



Globale Geräuschlevel Optimierung einer E-Achse am Akustikprüfstand

Referenz Projekt

Presenter

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Application Engineering

XSIC AI Optimization & Testing – Application

AVL List GmbH, Graz / Austria

Agenda

1 Calibration Task

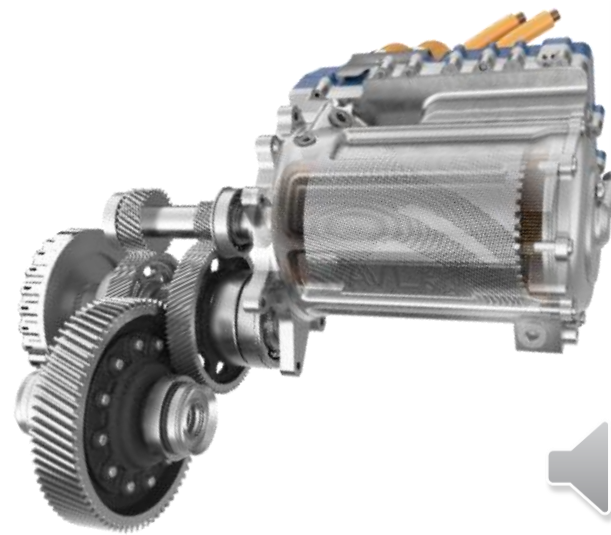
2 Testing Environment

3 Testing Approach

4 Results

Why noise reduction?

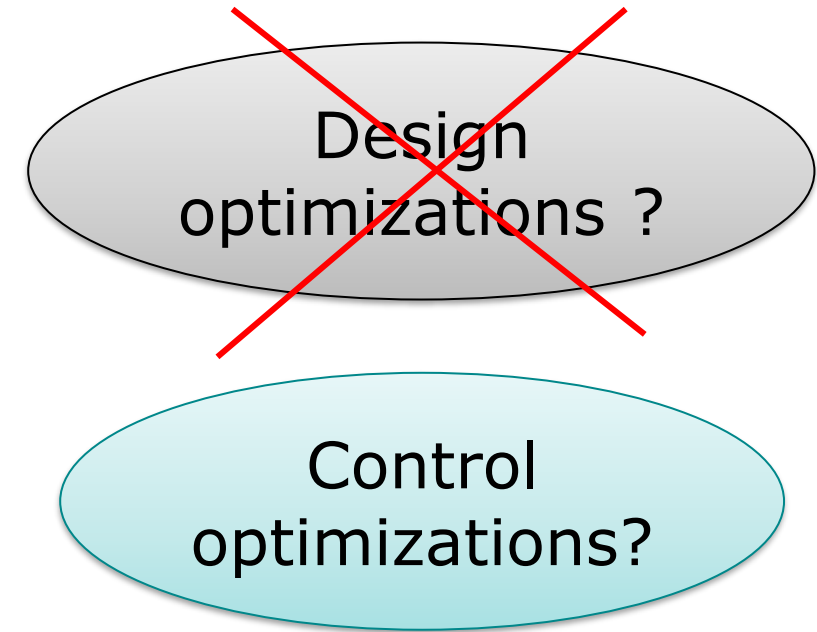
Aren't
E-Motors
silent ?



Run up @ constant load

Electromagnetic forces exiting mechanical structure → high level of noise

“Noise canceling” of critical frequencies?



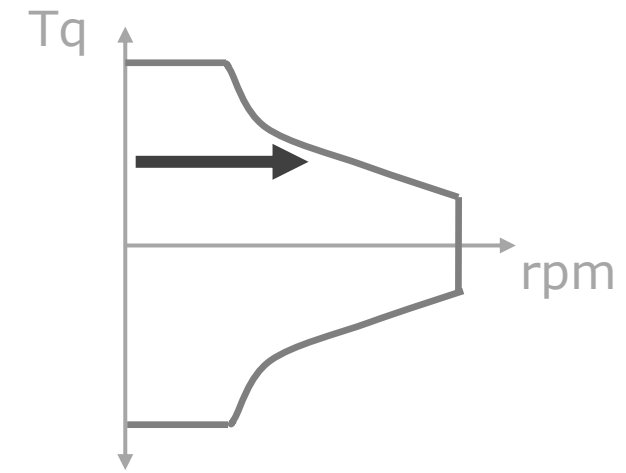
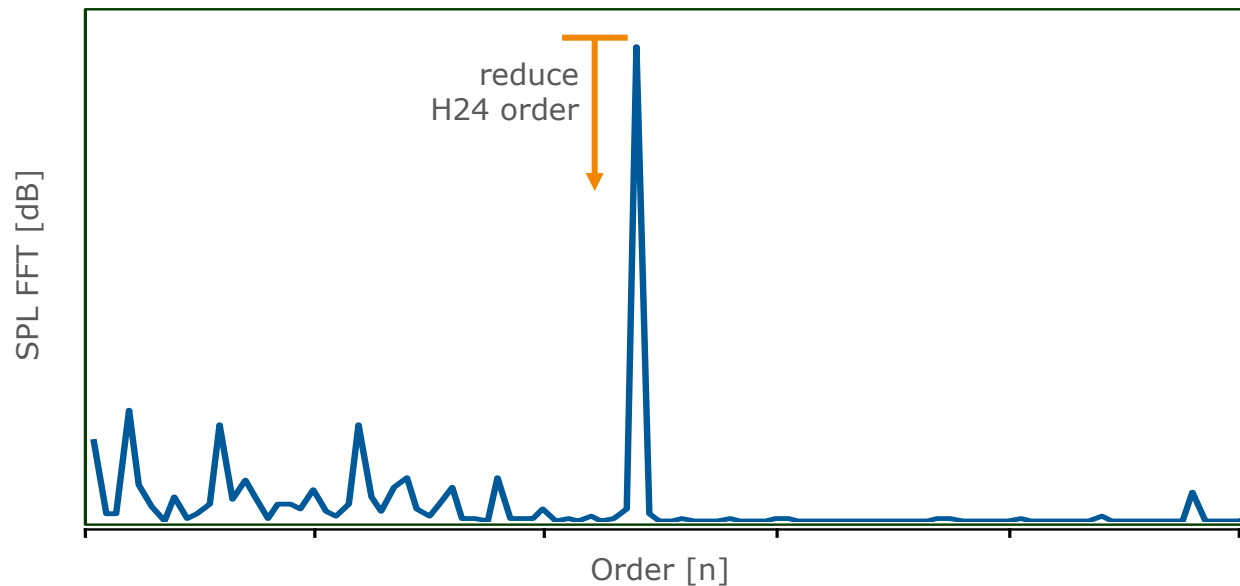
Harmonic Current Injection

Injection of $6f_e$ current into DQ frame
to reduce breathing mode harmonics (H24 / H48)
(for PMSM with $S=48/p=8$)

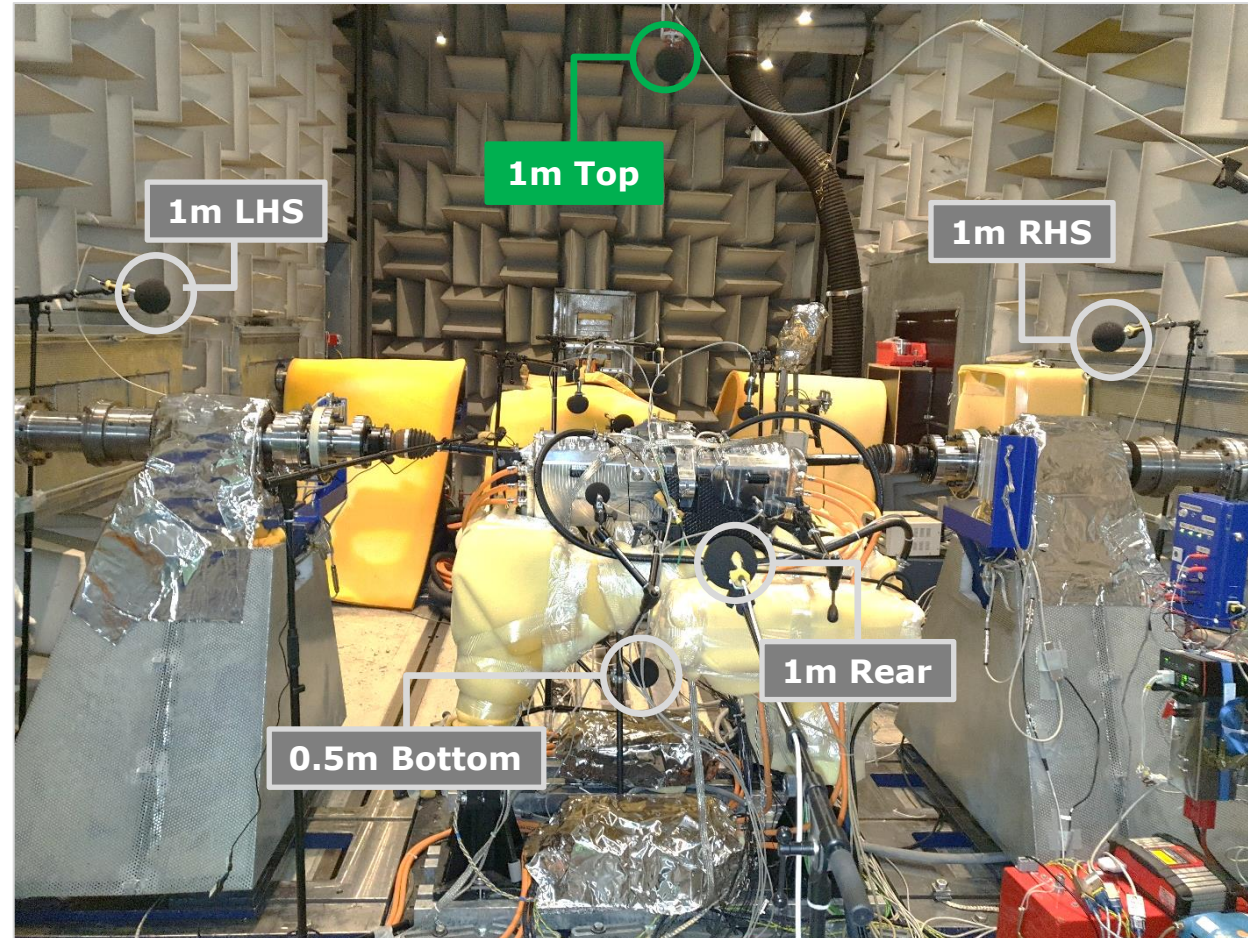
Calibration Task

Task:

- Calibrate 6fe harmonic current injection (amplitude & phase) to actively **reduce the H24/H48** breathing mode harmonics measured in the **airborne noise** for the full operating range (motor & generator)
- Validate reduction of sound pressure level (SPL) for dynamic speed/load points

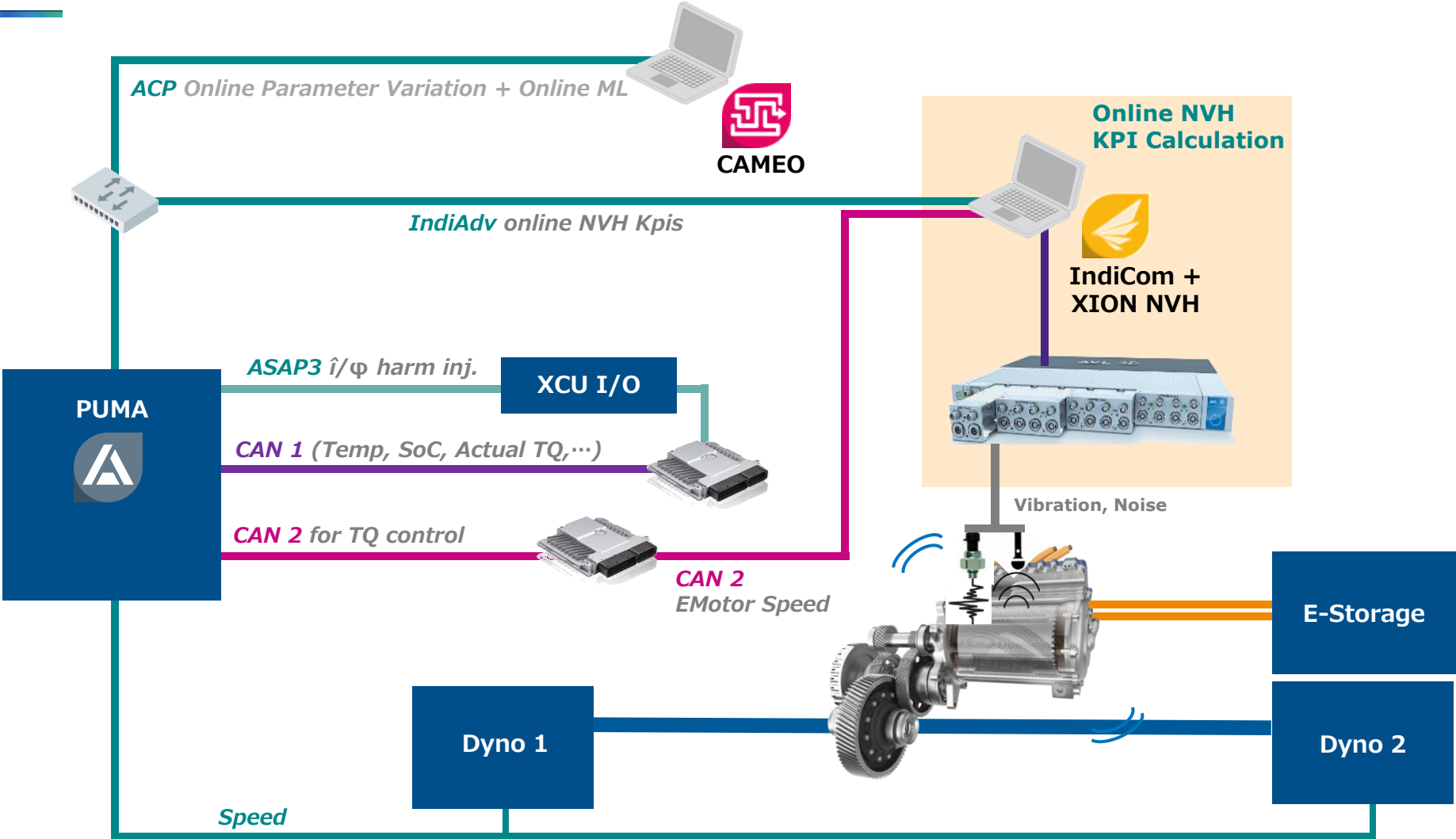


NVH Setup – EDU NVH Testing

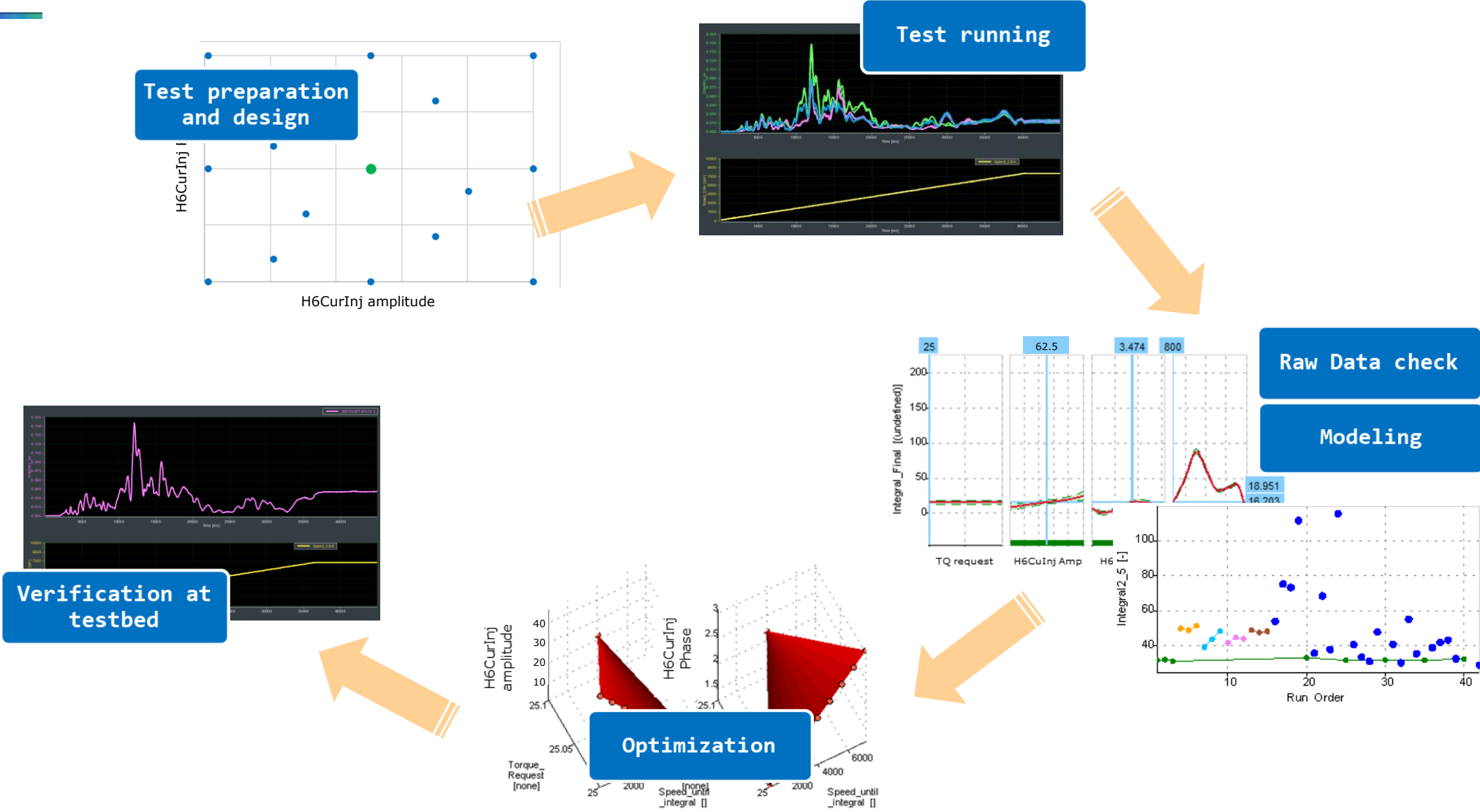


Example of standard airborne noise measurement set-up with 1m microphones

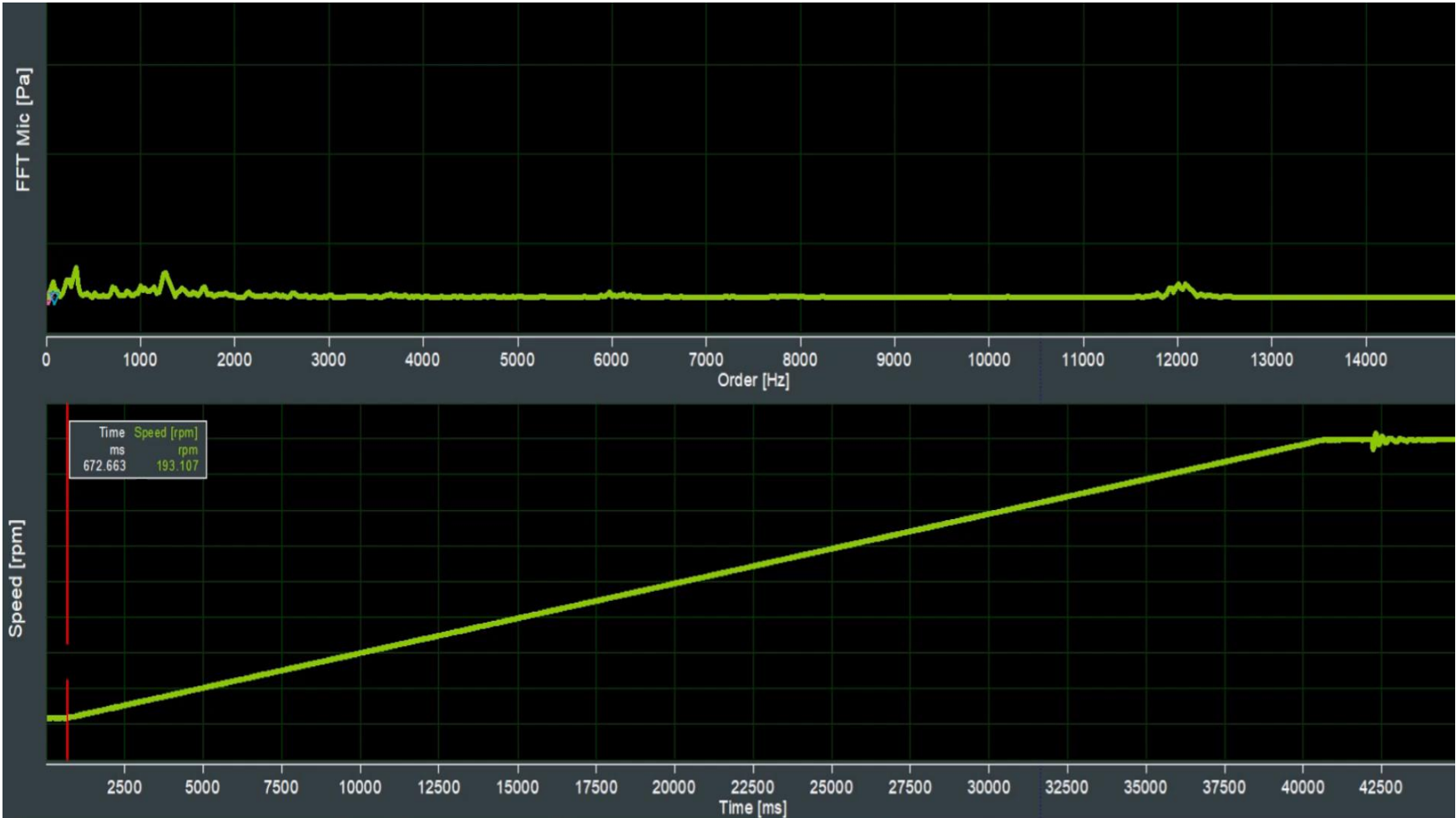
Testing Overview



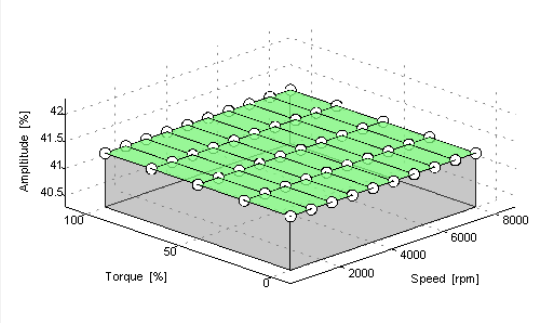
Testing methodology



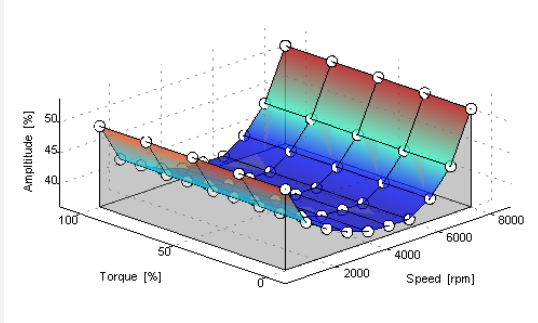
Testing Methodology – Run up at constant load



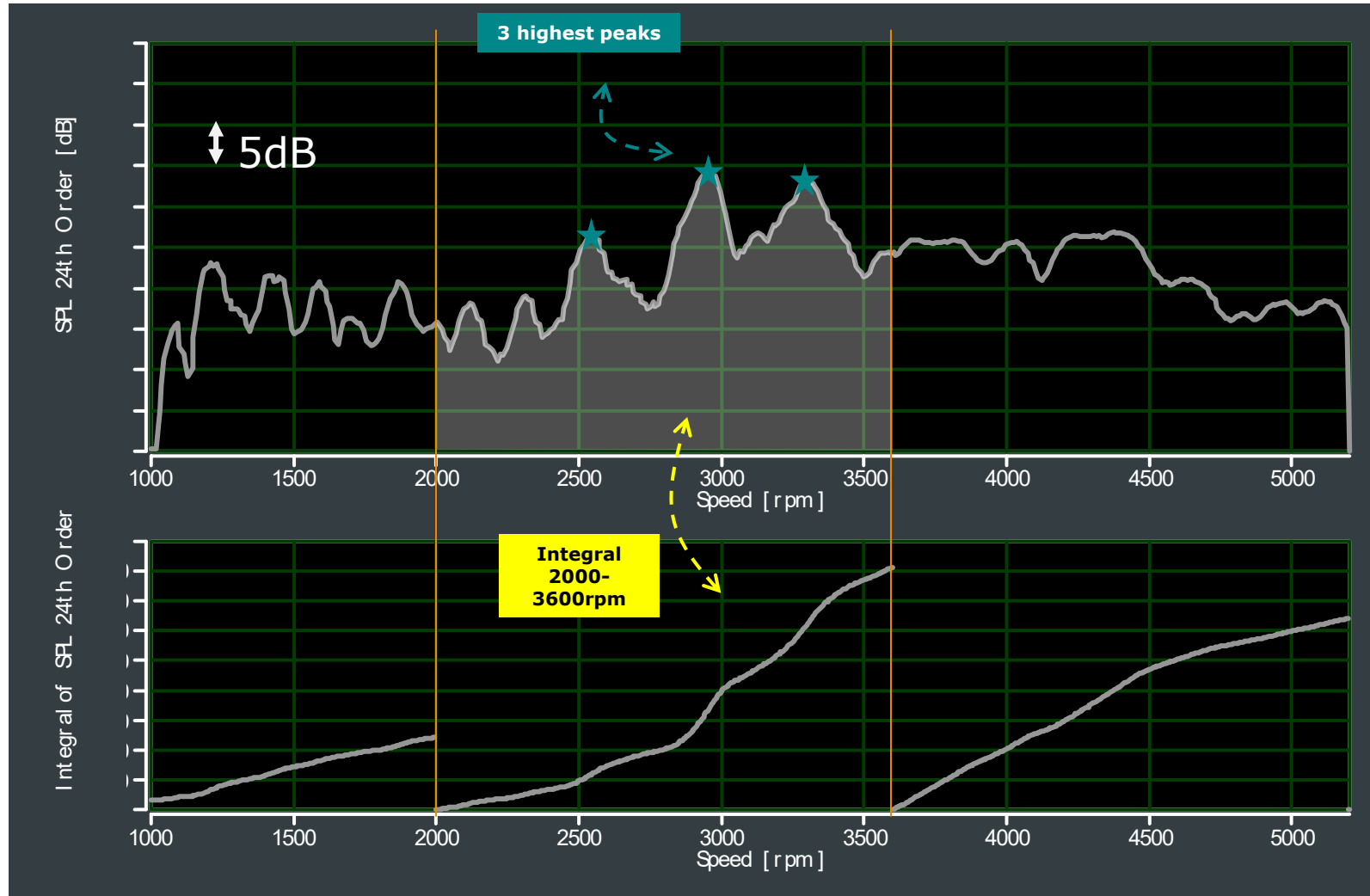
1) Fixed value



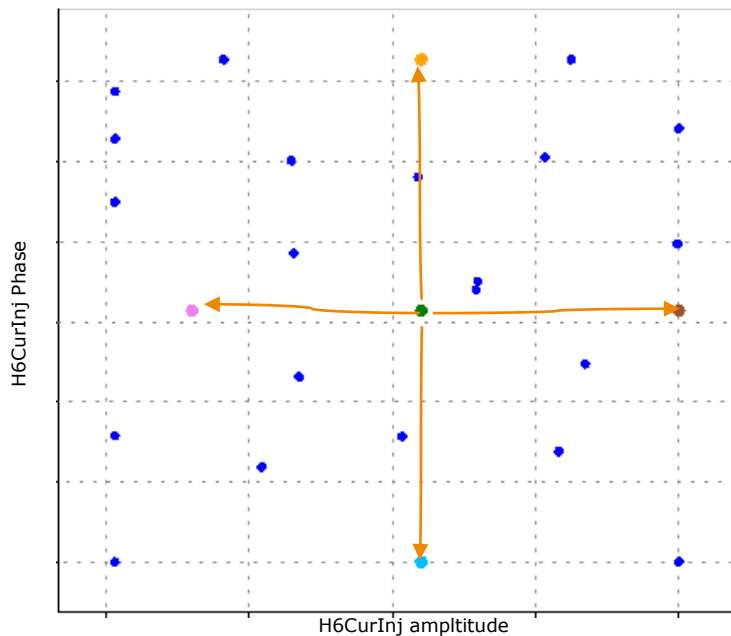
2) Map Shaping



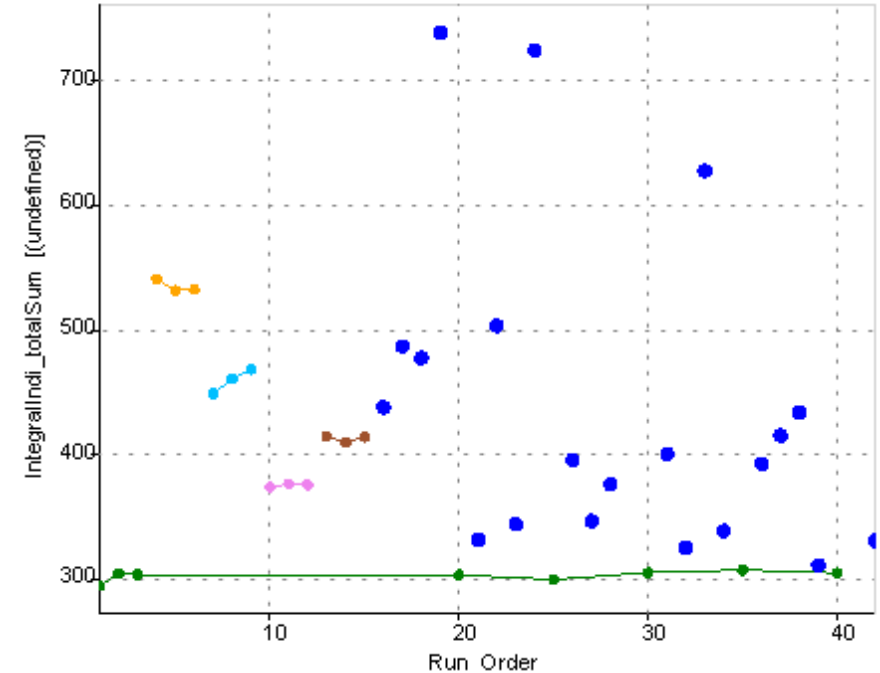
KPI definition – Integral and Peaks of SPL 24th Order



Feasibility of testing methodology with Star DOE

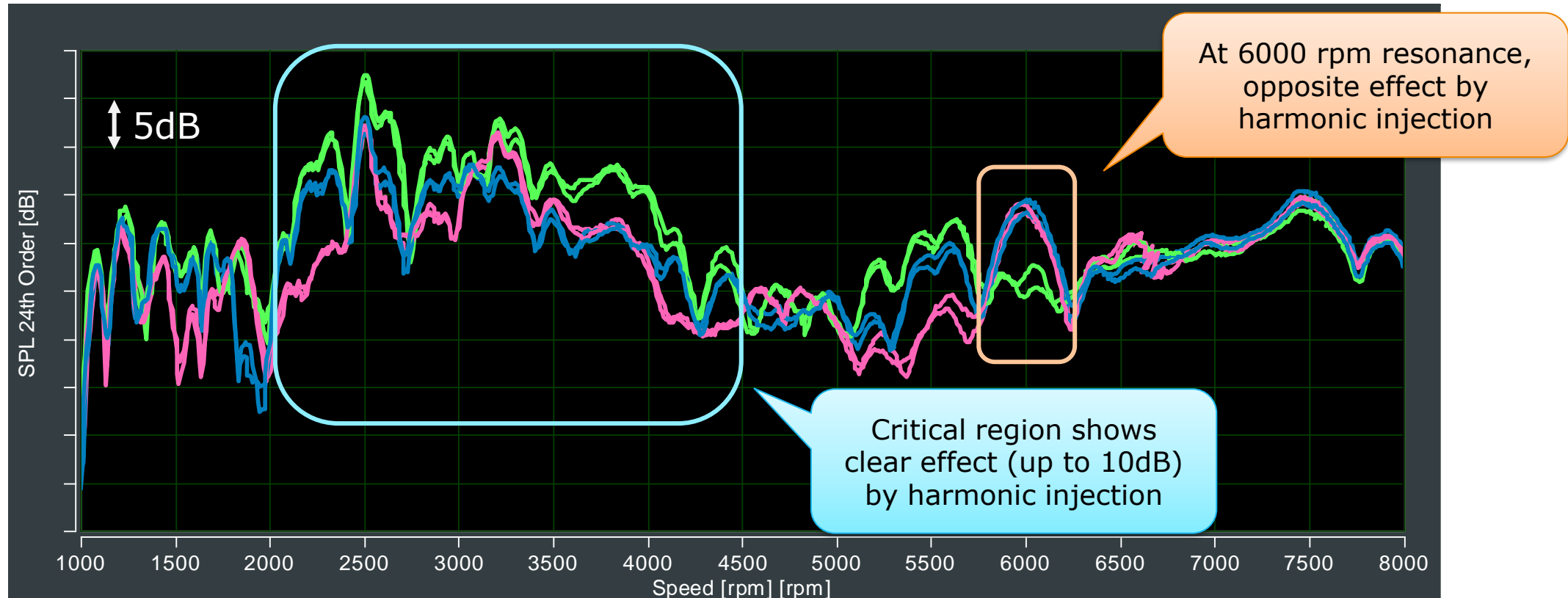


- DoE Points
- Start DoE point
- Star DoE variations



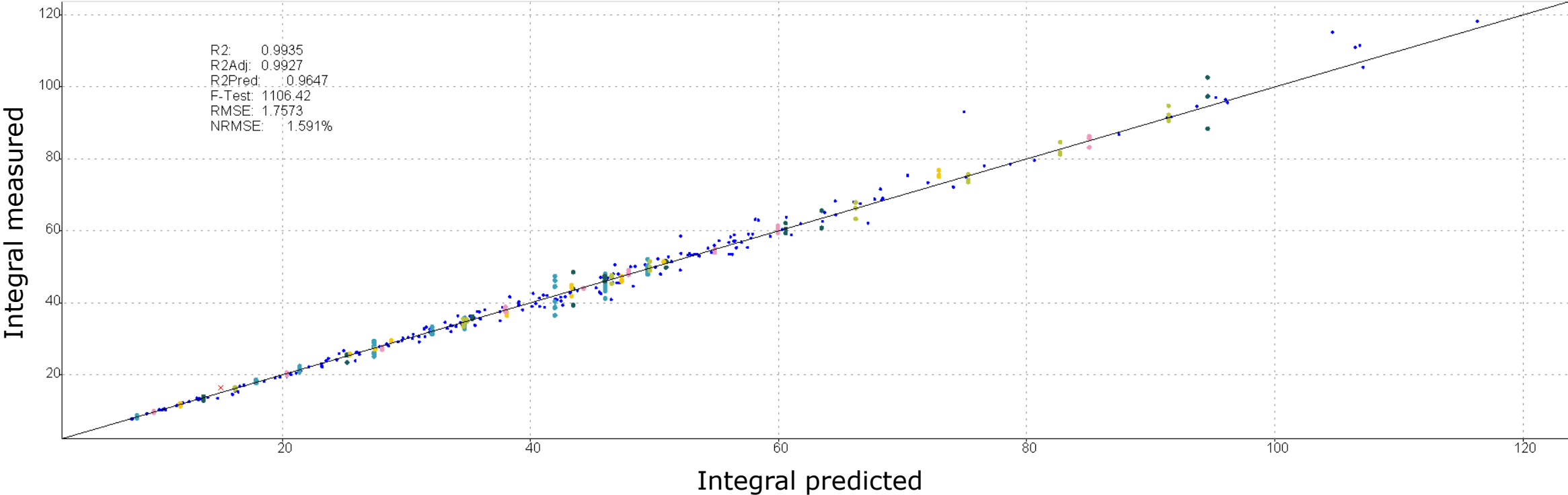
- Good repeatability, each color-pair shows repeated measurement
- Effect of harmonic current injection can be clearly seen with *Star DoE* → feasible methodology for calibration

Feasibility of testing methodology with Star DOE

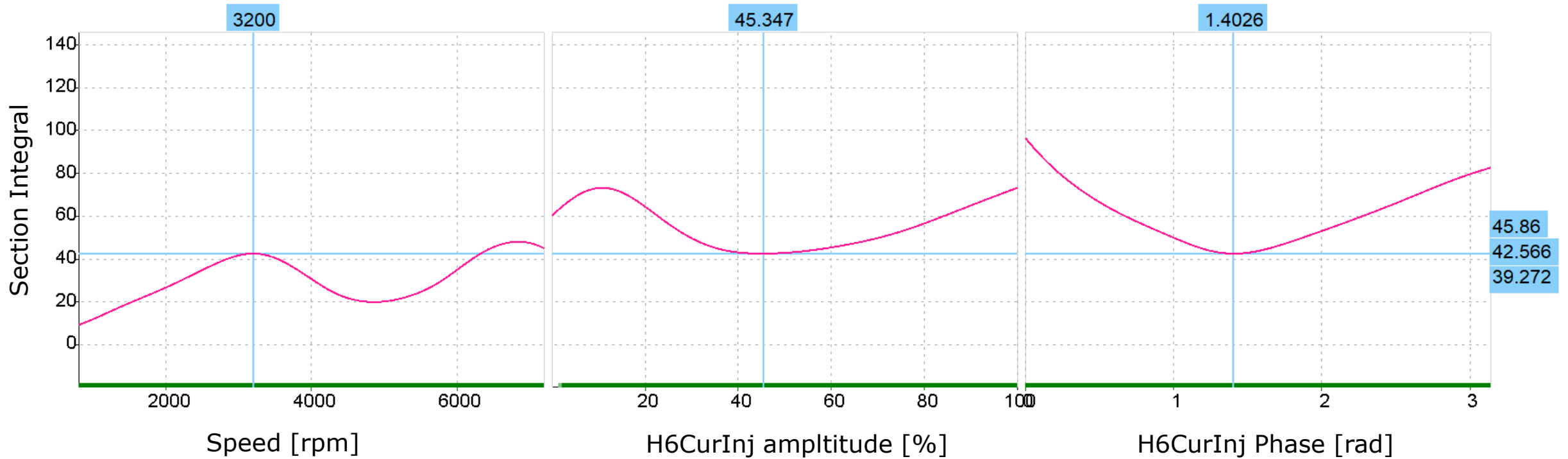


- Good repeatability, each color-pair shows repeated measurement
- Effect of harmonic current injection can be clearly seen with *Star DoE* → feasible methodology for calibration

CAMEO Model Quality

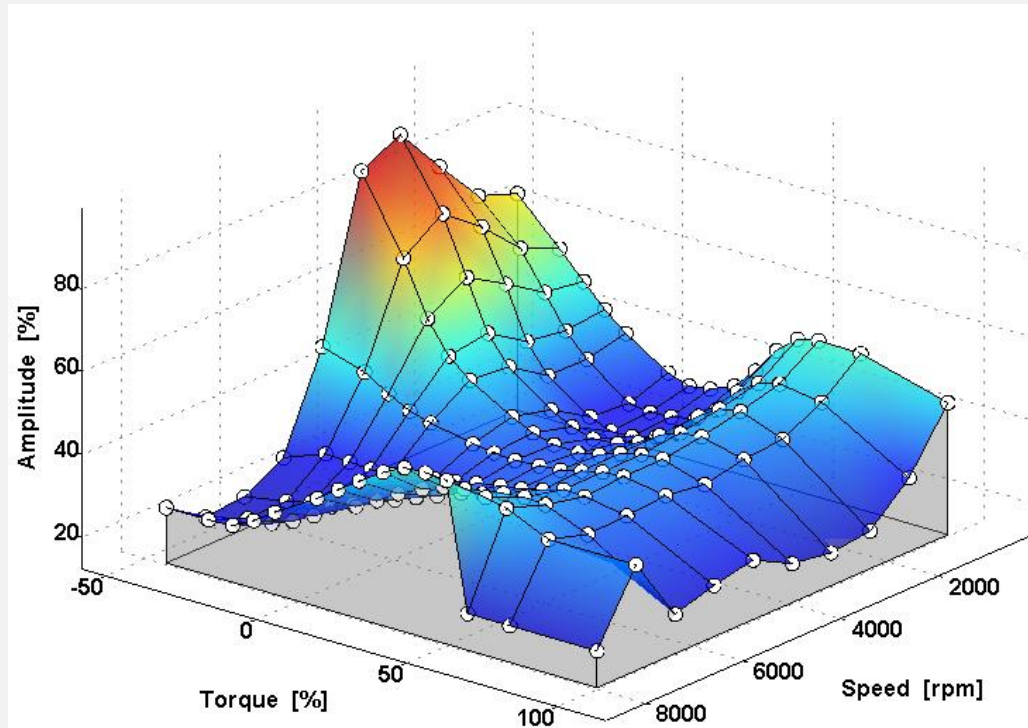


CAMEO model - intersection

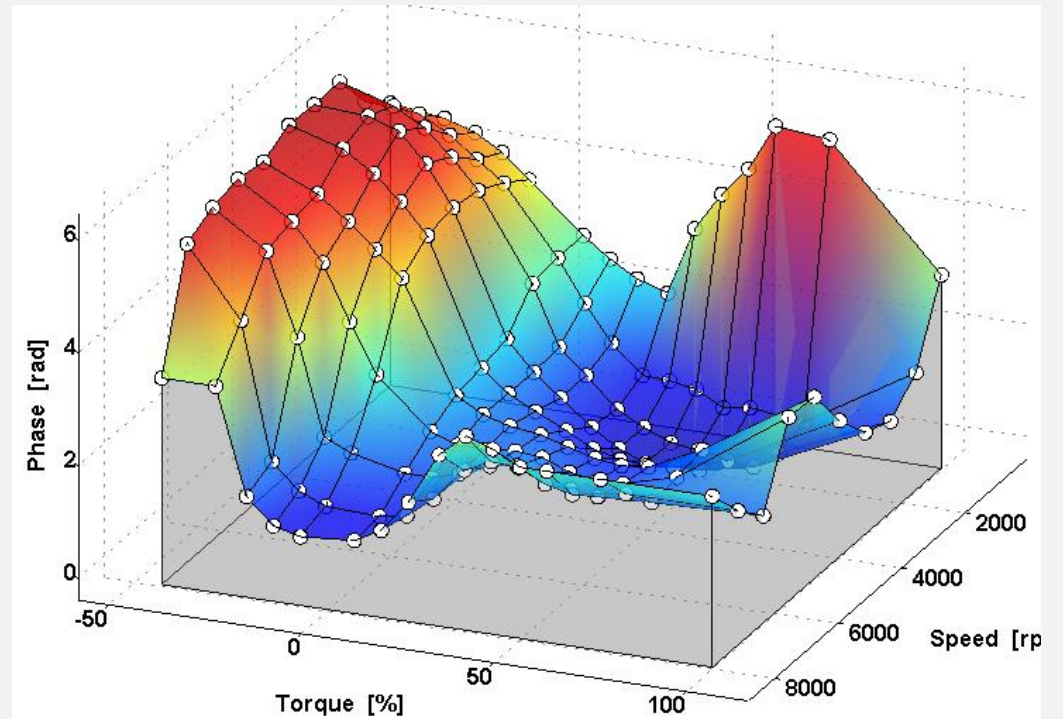


Calibration results

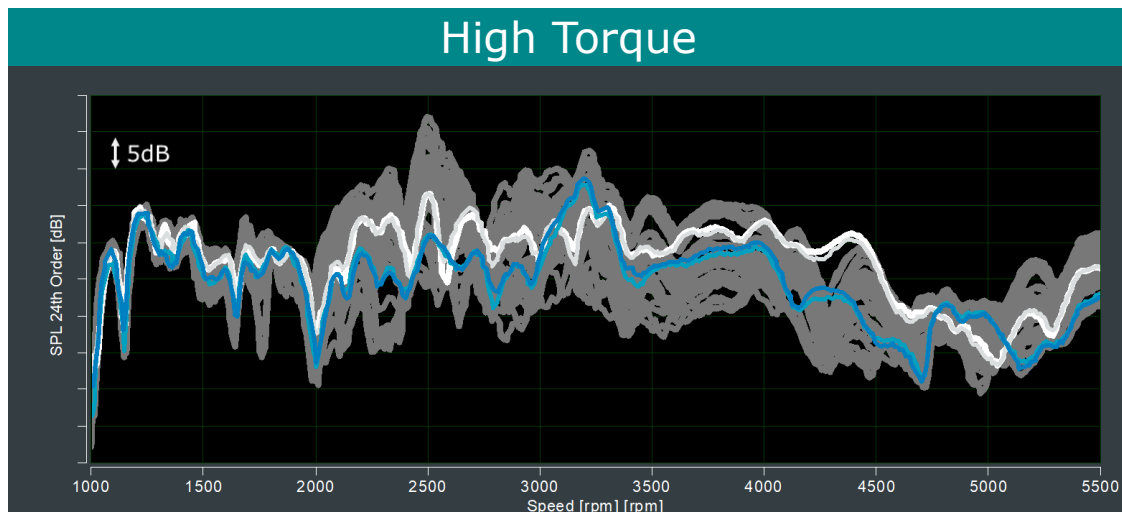
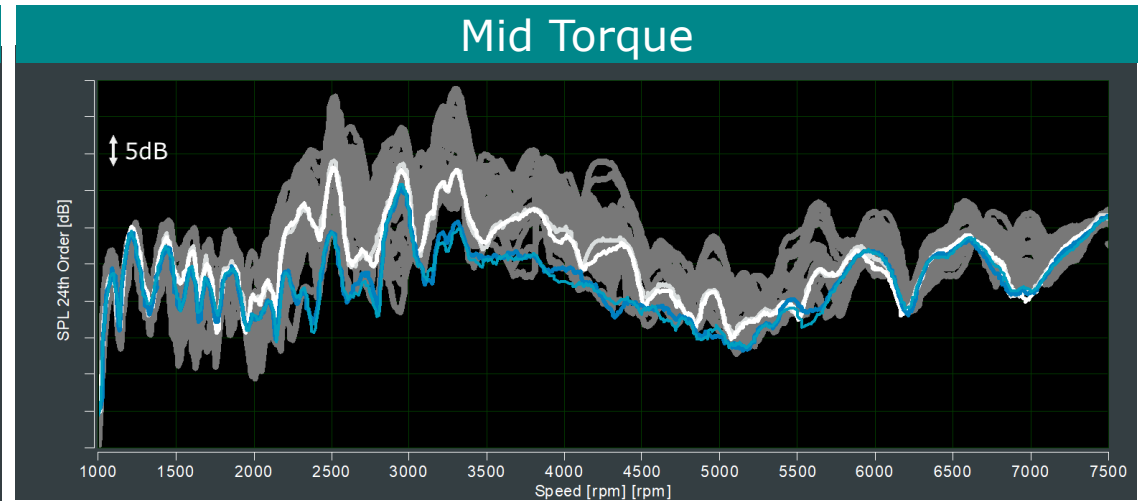
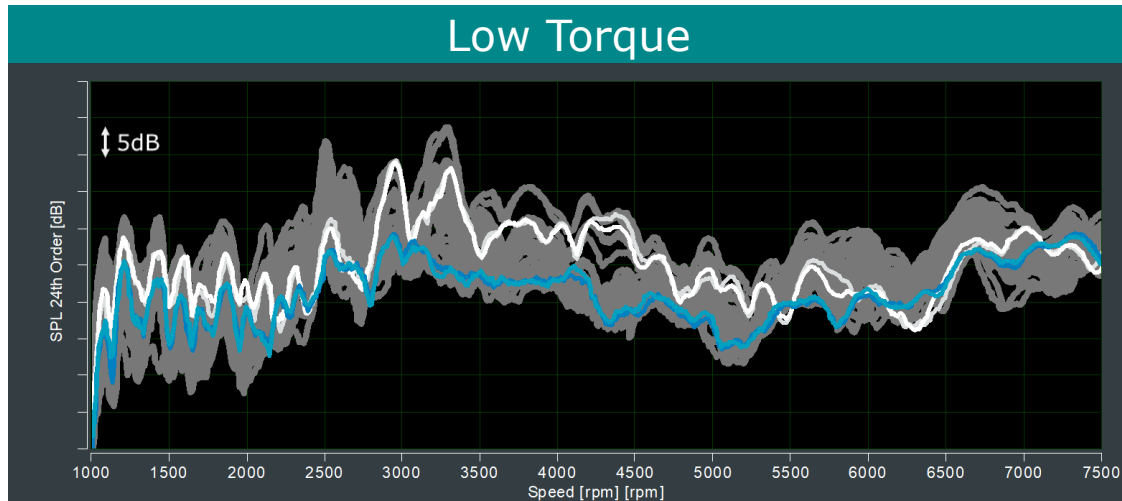
Amplitude



Phase

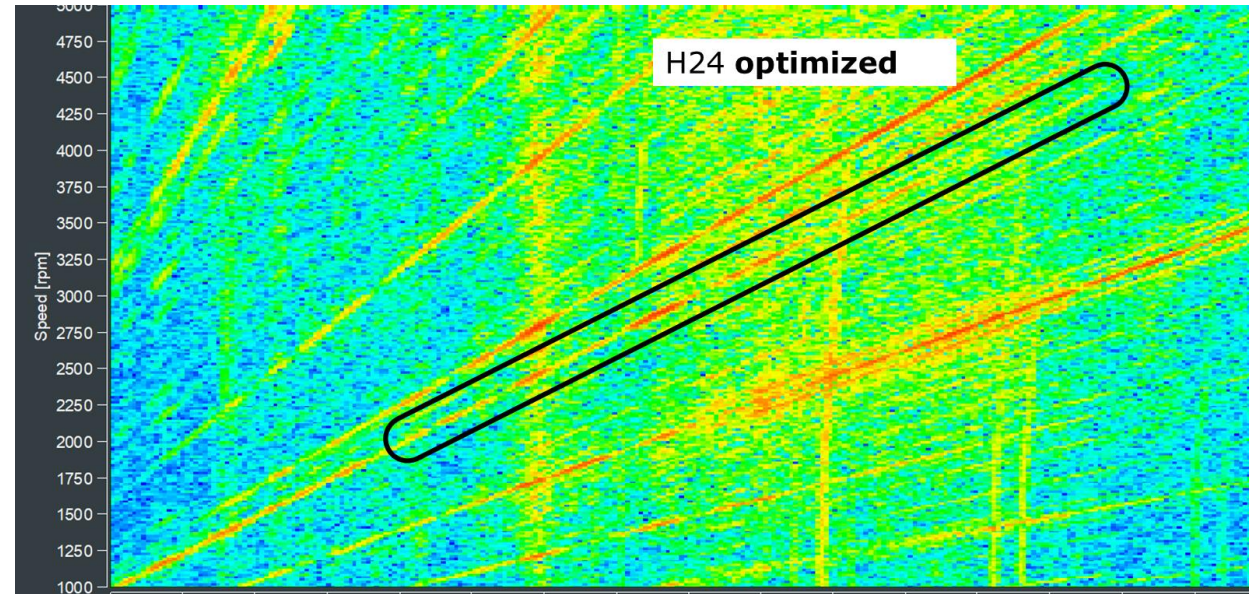
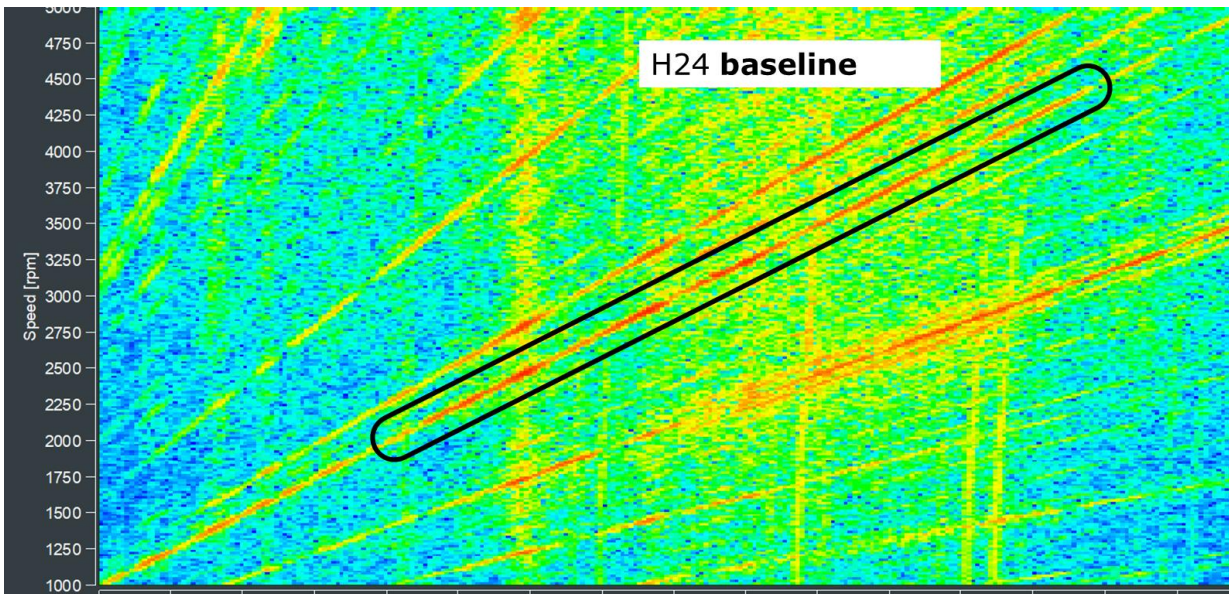


SPL 24th Order before/after with map v1



- variation range
- base
- optimum

Low Torque – optimized vs baseline (Map v1)



Fragen und Antworten

Stellen Sie Ihre Fragen und unsere Experten antworten.



Vielen Dank



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