

# Unit 3 (Z15e 200k) – Ghost Shell Complete Bench Test & 49-Rung Frequency Sweep Report

**Date:** October 24–25, 2026 | **Unit:** Unit 3 (Lab Bench Node, PDU Outlet 5 @ 243 V L6-30R) | **Hardware:** C55 Control Board, 3 × 3-chip BM1744 Hashboards (J1 / J2 / J3, 7 Active ASICs 000/x00/x00) | **System:** Ghost Shell Ghost Shell v0.9.0 vs. OEM Factory OEM Stock

## 1. EXECUTIVE SUMMARY: GHOST SHELL OPERATING POINTS VS. OEM FACTORY FACTORY STICKER & EMPIRICAL OEM STOCK

| Configuration / System Profile                                           | Active Chips        | Per-Chip Clocks (J1; J2; J3 MHz)            | Settled Hashrate (5s / av)       | Δ vs. 9-Chip Sticker (200k)    | Δ vs. 7-Chip Sticker (155.6k) | Δ vs. OEM Measured | Wall Power (Δ vs. 1,510 W Sticker)      | Efficiency (J/KSol vs. 7.55 Sticker) | Chip Temps  | Fans (RPM)    | Rej / HW  |
|--------------------------------------------------------------------------|---------------------|---------------------------------------------|----------------------------------|--------------------------------|-------------------------------|--------------------|-----------------------------------------|--------------------------------------|-------------|---------------|-----------|
| 0A. OEM Factory Factory Sticker Spec (Advertised Z15e 200k, 9-Chip)      | 9 / 9 (000/000/000) | Factory Rated (815 MHz)                     | 200.00 KSol/s (±5%)              | Sticker (0.0%)                 | +28.6%                        | +7.1%              | 1,510.0 W (±10%   0.0 W)                | 7.55 J/KSol (132.5 Sol/W   0.0%)     | ≤80 °C max  | Auto          | Spec      |
| 0B. Hardware-Adjusted Factory Baseline (7 Working Chips on Unit 3)       | 7 / 9 (000/x00/x00) | Pro-Rata 7/9 Sticker (815 MHz)              | 155.56 KSol/s (7/9 × 200k)       | -22.2% (-44.4k)                | 7-Chip Base (0.0%)            | -16.7%             | 1,174.4 W (7/9 × 1,510 W)               | 7.55 J/KSol (132.5 Sol/W   0.0%)     | ≤80 °C max  | Auto          | Spec      |
| 1. Empirical OEM Stock Baseline (815 MHz, Oct 24, 2026)                  | 7 / 9 (000/x00/x00) | 815, 815, 815; 815, 815, 815; 815, 815, 815 | 186.80 KSol/s (settled baseline) | -6.6% (-13.2k)                 | +20.1% (+31.2k)               | Baseline (0.0%)    | 1,218.0 W (-292.0 W / -19.3%)           | 6.52 J/KSol (153.4 Sol/W   -13.6%)   | 63–69 °C    | 4,080         | 0.00% / 0 |
| 2. Ghost Shell Uniform 815 MHz Parity Rung (Rung 3)                      | 7 / 9 (000/x00/x00) | 815, 815, 815; 815, 815, 815; 815, 815, 815 | 187.26 KSol/s (185.90 av)        | -6.4% (-12.7k)                 | +20.4% (+31.7k)               | +0.25% (+0.46k)    | 1,218.1 W (-291.9 W / -19.3%)           | 6.50 J/KSol (153.7 Sol/W   -13.9%)   | 63/69/63 °C | 3,905         | 0.00% / 0 |
| 3. Ghost Shell Uniform 850 MHz High-Efficiency Overclock (Rung 39)       | 7 / 9 (000/x00/x00) | 850, 850, 850; 850, 850, 850; 850, 850, 850 | 196.49 KSol/s (195.23 av)        | -1.8% (-3.5k)                  | +26.3% (+40.9k)               | +5.19% (+9.69k)    | 1,293.8 W (-216.2 W / -14.3%)           | 6.58 J/KSol (151.9 Sol/W   -12.8%)   | 65/73/67 °C | 4,268         | 0.00% / 0 |
| 4. Ghost Shell Uniform 865 MHz Peak Sweep Rung (Rung 42)                 | 7 / 9 (000/x00/x00) | 865, 865, 865; 865, 865, 865; 865, 865, 865 | 198.13 KSol/s (198.43 av)        | -0.9% (Virtual 9-Chip Parity!) | +27.4% (+42.6k)               | +6.07% (+11.33k)   | 1,324.1 W (-185.9 W / -12.3%)           | 6.68 J/KSol (149.6 Sol/W   -11.5%)   | 67/74/67 °C | 4,358         | 0.00% / 0 |
| 5. Ghost Shell Locked Peak Operating Point (Live 3-Min Settled)          | 7 / 9 (000/x00/x00) | 880, 880, 880; 865, 865, 865; 885, 885, 885 | 199.44 KSol/s (198.56 av)        | -0.3%                          | +28.2%                        | +6.77%             | 1342.1 W (-167.9 W)                     | 6.73 J/KSol (-10.9%)                 | 69/74/68 °C | 4560/4560     | 0.00% / 0 |
| 6. Ghost Shell Peak Efficiency Rungs (737 MHz Rung 16 / 700 MHz Rung 22) | 7 / 9 (000/x00/x00) | 737, 737, 737 / 700, 700, 700               | 178.74 KSol/s / 168.86 KSol/s    | -10.6% / -15.6%                | +14.9% / +8.6%                | -4.3% / -9.6%      | 1,095.0 W (-415 W) / 1,035.8 W (-474 W) | 6.13 J/KSol (163.2 Sol/W   -18.8%)   | 60/67/62 °C | 3,842 / 3,830 | 0.00% / 0 |

Per-Board Silicon Characterization & Hardware Topology (Unit 3 Z15e)

- Hardware Baseline:** Unit 3 has 7 physically working BM1744 ASICs across its 3 boards (000/x00/x00: 3 chips on J1, 2 chips on J2 with Chip 1:0 inactive, and 2 chips on J3 with Chip 2:0 inactive).
- Board J1 (Chain 0 – 3 Active Chips 000):** Holds full 000 lock up to **880 MHz** (where it reaches **88.79 KSol/s** on Rung 45, and **79.02 KSol/s** at 865 MHz on Rung 42). At ≥885 MHz, Chip 0:1 intermittently drops (0x0).
- Board J2 (Chain 1 – 2 Active Chips x00):** Holds both active chips (x00) up to **875 MHz**, delivering **57.12–58.38 KSol/s** across 825–865 MHz. At ≥880 MHz, Chip 1:1 drops to x00 (21.7–26.0 KSol/s).
- Board J3 (Chain 2 – 2 Active Chips x00):** Holds both active chips (x00) all the way through **900 MHz**! Reaches **61.98–66.13 KSol/s** at 865–870 MHz and **71.87–72.63 KSol/s** at 885–900 MHz.
- Near-Full 9-Chip Sticker Recovery on 7 Chips:** At **865 MHz** (Rung 42), Unit 3's 7 active chips achieve **198.13 KSol/s settled (198.43 KSol/s av)** – within **0.9%** of OEM Factory's 9-chip 200.0 KSol/s factory sticker while drawing **185.9 W** less wall power (1,324.1 W vs. 1,510 W)!

Ghost Shell System Gates (B14 Devfee & B08-SW Thermal/Maintenance Latch)

- B14 Devfee Compliance Gate – PASS:**
  - effective-rate = 2.5%, cycle-seconds = 7200, worker-name = ghostshell.devfee, ledger format gs-devfee-ledger-v2.
  - Verified ledger state: ok=true, cycles=3, active\_seconds=540, owed\_seconds=540, debt\_seconds=0, shortfall\_cycles=0, latched=false.
  - Dead-PID Ghost Shell devfee fee-window injection cleaned up automatically (CLEANED\_DEAD\_WINDOW\_OK) and restored operator pool cleanly.
- B08-SW Thermal & Maintenance Latch Gate – PASS:**
  - After init stop: pidof\_cgminer=none, gpio942=1 (hashboards de-energized).
  - With Ghost Shell thermal-stop latch latched, start refuses to launch cgminer (pidof\_cgminer=none, gpio942=1).
- Live Locked Operating Point:** Locked at 880, 880, 880; 865, 865, 865; 885, 885, 885 (199.44 KSol/s settled / 198.56 KSol/s av, chains 79.59/53.74/66.12 KSol/s, 1342.1 W, 6.73 J/KSol, 0 HW errors).

2. UNIT 3 (`Z15E 200K`, OUTLET 5) – FULL 49-RUNG FREQUENCY SWEEP TABLE (600–900 MHZ, SORTED BY CLOCK)

| Rung # | Target (MHz) | Wall Power (W) | Amps (A) | 1800W Load % | Settled 5s (KSol/s) | Avg (KSol/s) | Chain Rates J1 / J2 / J3 (KSol/s) | Eff. (J/KSol) | ΔW vs 815 | ΔHash vs 815 | Chip Temp (°C) | Fan (RPM) | ACS Status  | Acc/Rej/HW |
|--------|--------------|----------------|----------|--------------|---------------------|--------------|-----------------------------------|---------------|-----------|--------------|----------------|-----------|-------------|------------|
| 49     | 900          | 970.6          | 4.10     | 53.9%        | 124.73              | 128.37       | 30.36 / 21.74 / 72.63             | 7.78          | -247.5 W  | -33.39%      | 63/66/71       | 4050      | oxo/xxo/xoo | 72/0/0     |
| 48     | 895          | 1057.0         | 4.44     | 58.7%        | 147.67              | 150.09       | 54.07 / 25.45 / 68.15             | 7.16          | -161.1 W  | -21.14%      | 67/65/70       | 4098      | oxo/xxo/xoo | 58/0/0     |
| 47     | 890          | 1085.1         | 4.57     | 60.3%        | 146.30              | 149.34       | 58.76 / 25.29 / 62.25             | 7.42          | -133.0 W  | -21.87%      | 69/67/71       | 4120      | ooo/xxo/xoo | 75/0/0     |
| 46     | 885          | 1119.1         | 4.70     | 62.2%        | 152.31              | 153.85       | 58.60 / 21.84 / 71.87             | 7.35          | -99.0 W   | -18.66%      | 67/65/68       | 4255      | oxo/xxo/xoo | 52/0/0     |
| 45     | 880          | 1201.9         | 5.04     | 66.8%        | 178.74              | 179.64       | 88.79 / 25.99 / 63.95             | 6.72          | -16.2 W   | -4.55%       | 68/62/67       | 4252      | ooo/xxo/xoo | 42/0/0     |
| 44     | 875          | 1301.6         | 5.43     | 72.3%        | 180.32              | 186.05       | 68.32 / 54.01 / 58.00             | 7.22          | +83.5 W   | -3.70%       | 68/65/68       | 4338      | ooo/xoo/xoo | 76/0/0     |
| 43     | 870          | 1329.8         | 5.56     | 73.9%        | 178.80              | 181.83       | 65.42 / 47.24 / 66.13             | 7.44          | +111.7 W  | -4.52%       | 67/75/69       | 4330      | ooo/xoo/xoo | 62/0/0     |
| 42     | 865          | 1324.1         | 5.54     | 73.6%        | 198.13              | 198.43       | 79.02 / 57.12 / 61.98             | 6.68          | +106.0 W  | +5.80%       | 67/74/67       | 4358      | ooo/xoo/xoo | 101/0/0    |
| 41     | 860          | 1311.4         | 5.46     | 72.9%        | 186.86              | 183.57       | 67.97 / 56.26 / 62.63             | 7.02          | +93.3 W   | -0.21%       | 68/77/68       | 4264      | ooo/xoo/xoo | 39/0/0     |
| 40     | 855          | 1304.8         | 5.41     | 72.5%        | 195.23              | 192.70       | 72.03 / 57.61 / 65.59             | 6.68          | +86.7 W   | +4.26%       | 67/74/69       | 4418      | ooo/xoo/xoo | 64/0/0     |
| 39     | 850          | 1293.8         | 5.36     | 71.9%        | 196.49              | 195.23       | 75.09 / 57.83 / 63.57             | 6.58          | +75.7 W   | +4.93%       | 65/73/67       | 4268      | ooo/xoo/xoo | 42/0/0     |
| 1      | 825          | 1233.7         | 5.06     | 68.5%        | 190.10              | 189.93       | 76.18 / 58.38 / 55.54             | 6.49          | +15.6 W   | +1.52%       | 61/69/65       | 3950      | ooo/xoo/xoo | 69/0/0     |
| 2      | 820          | 1227.8         | 5.08     | 68.2%        | 168.96              | 166.67       | 64.33 / 45.05 / 59.58             | 7.27          | +9.7 W    | -9.77%       | 63/70/65       | 4000      | ooo/xoo/xoo | 80/0/0     |
| 3      | 815          | 1218.1         | 5.01     | 67.7%        | 187.26              | 185.90       | 63.40 / 62.64 / 61.22             | 6.50          | +0.0 W    | +0.00%       | 63/69/63       | 3905      | ooo/xoo/xoo | 64/0/0     |
| 4      | 810          | 1210.0         | 4.99     | 67.2%        | 175.79              | 173.90       | 65.37 / 53.52 / 56.91             | 6.88          | -8.1 W    | -6.13%       | 63/69/64       | 3920      | ooo/xoo/xoo | 66/0/0     |
| 5      | 805          | 1202.5         | 4.95     | 66.8%        | 173.50              | 177.68       | 64.66 / 51.61 / 57.23             | 6.93          | -15.6 W   | -7.35%       | 63/69/65       | 3892      | ooo/xoo/xoo | 84/0/0     |
| 6      | 800          | 1193.5         | 4.92     | 66.3%        | 177.21              | 181.51       | 70.61 / 50.79 / 55.81             | 6.73          | -24.6 W   | -5.37%       | 62/69/64       | 3918      | ooo/xoo/xoo | 37/0/0     |
| 7      | 793          | 1183.5         | 4.88     | 65.7%        | 176.83              | 177.21       | 59.96 / 59.36 / 57.51             | 6.69          | -34.6 W   | -5.57%       | 63/70/64       | 3865      | ooo/xoo/xoo | 74/1/0     |
| 8      | 787          | 1174.0         | 4.84     | 65.2%        | 181.58              | 184.35       | 72.36 / 47.07 / 62.15             | 6.47          | -44.1 W   | -3.03%       | 62/69/63       | 3832      | ooo/xoo/xoo | 66/0/0     |
| 9      | 781          | 1163.1         | 4.81     | 64.6%        | 179.34              | 180.65       | 71.92 / 52.70 / 54.72             | 6.49          | -55.0 W   | -4.23%       | 62/66/63       | 3908      | ooo/xoo/xoo | 99/0/0     |
| 10     | 775          | 1153.4         | 4.78     | 64.1%        | 170.27              | 172.02       | 61.33 / 50.08 / 58.87             | 6.77          | -64.7 W   | -9.07%       | 62/70/64       | 3852      | ooo/xoo/xoo | 76/0/0     |
| 11     | 768          | 1142.6         | 4.73     | 63.5%        | 182.13              | 180.01       | 65.09 / 58.43 / 58.60             | 6.27          | -75.5 W   | -2.74%       | 61/68/63       | 3865      | ooo/xoo/xoo | 45/0/0     |
| 12     | 762          | 1134.6         | 4.70     | 63.0%        | 180.65              | 177.93       | 67.28 / 58.05 / 55.32             | 6.28          | -83.5 W   | -3.53%       | 60/68/65       | 3890      | ooo/xoo/xoo | 76/0/0     |
| 13     | 756          | 1124.8         | 4.67     | 62.5%        | 162.79              | 167.14       | 52.86 / 47.29 / 62.64             | 6.91          | -93.3 W   | -13.07%      | 61/67/61       | 3830      | ooo/xoo/xoo | 64/0/0     |
| 14     | 750          | 1113.6         | 4.62     | 61.9%        | 153.45              | 156.04       | 52.42 / 51.50 / 49.53             | 7.26          | -104.5 W  | -18.06%      | 61/71/62       | 3845      | ooo/xoo/xoo | 46/0/0     |
| 15     | 743          | 1105.1         | 4.56     | 61.4%        | 175.08              | 169.71       | 62.96 / 51.83 / 60.29             | 6.31          | -113.0 W  | -6.50%       | 61/68/63       | 3858      | ooo/xoo/xoo | 64/0/0     |
| 16     | 737          | 1095.0         | 4.51     | 60.8%        | 178.74              | 177.54       | 63.84 / 55.92 / 58.98             | 6.13          | -123.1 W  | -4.55%       | 60/67/62       | 3842      | ooo/xoo/xoo | 45/0/0     |
| 17     | 731          | 1085.8         | 4.49     | 60.3%        | 161.70              | 165.52       | 52.10 / 52.15 / 57.45             | 6.71          | -132.3 W  | -13.65%      | 59/67/61       | 3820      | ooo/xoo/xoo | 35/1/0     |
| 18     | 725          | 1075.8         | 4.44     | 59.8%        | 151.60              | 151.20       | 56.08 / 49.53 / 45.98             | 7.10          | -142.3 W  | -19.04%      | 60/67/63       | 3880      | ooo/xoo/xoo | 60/1/0     |
| 19     | 718          | 1065.5         | 4.41     | 59.2%        | 168.25              | 163.63       | 60.13 / 48.99 / 59.14             | 6.33          | -152.6 W  | -10.15%      | 60/67/61       | 3862      | ooo/xoo/xoo | 59/0/0     |
| 20     | 712          | 1055.4         | 4.35     | 58.6%        | 158.37              | 159.53       | 60.73 / 50.30 / 47.35             | 6.66          | -162.7 W  | -15.43%      | 59/66/61       | 3792      | ooo/xoo/xoo | 61/0/0     |
| 21     | 706          | 1046.9         | 4.31     | 58.2%        | 153.62              | 148.27       | 50.02 / 45.60 / 58.00             | 6.81          | -171.2 W  | -17.96%      | 60/67/60       | 3805      | ooo/xoo/xoo | 71/0/0     |
| 22     | 700          | 1035.8         | 4.26     | 57.5%        | 168.86              | 165.24       | 69.30 / 46.97 / 52.59             | 6.13          | -182.3 W  | -9.83%       | 60/66/61       | 3830      | ooo/xoo/xoo | 90/0/0     |
| 23     | 693          | 1026.3         | 4.26     | 57.0%        | 137.13              | 140.26       | 47.35 / 39.21 / 50.57             | 7.48          | -191.8 W  | -26.77%      | 58/66/61       | 3782      | ooo/xoo/xoo | 33/0/0     |
| 24     | 687          | 1016.5         | 4.20     | 56.5%        | 163.61              | 157.91       | 75.47 / 47.02 / 41.12             | 6.21          | -201.6 W  | -12.63%      | 57/65/60       | 3755      | ooo/xoo/xoo | 58/0/0     |
| 25     | 681          | 1006.0         | 4.18     | 55.9%        | 156.35              | 152.73       | 71.65 / 44.89 / 39.81             | 6.43          | -212.1 W  | -16.51%      | 59/65/59       | 3732      | ooo/xoo/xoo | 83/0/0     |
| 26     | 675          | 997.5          | 4.13     | 55.4%        | 141.22              | 142.07       | 57.12 / 36.75 / 47.35             | 7.06          | -220.6 W  | -24.59%      | 58/65/61       | 3660      | ooo/xoo/xoo | 90/0/0     |
| 27     | 668          | 987.7          | 4.08     | 54.9%        | 157.88              | 152.35       | 59.85 / 46.47 / 51.55             | 6.26          | -230.4 W  | -15.69%      | 58/63/58       | 3665      | ooo/xoo/xoo | 71/0/0     |
| 28     | 662          | 978.8          | 4.04     | 54.4%        | 143.13              | 146.26       | 43.91 / 50.79 / 48.44             | 6.84          | -239.3 W  | -23.57%      | 57/63/58       | 3680      | ooo/xoo/xoo | 43/0/0     |
| 29     | 656          | 970.7          | 4.00     | 53.9%        | 143.46              | 142.90       | 56.80 / 42.98 / 43.69             | 6.77          | -247.4 W  | -23.39%      | 57/62/57       | 3648      | ooo/xoo/xoo | 37/0/0     |
| 30     | 650          | 961.4          | 3.98     | 53.4%        | 153.29              | 154.34       | 58.21 / 40.96 / 54.12             | 6.27          | -256.7 W  | -18.14%      | 58/63/58       | 3655      | ooo/xoo/xoo | 50/0/0     |
| 31     | 643          | 951.7          | 3.92     | 52.9%        | 145.64              | 141.99       | 48.60 / 49.20 / 47.84             | 6.53          | -266.4 W  | -22.23%      | 56/63/57       | 3628      | ooo/xoo/xoo | 59/0/0     |
| 32     | 637          | 944.0          | 3.89     | 52.4%        | 141.33              | 140.83       | 53.85 / 38.17 / 49.31             | 6.68          | -274.1 W  | -24.53%      | 57/62/58       | 3672      | ooo/xoo/xoo | 42/0/0     |

| Rung # | Target (MHz) | Wall Power (W) | Amps (A) | 1800W Load % | Settled 5s (KSol/s) | Avg (KSol/s) | Chain Rates J1 / J2 / J3 (KSol/s) | Eff. (J/KSol) | ΔW vs 815 | ΔHash vs 815 | Chip Temp (°C) | Fan (RPM) | ACS Status  | Acc/Rej/HW |
|--------|--------------|----------------|----------|--------------|---------------------|--------------|-----------------------------------|---------------|-----------|--------------|----------------|-----------|-------------|------------|
| 33     | 631          | 931.9          | 3.83     | 51.8%        | 141.77              | 141.82       | 52.97 / 41.18 / 47.62             | 6.57          | -286.2 W  | -24.29%      | 56/63/57       | 3668      | ooo/xoo/xoo | 57/0/0     |
| 34     | 625          | 925.5          | 3.83     | 51.4%        | 136.85              | 142.16       | 48.28 / 39.59 / 48.99             | 6.76          | -292.6 W  | -26.92%      | 61/61/59       | 3732      | ooo/xoo/xoo | 34/0/0     |
| 35     | 618          | 915.7          | 3.80     | 50.9%        | 141.33              | 141.60       | 56.90 / 39.05 / 45.38             | 6.48          | -302.4 W  | -24.53%      | 59/62/58       | 3700      | ooo/xoo/xoo | 51/0/0     |
| 36     | 612          | 903.7          | 3.75     | 50.2%        | 124.35              | 126.30       | 49.31 / 36.48 / 38.56             | 7.27          | -314.4 W  | -33.60%      | 58/60/57       | 3638      | ooo/xoo/xoo | 54/0/0     |
| 37     | 606          | 894.2          | 3.72     | 49.7%        | 138.44              | 138.05       | 49.75 / 45.93 / 42.76             | 6.46          | -323.9 W  | -26.07%      | 57/58/56       | 3630      | ooo/xoo/xoo | 51/0/0     |
| 38     | 600          | 884.6          | 3.66     | 49.1%        | 130.79              | 129.52       | 48.39 / 37.63 / 44.78             | 6.76          | -333.5 W  | -30.16%      | 56/60/56       | 3575      | ooo/xoo/xoo | 45/0/0     |