PERMAS

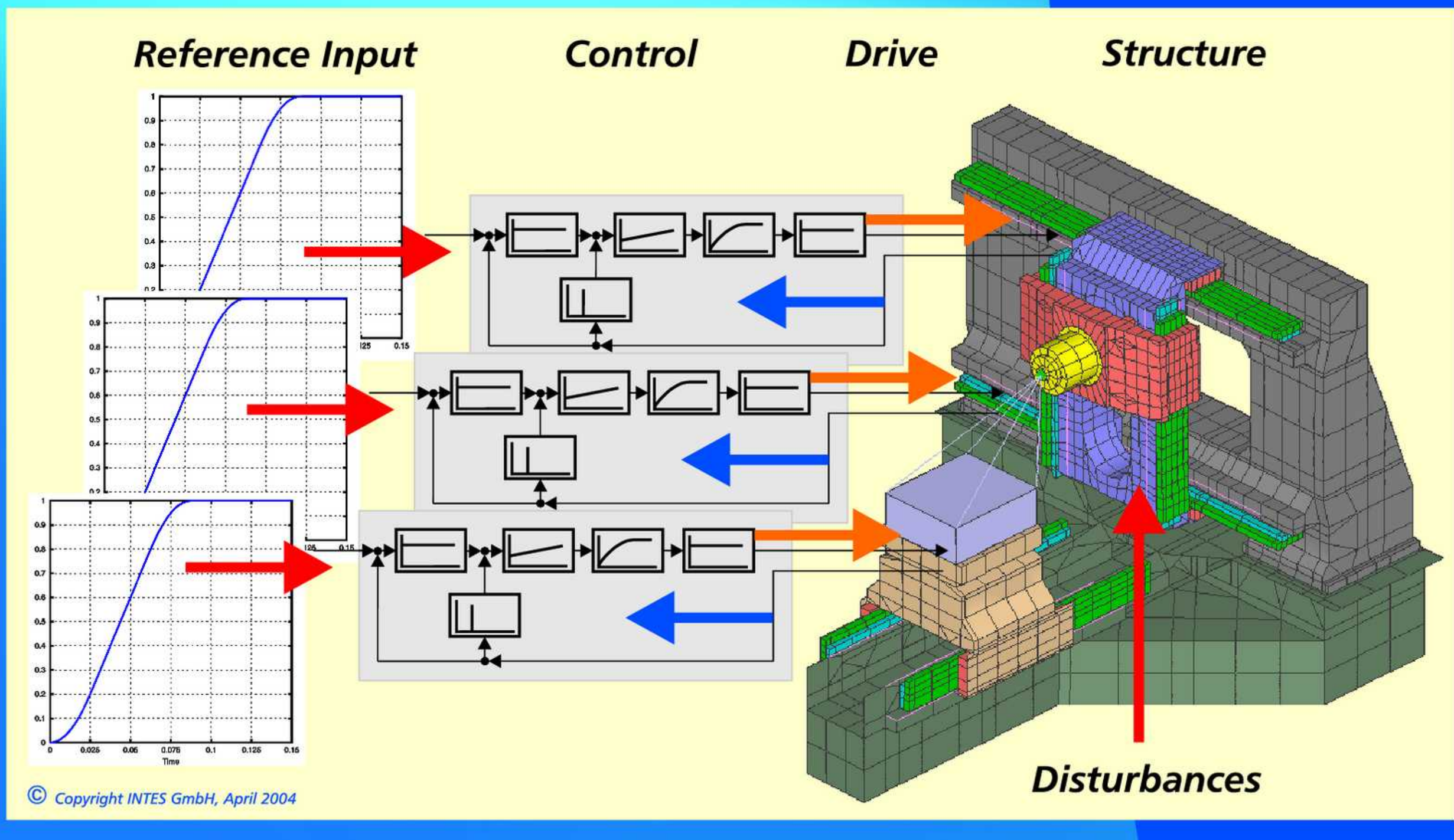
Machine Dynamics with Control

Full integration of control in FE models:

- ***Control elements (three-term and cascade controllers)***
- ***Calculation and evaluation in the time and frequency domain***
- ***Consideration of static mode shapes caused by driving forces and disturbances***
- ***Analysis of machine behavior using complex vibration modes and frequencies***

Background:

- *Strong coupling due to high dynamics of linear direct drives*
- *Joint design of machines and their active control*
- *Optimization using realistic modelling of overall machine dynamics*



All images are shown by courtesy of Siemens Linear Motor Systems GmbH & Co. KG, München.

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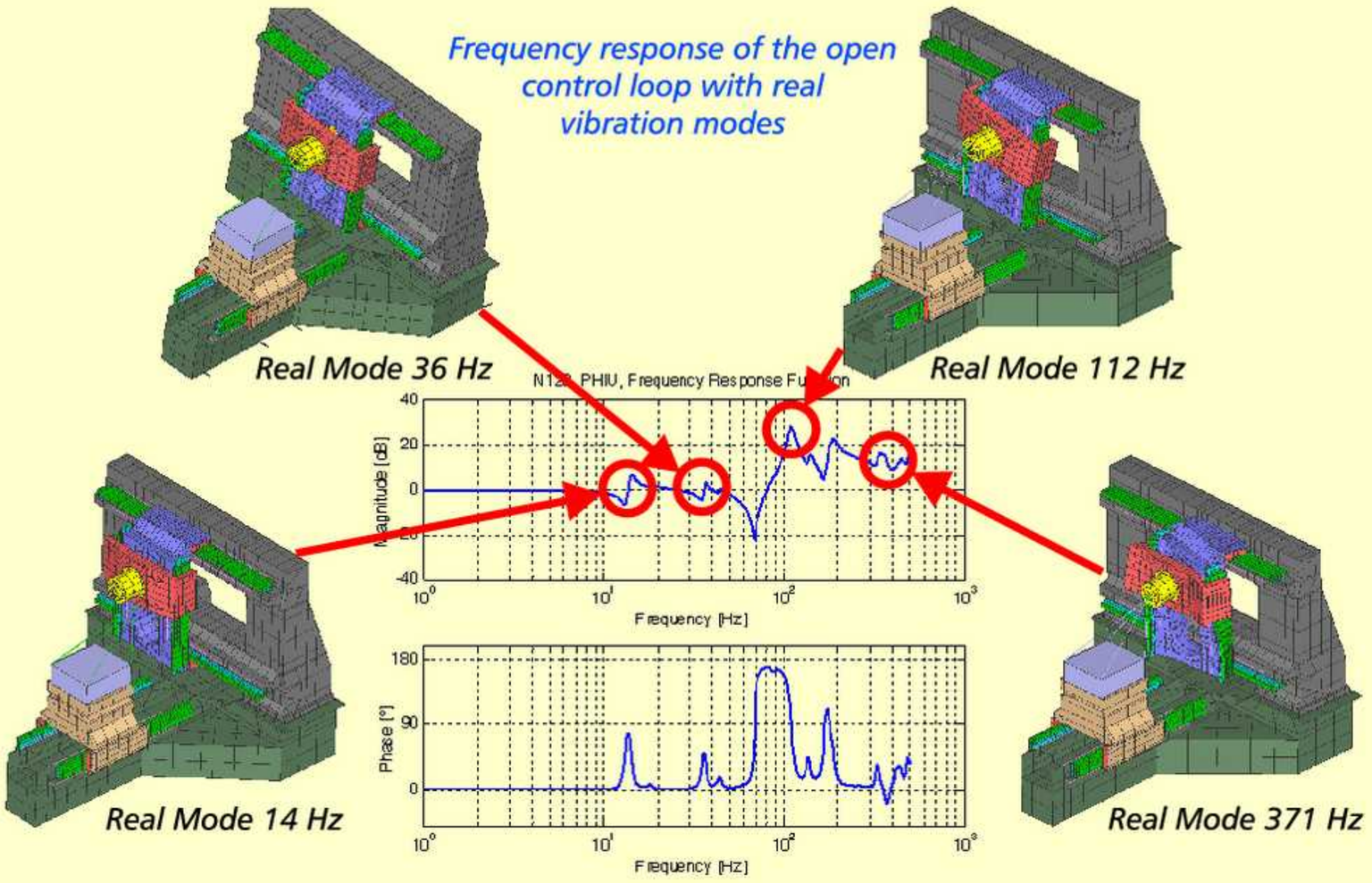
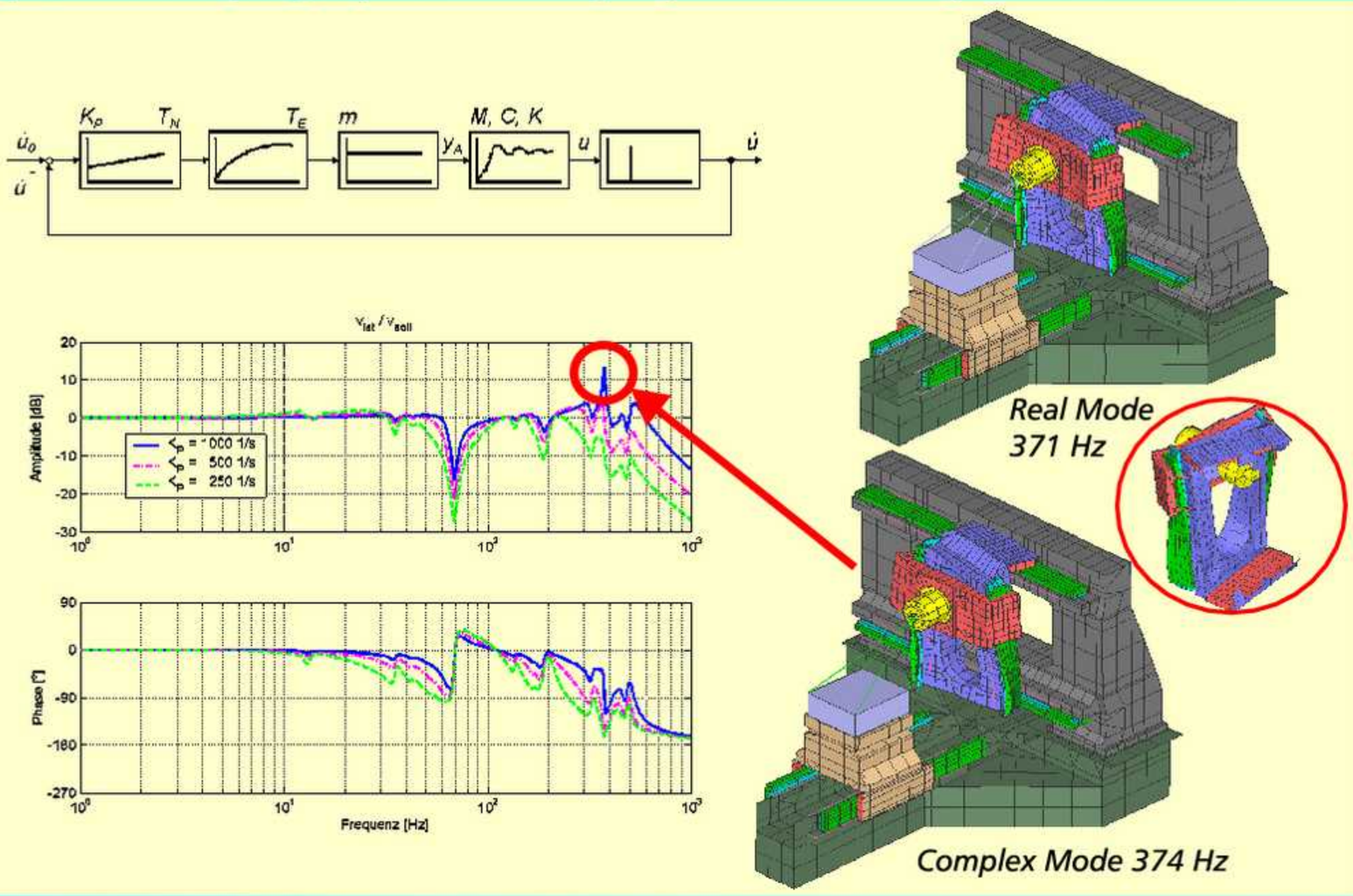
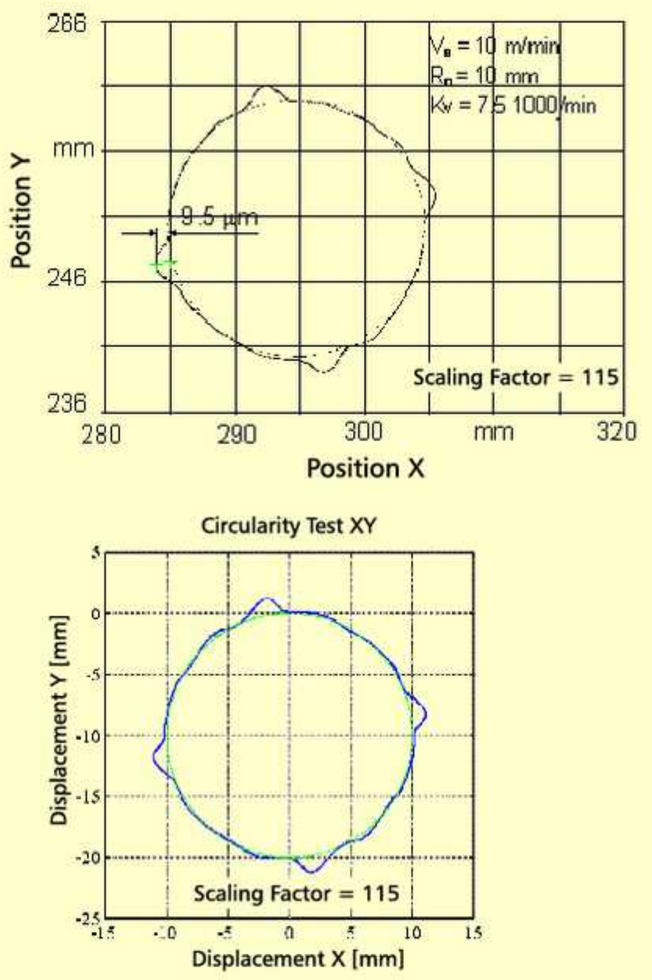
Frequency response of the open control loop with real vibration modes



Frequency response of a closed speed controller with different values for the proportional control element K_p. On the upper right the open-loop vibration mode shape at 371 Hz is shown and below the relevant complex closed-loop vibration mode shape at 374 Hz, which cooresponds to the peak of the frequency response at this frequency. There, an instability occurs.



Circularity test using a position controller - the experimental result on top and the FE analysis result in the time domain below.



Frequency response of a closed position controller with different values for the amplifying element K_v. On the upper right the open-loop vibration mode shape at 112 Hz is shown and below die relevant complex closed-loop vibration mode shape at 65 Hz, which corresponds to the critical response at this frequency.

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