





F. Hernández<sup>†</sup>, M. Quispe<sup>\*</sup>, E. Ayas, J.J. Casas, M.Ll. Fuentes, J. Iglesias, C. Colldelram ALBA-CELLS Synchrotron, 08290 Cerdanyola del Vallès, Spain

# CONTENTS

- > Thermohydraulic circuit scheme.
- > Thermal instabilities description.
- > Pipe Flow Expert simulations.
- SimsScale CFD simulations.
- > Matlab calculations.
- > Conclusions.





#### **THERMOHYDRALIC CIRCUIT SCHEME**





### THERMAL INSTABILITIES DESCRIPTION



 $\bigcirc$ 

#### **PIPE FLOW EXPERT SIMULATIONS**



- □ Pressure distribution along the circuit.
- □ Pressure drop at each singularity.
- □ Mass flow distribution in the pipes of the circuit.
- Discretized model of the circuit geometry.



### **SIMSCALE - CFD SIMULATIONS**





- □ Accurate description of the thermophysical variables at the exchanger inlets.
- □ Pressure drop in the involved pipes close to E07.
- □ Mass flow rate in each exchanger.



#### **MATLAB CALCULATIONS**

- Temperature distribution along the Pipe Flow Expert discretized model of the circuit.
- □ Effect of the external air temperature.
- □ Minimum ST4 working conditions to ensure a good performance of the circuit.
- □ D02 tank temperature dependency with P11 operating mass flow.
- □ Statistical model of the E07 power as a function of the ST4 working conditions.







# CONCLUSIONS

- ✓ Modification of the setpoint of the differential pressure valves.
- ✓ Lack of instrumentation for the pressure and mass flow measurements.
- ✓ An increase of cold water mass flow in E07 is needed to improve the in-tank temperature conditions:
  - Extra 25 m<sup>3</sup>/h of cold water at the current regime (P11 moving 430 m<sup>3</sup>/h).
  - Extra 65 m<sup>3</sup>/h at the nominal regime (P11 moving 645 m<sup>3</sup>/h)
- ✓ The external temperature does not produce a significant variation in the tank temperature.
- $\checkmark$  Temperature peaks reduced by 50% when recovering the nominal mass flow at the P11.

## THANK YOU FOR THE ATTENTION

#### Contact details:

- \* Francesc Hernández Garcia (UPC): fran.14hg@gmail.com
- \* Marcos Quispe Flores (ALBA): mquispe@cells.es



