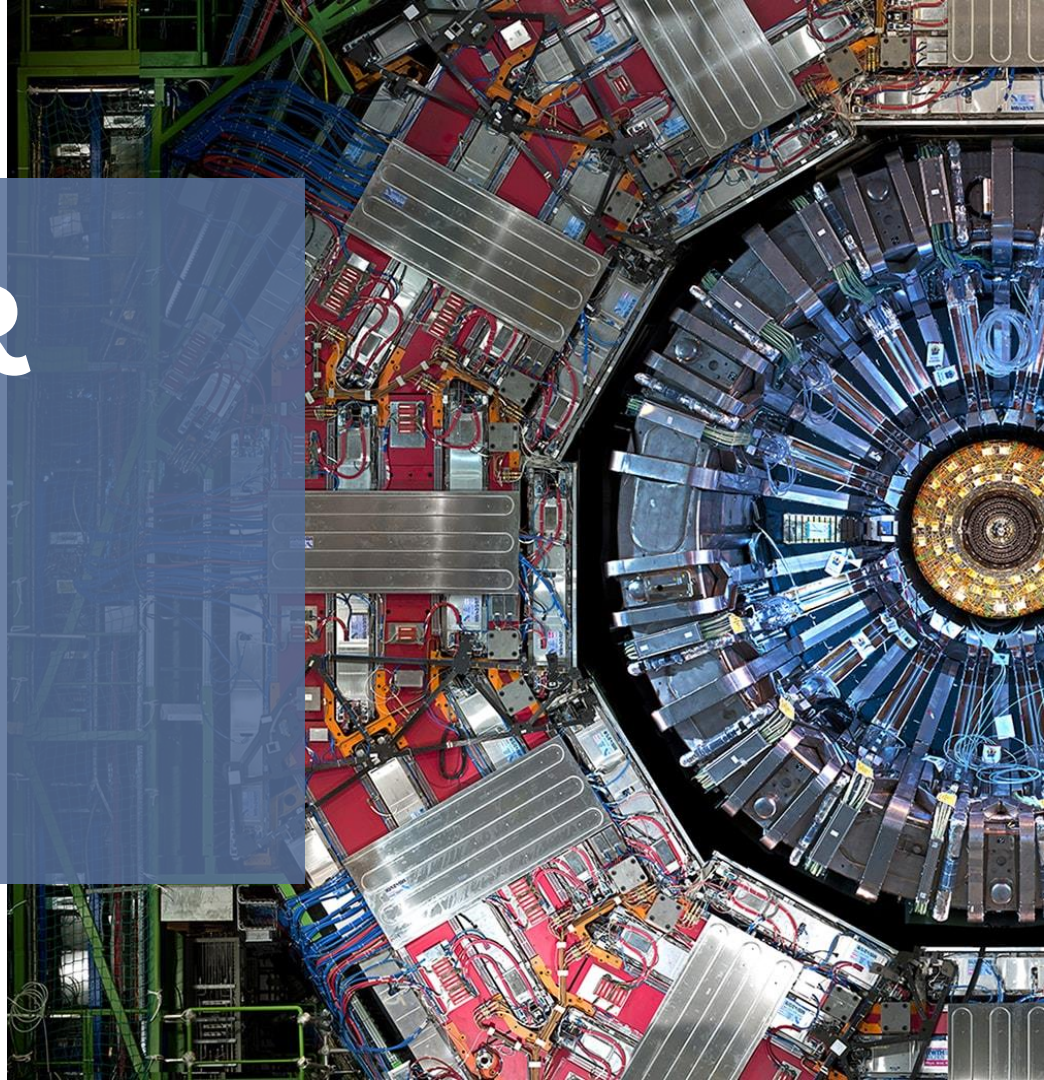


# CMS – FGR TESTS UPDATE

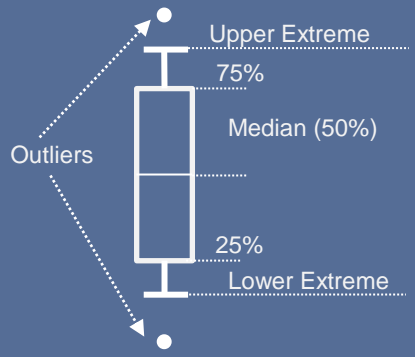
Damiano (11/07/2024)



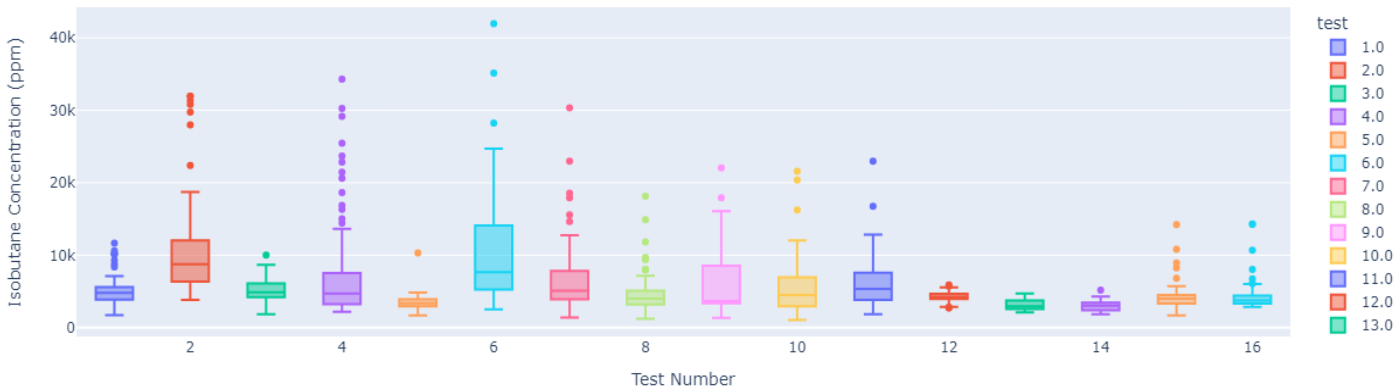
# SUMMARY

The starting **goal** of the tests was to analyze the **influence of thermal conditions on the product quality**.

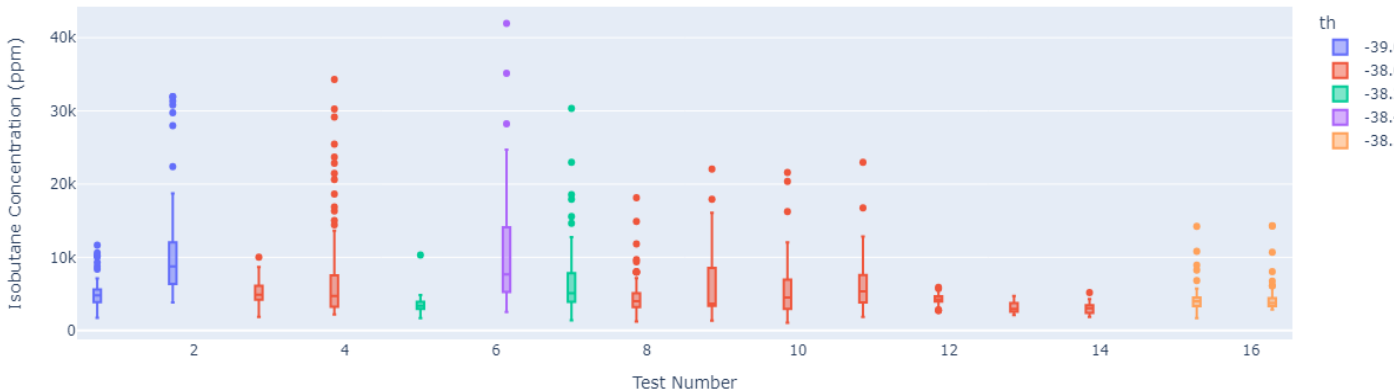
Unfortunately, the **system** was **not stable** at all, thus the **noise** created by the **high variability** of the quality made **impossible to highlight the influence of the chiller/heater temperatures**



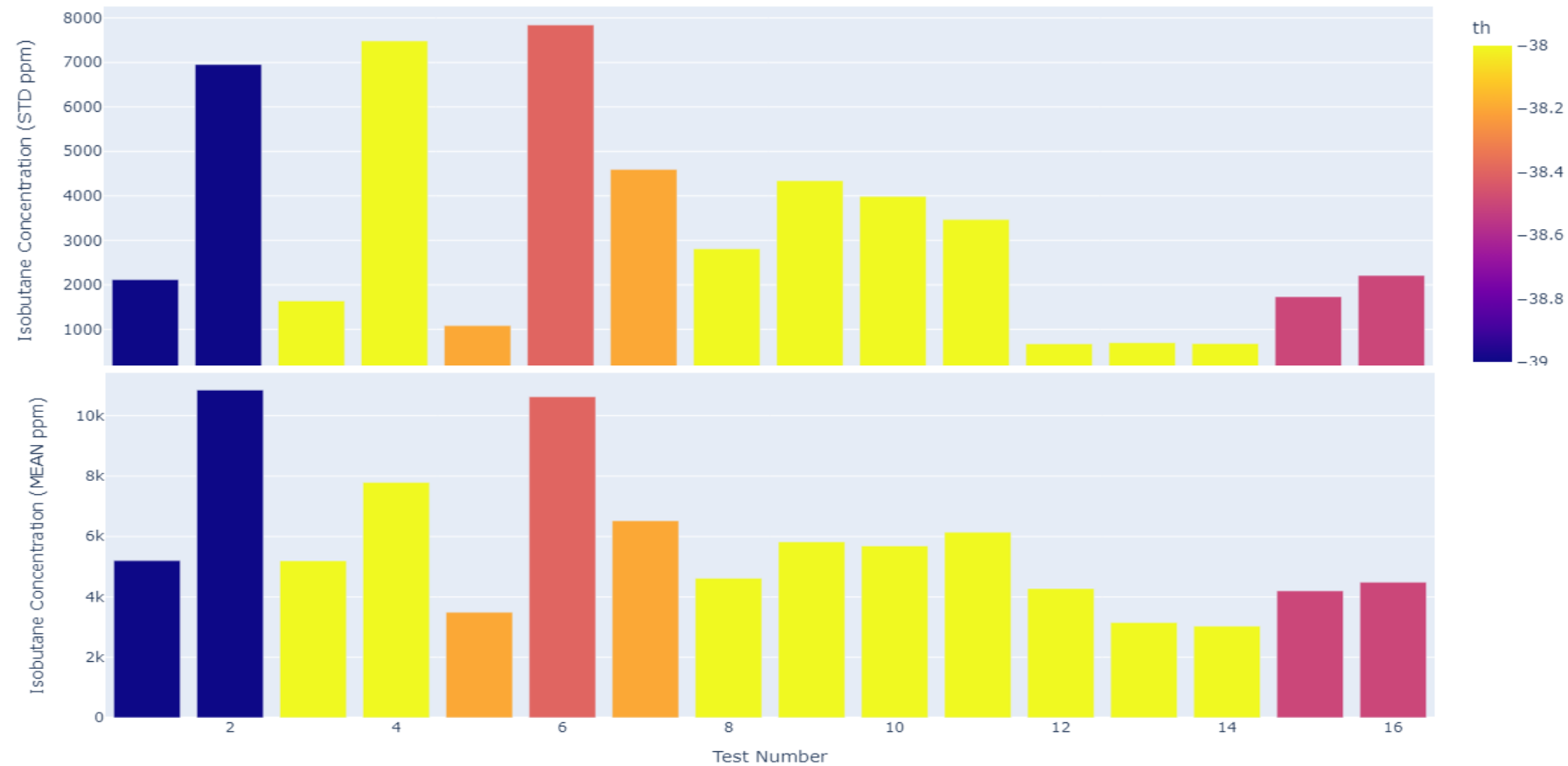
Main Statistics for Different Cooler Set Temperature



Main Statistics for each Test and Temperature



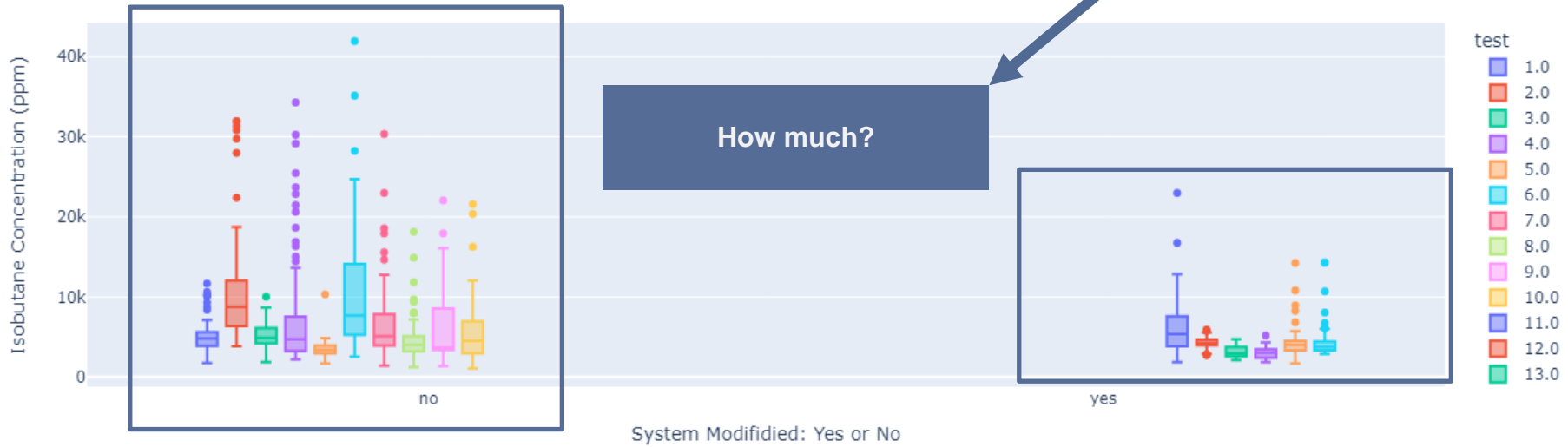
# TEMPERATURES... STILL NOT USEFUL



# IMPROVEMENTS: KEY POINTS

- Then we **modified the system** to guarantee a **parallel** configuration during **extraction mode**.
- Even if this change did **not stabilize the system**, it gives us the **chance to regulate the extraction flow of single columns**.
- **Reducing the extraction flow of critical columns (C1 and C2) stabilizes the system and improves the quality**

Main Statistics for Each Test Before and After Modification



# IMPROVEMENTS: MEAN and STD

Average Concentration of Isobutane



Grouping the data by test and aggregating by mean and STD of isobutane concentration confirms that **the modification itself is not enough**

Standard Deviation of Concentration of Isobutane



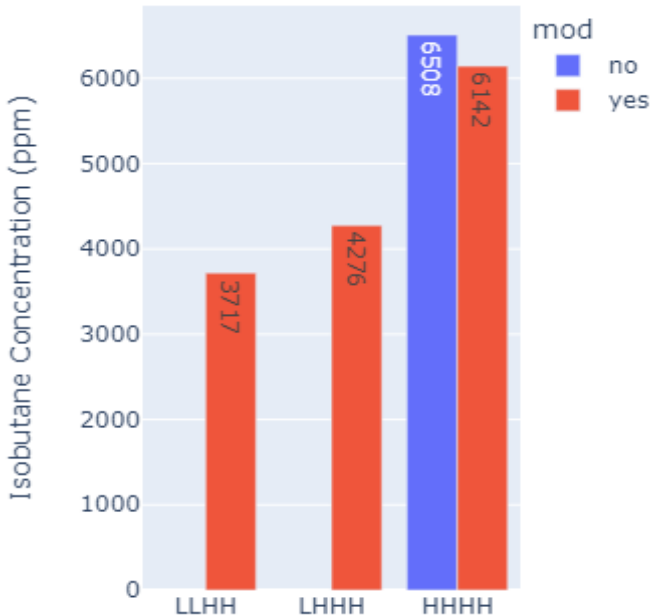
H = 650 L/h & L = 450 L/h

# IMPROVEMENTS: KEY DATA

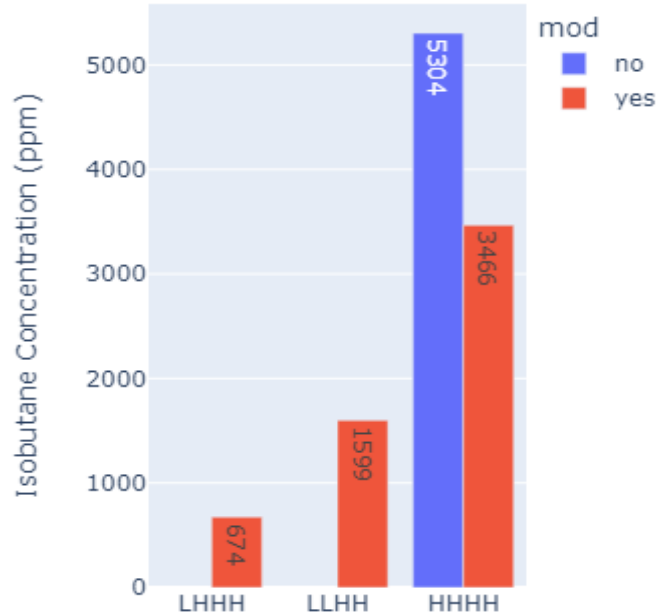
- The modification does not influence the average quality
- Reducing the extraction flow is key to dump this metric

- The **modification improves the stability** (decreases STD)
- The **major reduction is associated with the reduction of the extraction flow of C1**

Average Concentration of Isobutane

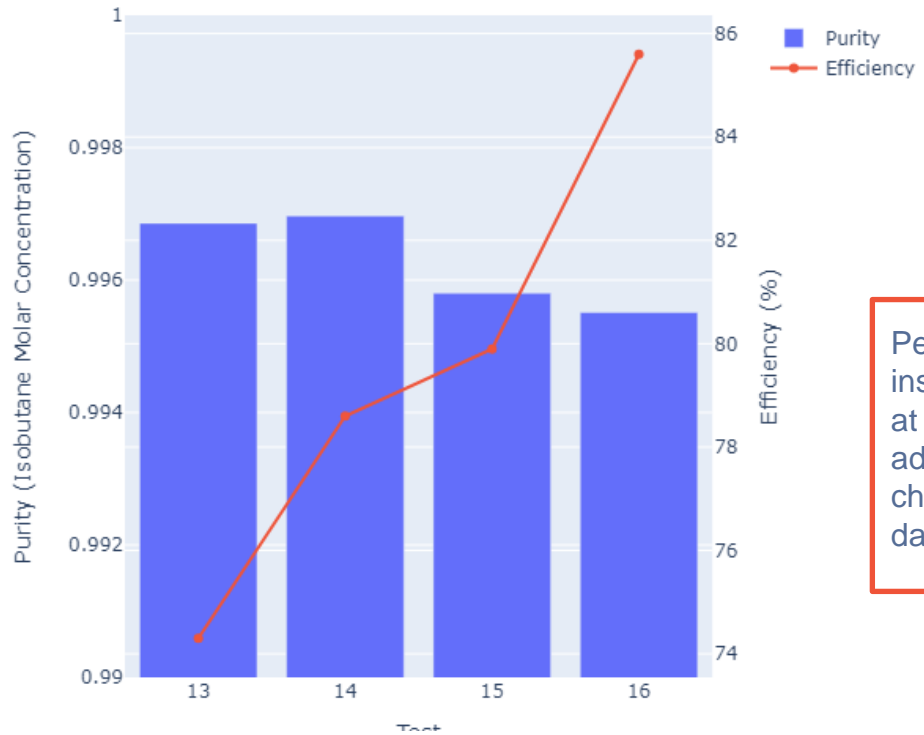


STD of Concentration of Isobutane

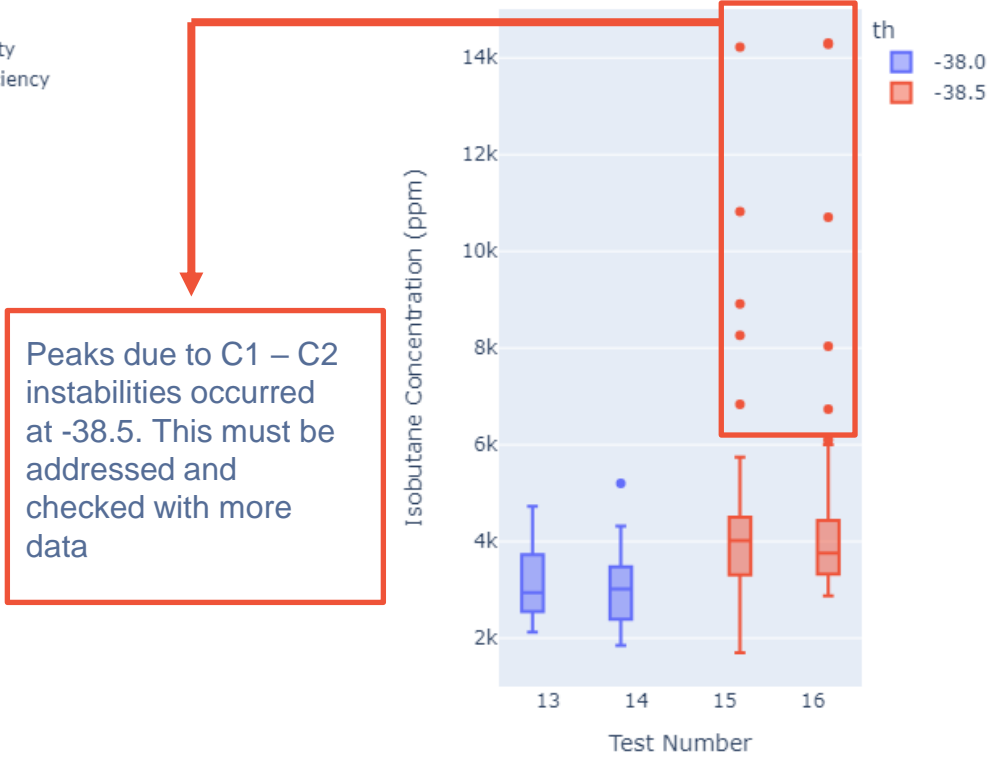


# PURITY, EFFICIENCY AND STABILITY

### Efficiency and Quality of the FGR in LLHH State



### Box Plots at LLHH



# NEXT STEPS

## 1. Systematically change Temperature to check:

- Average and STD of Isobutane Concentration
- Stability Optimum (a.k.a. keep dumping the peaks)

## 2. System Optimization and Management

- Define a “Goal Function” (e.g.  $F = Purity^\alpha \times Recovery^\beta$ ) to maximize
- Continuously check the status and inform the group/experiment