



# The New Virtual BERTA Test Bench



**Tested Synchronous Generator**

6,000	1,100
Vg Rated VV	Vg Xd
100,000	0,100
Vg T11 MVA	Vg Xd'
80,905	0,600
Tested Unit MW	Vg Xq
	6,000
	Vg T'ab
2,000	2,500
Vg T17 & 20 amp	Vg T11 H

**Excitation Model**

**P.T. & C.T.**

0000,000	Vg PI High
115,000	Vg PI Low
1,200+4	Vg CT High
5,000	Vg CT Low



# BERTA - Windows: What Is It?



- A quasi-real-time replica of the real BERTA Test Bench:
  - Windows version of the BERTA on Site application
  - Speed governor tests
  - Automatic Voltage Regulator tests
  - Power System Stabilizer tests
- The best training tool to conduct tests for:
  - Complying to NERC'S standards MOD-026 and MOD-027
  - Or equivalent standards from energy regulating authorities
- Powered by:
  - RT-LAB in software synchronized mode;
  - Testdrive V2.8



# BERTA - Windows: What do you need?



- A Windows 10 platform
- A computer with 4 virtual processors or more
- A recent computer with processor from 4<sup>th</sup> generation or more
- A basic knowledge of generating unit control:
  - Speed/Frequency control and stability
  - Voltage regulation
  - Power System Stabilizer utility
- No need for programming
- No need for training on RT-LAB
- No need for building models
- Enough imagination to recommend improvements to BERTA - Windows



# BERTA for Tests in Power Plant – Version for Windows



- The real tested unit is replaced by a simulated tested unit:
  - Connected and synchronized to a virtual grid with an equivalent Thevenin source with finite inertia;
  - Hydro, gas and steam turbine models;
  - Appropriate speed governor models;
  - Static excitation model;
  - Up to 4 models of P.S.S. – Power System Stabilizer
- Conditions of real tests can be replicated and/or anticipated;
- Adjustable parameters and settings;
- Simulation using a 50  $\mu$ s time step as in the real BERTA Test Bench.



# BERTA - Windows: OBJECTIVES



- Improve your ability to:
  - Conduct speed governor, AVR and PSS tests on an actual operating unit in the power plant
  - Enhance the power system stability
  - Ensure the frequency stability of an islanded system
- Improve the accuracy of a generator controller models:
  - Reverse engineering of the models using test results
  - Build your own models on another platform and compare your results with those of BERTA – Windows





# Who need it?



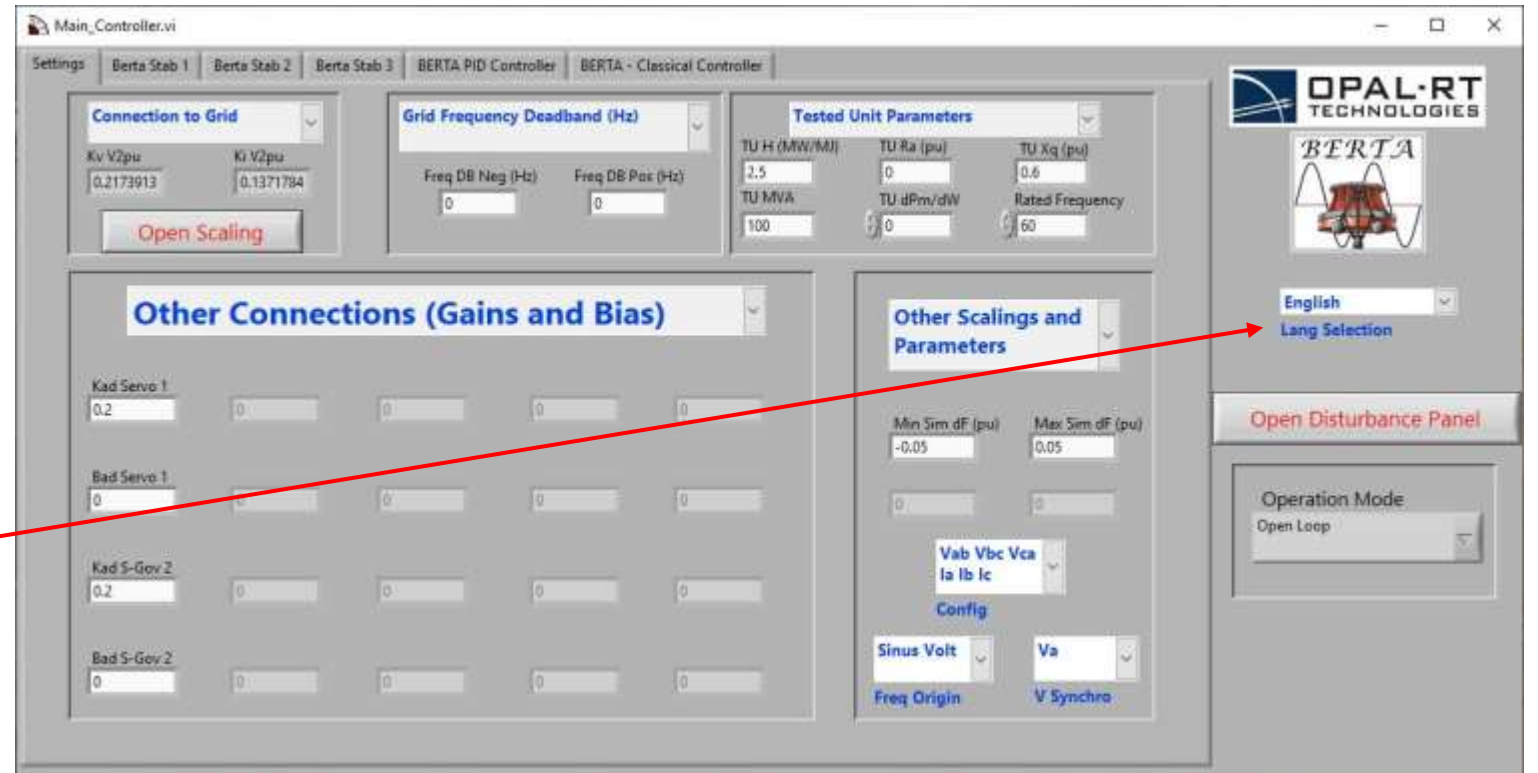
- Power system engineering departments of universities:
  - Under-graduated and Graduated students
  - Focusing on controller settings to ensure power system stability
- Power generation utilities:
  - Who must comply to energy regulating authorities standards. (Ref.: NERC)
  - Best training tool for technical staff responsible of AVR, PSS and speed governor settings on site
  - Best training tool for conducting on-site tests in the power plant
- People may be different than researchers



# Multilingual BERTA



- Most GUI titles can be displayed in:
  - English
  - Français
  - Español
  - Português
  - Others to come with users' collaboration
- Click on "Lang Selection" scrolling list





# Multilingual BERTA



- Aliases can be translated into your own language
- In directory C:\OPAL-RT\TestDrive2.8\Scripts\Berta\_Site\_Plus
  - Open file “nouveaux\_alias.xlsx”
  - Go to page “custom”
  - In column C “My Alias”, replace the initial aliases by your own aliases
  - You can also translate the descriptions in column D
  - Limitation for aliases: do not use accents. This limitation should be corrected in a future version
  - Changes in other columns are not authorized

	A	B	C	D
4	Panneau - Onglet / Panel - Tab	Alias Initial	My Alias	Description
5	Automatic Scaling	BNC Volt Gain	BNC Ganho Volt	OPAL-RT equipment. BNC voltage reduction gain for current measurement. Set to 5 V/V
6	Automatic Scaling	CT High (A)	TC Alto (A)	Tested unit CT transformer high current
7	Automatic Scaling	CT Low (A)	TC Baixo (A)	Tested unit CT transformer low current
8	Automatic Scaling	Current Clamps A2V	Alicates Corrente A2V	AC current clamps Ampere to Volt characteristics. Set to 0.4 V/A
9	Automatic Scaling	I base	I base	Reference current. Output from CT
10	Automatic Scaling	PT High (V)	PT High (V)	Scaling panel. Tested unit PT transformer high voltage
11	Automatic Scaling	PT Low (V)	PT Low (V)	Scaling panel. Tested unit PT transformer low voltage
12	Automatic Scaling	Rated I	Rated I	Tested unit rated current (A)
13	Automatic Scaling	Rated kV	Rated kV	Tested unit rated kV
14	Automatic Scaling	Tested Unit MVA	Tested Unit MVA	Rated MVA of the tested unit
15	Automatic Scaling	V base	V base	Reference voltage. Output from PT
16	Automatic Scaling	Volt Reduction	Volt Reduction	OPAL-RT equipment. Voltage reduction gain. Set to 0.04 V/V