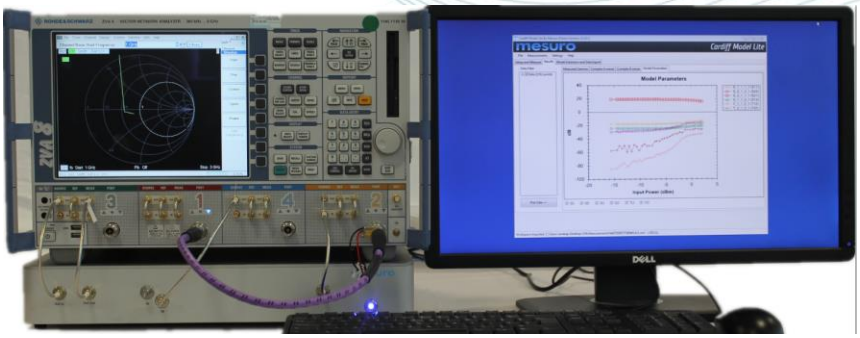
mesuro
leaders in RF device characterization solutions

Cardiff Model Lite Datasheet



Mesuro is the world's leading developer of Open Loop Active Harmonic Load Pull solutions, which deliver ground breaking performance improvements in the design and manufacture of RF & microwave devices and amplifiers.

Mesuro's unique measurement solutions integrate patented hardware with our WaveForm Engineering software suite to deliver rapid, accurate design information making first pass design success an engineering reality.

Mesuro's testing techniques enable semiconductor and power amplifier engineers to have the information they need to deliver market winning solutions efficiently, on time and on budget.

Background

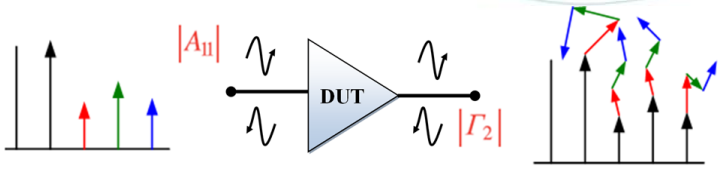
Non-linear measurement data has been exploited in various ways to create behavioral models for high frequency components. These include frequency-domain descriptive behavioral models, such as Poly Harmonic Distortion (PHD) Models, S-function and X-parameter*. Formulations of these models have been defined in terms of the travelling waves, with a desire to represent nonlinear behavior of high frequency transistors through a direct extension from the linear s-parameters.

The Mesuro model portfolio has a number of models each targeted at the end use, these range from the direct data look up approach of the Cardiff DWLU Model, for recreation of measured data; to Cardiff Model Lite, where the desired output is a local model; through to the Cardiff Model+ formulation, which incorporates higher order mixing terms.

Electro Rent Corporation Vince Mallette | (514) 653-8629 focusmicro@electrorent.com

Cardiff Model Lite

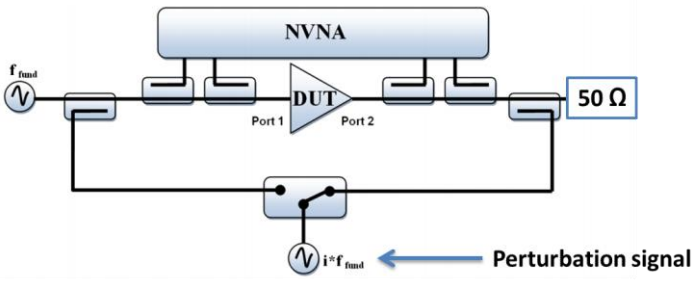
The 'Cardiff Model Lite' is a third order formulation that allows the extension of S-Parameters under Large Signal operation. It is a Polyharmonic Distortion (PHD) based behavioral model formulation, based upon the harmonic superposition principle. This principle describes the large signal 'B' wave (B_{pm}) response, linearized around a Large Signal Point (LSP), in terms of a linear mapping with the other stimulus 'A' waves (A_{qn}). The LSP is determined by A_{11} and thus, there is a non-linear dependence with this parameter. In order to extract the data required, it is necessary to use a non-linear vector network analyzer.



$$B_{pm} = S_{p1,m1}(DC,|A_{11}|)P^m \cdot |A_{11}| + \sum_{qn} S_{pq,mn}(DC,|A_{11}|)P^{m-n} \cdot A_{qn} + \sum_{qn} T_{pq,mn}(DC,|A_{11}|,)P^{m+n} \cdot A^*_{qn}$$

In order to extract the data for the model the following process is undertaken:

The DUT is first driven with a fundamental tone, in this case A_{11}. At each fundamental input power (A_{11}) the device is simultaneously perturbated with a small signal tone at each harmonic frequency. This is accomplished using the second source within a network analyzer. The phase of this generator is swept with at least 6 different phases measured to allow the model to predict performance correctly. This perturbation process can be completed on both sides of the device, using the circuitry provided within the Mesuro module.



Thus for each harmonic component, the corresponding S_{p1m1}, $S_{pq,mn}$ and $T_{pq,mn}$ parameters will be easily obtained, by applying a least-squares fit algorithm to the measured data.

The data is then exported in a format that can be used within the EDA simulation tools, both in its raw format and those compatible with other behavioral model formulations.

For devices where 'non-50Ω' or 'non-system impedance' loads are required then additional external tuning elements are required in order to change the impedance being presented to the device under test. The tuning element can be either active or passive in nature. This is achieved with the addition of the 'load dependent' software module to the Cardiff Model Lite system.

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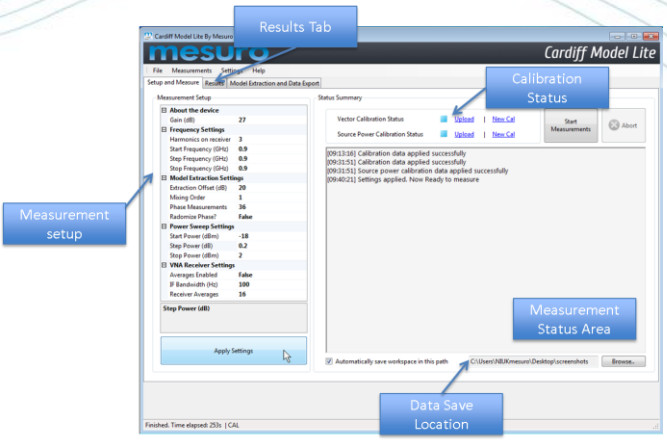
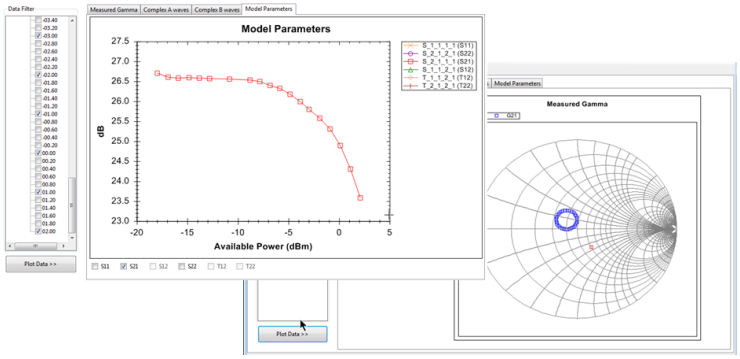
Control Software

The Cardiff Model Lite measurement suite allows all measurement parameters to be programed and used, to formulate the models described above. The software contains calibration and characterization setups as well as the measurement configuration.
During measurements the progress and status is displayed on one easily interpreted screen.

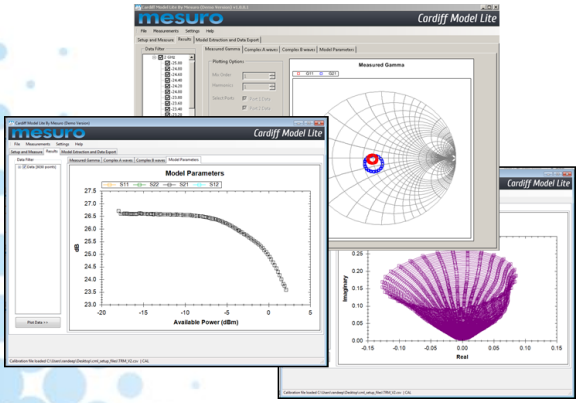


Once the measurement set is completed, the model is automatically extracted and the results can be viewed within the 'results' tab.



The data set can be filtered and analyzed as required by the user. The comparison of the modeled data versus the measured can be examined to ensure confidence prior to exporting for use within the simulation environment.

Model Export



The measurement data can then be exported in a file format as required by the user, such as .XNP or .MDF, to be used within the available EDA tools.

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Ordering Information

Phase Reference		
MB-PR67[1]	100MHz-67GHz Phase Reference	
MB-PR50[1]	100MHz to 50GHz Phase Reference	
MB-PR30[1]	100MHz to 30GHz Phase Reference	
Signal Conditioning Module		
MB-MG67[2]	67GHz Signal conditioning hardware	
MB-MG50[2]	50GHz Signal conditioning hardware	
MB-MG30[2]	30GHz Signal conditioning hardware	
Software & Options		
MW-CBM	Control Software	
MW-MGL	Cardiff Model Lite Generation Software	
MW-AMG[3]	Load Dependent Cardiff Model Lite	
MW-MGP[3]	Cardiff Model+ Generation Software	

1. Required for Waveform Measurement
2. Required for generation of Cardiff Model Lite
3. Other options or equipment may be required

Contact Details:
Mesuro Ltd, Pencoed Technology Park, Pencoed. CF35 5HZ
Tel.: +44 (0) 292 0497102
Tel: +1 888 666 4131 (US Toll Free)
Email: info@mesuro.com