



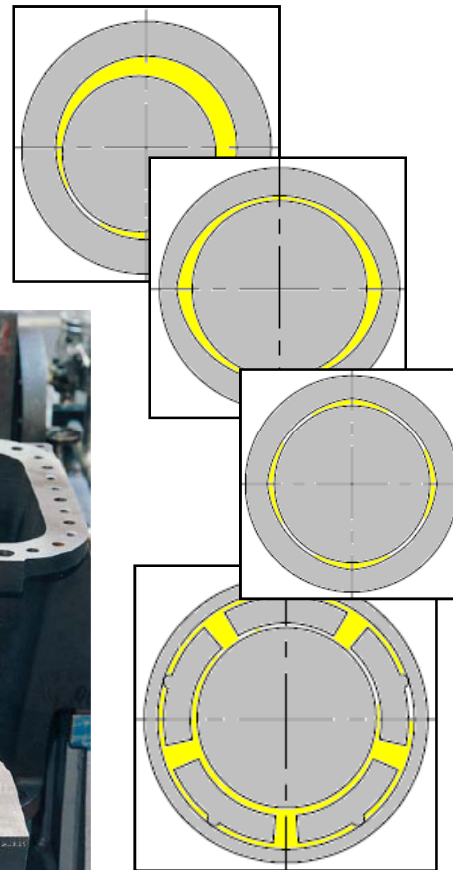
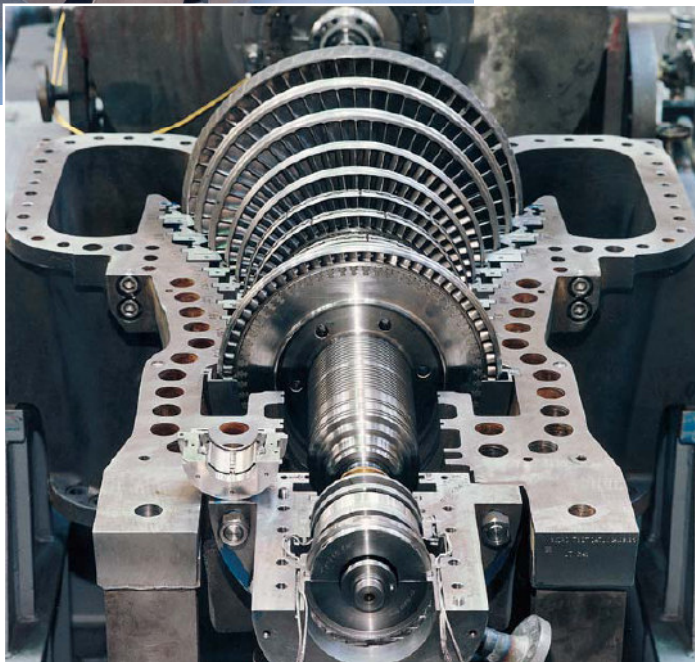
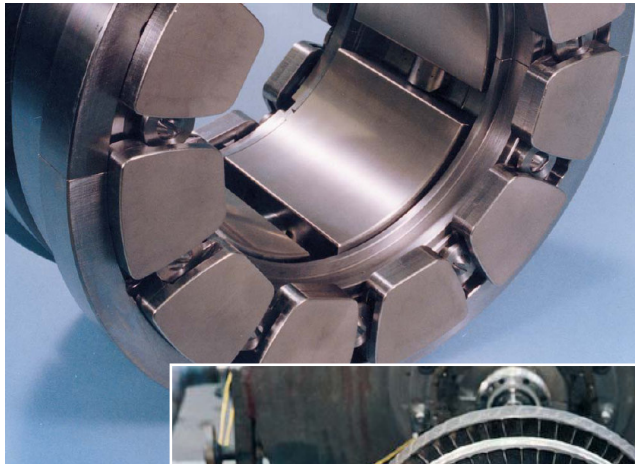
## Rotordynamic Analysis of 120 MW Turbine Generator

***DYNAMICS R4***

Alfa-Tranzit Co., Ltd



# Bearings for quasi-nonlinear analysis

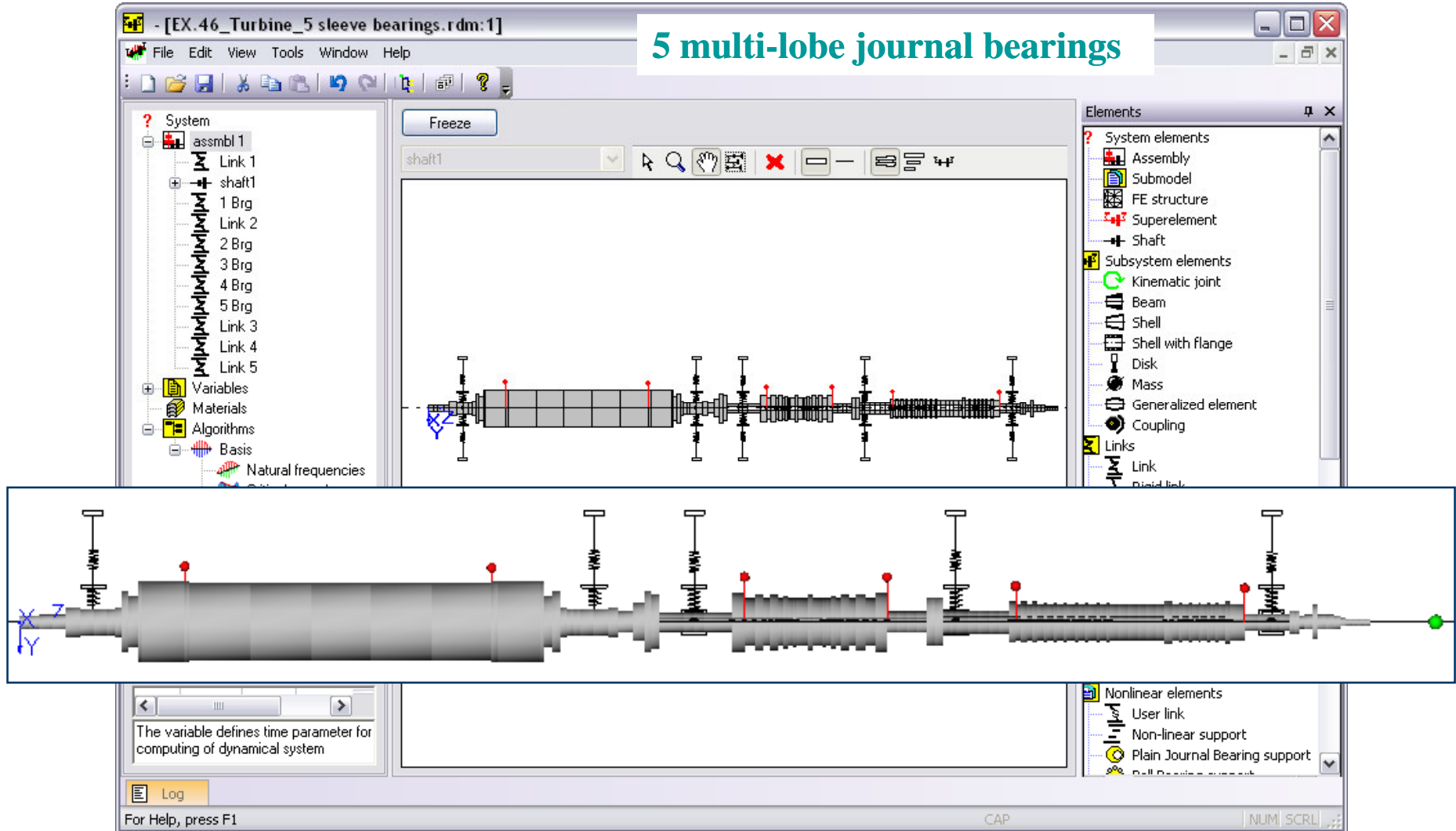


- *Plain sleeve bearings*
- *Lemon bearings*
- *Multi-lobe sleeve bearings*
- *Tilting pads*
- *etc*

# Rotor model of Turbine Generator



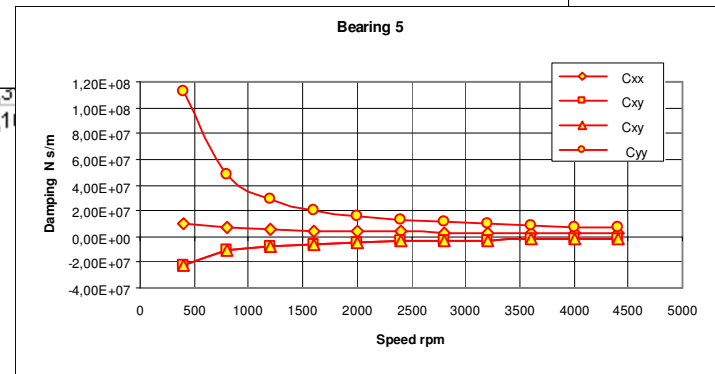
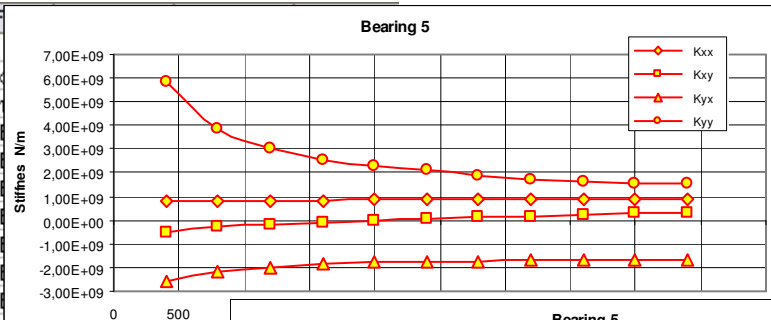
5 multi-lobe journal bearings



# Bearings Stiffness and Damping Coefficients



	A	B	C	D	E	F
1	Bearing5					
2	Speed	Kxx	Kxy	Kyx	Kyy	Cxx
3	1/min	N/m	N/m	N/m	N/m	N*s/m
4	400	7,99E+08	-5,20E+08	-2,57E+09	5,87E+09	1,00E+09
5	800	8,15E+08	-3,01E+08	-2,16E+09	3,86E+09	6,43E+08
6	1200	8,31E+08	-1,75E+08	-1,98E+09	3,03E+09	5,03E+08
7	1600	8,40E+08	-7,77E+07	-1,87E+09	2,56E+09	4,30E+08
8	2000	8,51E+08	-393860	-1,79E+09	2,25E+09	3,80E+08
9	2400	8,63E+08	5,92E+07	-1,76E+09	2,08E+09	3,36E+08
10	2800	8,75E+08	1,19E+08	-1,72E+09	1,92E+09	3,04E+08
11	3200	8,87E+08	1,78E+08	-1,69E+09	1,75E+09	2,80E+08
12	3600	8,97E+08	2,29E+08	-1,68E+09	1,65E+09	2,62E+08
13	4000	9,08E+08	2,75E+08	-1,67E+09	1,58E+09	2,48E+08
14	4400	9,18E+08	3,21E+08	-1,67E+09	1,51E+09	2,36E+08



**Kxx5**

Characteristic curve

time parameter	Kxx5
1200	3.1419e+008
1600	3.21839e+008
2000	3.29237e+008
2400	3.35791e+008
2800	3.42346e+008
3200	3.48609e+008
3600	3.54368e+008
4000	3.60128e+008
4400	3.65887e+008

Timeindependent value: 0

**Matrix**

		Fx	Fy	Fz	Mx	My	Mz
		N	N	N	N m	N m	N m
ut_x	m	Kxx1	Kxy1	0	0	0	0
ut_y	m	Kyx1	Kyy1	0	0	0	0
ut_z	m	0	0	0	0	0	0
ur_x	rad	0	0	0	0	0	0
ur_y	rad	0	0	0	0	0	0
ur_z	rad	0	0	0	0	0	0

OK Cancel Attach external variable Detach external variable

# Natural frequencies



EX.46\_Turbine\_5 sleeve bearings.rdm:1

Freeze Start Break UT 3D

shaft1

0.0 (0.0)
0.0 (0.0)
0.0 (0.0)
0.0 (0.0)
784.5 (13.1)
1686.4 (28.1)
1880.9 (31.3)
1922.8 (32.0)
2120.0 (35.3)
2316.0 (38.6)
2611.2 (43.5)
2704.3 (45.1)
2736.6 (45.6)
2896.3 (48.3)
2963.9 (49.4)
2999.0 (50.0)
3453.4 (57.6)
3638.2 (60.6)
5175.4 (86.3)
5739.6 (95.7)
6047.2 (100.8)
7310.8 (121.8)

System

- assmbl 1
  - Link 1
  - shaft1
    - 1 Brg
    - Link 2
    - 2 Brg
    - 3 Brg
    - 4 Brg
    - 5 Brg
    - Link 3
    - Link 4
    - Link 5
  - Variables
  - Materials
  - Algorithms
    - Basis
      - Natural frequencies
      - Critical speeds
      - Natural frequencies n
      - Unbalance response
      - Orbit (unbalance)

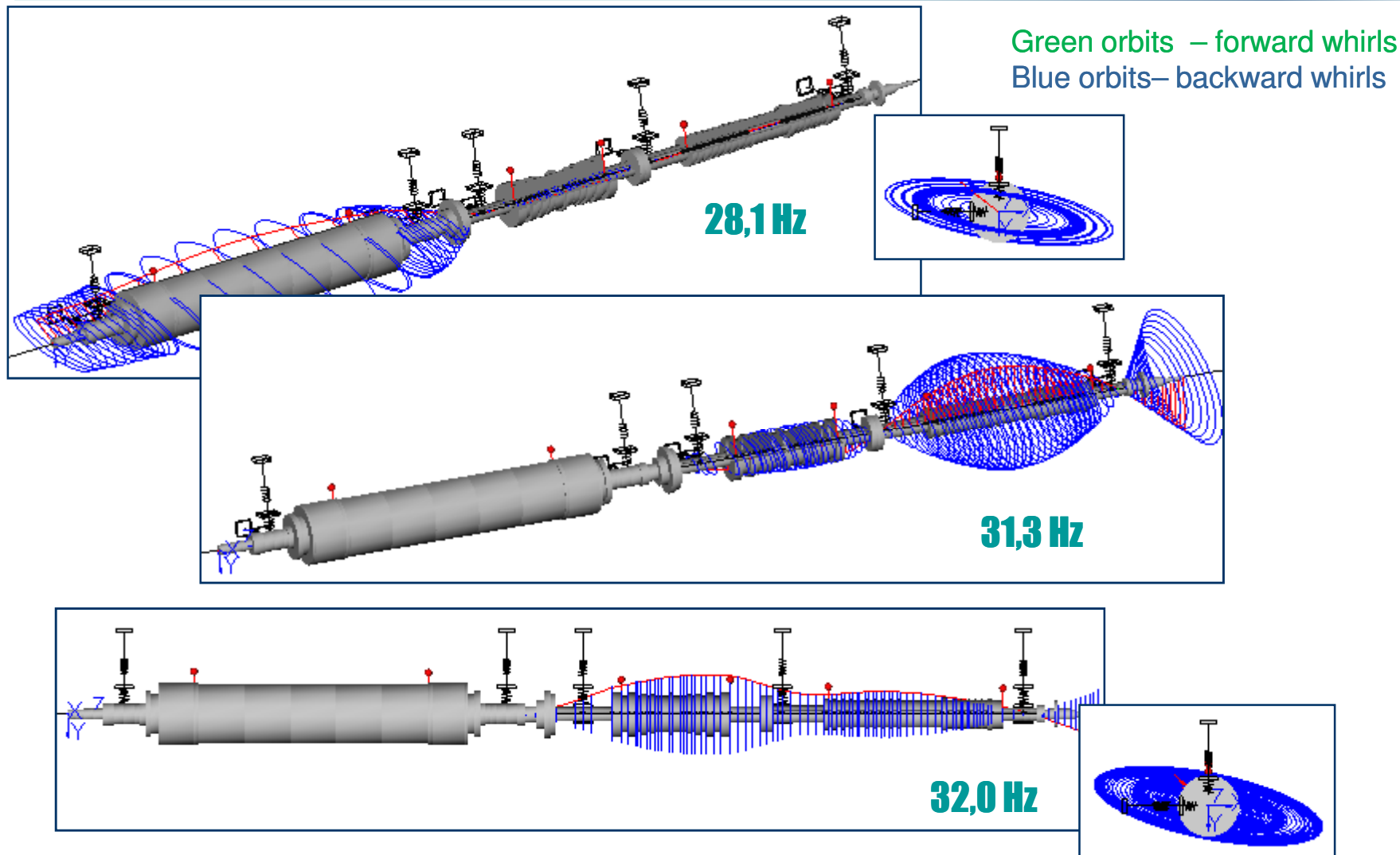
Des Designation

t\_pr 3600 Time parameter

The variable defines time parameter for computing of dynamical system

RotX RotY Zoom

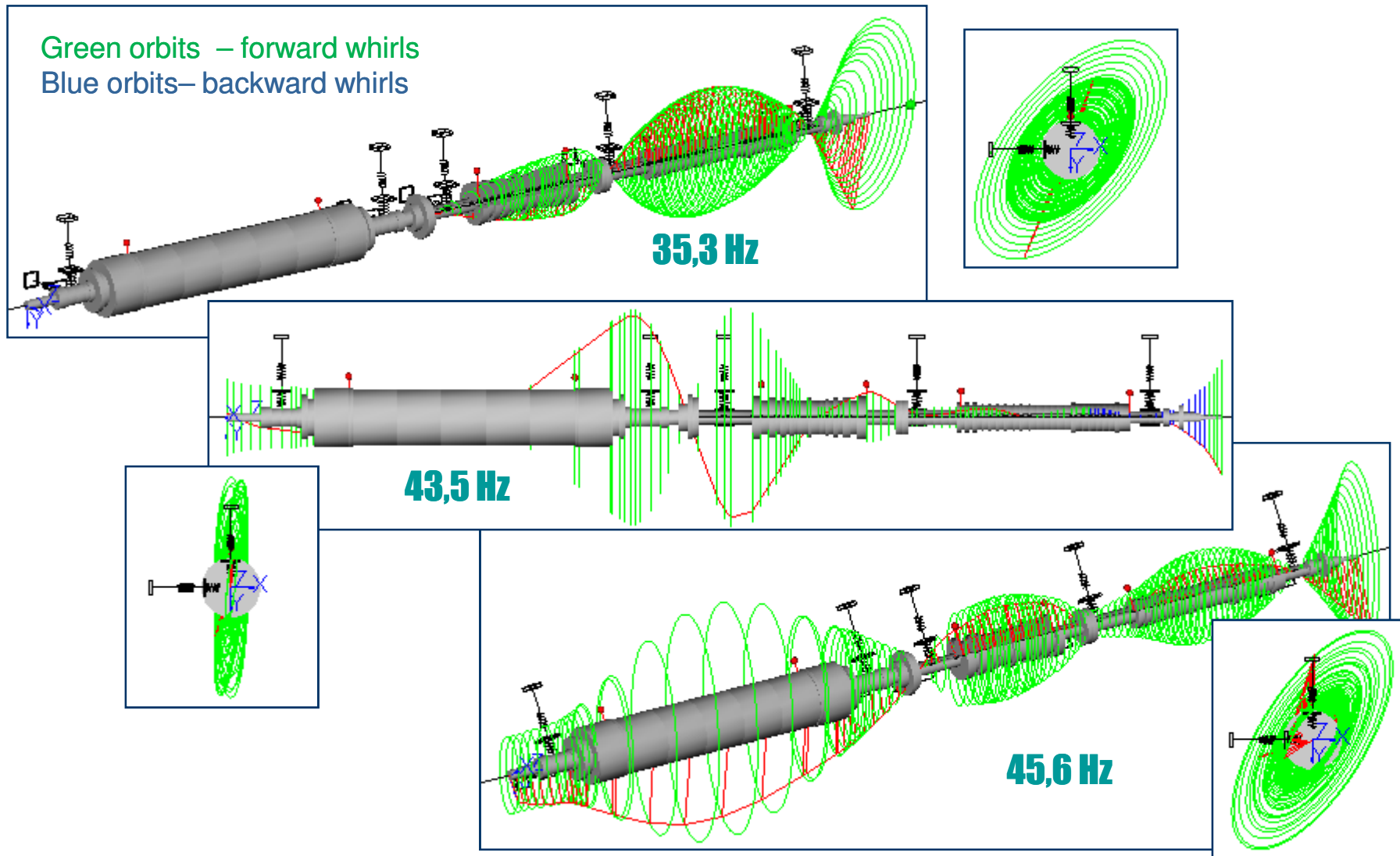
# Natural frequencies and mode shapes (3600 rpm)



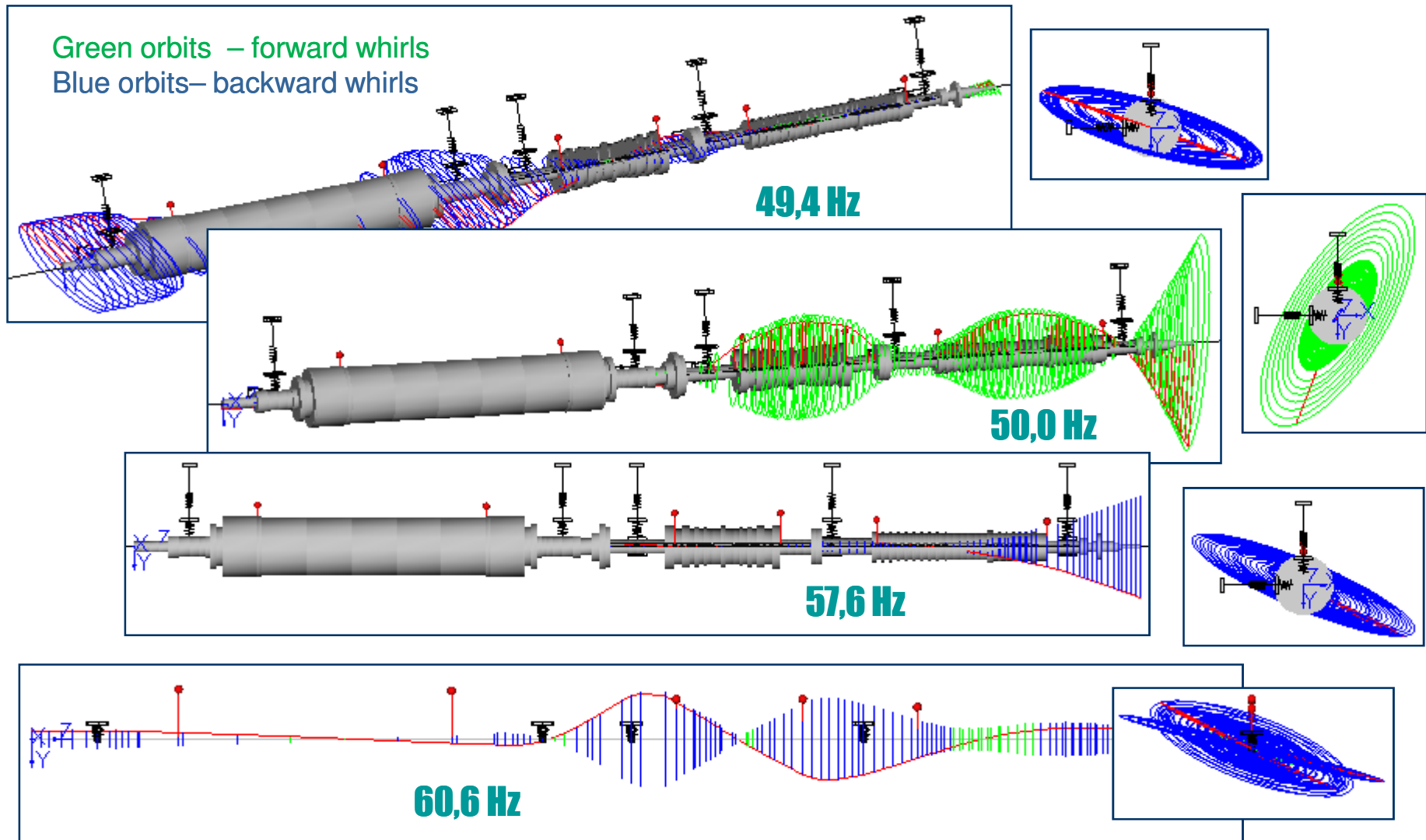
# Natural frequencies and mode shapes (3600 rpm)



Green orbits – forward whirls  
Blue orbits – backward whirls



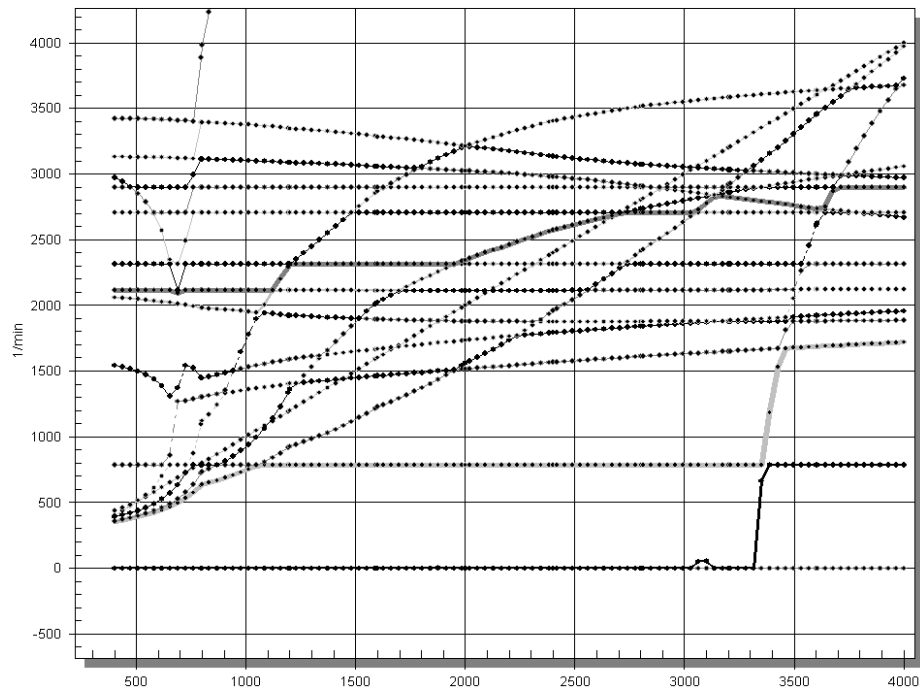
# Natural frequencies and mode shapes (3600 rpm)



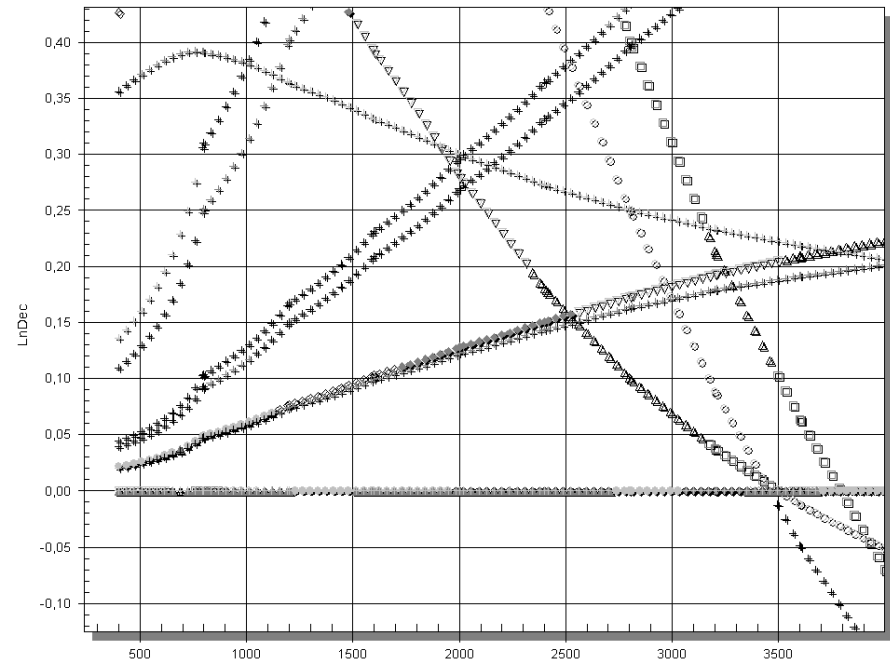
# Natural frequencies and stability maps



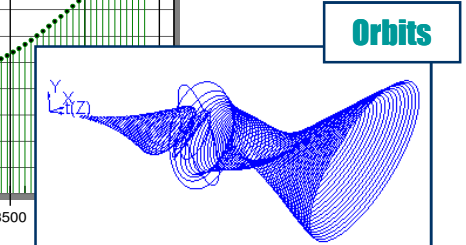
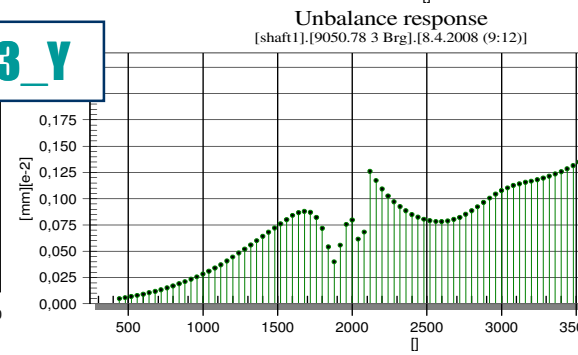
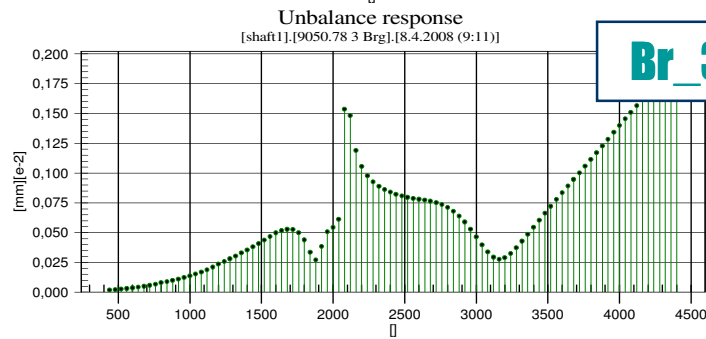
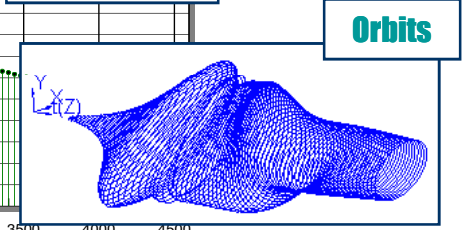
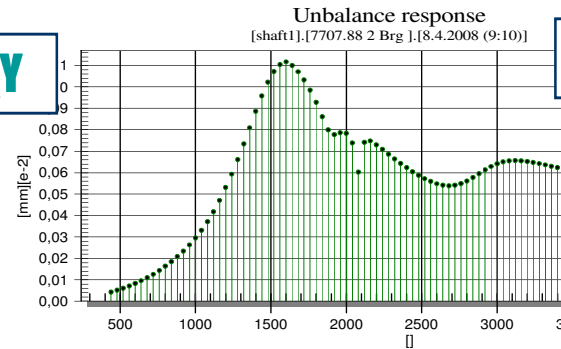
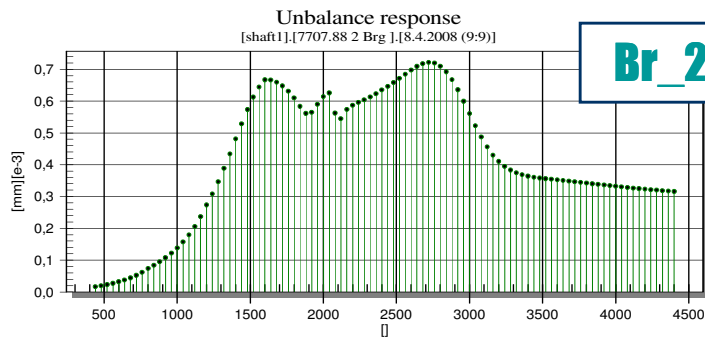
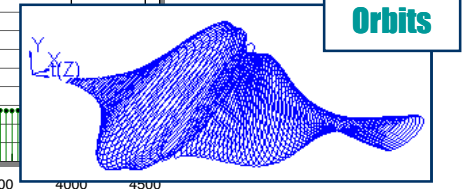
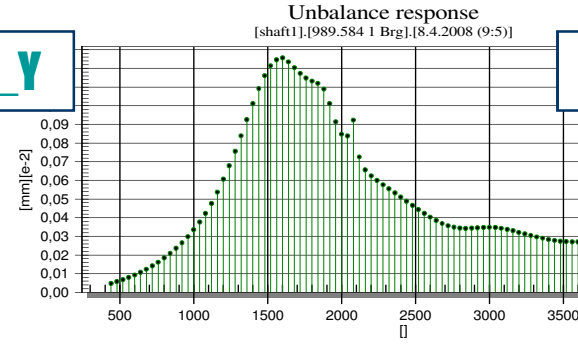
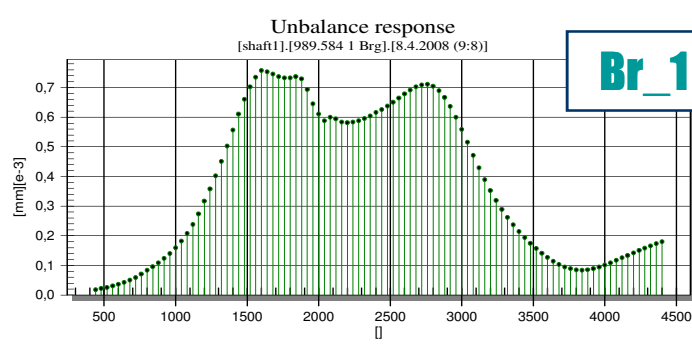
## Natural frequencies map



## Stability map



# Unbalance response



# Unbalance response (3D-chart)

