EVGA

EVGA SuperNOVA 650 G+

Serial Number 1703140604800003

Lab ID 400

Certification ID 25400

Test Result Report ID: 19PS400A

Certificate Issue Date: Jan 6, 2018

Scheme: ETA-EMI PSU

115V

230V

115V

230V

Scheme: LAMBDA PSU

Aristeidis Bitziopoulos, Certification Body General Manager

General Information

Test Equipment

Electronic Loads	Chroma 63601-5 x2 Chroma 63600-2 Chroma 63640-80-80 x10 Chroma 63610-80-20
AC Sources	Chroma 6530, APM SP300VAC4000W-P, GW Instek ASR-3500
Power Analyzers	Rohde & Schwarz HMC8015 & NPA701
Oscilloscopes	Picoscope 4444, Siglent SDS2104X PLUS
Sound Analyzer	Bruel & Kjaer 2270 G4
Microphone	Bruel & Kjaer Type 4955-A
Temperature Logger	Picoscope TC-08
Tachometer	UNI-T UT372
Multimeters	Keysight 34465A
EMI Analyzer	TekBox TBMR-110M-EU
Isolation Transformer	4kVA
UPS	FSP Champ Tower 3kVA, CyberPower OLS3000E 3kVA
Testing Methodology	Cybenetics PSU Test Protocol

DUT Information(Non-accredited measurements)

Product Identification Details	
Brand	EVGA
Model	SuperNOVA 650 G+
OEM/ODM	FSP
Serial Number	1703140604800003
Product Specifications	
Manufacturer-Provided Information	
Rated Voltage (Vrms)	100-240
Rated Current (Arms)	10-5
Rated Frequency (Hz)	50-60

Rated Power (W)	650
Operating Temperature (Continuous Full Load) (°C)	
Type	ATX12V
Cable Design	Fully Modular
Warranty	-
Cybenetics Measurements	
Dimensions (W x H x D)	
Weight	
Cooling	135mm Fluid Dynamic Bearing Fan (MGA13512XF-O25)
Semi-Passive Operation	✗
Cybenetics Testing Information	
Lab ID	400
Date of receipt	Dec 26, 2017
Testing Date	Jan 3, 2018
Report Issued Date	Jan 6, 2018
DUT Notes	Low PF
Engineer Name	-
Authorized By the Laboratory Technical Manager	Aristeidis Bitziopoulos
Signature	

Cables and Connectors(Non-accredited measurements)

Modular Cables				
Description	Cable Count	Connector Count (Total)	Gauge	In Cable Capacitors
ATX connector 20+4 pin (600mm)	1	1	18-22AWG	No
4+4 pin EPS12V (650mm)	2	2	18AWG	No
6+2 pin PCIe (650mm)	4	4	18AWG	No
SATA (550mm+100mm+100mm)	3	9	18AWG	No
4 pin Molex (550mm+100mm+100mm)	2	6	18AWG	No
FDD Adapter (2x100mm)	1	2	22AWG	No
AC Power Cord (1400mm) - C13 coupler	1	1	18AWG	-

Power Specifications

Rail		3.3V	5V	12V	5VSB	-12V
Max. Power	Amps	24	24	54	3	0.3
	Watts	120		648	15	3.6
Total Max. Power (W)		650				

Test Results

Temperature & Compliance Info

Temperature Range (°C /°F)	28-32 / 82.4-89.6
ErP Lot 3/6 Ready	✓
(EU) No 617/2013 Compliance	✓

Performance Summary

115V

Accredited	
Average Efficiency (>1450 load combinations)	89.064%
Average Noise Output (>1450 Load Combinations)	26.93dBA
Average PF (>1450 Load Combinations)	0.959
Efficiency With 10W (≤500W) or 2% (>500W) Load	-
Standby Power Consumption	0.1430W
Non-Accredited	
12V Ripple (Full Load)	19.03mV
5V Ripple (Full Load)	24.56mV
3.3V Ripple (Full Load)	32.33mV
5VSB Ripple (Full Load)	27.94mV
12V Load Regulation	0.33%
5V Load Regulation	0.44%
3.3V Load Regulation	0.81%

5VSB Load Regulation	1.35%
Inrush Current	32.750A

230V

Accredited		
Average Efficiency (>1450 load combinations)	90.281%	
Average Noise Output (>1450 Load Combinations)	26.58dBA	
Average PF (>1450 Load Combinations)	0.918	
Efficiency With 10W (≤500W) or 2% (>500W) Load	-	
Standby Power Consumption	0.2312W	
Non-Accredited		
12V Ripple (Full Load)	20.10mV	
5V Ripple (Full Load)	18.44mV	
3.3V Ripple (Full Load)	25.15mV	
5VSB Ripple (Full Load)	17.68mV	
12V Load Regulation	0.26%	
5V Load Regulation	0.24%	
3.3V Load Regulation	0.42%	
5VSB Load Regulation	1.13%	
Inrush Current	39.535A	
Hold-Up Time & PWR_OK Signal	27.20ms	
AC Loss to PWR_OK Hold Up Time	30.70ms	
PWR_OK Inactive to DC Loss Delay	-3.50ms	
OPP (0.00°C / 0.00°C)	-	-

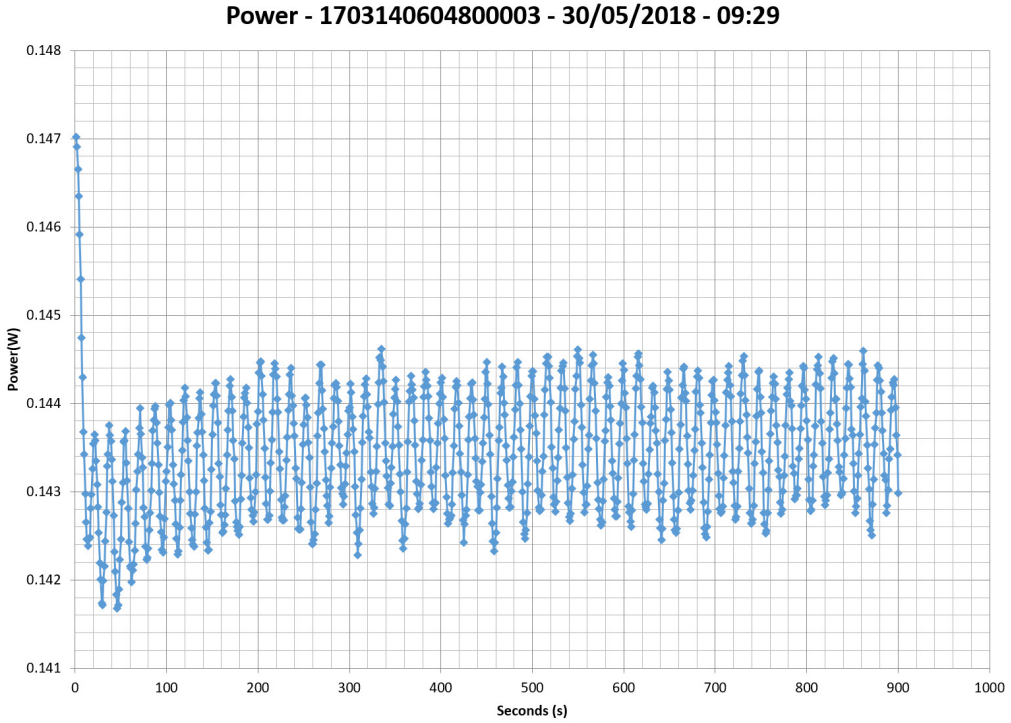
Hold-Up Time & PWR_OK Signal

Hold-Up Time (ms)	27.20
AC Loss to PWR_OK Hold Up Time (ms)	30.70
PWR_OK Inactive to DC Loss Delay (ms)	-3.50

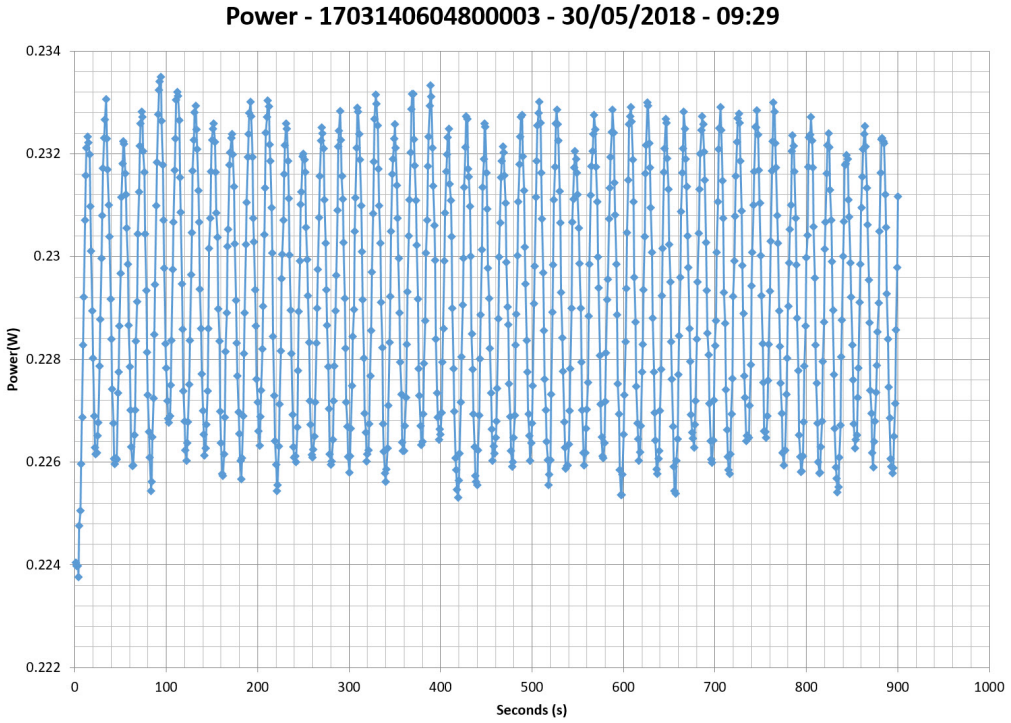
Vampire Power

Graphs

115V

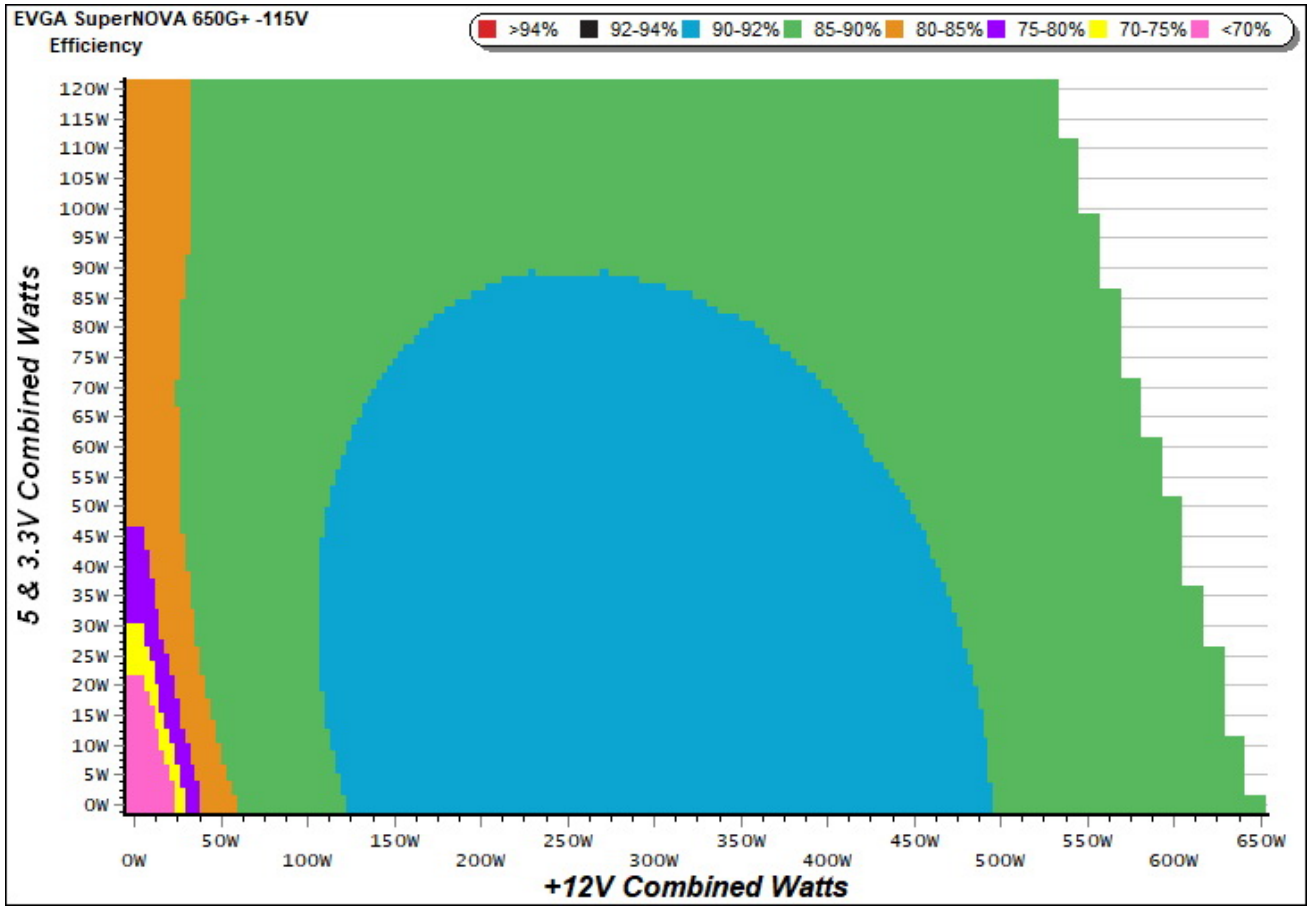


230V



Efficiency Graph

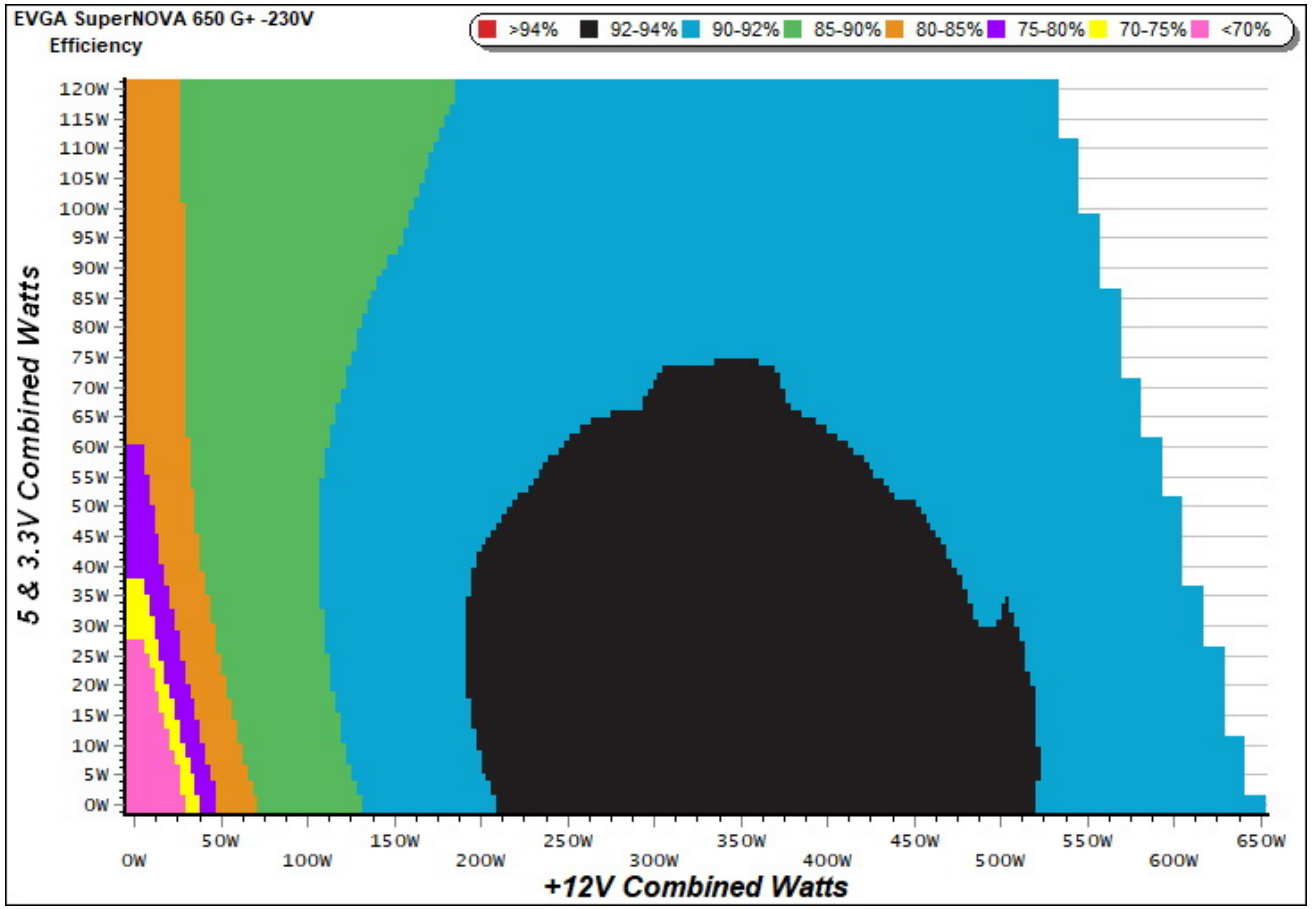
115V



INFO

This graph depicts the PSU`s efficiency throughout its entire operational range. For the generation of the efficiency and noise graphs we set our loaders to auto mode through our custom-made software before trying thousands of possible load combinations.

230V



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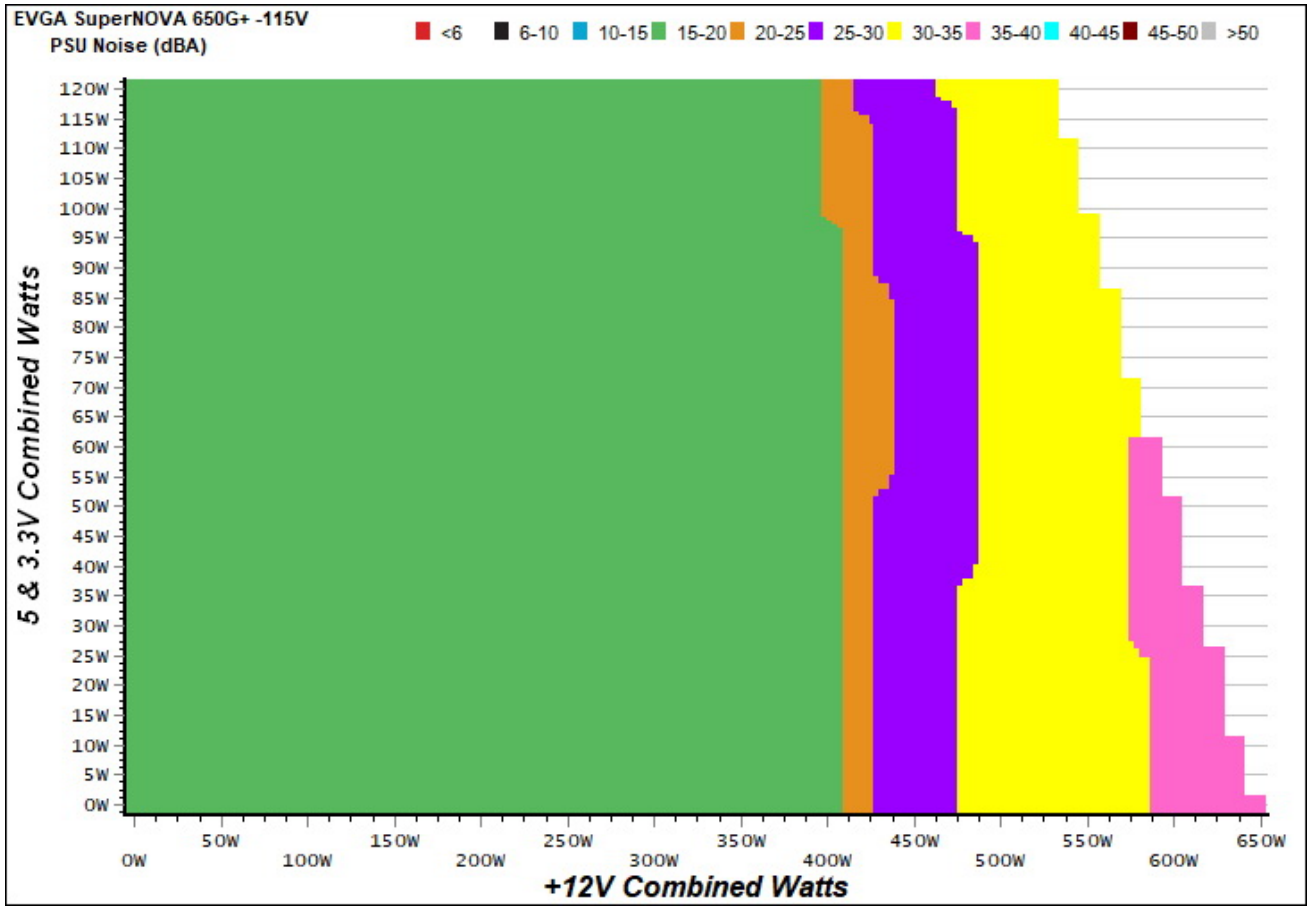
Noise Graph

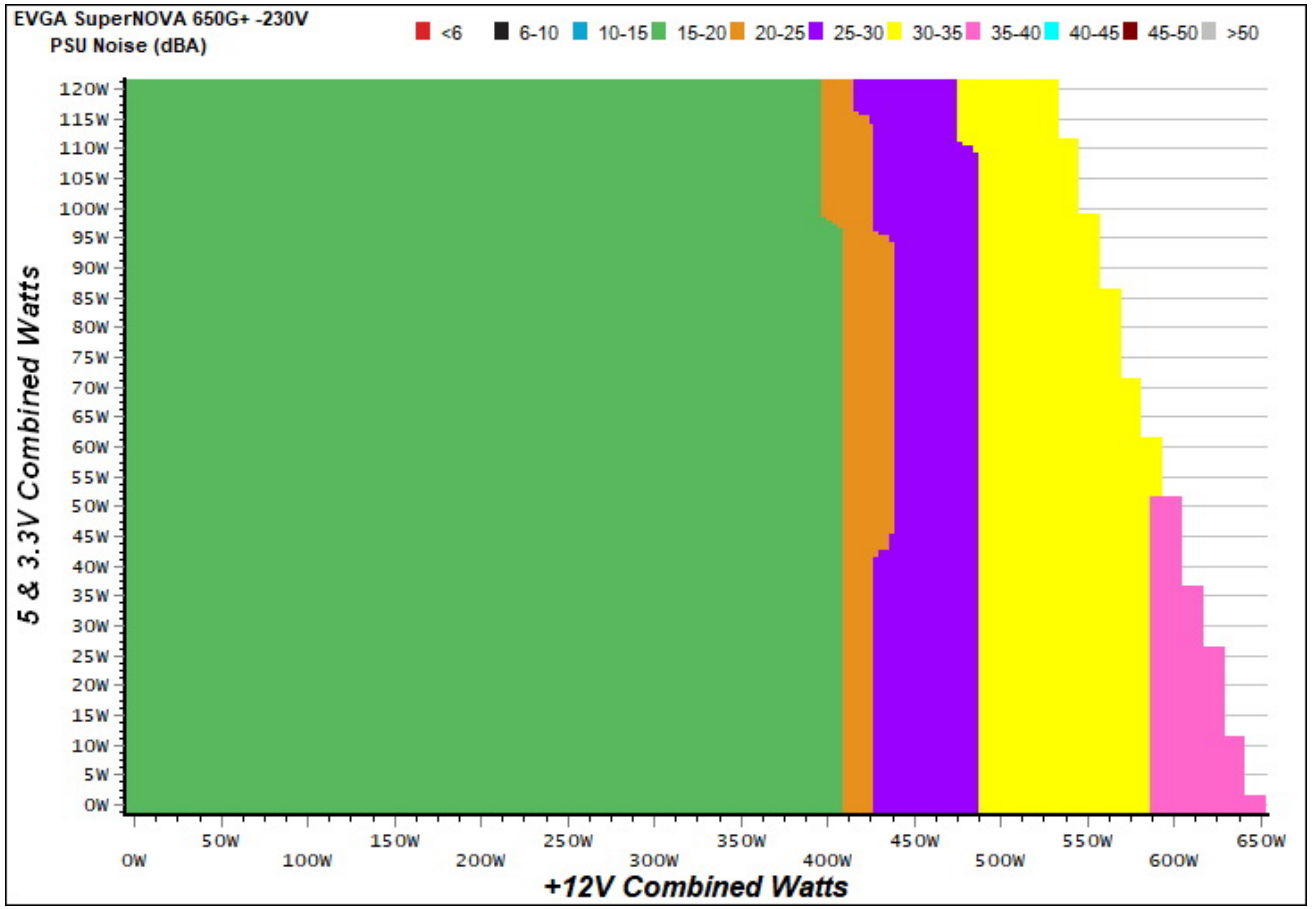
115V



INFO

The PSU`s noise in its entire operational range and under 30-32 °C ambient is depicted in this graph. The X axis represents the load on the +12V rail(s) while the Y axis is the load on the minor rails.

230V

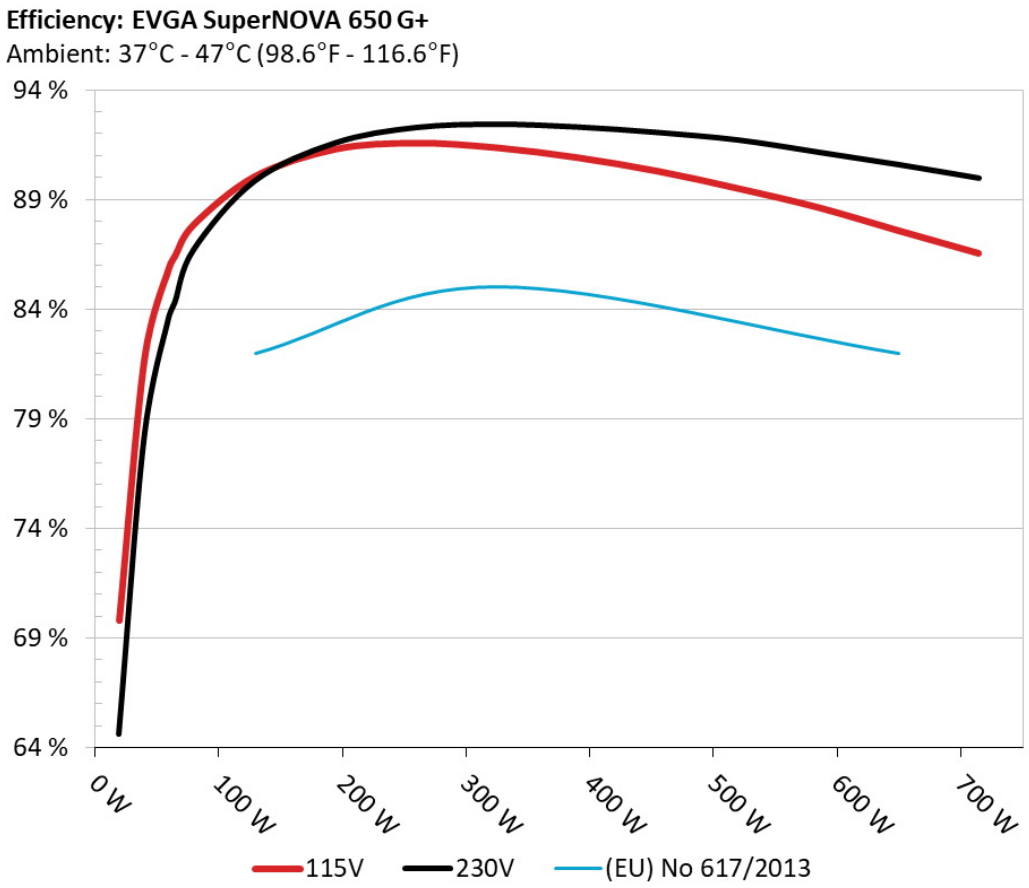


INFO

The PSU`s noise in its entire operational range and under 30-32 °C ambient is depicted in this graph. The X axis represents the load on the +12V rail(s) while the Y axis is the load on the minor rails.

Indicative Performance

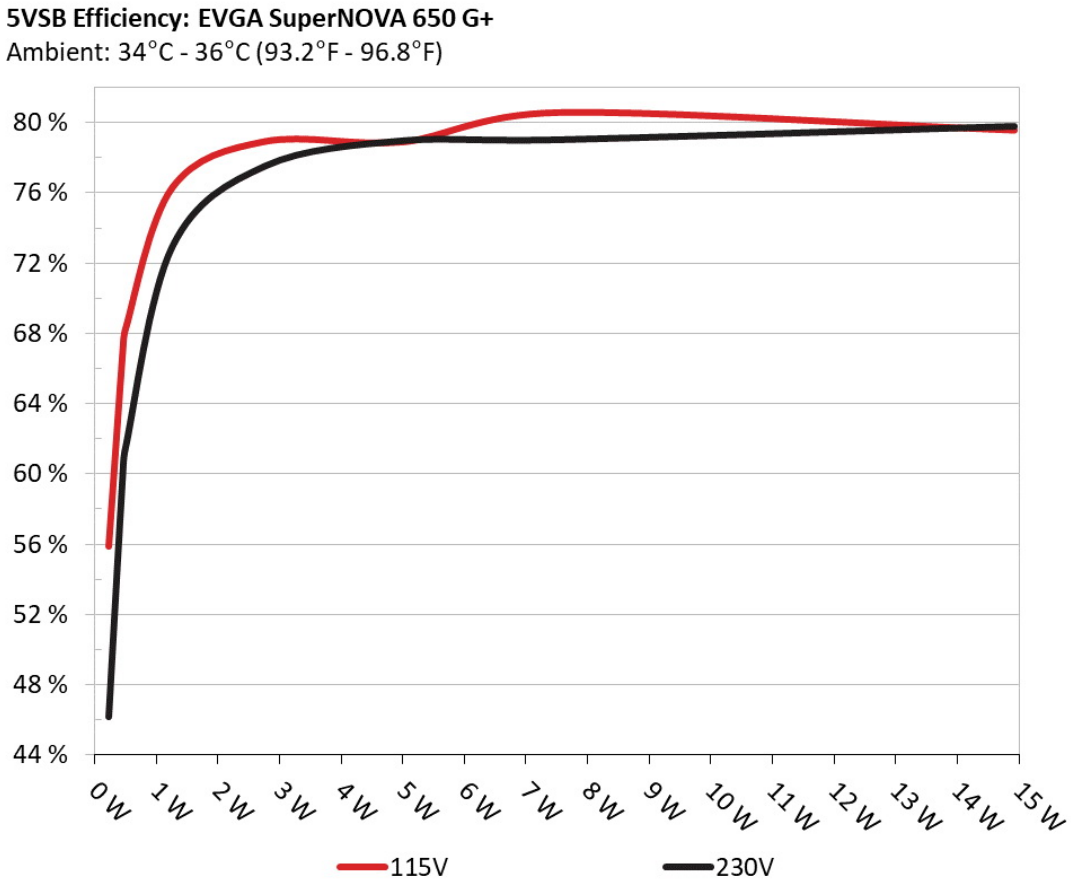
Efficiency under high ambient temperature



INFO

The PSU`s efficiency under high ambient temperatures with 115V and 230V input. For this graph the results of the 10-110% load regulation table are used.

5VSB Efficiency



INFO

This graph depicts the efficiency levels of the 5VSB rail with 115V and 230V input.

5VSB Efficiency (ERP LOT 3/6 & CEC)

115V

Test #	5VSB	DC/AC (Watts)	Efficiency	PF/AC Volts
1	0.045A	0.228	55.882%	0.033
	5.046V	0.408		115.38V
2	0.090A	0.455	67.010%	0.054
	5.045V	0.679		115.38V
3	0.550A	2.769	78.956%	0.227
	5.033V	3.507		115.37V
4	1.000A	5.024	78.932%	0.317
	5.022V	6.365		115.38V
5	1.500A	7.518	80.605%	0.367
	5.011V	9.327		115.36V
6	3.001A	14.928	79.595%	0.437
	4.975V	18.755		115.35V

230V

Test #	5VSB	DC/AC (Watts)	Efficiency	PF/AC Volts
1	0.045A	0.228	46.154%	0.015
	5.046V	0.494		230.93V
2	0.090A	0.454	59.894%	0.022
	5.044V	0.758		230.92V
3	0.550A	2.769	77.563%	0.100
	5.033V	3.570		230.93V
4	1.000A	5.023	79.015%	0.165
	5.022V	6.357		230.93V
5	1.500A	7.517	79.060%	0.223
	5.011V	9.508		230.93V
6	3.000A	14.927	79.824%	0.319
	4.975V	18.700		230.93V

Supplementary Tests (For Reference)

Typical Load Tests

115V

Test #	12V	5V	3.3V	5VSB	DC/AC (Watts)	Efficiency	Fan Speed (RPM)	PSU Noise (dB[A])	Temps (In/Out)	PF/AC Volts
1	3.576A	2.015A	1.984A	1.013A	64.802	86.442%	795	18.3	38.76°C	0.886
	12.083V	4.961V	3.324V	4.938V	74.966				42.43°C	115.30V
2	8.145A	3.023A	2.977A	1.216A	129.273	90.043%	790	18.3	39.13°C	0.938
	12.079V	4.961V	3.322V	4.937V	143.568				43.10°C	115.22V
3	13.115A	3.531A	3.462A	1.421A	194.357	91.281%	790	18.3	39.64°C	0.955
	12.075V	4.956V	3.319V	4.929V	212.921				43.95°C	115.13V
4	18.091A	4.037A	3.979A	1.625A	259.574	91.559%	795	18.3	40.26°C	0.961
	12.071V	4.955V	3.316V	4.923V	283.505				44.86°C	115.14V
5	22.735A	5.048A	4.980A	1.830A	324.866	91.346%	790	18.3	40.89°C	0.965
	12.068V	4.952V	3.313V	4.920V	355.645				46.00°C	115.05V
6	27.323A	6.061A	5.980A	2.034A	389.395	90.902%	795	18.3	41.85°C	0.968
	12.063V	4.950V	3.310V	4.918V	428.366				47.46°C	114.96V
7	31.976A	7.074A	6.983A	2.238A	454.704	90.282%	925	22.3	42.84°C	0.969
	12.059V	4.948V	3.308V	4.917V	503.650				48.64°C	114.87V
8	36.636A	8.085A	7.988A	2.442A	520.001	89.492%	1260	32.1	44.15°C	0.971
	12.054V	4.946V	3.305V	4.915V	581.057				50.34°C	114.88V
9	41.698A	8.596A	8.479A	2.441A	584.918	88.629%	1500	36.9	45.21°C	0.971
	12.049V	4.944V	3.302V	4.917V	659.966				51.80°C	114.78V
10	46.500A	9.108A	9.003A	3.066A	649.742	87.574%	1735	42.1	45.92°C	0.972
	12.044V	4.941V	3.298V	4.893V	741.933				53.13°C	114.68V
11	51.902A	9.111A	9.010A	3.067A	714.566	86.542%	1915	42.2	46.76°C	0.972
	12.039V	4.940V	3.297V	4.892V	825.686				54.34°C	114.70V
CL1	0.132A	14.002A	13.999A	0.000A	117.255	81.801%	1125	29.0	43.43°C	0.937
	12.075V	4.945V	3.316V	5.060V	143.342				49.29°C	115.20V

CL2	54.003A	1.002A	0.998A	1.000A	663.533	87.681%	1780	40.5	44.53°C	0.972
	12.043V	4.951V	3.301V	4.919V	756.760				51.75°C	114.67V

The results above are not used in the certification process

230V

Test #	12V	5V	3.3V	5VSB	DC/AC (Watts)	Efficiency	Fan Speed (RPM)	PSU Noise (dB[A])	Temps (In/Out)	PF/AC Volts
1	3.586A	2.022A	1.994A	1.016A	64.913	84.332%	790	18.3	40.14°C	0.795
	12.074V	4.950V	3.311V	4.926V	76.973				42.77°C	230.90V
2	8.163A	3.028A	2.991A	1.218A	129.427	89.853%	790	18.3	40.69°C	0.878
	12.070V	4.952V	3.311V	4.928V	144.043				43.60°C	230.86V
3	13.134A	3.538A	3.479A	1.423A	194.518	91.587%	795	18.3	41.11°C	0.896
	12.068V	4.949V	3.307V	4.921V	212.386				44.68°C	230.82V
4	18.116A	4.044A	3.991A	1.628A	259.740	92.288%	790	18.3	41.62°C	0.917
	12.063V	4.948V	3.306V	4.916V	281.446				45.52°C	230.78V
5	22.763A	5.055A	4.990A	1.831A	325.032	92.434%	790	18.3	42.17°C	0.928
	12.060V	4.948V	3.306V	4.916V	351.636				46.29°C	230.82V
6	27.344A	6.065A	5.990A	2.035A	389.525	92.315%	790	18.3	42.76°C	0.936
	12.058V	4.948V	3.305V	4.916V	421.952				47.09°C	230.77V
7	32.002A	7.078A	6.990A	2.240A	454.862	92.062%	860	23.6	43.74°C	0.942
	12.054V	4.946V	3.304V	4.914V	494.084				48.96°C	230.72V
8	36.661A	8.095A	7.995A	2.444A	520.180	91.719%	1200	30.0	44.72°C	0.946
	12.050V	4.943V	3.302V	4.911V	567.143				50.25°C	230.50V
9	41.719A	8.600A	8.485A	2.443A	585.104	91.162%	1450	35.3	45.43°C	0.949
	12.047V	4.942V	3.301V	4.914V	641.832				51.40°C	230.46V
10	46.512A	9.114A	9.005A	3.068A	649.921	90.596%	1630	38.4	46.15°C	0.952
	12.044V	4.940V	3.298V	4.892V	717.385				52.80°C	230.51V
11	51.922A	9.116A	9.012A	3.069A	714.764	89.981%	1870	41.6	47.04°C	0.954
	12.038V	4.938V	3.296V	4.890V	794.349				54.27°C	230.62V
CL1	0.145A	14.005A	14.002A	0.000A	117.127	82.221%	1030	26.4	43.75°C	0.876
	12.066V	4.936V	3.303V	5.052V	142.454				49.35°C	230.87V

CL2	54.015A	1.003A	1.001A	1.000A	663.687	90.753%	1710	39.7	44.30°C	0.952
	12.043V	4.948V	3.300V	4.917V	731.312				51.30°C	230.49V

The results above are not used in the certification process

Light Load Tests

115V

Test #	12V	5V	3.3V	5VSB	DC/AC (Watts)	Efficiency	Fan Speed (RPM)	PSU Noise (dB[A])	PF/AC Volts
1	1.192A	0.502A	0.481A	0.202A	19.499	69.824%	795	18.3	0.812
	12.085V	4.965V	3.326V	4.960V	27.926				115.35V
2	2.451A	1.007A	0.991A	0.404A	39.912	81.750%	795	18.3	0.881
	12.084V	4.963V	3.325V	4.955V	48.822				115.33V
3	3.642A	1.510A	1.472A	0.606A	59.395	85.826%	795	18.3	0.886
	12.084V	4.962V	3.324V	4.950V	69.204				115.31V
4	4.900A	2.016A	1.983A	0.809A	79.796	87.850%	795	18.3	0.906
	12.082V	4.961V	3.324V	4.945V	90.832				115.28V

The results above are not used in the certification process

230V

Test #	12V	5V	3.3V	5VSB	DC/AC (Watts)	Efficiency	Fan Speed (RPM)	PSU Noise (dB[A])	PF/AC Volts
1	1.200A	0.506A	0.484A	0.202A	19.603	64.641%	790	18.3	0.556
	12.078V	4.952V	3.313V	4.947V	30.326				230.92V
2	2.460A	1.010A	0.996A	0.405A	40.011	78.122%	795	18.3	0.701
	12.077V	4.951V	3.312V	4.943V	51.216				230.92V
3	3.651A	1.516A	1.480A	0.608A	59.493	83.533%	790	18.3	0.780
	12.075V	4.950V	3.311V	4.938V	71.221				230.90V
4	4.910A	2.022A	1.995A	0.811A	79.899	86.707%	790	18.3	0.824
	12.074V	4.950V	3.311V	4.934V	92.148				230.89V

The results above are not used in the certification process

Ripple Measurements

115V

Test	12V	5V	3.3V	5VSB	Pass/Fail
10% Load	8.2 mV	11.9 mV	9.5 mV	7.2 mV	Pass
20% Load	9.7 mV	13.4 mV	12.8 mV	9.2 mV	Pass
30% Load	11.1 mV	15.1 mV	16.3 mV	11.3 mV	Pass
40% Load	11.5 mV	16.0 mV	18.1 mV	12.4 mV	Pass
50% Load	13.3 mV	16.7 mV	20.5 mV	13.2 mV	Pass
60% Load	14.1 mV	17.4 mV	22.1 mV	14.2 mV	Pass
70% Load	15.9 mV	18.3 mV	24.1 mV	15.3 mV	Pass
80% Load	16.1 mV	19.6 mV	27.2 mV	18.1 mV	Pass
90% Load	18.5 mV	21.9 mV	30.0 mV	22.5 mV	Pass
100% Load	19.0 mV	24.6 mV	32.3 mV	27.9 mV	Pass
110% Load	19.9 mV	29.4 mV	35.3 mV	38.1 mV	Pass
Crossload 1	10.7 mV	14.3 mV	16.2 mV	9.0 mV	Pass
Crossload 2	19.5 mV	25.2 mV	30.0 mV	29.6 mV	Pass

The results above are not used in the certification process

230V

Test	12V	5V	3.3V	5VSB	Pass/Fail
10% Load	10.2 mV	11.6 mV	6.8 mV	6.5 mV	Pass
20% Load	11.3 mV	13.0 mV	9.4 mV	7.6 mV	Pass
30% Load	12.1 mV	13.4 mV	11.5 mV	8.6 mV	Pass
40% Load	12.9 mV	14.6 mV	14.1 mV	9.8 mV	Pass
50% Load	15.0 mV	16.0 mV	16.0 mV	11.3 mV	Pass
60% Load	15.5 mV	15.9 mV	17.7 mV	11.9 mV	Pass
70% Load	15.7 mV	15.8 mV	19.1 mV	12.5 mV	Pass
80% Load	17.9 mV	17.5 mV	22.1 mV	14.7 mV	Pass

Test	12V	5V	3.3V	5VSB	Pass/Fail
90% Load	18.5 mV	17.6 mV	23.6 mV	15.5 mV	Pass
100% Load	20.1 mV	18.4 mV	25.2 mV	17.7 mV	Pass
110% Load	21.7 mV	18.3 mV	27.3 mV	18.2 mV	Pass
Crossload 1	12.2 mV	13.1 mV	12.4 mV	8.6 mV	Pass
Crossload 2	20.2 mV	18.1 mV	23.5 mV	18.3 mV	Pass

The results above are not used in the certification process

EVGA SuperNOVA 650 G+

Top side

Power specifications label

All data and graphs included in this test report can be used by any individual on the following conditions:
› It should be mentioned that the test results are provided by Cybenetics
› The link to the original test results document should be provided in any case

Cybenetics runs voluntary certification programs for power supplies - ETA for efficiency, LAMBDA for noise and SAFE for safety and correct operation - and for cooling products, with DELTA for chassis soundproofing and PHI for fan airflow and static pressure. THETA rates cooler performance on AMD AM5 and Intel LGA1851 outside ISO 17065 and accreditation scope

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