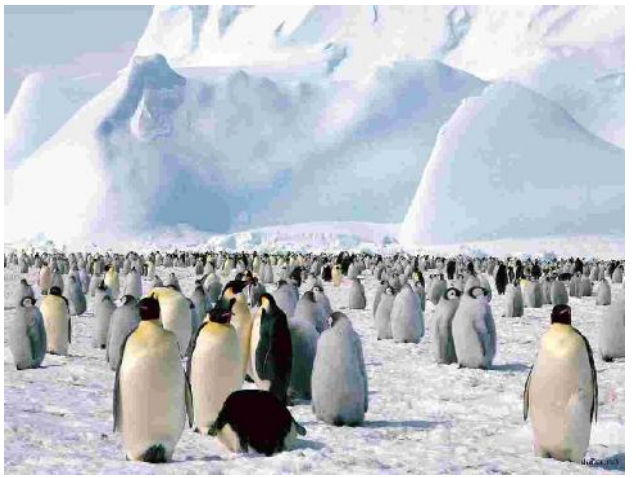
NMDG
LEADING BEYOND S-PARAMETERS

Optimize Performance around 60 GHz thanks to Cost-efficient Fast Source- and Load-pull using a vector network analyzer



Outline

- Key Benefits
- Markets
- Blockdiagram
- Measurement setup
- Load-pull results
- Source-pull results
- Coupling in simulation tool using S-functions
- Conclusions

Key Benefits

- Source- and load-pull at lower high frequency are proven techniques to optimize the performance of components

- Around 60 GHz one is presently very limited and uses typically
  - S-parameters
  - The combination of signal source and spectral analysis
  - Assumption that the device is working optimally when it performs more or less according to simulations

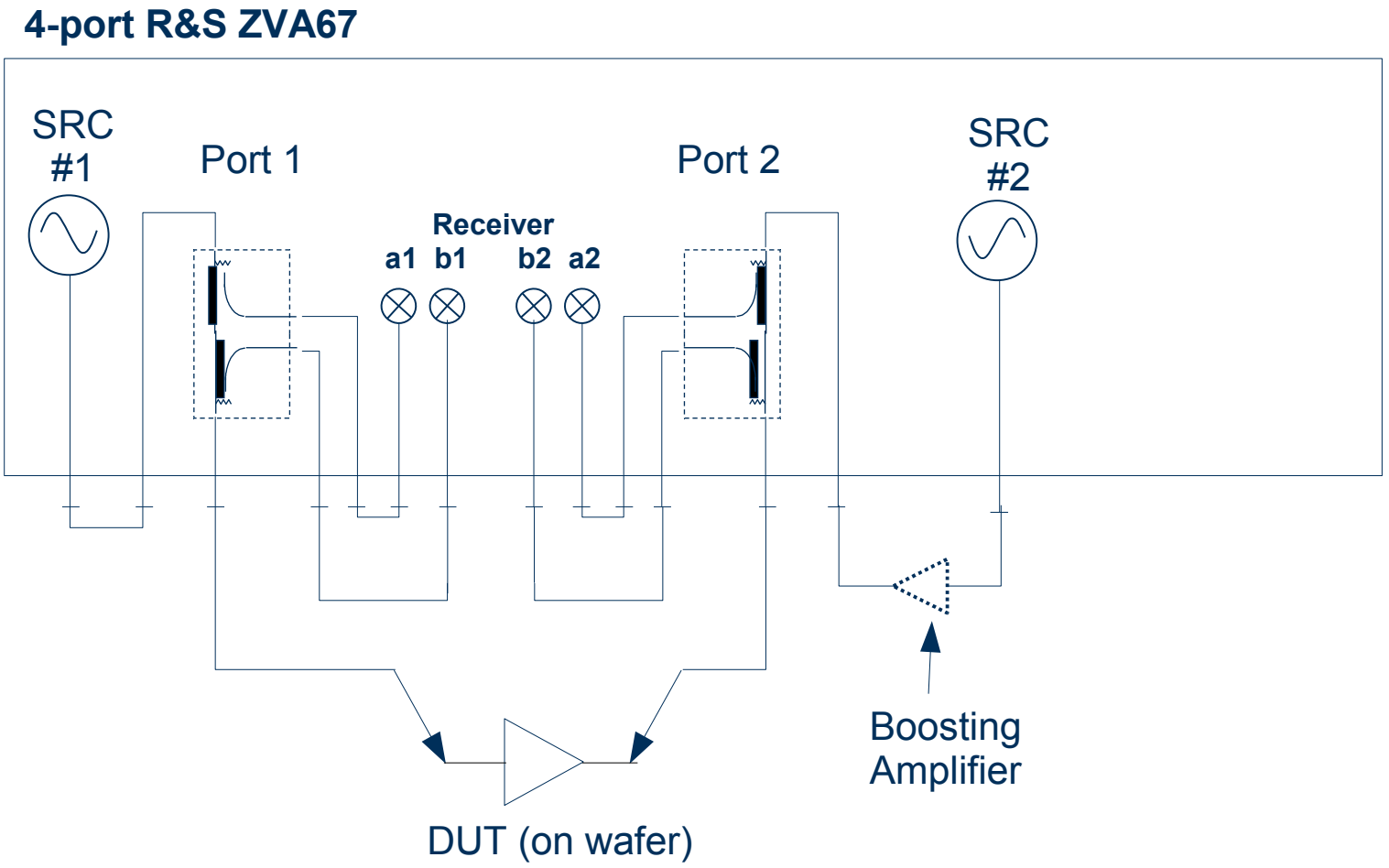
- Now using a vector network analyzer, cost-efficient and easy non-50 Ohm characterization of a component can be done
  - Determine the optimal input impedance as function of power
  - Make trade-offs of PAE and delivered output power
  - Evaluate the impact of antenna impedance
  - Perform reliability tests under mismatched conditions

60 GHz Markets

- Wireless streaming of high-definition video for entertainment (Gbit/sec)

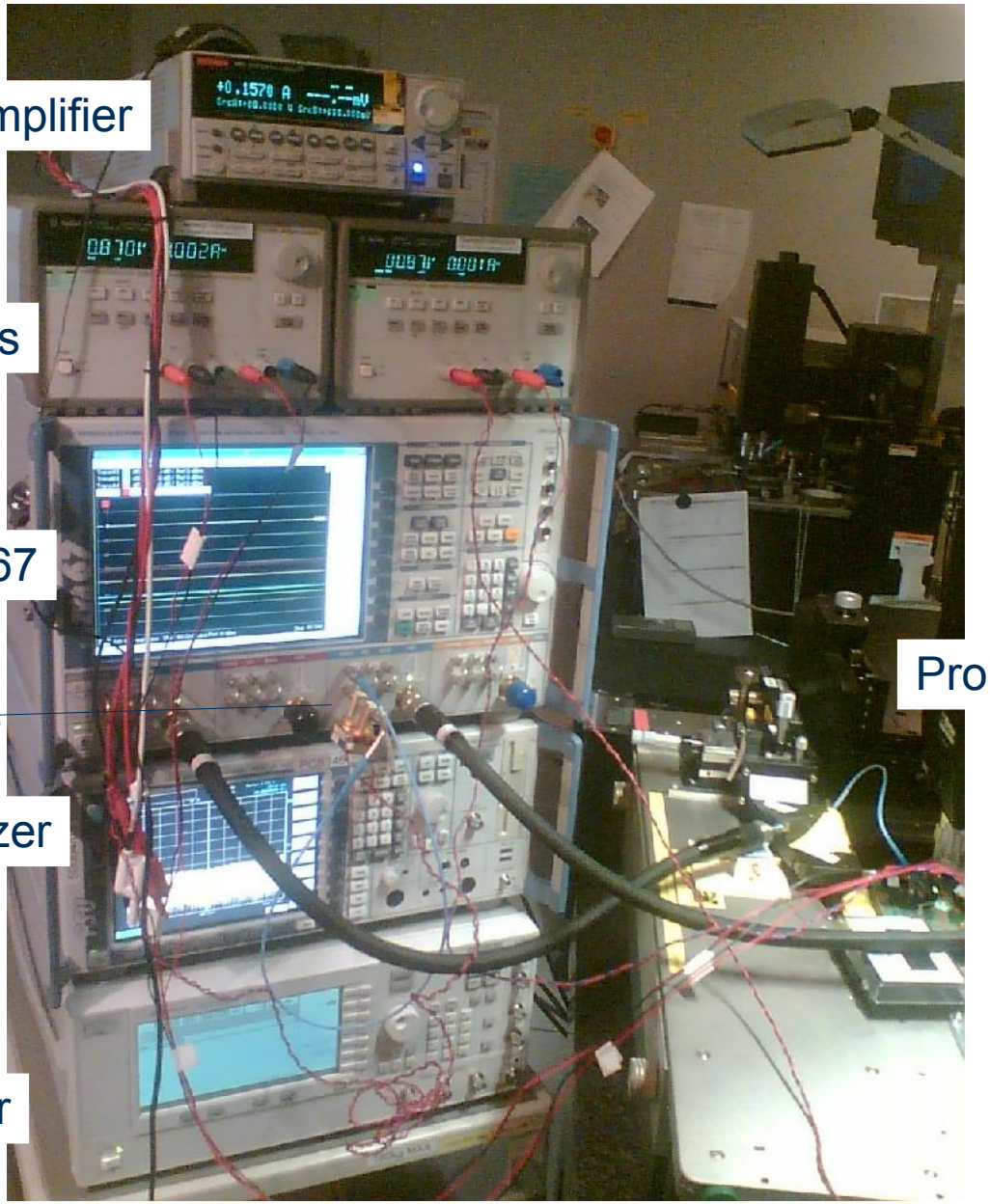
- Wireless communication of Gbit / sec with Iphone etc..
  - Companies: Intel, Panasonic, Samsung,...
  - Standard on its way: wirelessgigabitalliance.org

Blockdiagram

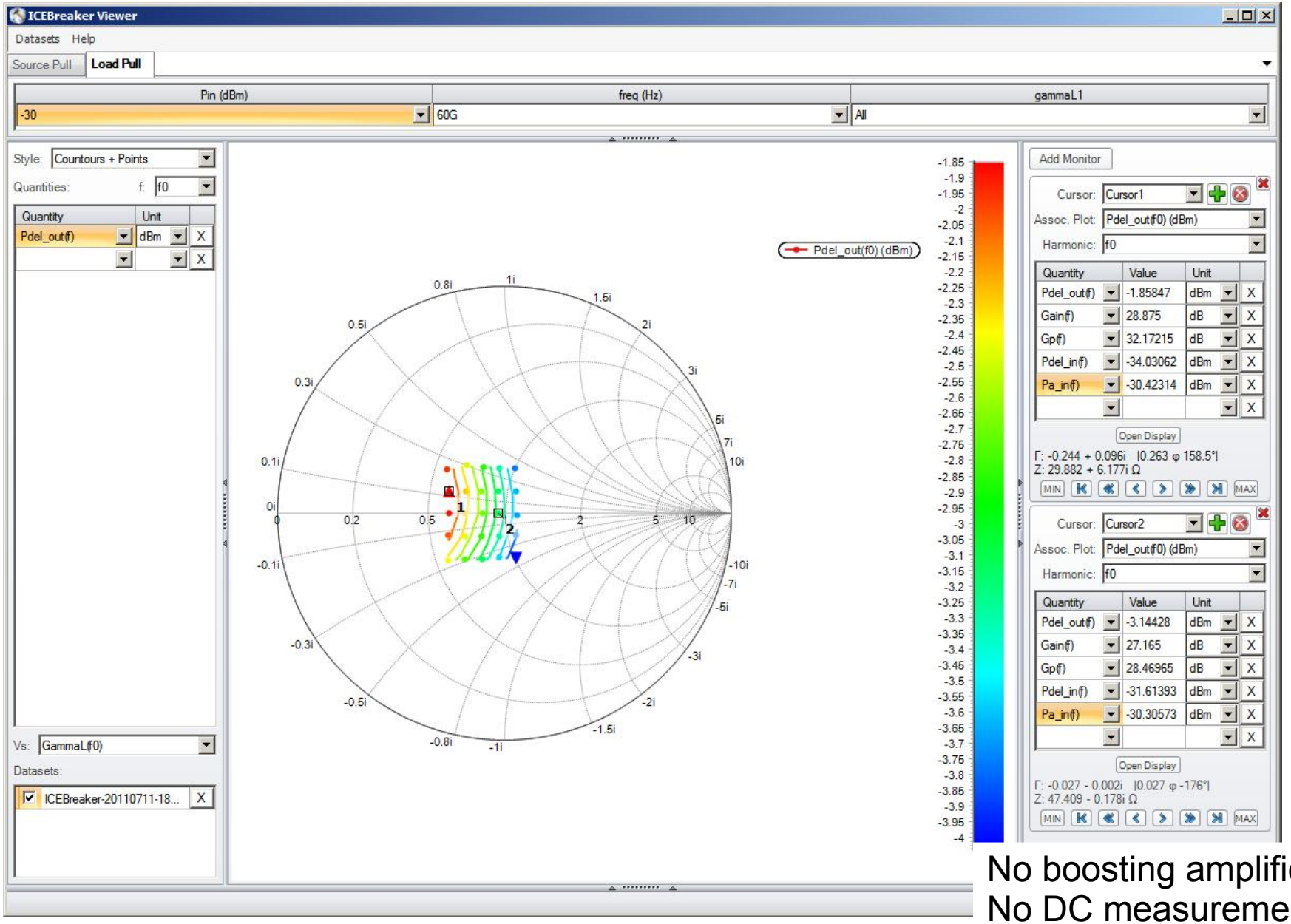


Test-Set Limitations: 27 dBm

Measurement Setup

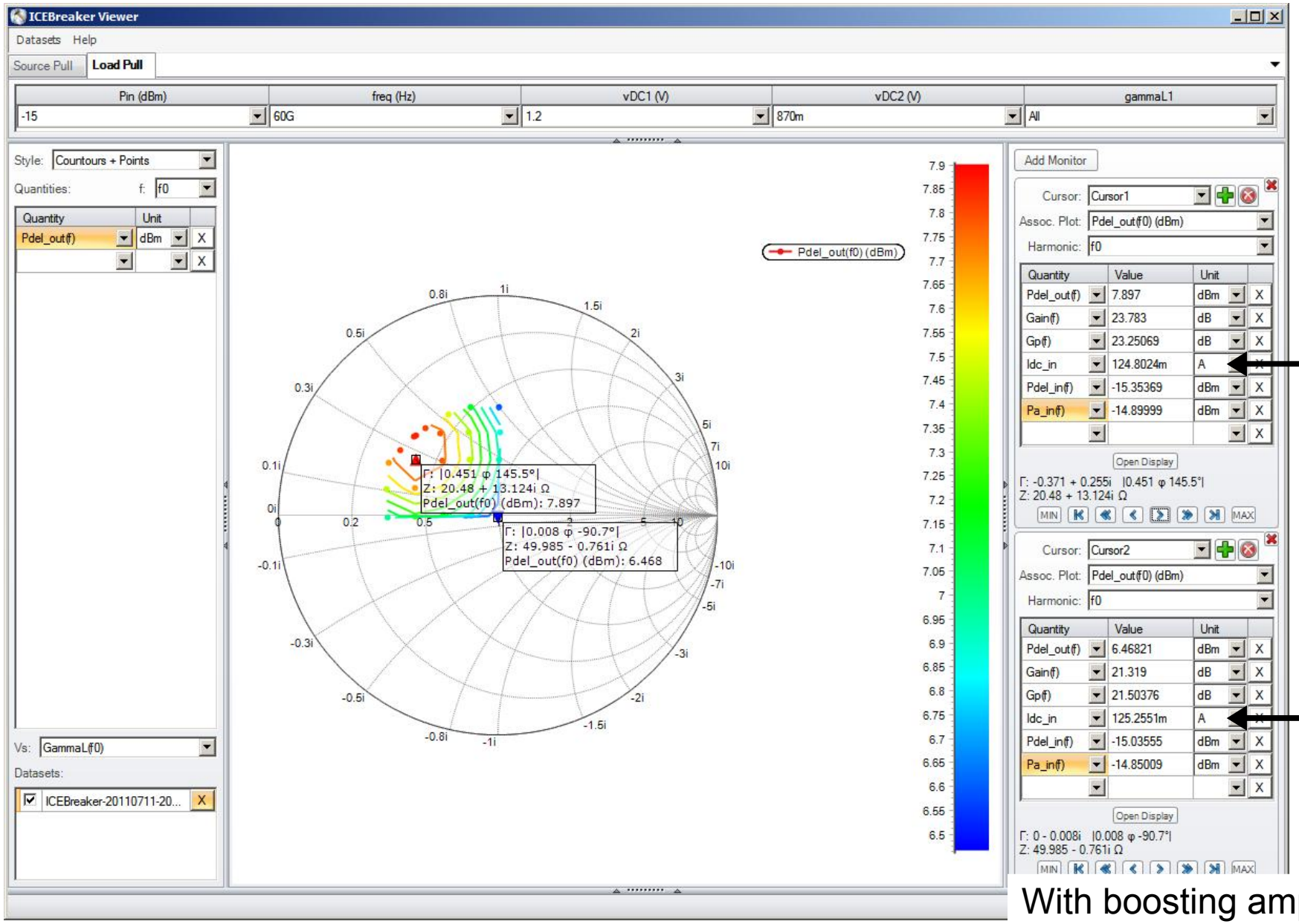


Load-Pull Results (Pin = -30 dBm, v_G = 0.8 V, v_D = 1.2 V)



No boosting amplifier
No DC measurements

Load-Pull Results (Pin = -15 dBm, v_G = 0.87 V, v_D = 1.2 V)

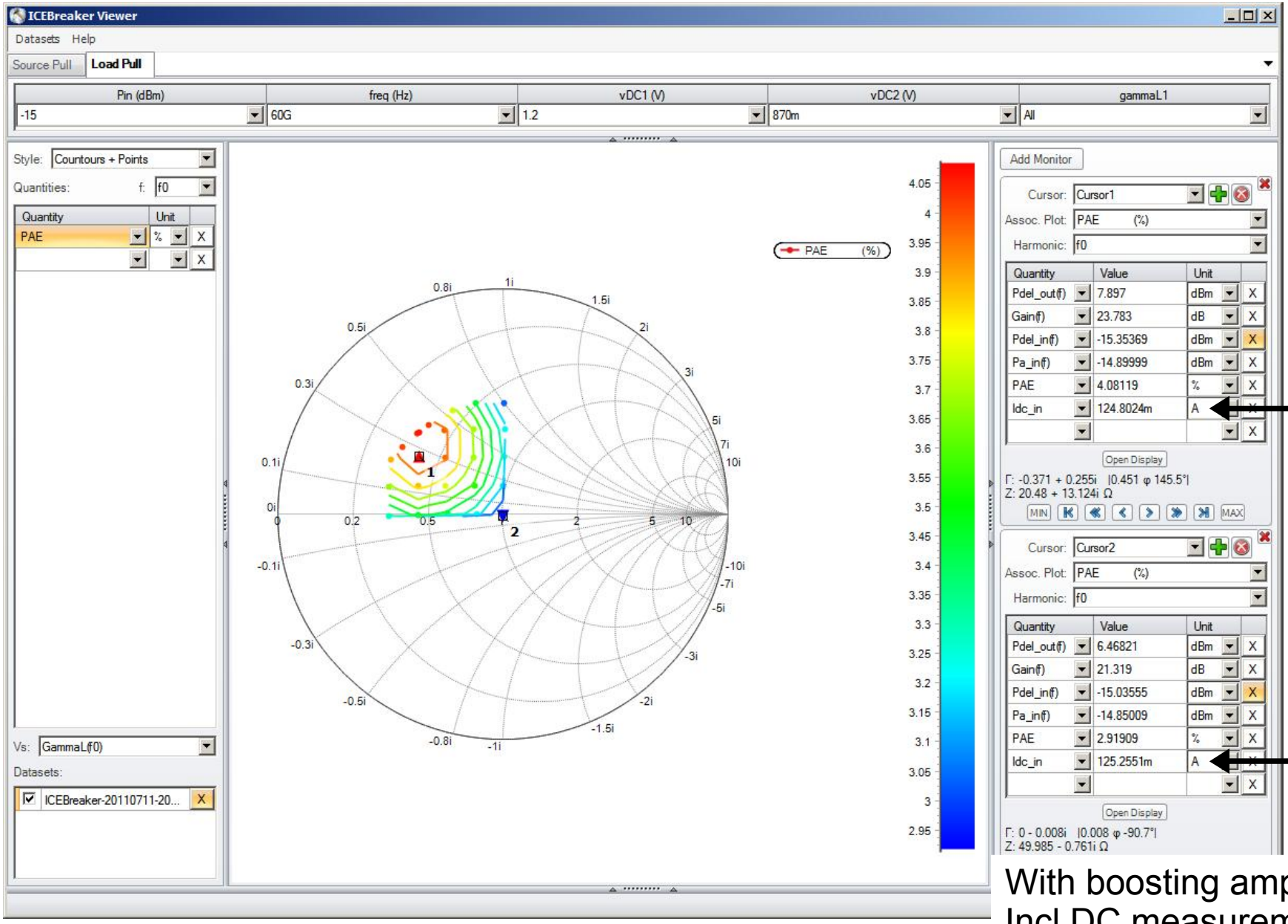


DC

DC

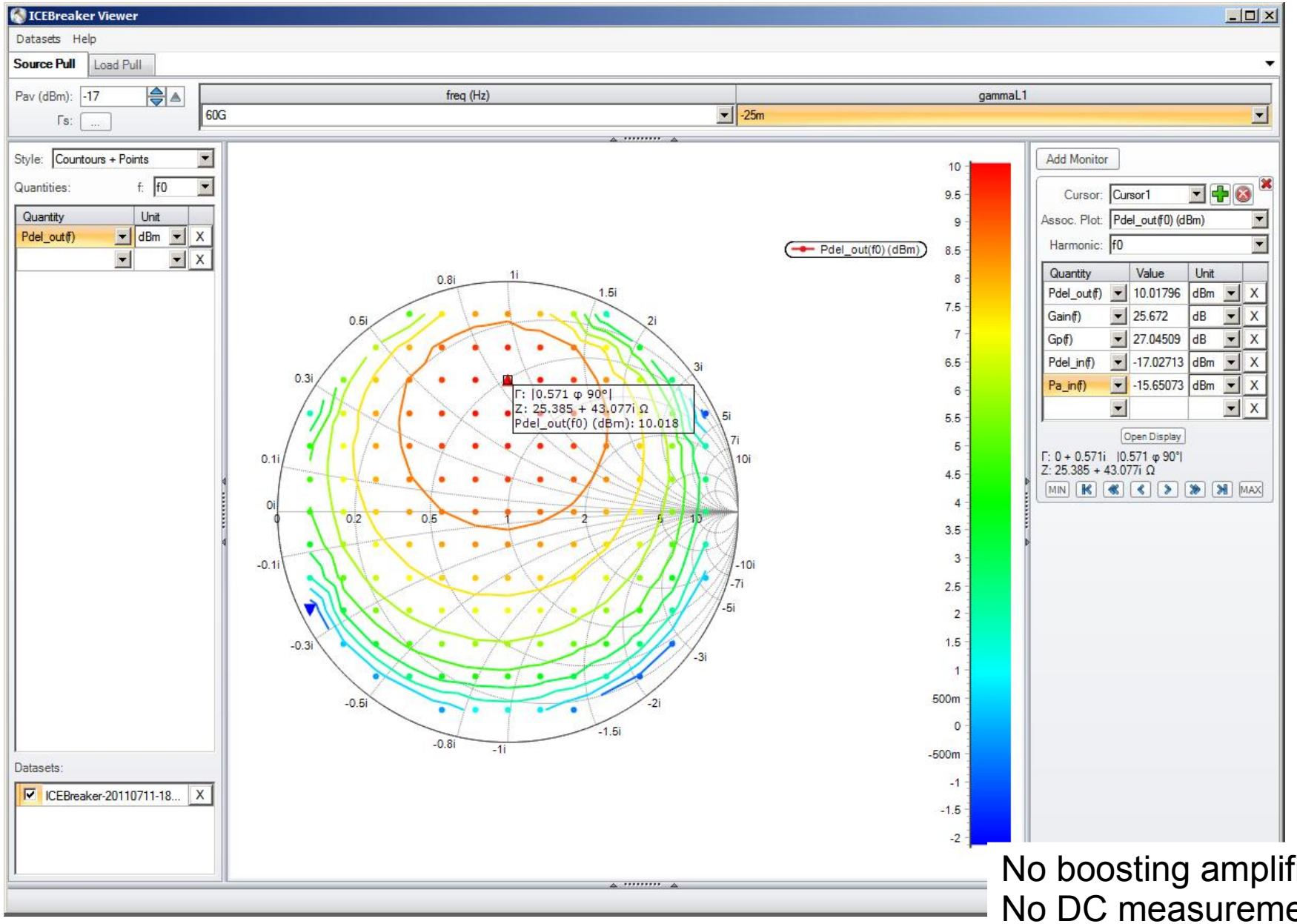
With boosting amplifier
Incl DC measurements

Load-Pull Results (Pin = -15 dBm, v_G = 0.87 V, v_D = 1.2 V)



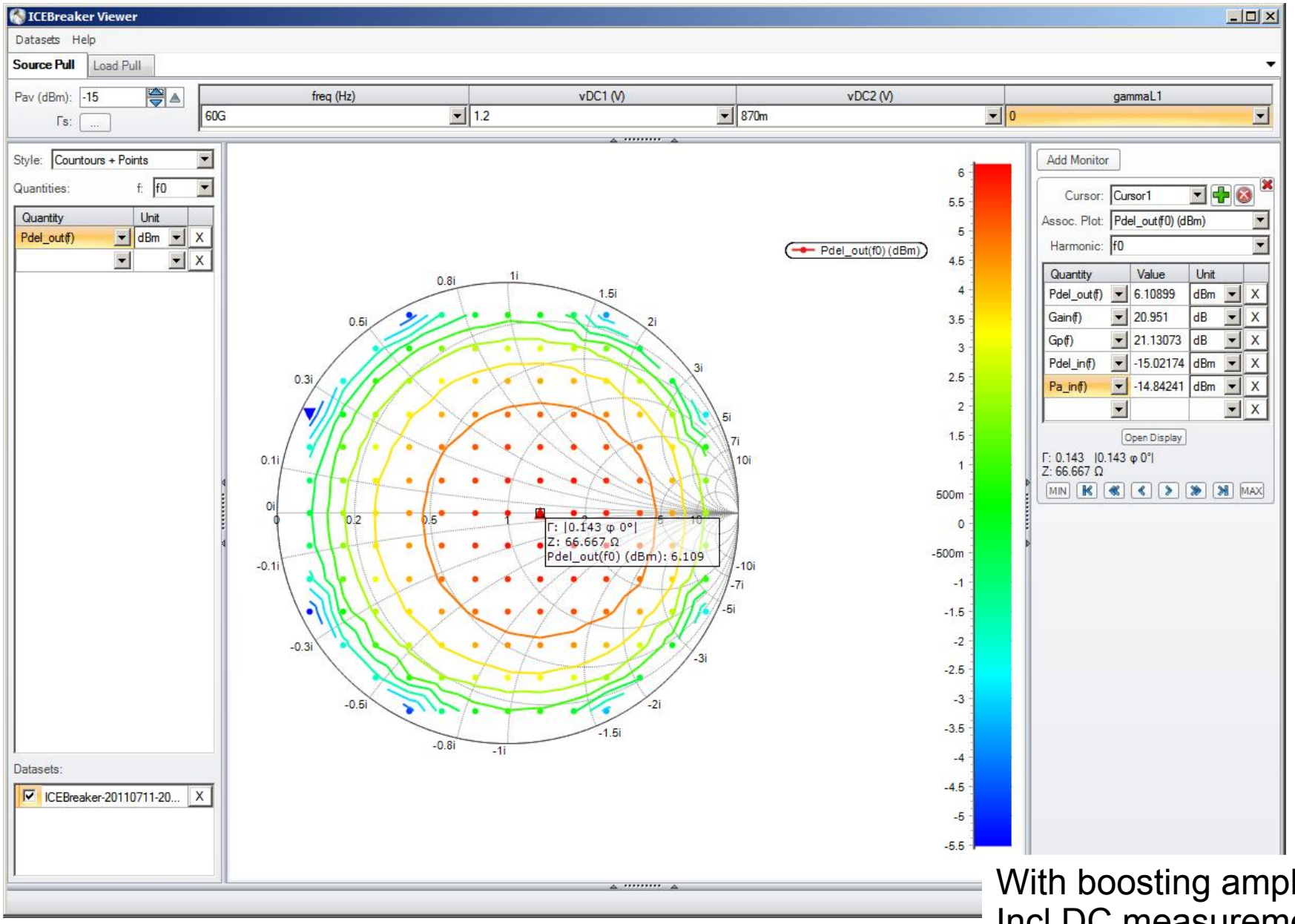
With boosting amplifier
Incl DC measurements

Source-Pull (v_G = 0.8 V, v_D = 1.2 V, P_{av} = -17 dBm, Γ_L = -0.025)



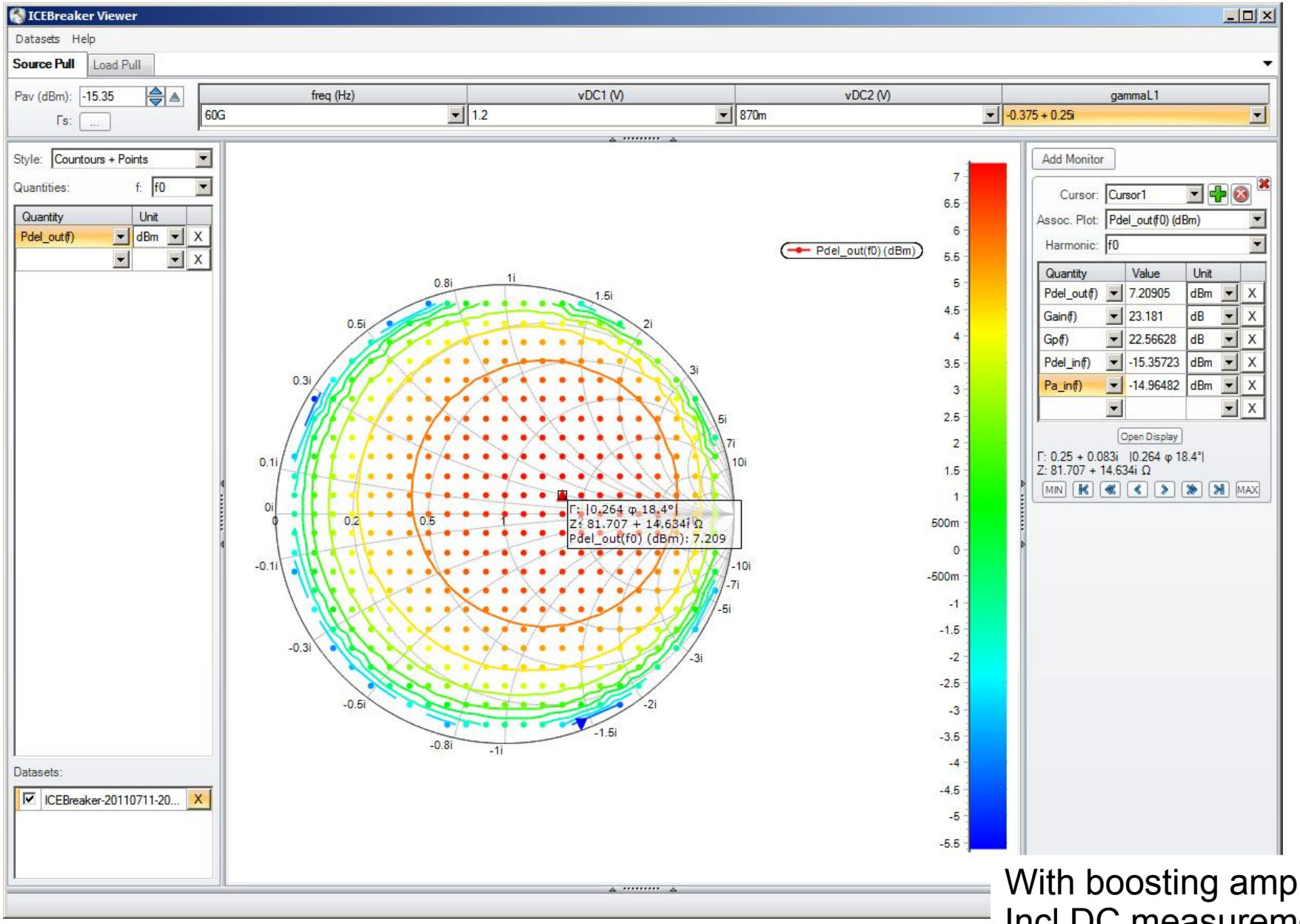
No boosting amplifier
No DC measurements

Source-Pull (v_G = 0.87 V, v_D = 1.2 V, P_{av} = -15 dBm, Γ_L = 0)



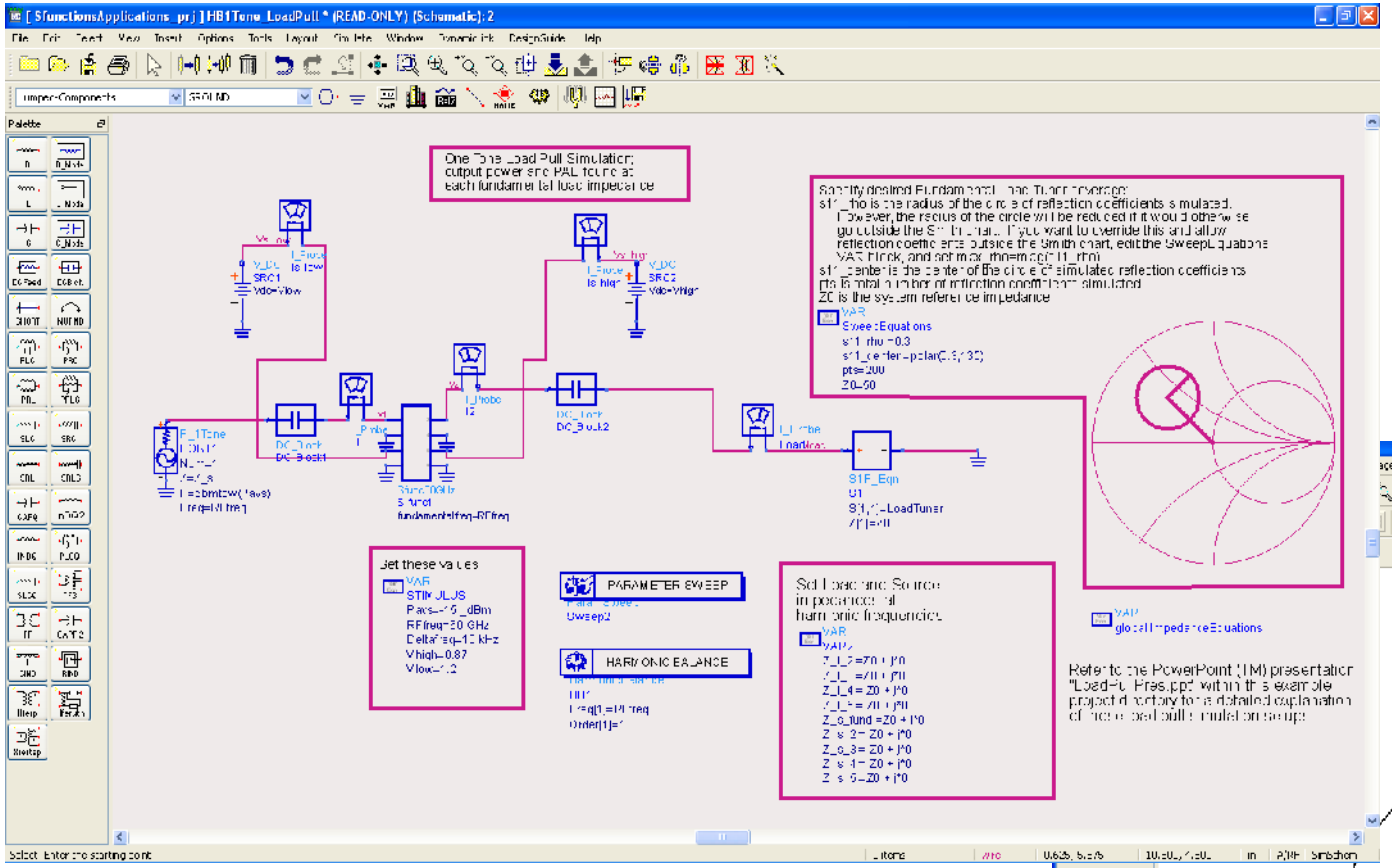
With boosting amplifier
Incl DC measurements

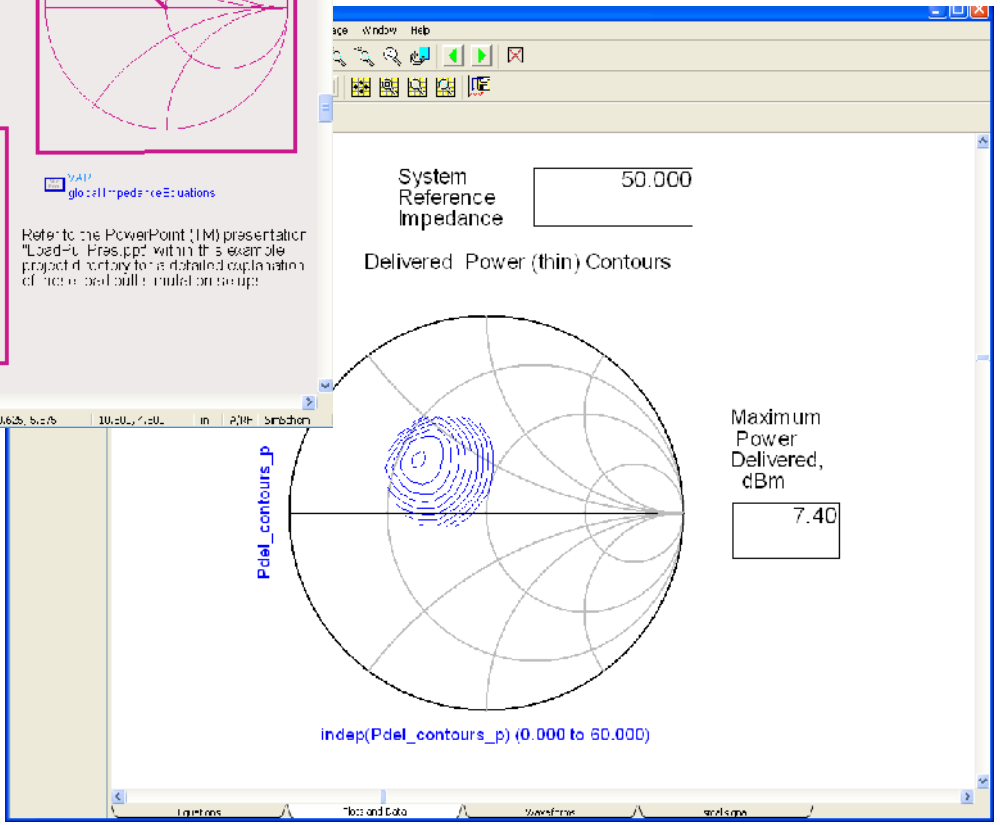
Source-Pull (v_G = 0.87 V, v_D = 1.2 V, P_{av} = -15 dBm, optimal Γ_L)



With boosting amplifier
Incl DC measurements

Fundamental S-function in ADS





Coupling measurement data into ADS using S-functions allows to simulate in conjunction with other circuits

Conclusion

- Thanks to the cost-efficient fast source- and load-pull, performance trade-offs are now possible around 60 GHz using a vector network analyzer beyond its S-parameter capability

- Stay ahead of the competition
  - Move beyond the combination of signal source and spectrum analyzer to get an idea of component performance
  - Use the present new capabilities of vector network analyzers

For more information info@nmdg.be www.nmdg.be

Acknowledgement NMDG wants to thank

- Rohde & Schwarz for supplying ZVA 67 and supporting this work
- Agilent Technologies for the ADS™ license support
- IMEC for providing the 60 GHz 40 nm CMOS PA

Contact Info

Want to try this capability?

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