed for each 10 or 50 neighboring points using ORIGIN software. The smoothed curves are presented below with red and the original data with black.

2.1 Boiling transition TGA10008, C2A: Turbine trip without bypass

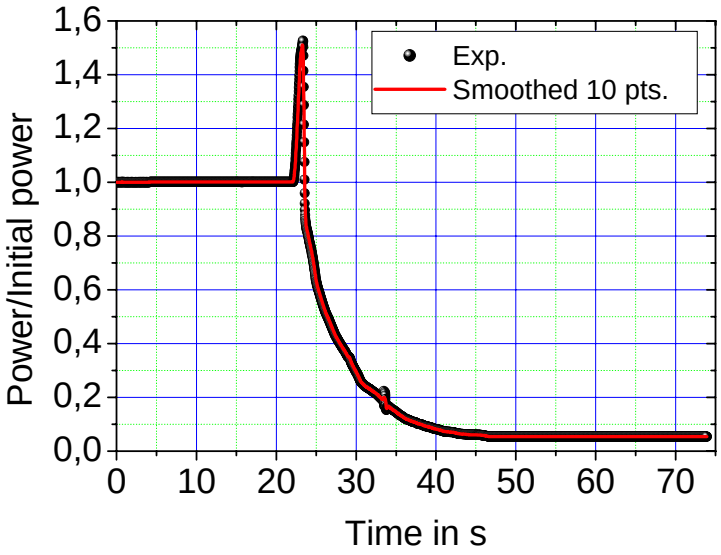

Fig. 11. Boiling transition TGA10008, C2A: Relative power as a function of the time. Initial power 7.035558 MW. Smoothed file: Power_10008.dat

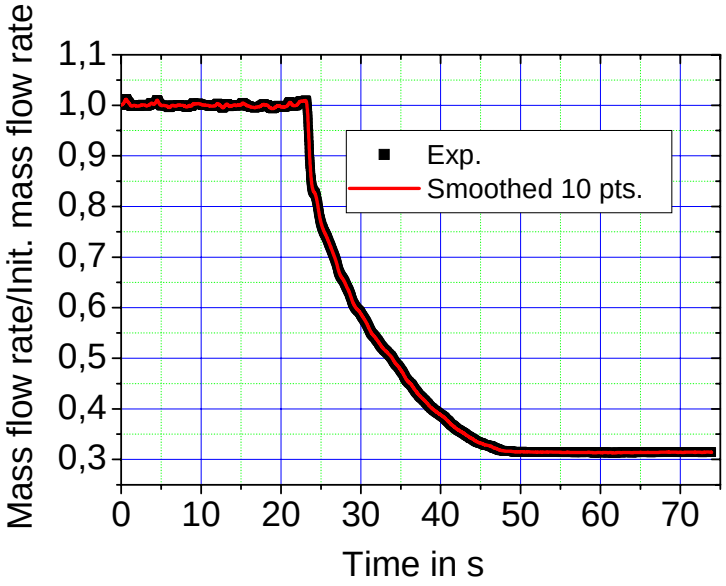

Fig. 12. Boiling transition TGA10008, C2A: Relative inlet volume flow rate as a function of the time. Initial volume flow 55.27m³/h. Smoothed file: Flow_rate_10008.dat

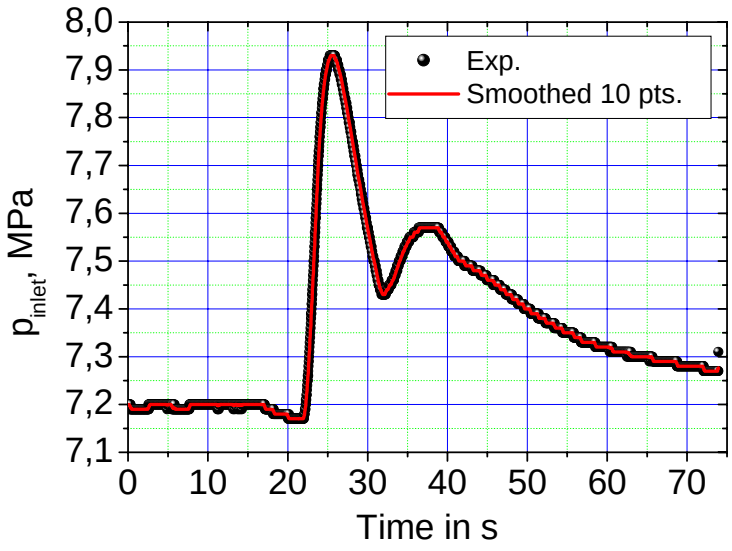

Fig. 13. Boiling transition TGA10008, C2A: Inlet pressure as a function of time. . Smoothed file: p_inlet_10008.dat

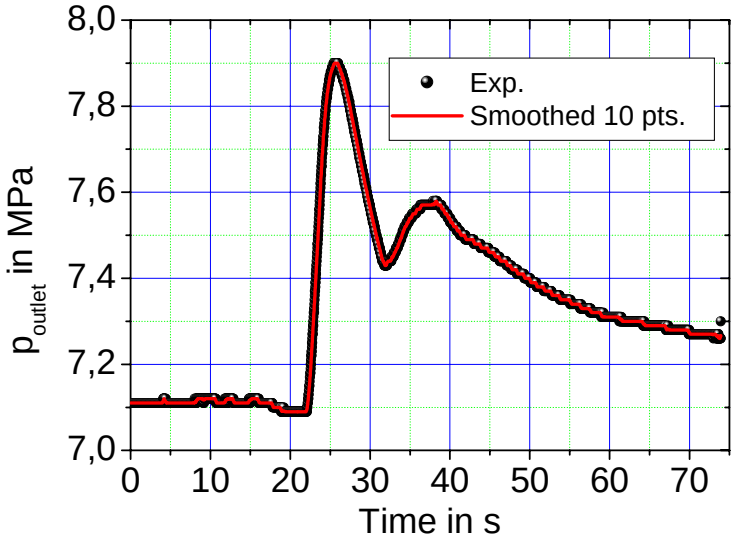

Fig. 14. Boiling transition TGA10008, C2A: Outlet pressure as a function of time. Smoothed file: p_outlet_10008.dat

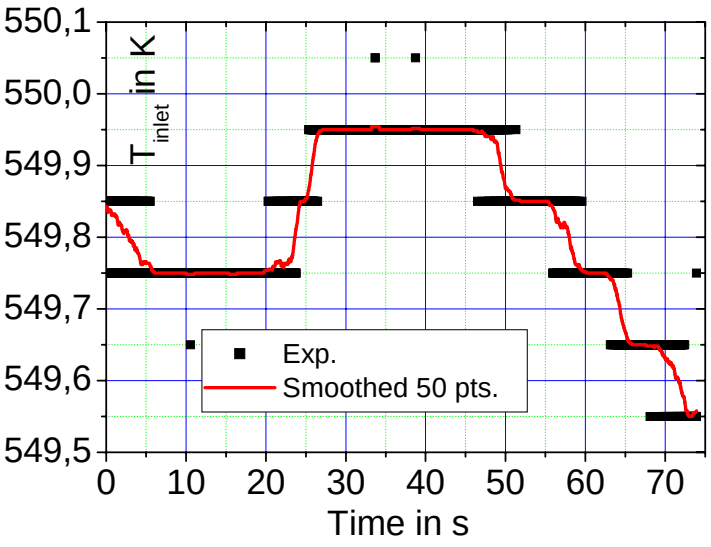

Fig. 15. Boiling transition TGA10008, C2A: Inlet temperature as a function of time. Smoothed file: T_inlet_10008.dat

2.2 Boiling transition TRA10012, C2A: Recirculation pump trip

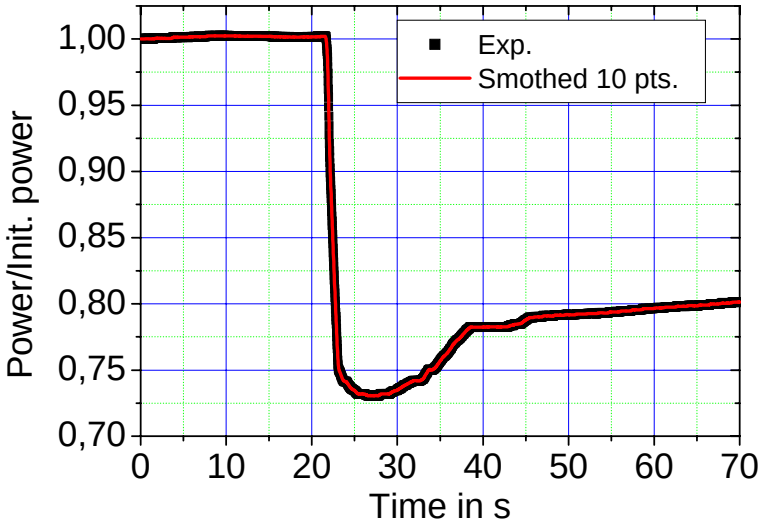

Fig. 16. Boiling transition TRA10012, C2A: Relative power as a function of the time. Initial power 8.091071 MW. Smoothed file: Power_10012.dat

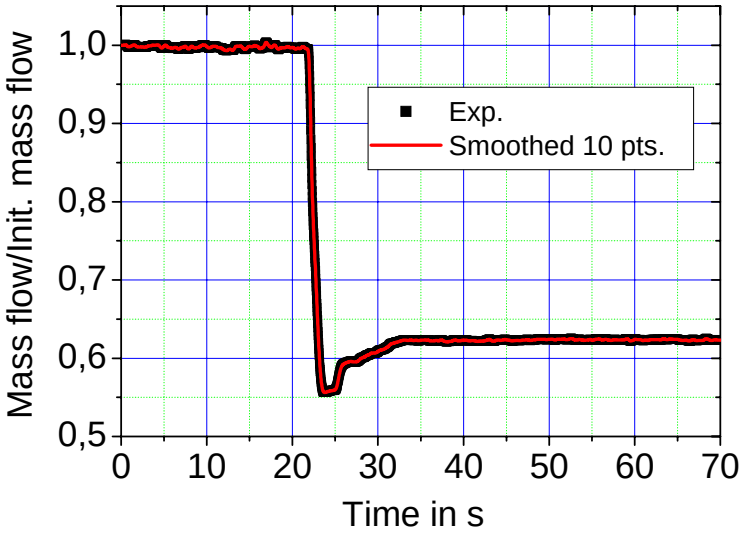

Fig. 17. Boiling transition TRA10012, C2A: Relative inlet volume flow rate as a function of the time. Initial volume flow 61.13 m³/h. Smoothed file: Flow_rate_10012.dat

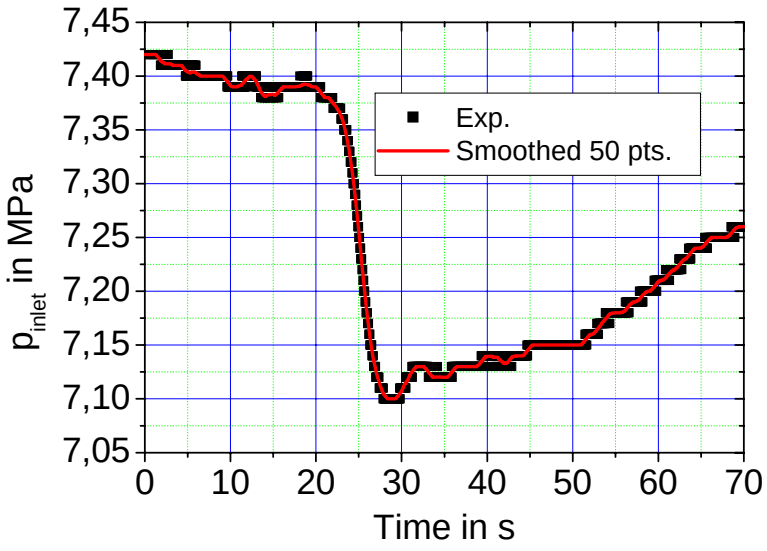

Fig. 18. Boiling transition TRA10012, C2A: Inlet pressure as a function of time. Smoothed file: p_inlet_10012.dat

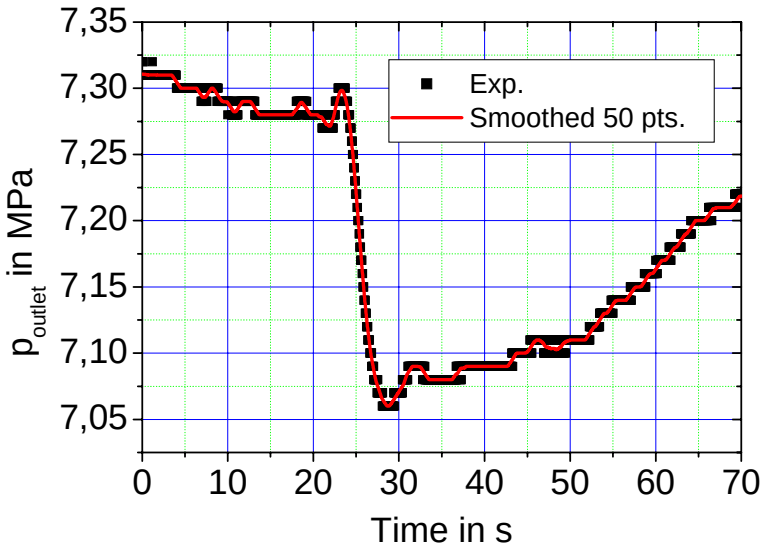

Fig. 19. Boiling transition TRA10012, C2A: Outlet pressure as a function of time. Smoothed file: p_outlet_10012.dat

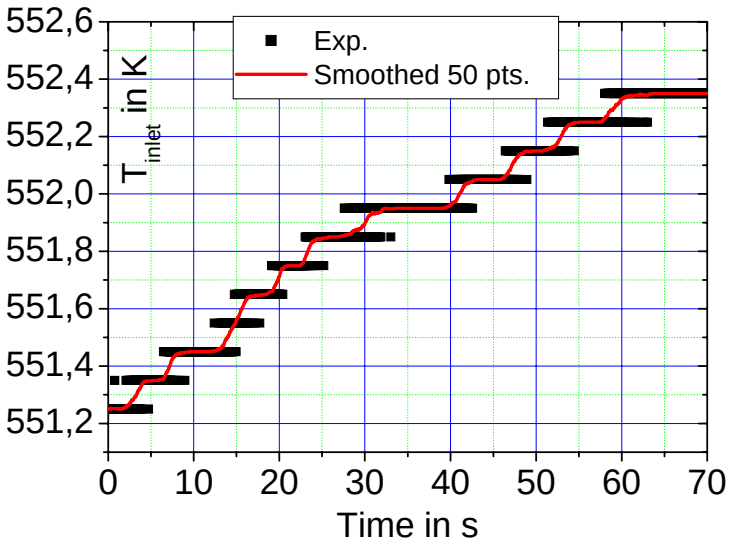

Fig. 20. Boiling transition TRA10012, C2A: Inlet temperature as a function of time. Smoothed file: T_inlet_10012.dat

2.3 Boiling transition TGC10018, C3: Turbine trip without bypass

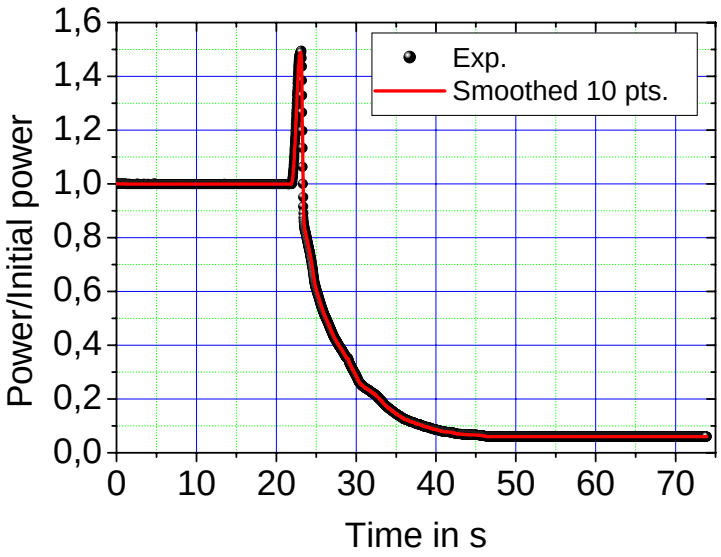

Fig. 21. Boiling transition TGC10018, C3: Relative power as a function of the time. Initial power 7.17976575 MW. Smoothed file: Power_TGC10018.dat

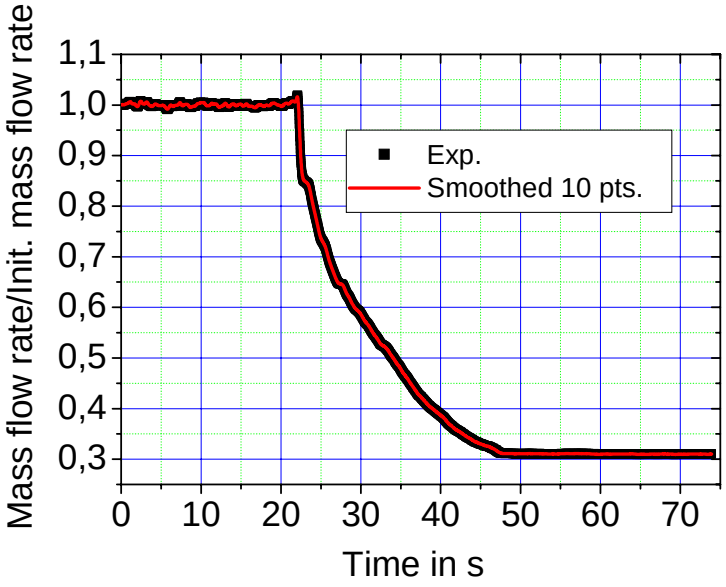

Fig. 22. Boiling transition TGC10018, C3: Relative inlet volume flow rate as a function of the time. Initial volume flow 55.11m³/h. Smoothed file: Flow_rate_TGC10018.dat

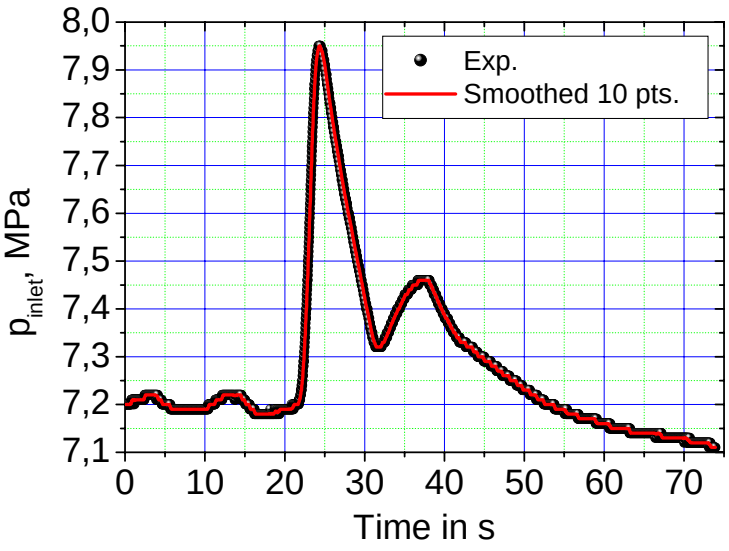

Fig. 23. Boiling transition TGC10018, C3: Inlet pressure as a function of time. Smoothed file: p_inlet_TGC10018.dat

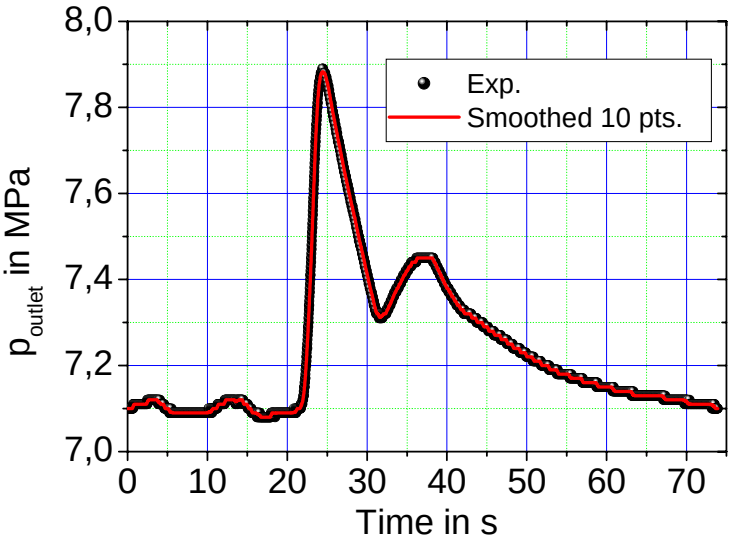

Fig. 24. Boiling transition TGC10018, C3: Outlet pressure as a function of time. Smoothed file: p_outlet_TGC10018.dat

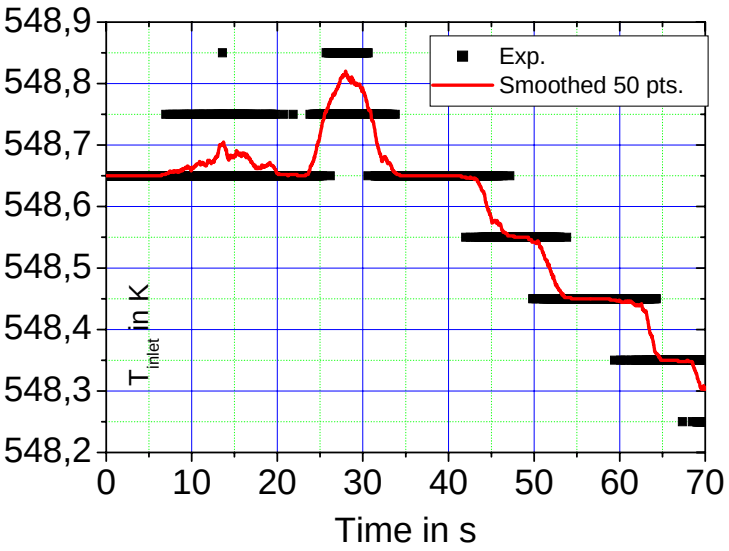

Fig. 25. Boiling transition TGC10018, C3: Inlet temperature as a function of time. Smoothed file: T_inlet_TGC10018.dat

2.4 Boiling transition TIC10012, C3: Recirculation pump trip

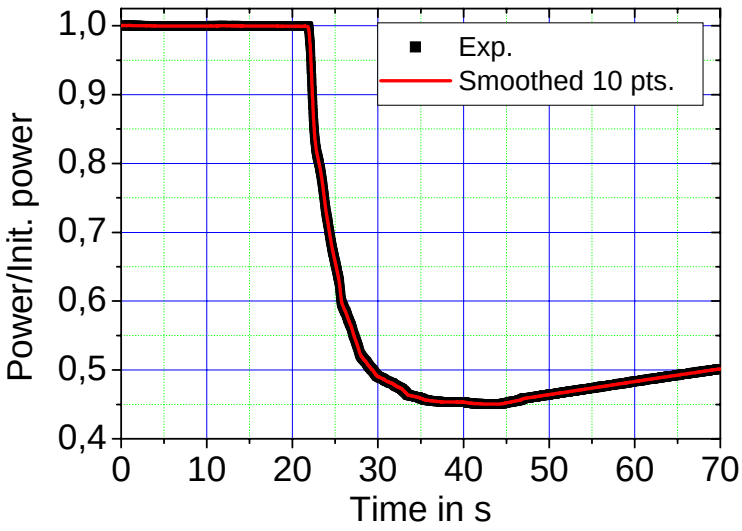

Fig. 26. Boiling transition TIC10012, C3: Relative power as a function of the time. Initial power 7.1805285 MW. Smoothed file: Power_TIC10012.dat

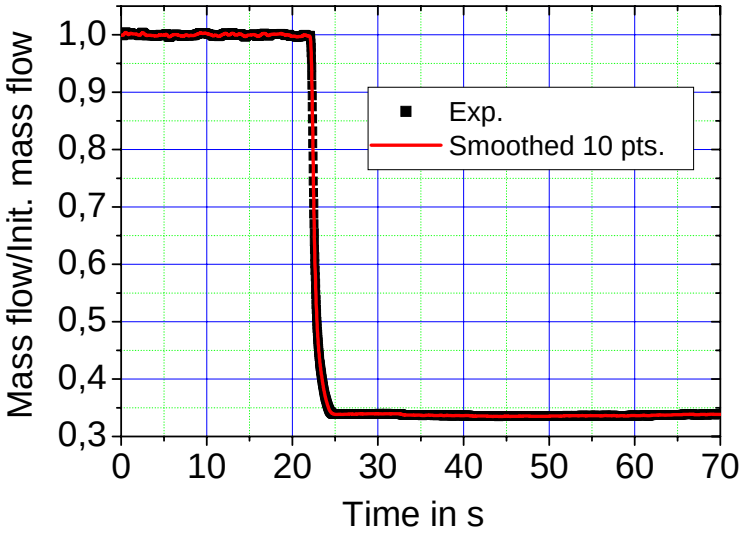

Fig. 27. Boiling transition TIC10012, C3: Relative inlet volume flow rate as a function of the time. Initial volume flow 61.13 m³/h. Smoothed file: Flow_rate_TIC10012.dat

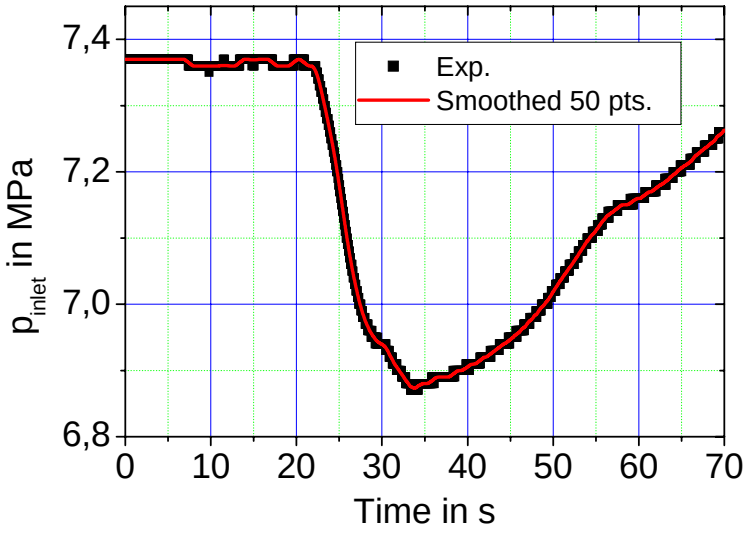

Fig. 28. Boiling transition TIC10012, C3: Inlet pressure as a function of time. Smoothed file: p_inlet_TIC10012.dat

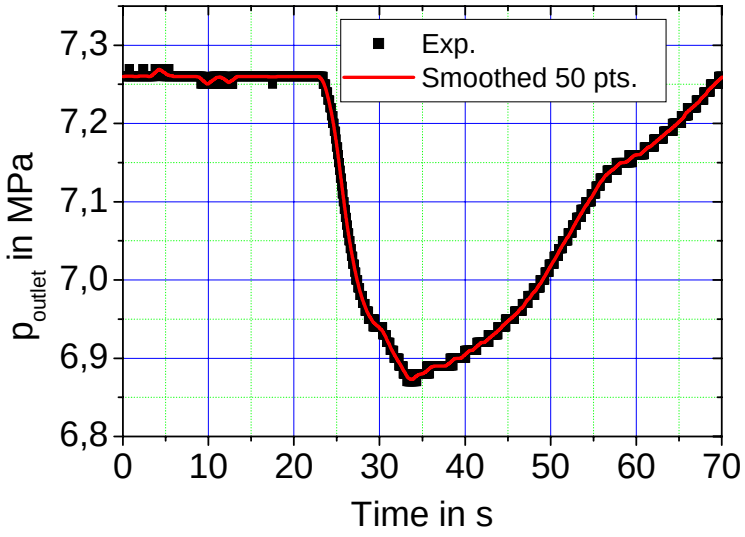

Fig. 29. Boiling transition TIC10012, C3: Outlet pressure as a function of time. Smoothed file: p_outlet_TIC10018.dat

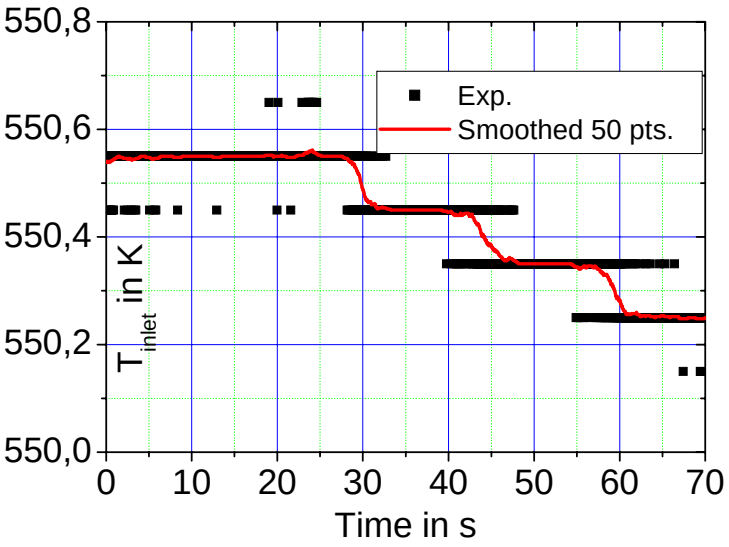

Fig. 30. Boiling transition TIC10012, C3: Inlet temperature as a function of time. Smoothed file: T_inlet_TIC10012.dat