GT2500-BRUSH GENERATOR DRIVE TRAIN
Modeling and Analysis

DYNAMICS R4

Alfa-Tranzit Co., Ltd

TRANZIT

Customer - Magellan Aerospace, Canada

The task of the work is the determination of main resonant modes of the rotor drive train system ”GT25000 Power turbine – BRUSH generator” regarding all oscillation modes - bending, torsion and longitudinal ones.

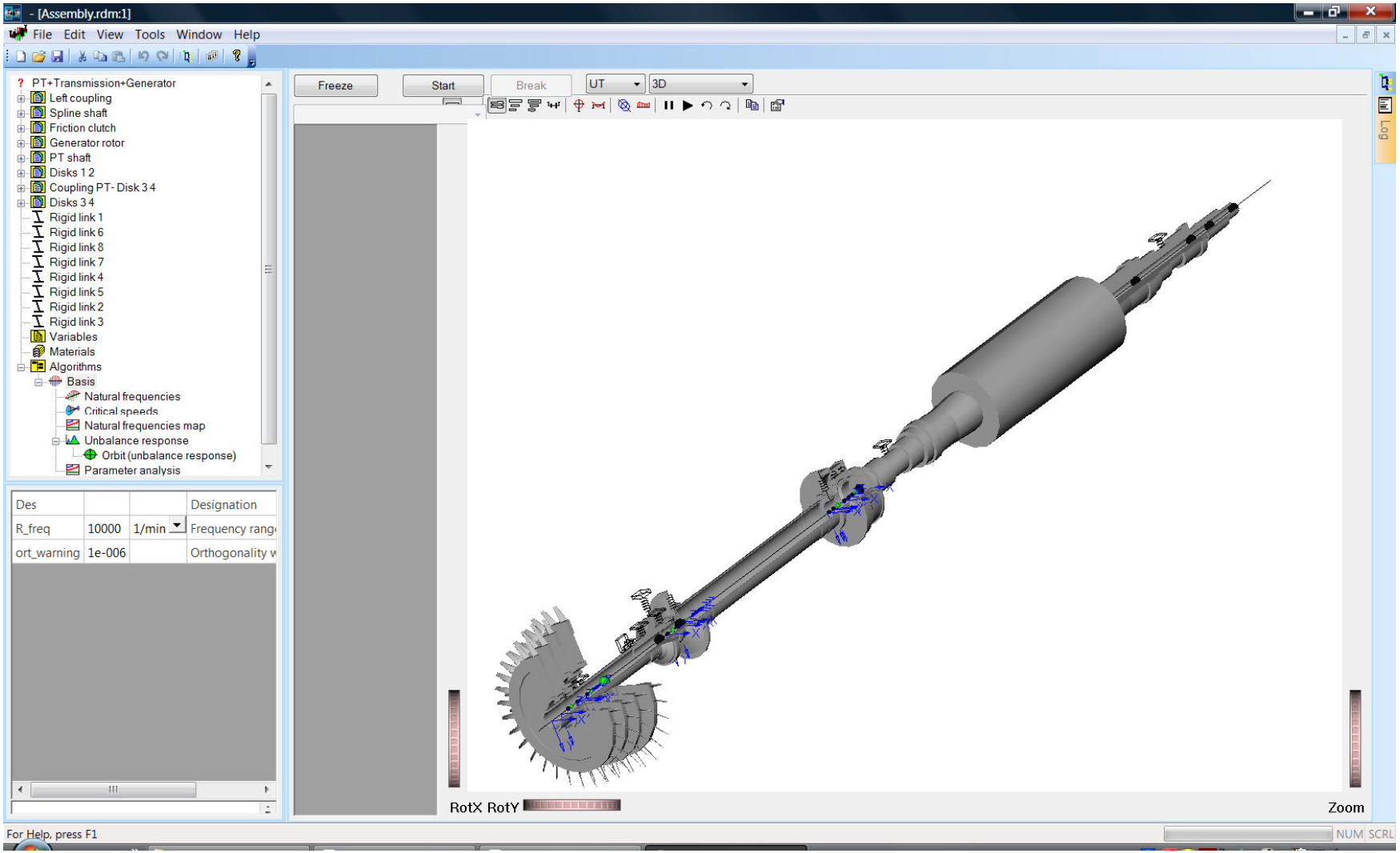
The following was done to accomplish this task:

- the rotor system model creation;
- geometric and mass identification of the rotor system;
- calculation of natural frequencies and mode shapes of all types;
- calculation of critical speeds and the corresponding mode shapes;
- calculation of forced oscillation under the influence of the distributed system of unbalances.

Modeling was carried out in the Dynamics R4.5 program system by the company Alfa-Tranzit Co., Ltd on the basis of the data provided by Magellan Aerospace

Alfa-Tranzit Co., Ltd
(495)232-60-91
www.alfatran.com

Dynamics R4 main window with rotor drive train

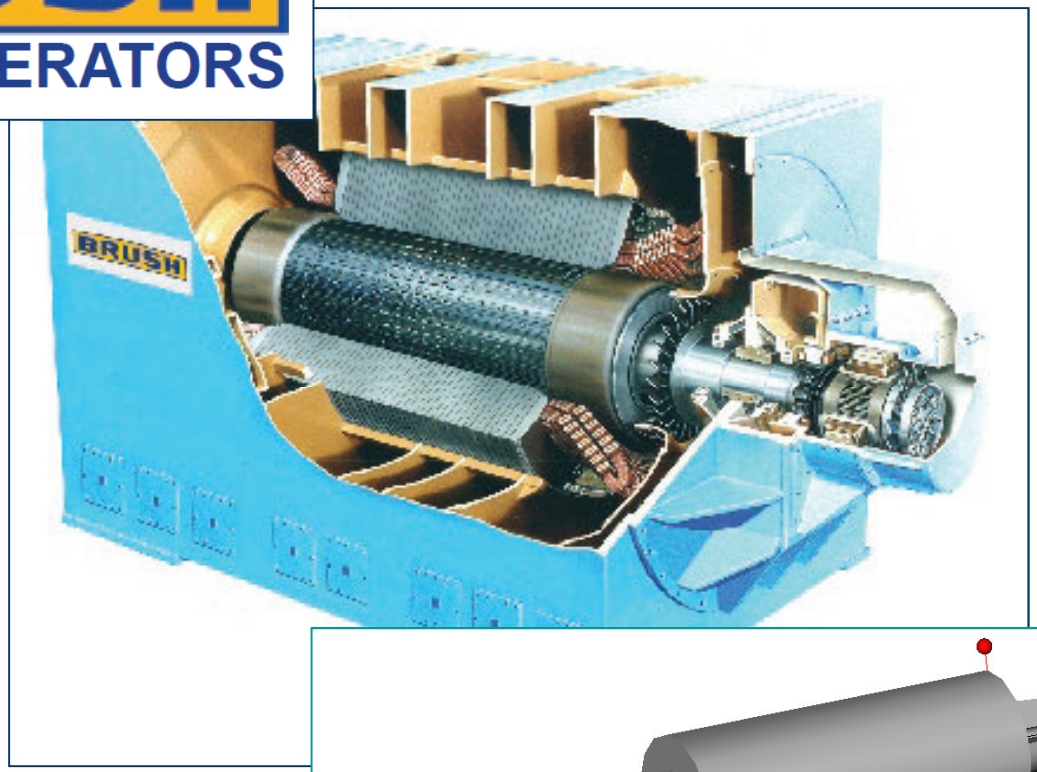


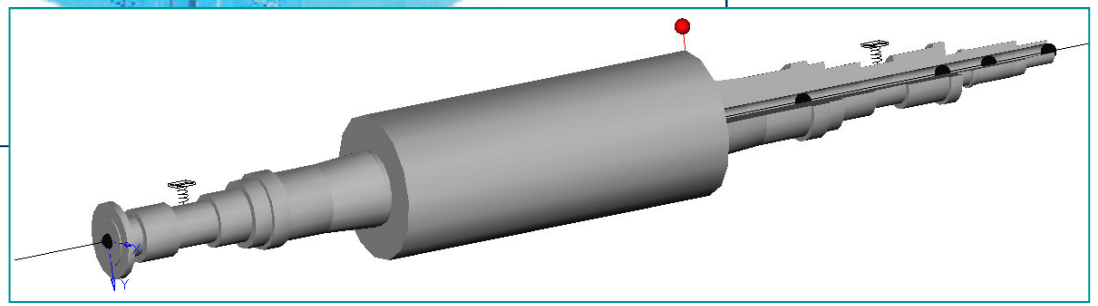
DYNAMICS R4

Alfa-Tranzit Co., Ltd
(495)232-60-91
www.alfatran.com

Generator modeling

BRUSH TURBOGENERATORS





DYNAMICS R4

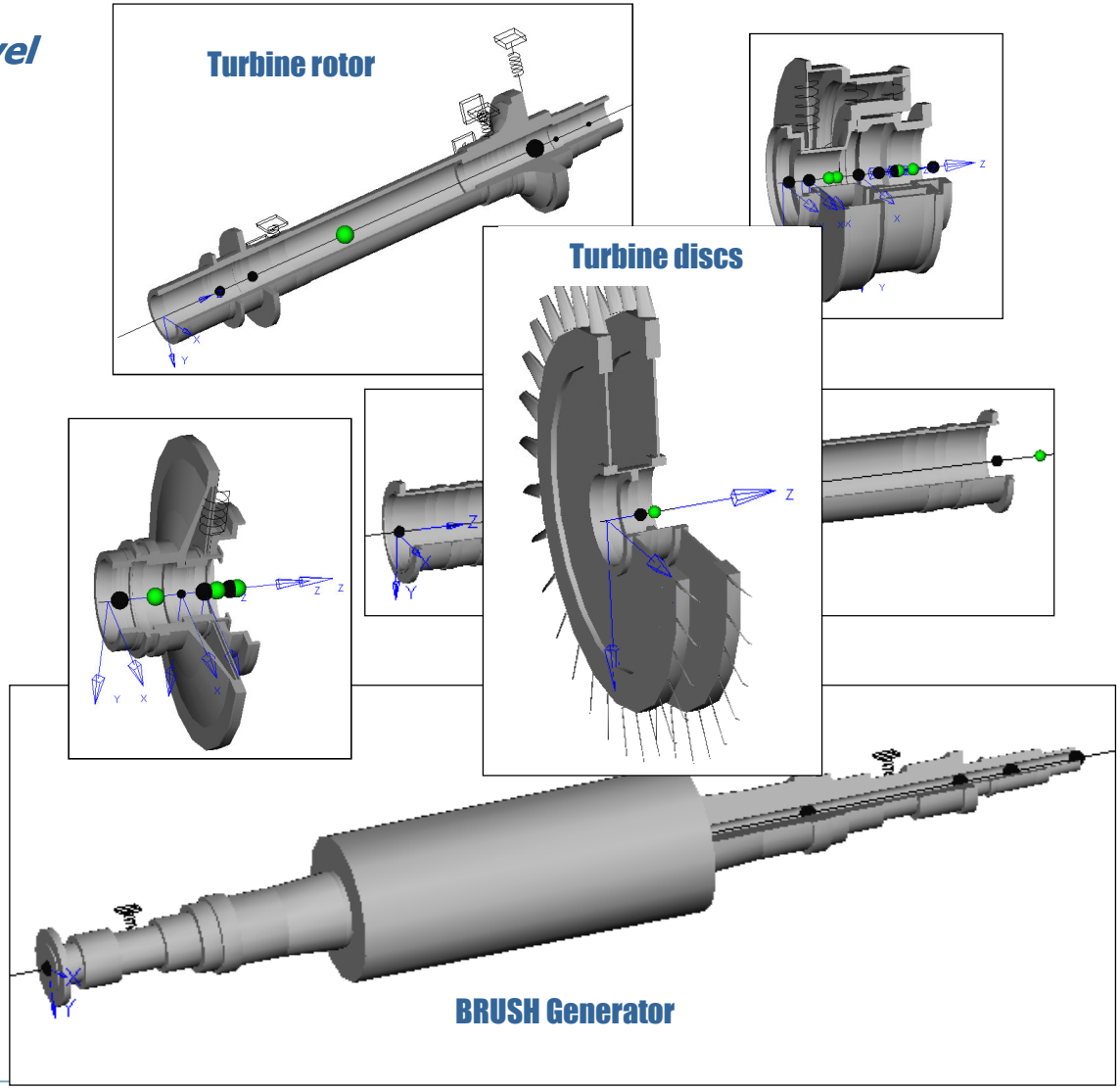
Alfa-Tranzit Co., Ltd
(495)232-60-91
www.alfatran.com

Modeling

TRANZIT

A dynamic model may be multi-level and consists of the following structure items:

- *Subsystems – low level structure item constructed out of standard elements*
- *Assembly – may consist of any structure items*
- *Sub-models – structure parts stored in an outer file not inside the project*

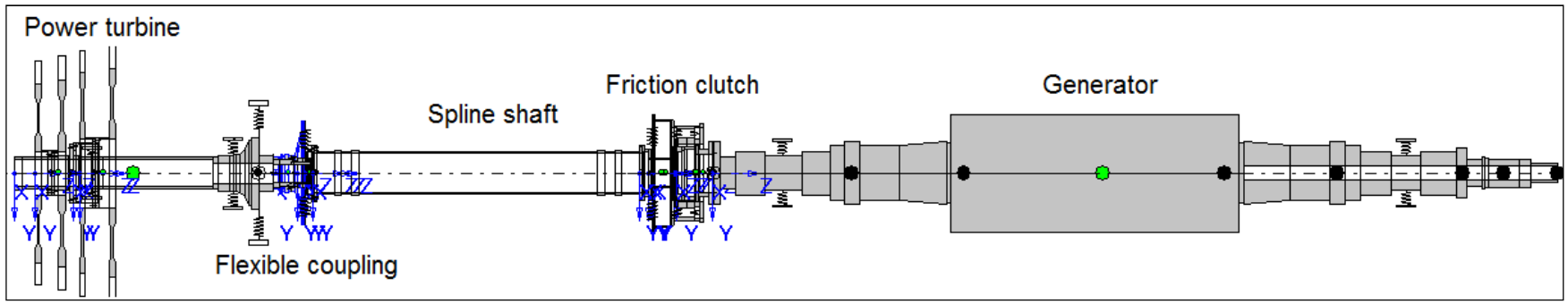


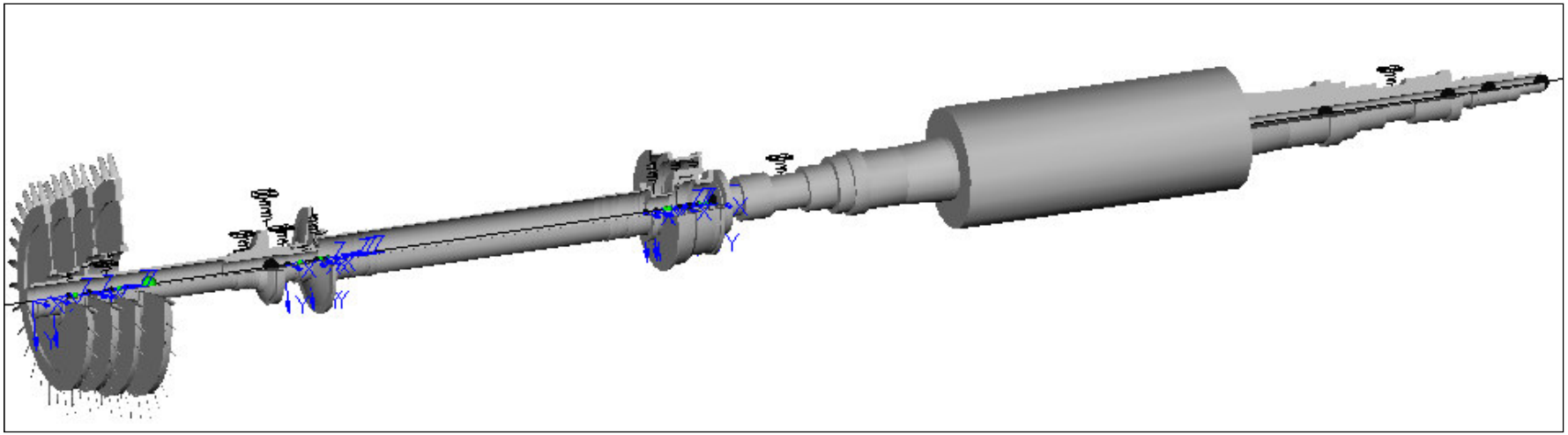
Structure items are assembled with different types of links (bearings)

DYNAMICS R4

Alfa-Tranzit Co., Ltd
(495)232-60-91
www.alfatran.com

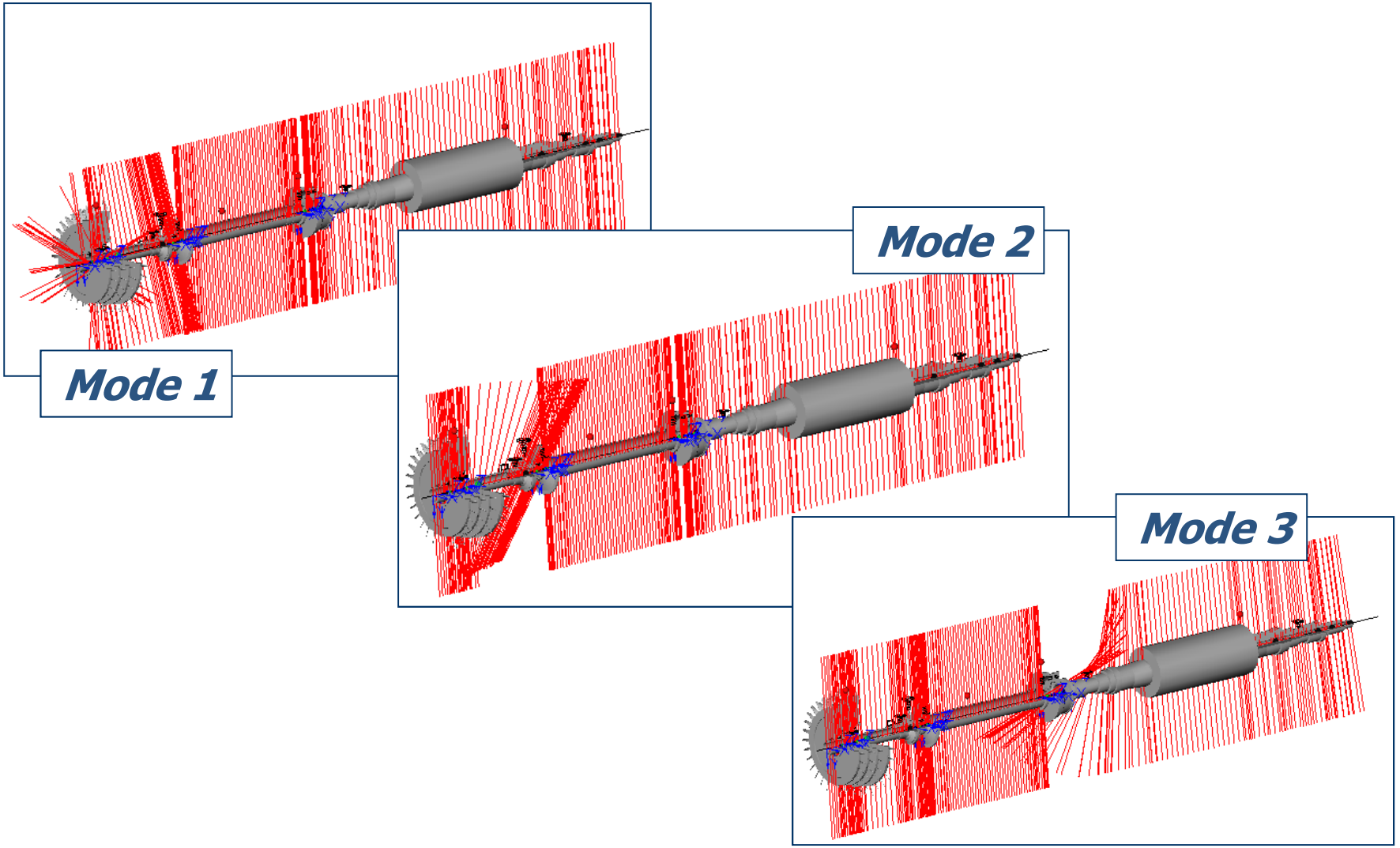
Complete drive train model





Alfa-Tranzit Co., Ltd
(495)232-60-91
www.alfatran.com

Torsional vibrations of drive train



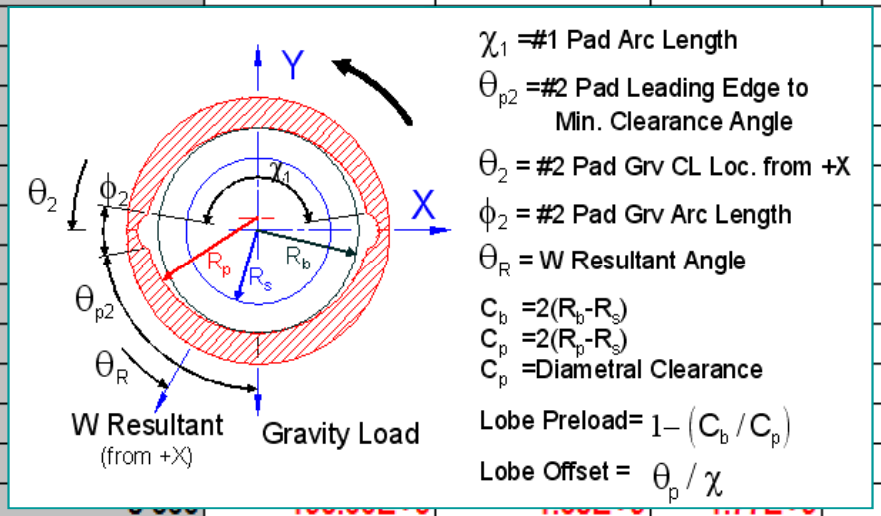
Alfa-Tranzit Co., Ltd
(495)232-60-91
www.alfatran.com

Journal bearings coefficients (*RMT, Inc. s/w*)

TRANZIT

www.rmt-inc.com

Speed rpm	Kxx N/m	Kxy N/m	Kyx N/m	Kyy N/m	Cxx N-s/m	Cxy N-s/m	Cyx N-s/m	Cyy N-s/m
500	621.54E+6	-268.71E+6	-2.06E+9	3.67E+9	9.23E+6	-16.38E+6	-23.19E+6	78.66E+6
1 000	527.01E+6	-62.95E+6	-1.68E+9	2.59				
1 500	510.31E+6	135.17E+6	-1.59E+9	2.20				
2 000	471.51E+6	298.15E+6	-1.52E+9	2.08				
				2.03				
				2.05				
				2.10				
				2.13				
				2.18				
				2.23				
				2.27				
				2.37				
				2.44				
				2.48				
				2.54E+9				
				2.63E+9				
				2.70E+9				
9 000	175.69E+6	1.64E+9	-1.76E+9	2.77E+9				
9 500	165.85E+6	1.72E+9	-1.83E+9	2.83E+9				
10 000	126.22E+6	1.82E+9	-1.95E+9	2.94E+9				



χ_1 =#1 Pad Arc Length

θ_{p2} =#2 Pad Leading Edge to Min. Clearance Angle

θ_2 = #2 Pad Grv CL Loc. from +X

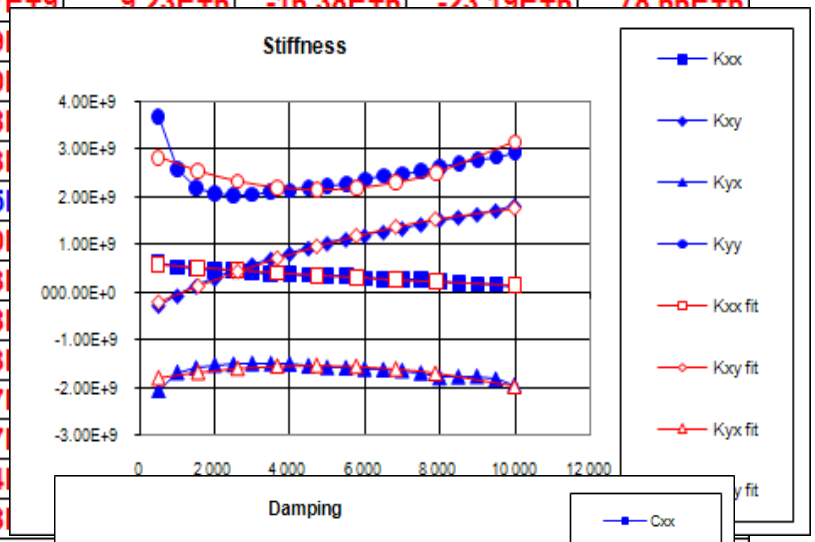
ϕ_2 = #2 Pad Grv Arc Length

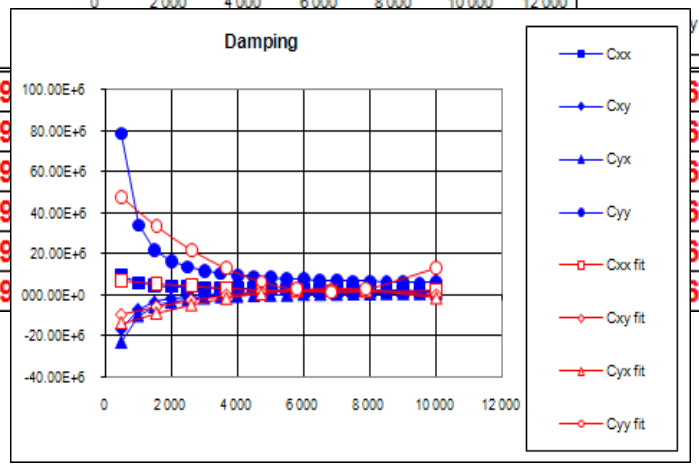
θ_R = W Resultant Angle

C_b =2(R_b-R_s)
C_p =2(R_p-R_s)
C_p =Diametral Clearance

Lobe Preload= $1-(C_b/C_p)$

Lobe Offset = θ_p/χ



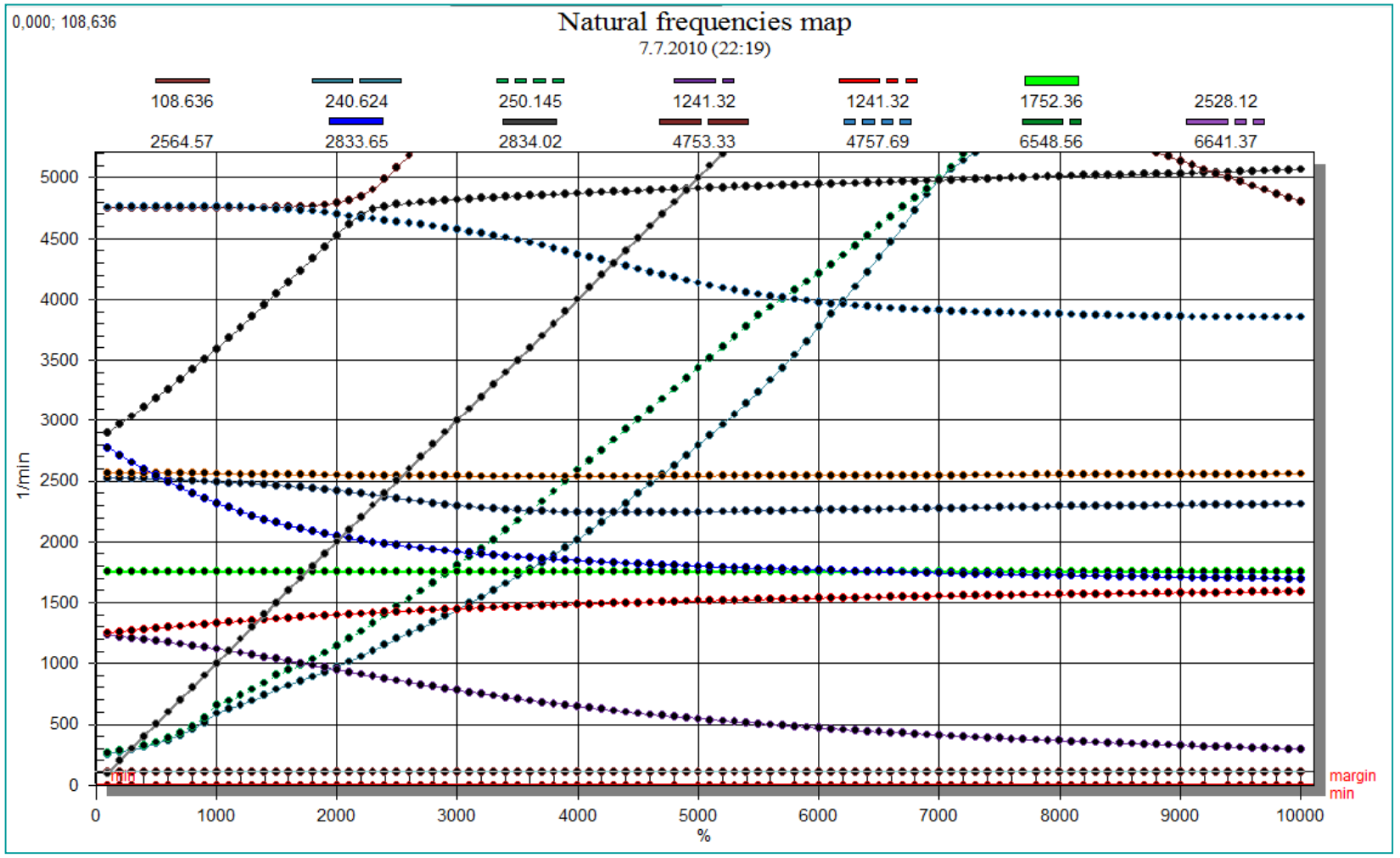


Data from XLTltpad & XLPocket can be imported into Dynamics R4

DYNAMICS R4

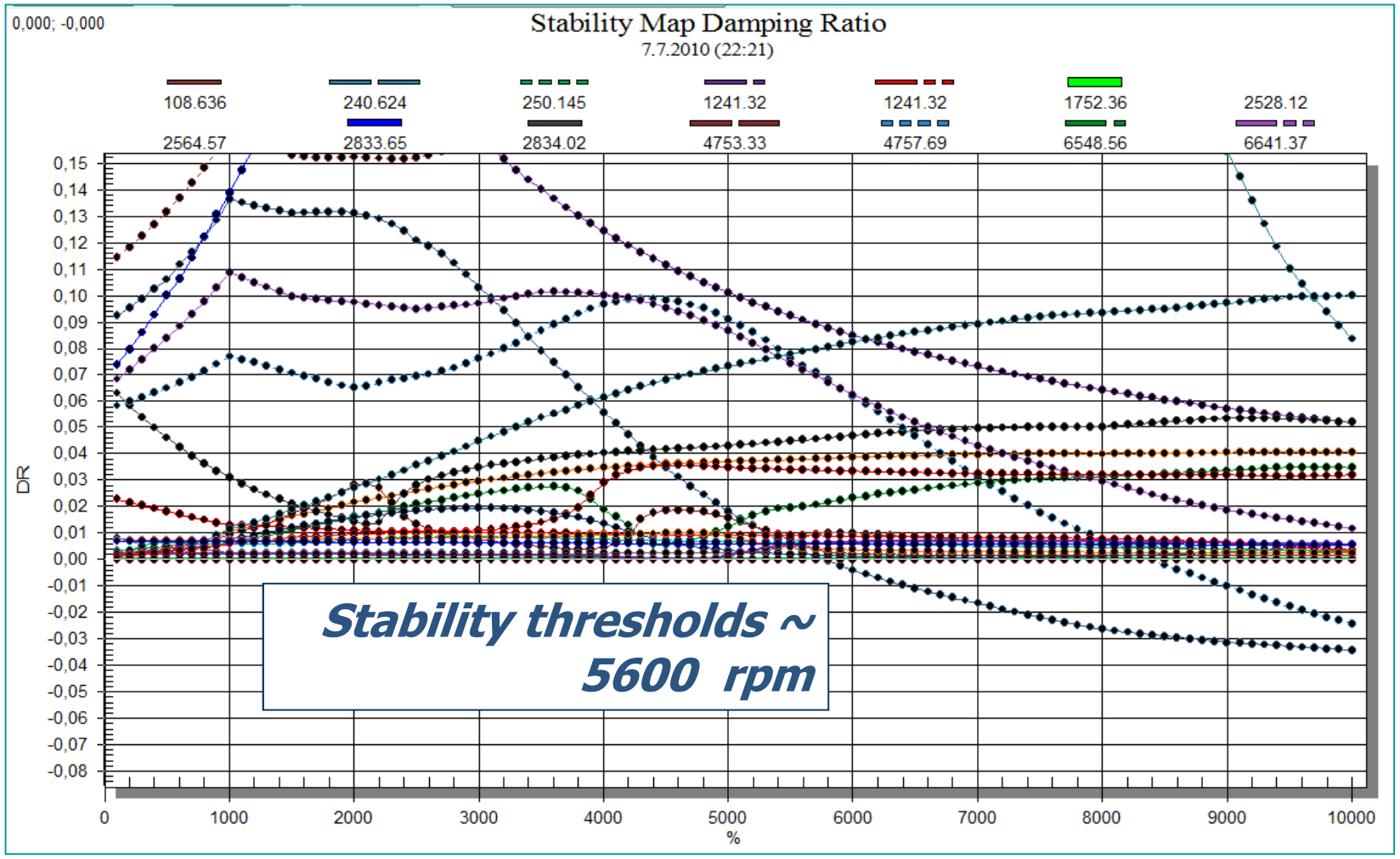
Alfa-Tranzit Co., Ltd
(495)232-60-91
www.alfatran.com

Natural frequency map

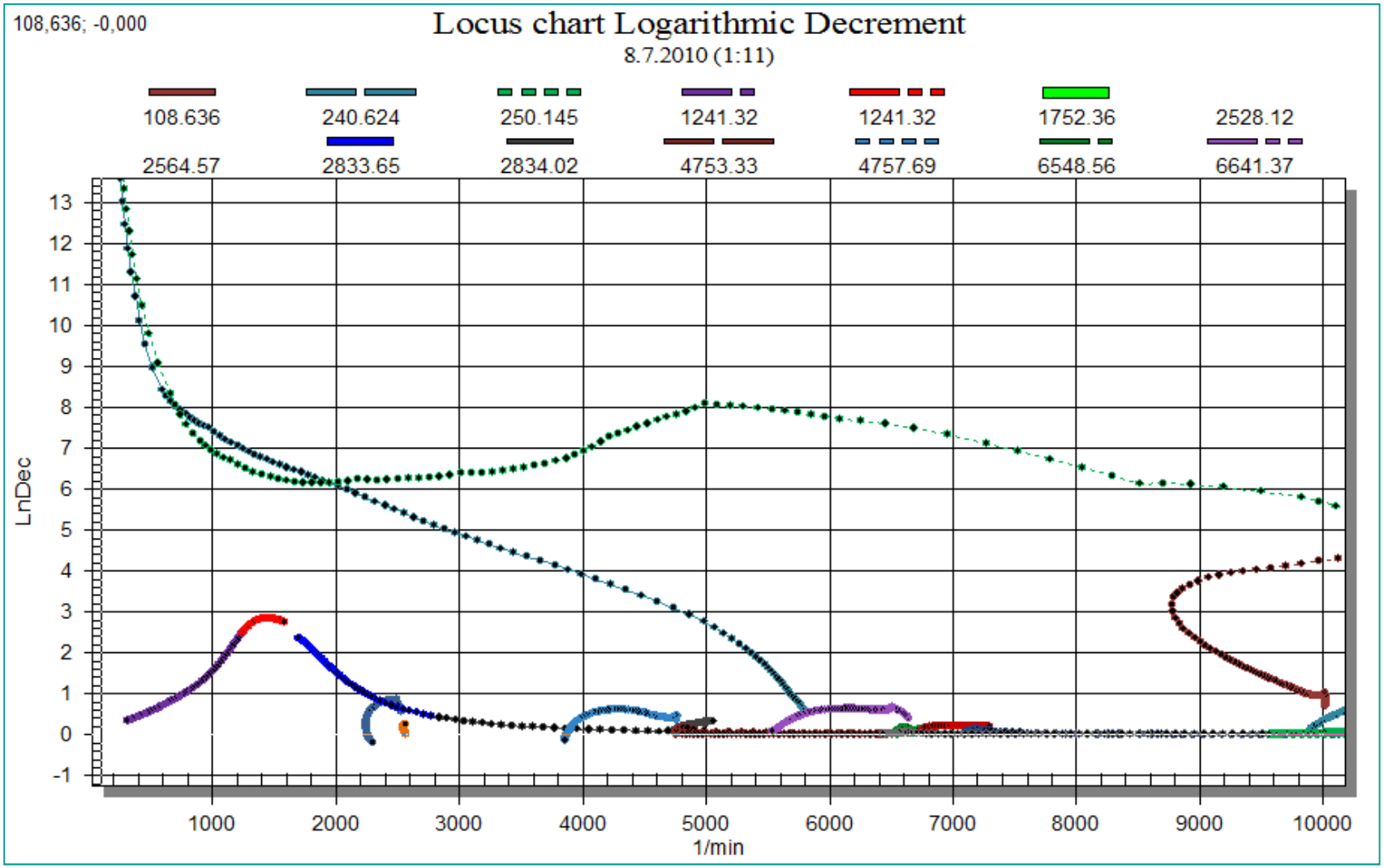


Alfa-Tranzit Co., Ltd
(495)232-60-91
www.alfatran.com

Quasi-nonlinear analysis - Stability Map



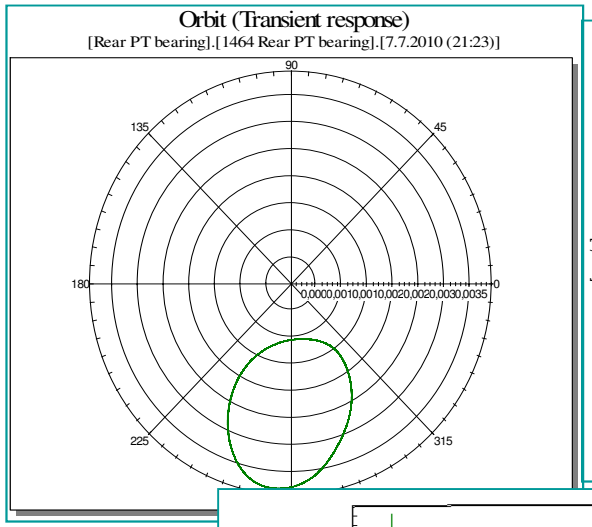
Locus chart

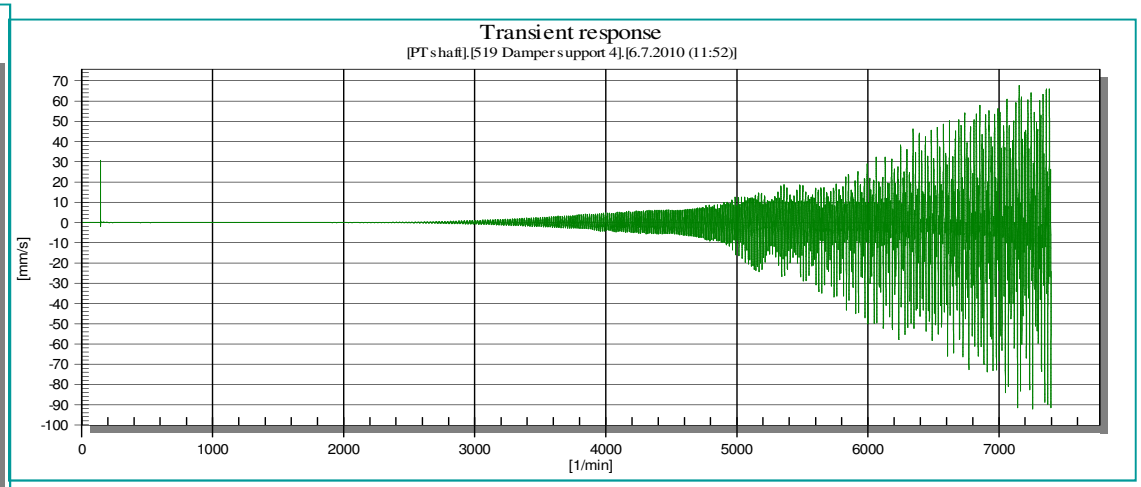


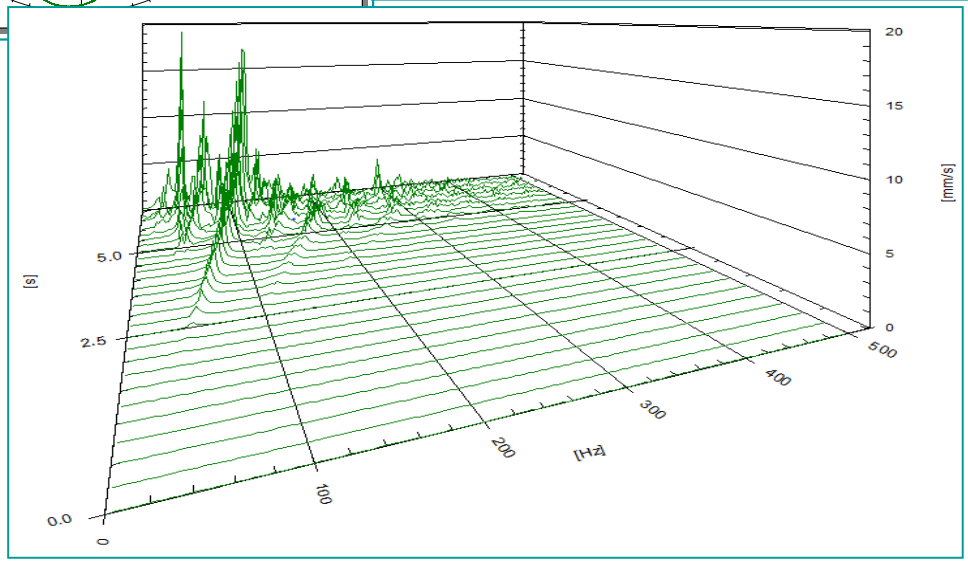
DYNAMICS R4

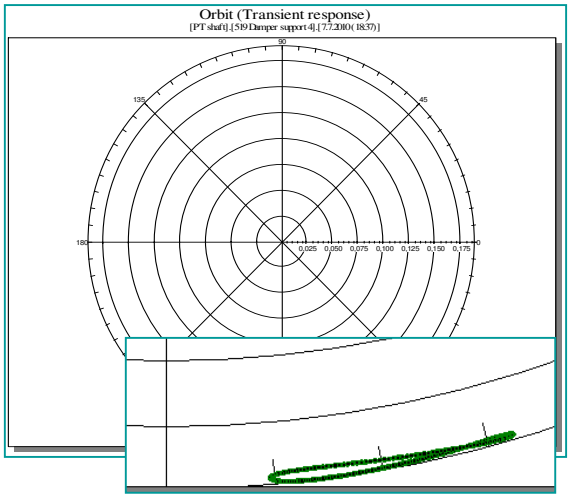
Alfa-Tranzit Co., Ltd
(495)232-60-91
www.alfatran.com

Nonlinear analysis









DYNAMICS R4

Alfa-Tranzit Co., Ltd
(495)232-60-91
www.alfatran.com