

CURRENT DRAWN BY MODEL 9601-D

TECHNICAL NOTE

March 18, 2006



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1.0 INTRODUCTION

This technical note documents the current drawn by model 9601-D during various operating conditions including power-up, standby, power-down and short-burst data (SBD). For each operating condition, the Agilent 66321B was used to measure the current time history over a span of 30 minutes. The sampling rate was set at 64.10KHz (or 15.6 μ sec). Each current measurement was captured over a 5-millisecond integration time. Three current values were obtained and plotted for each integration time—the average current, the maximum current and the minimum current. The average current was calculated by averaging all samples captured over the 5-millisecond integration period (321 points). The highest sample of each integration period is the maximum current and the lowest sample of each integration period is the minimum current. The time history of the input DC voltage to the 9601-D was also measured simultaneously with the current.

It should be noted that the actual current profile may vary for a number of reasons and care should be taken to minimize power consumption:

1. View of the sky—in poor visibility of the sky where a clear line-of-sight is not available between the 9601-D and the satellite.
2. The higher the antenna VSWR the higher the current consumed by the 9601-D.
3. The higher the antenna cable loss the higher the current consumed by the 9601-D.
4. Possible manufacturing variation from one 9601-D to another 9601-D (i.e., the 9601-D still meets specifications, but over a large sample size some may operate better than average). Application designer should be sure NOT to use best case numbers for average and expected the worse case scenarios.

2.0 CURRENT DRAWN DURING POWER-UP

Case #1: 4.0V Input

Figures 1, 2 and 3 display the average, maximum and minimum current plots for the modem 9601-D, respectively, during power-up. The input DC voltage to the 9601-D was measured at a constant 4.005V during the tests. Figure 2 shows a maximum current spike of $\sim 1.7A$ at power-up. Thus, for input voltage of 4.0VDC, a power supply capable of producing about 2.0A must be provided in order to power-up the 9601-D properly.

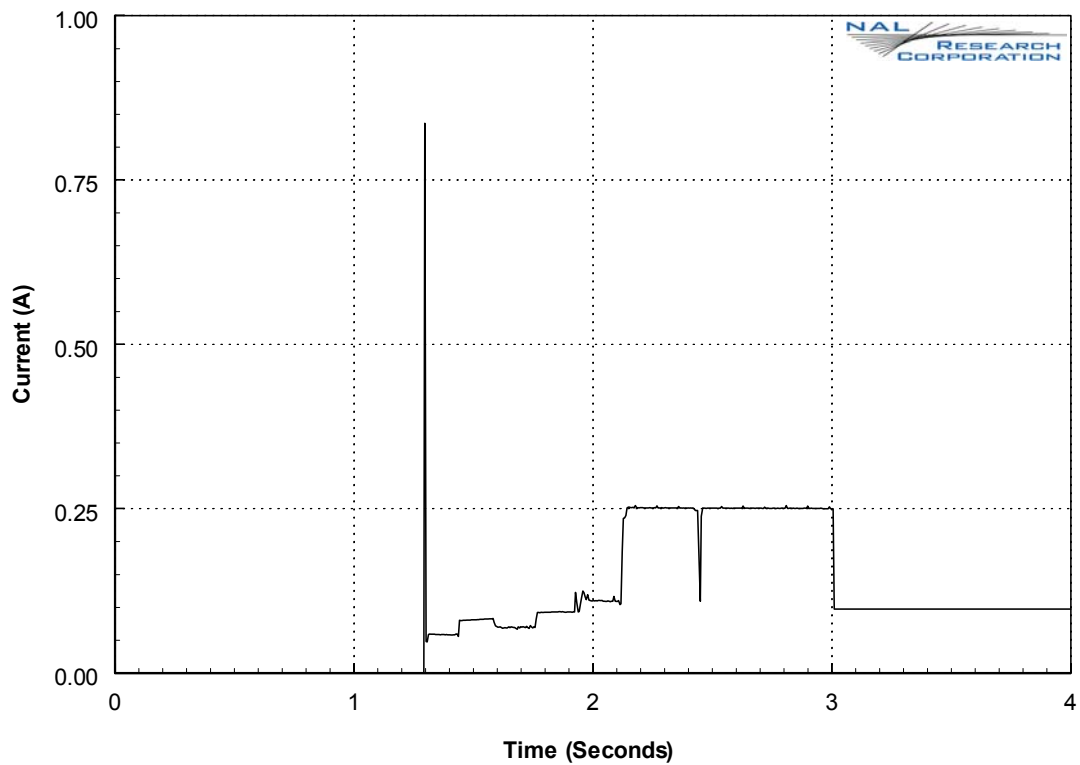


Figure 1. Average current drawn by model 9601-D during power-up at 4.0V input.

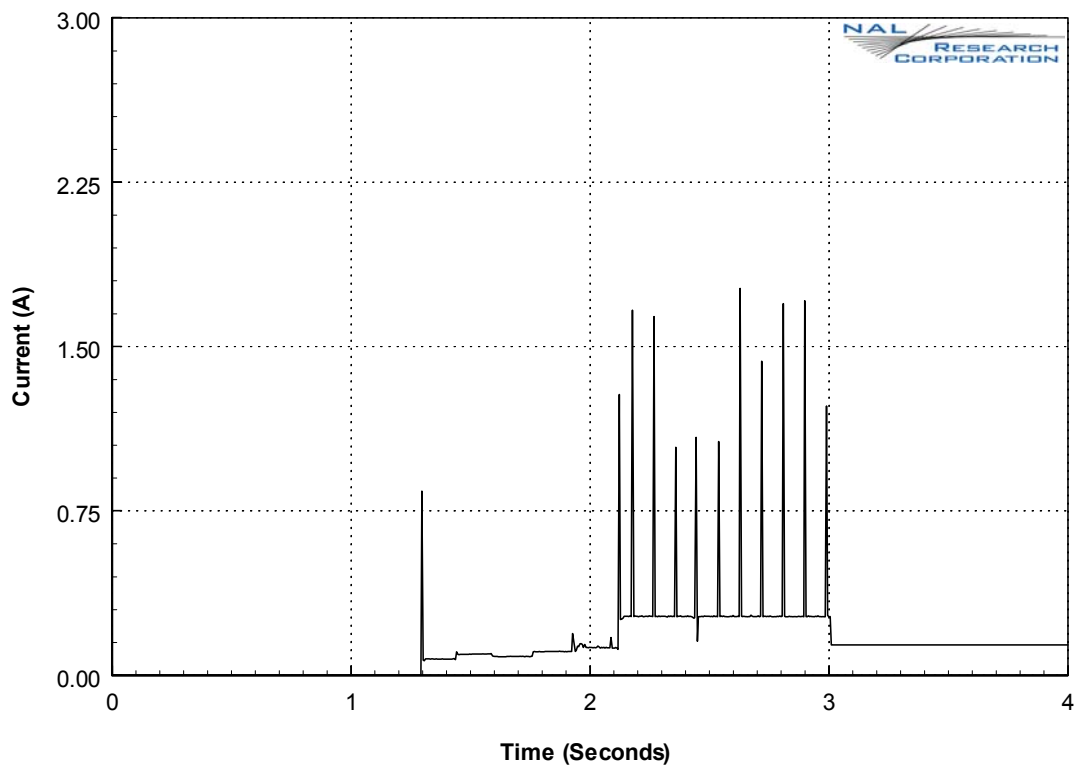


Figure 2. Maximum current drawn by model 9601-D during power-up at 4.0V input.

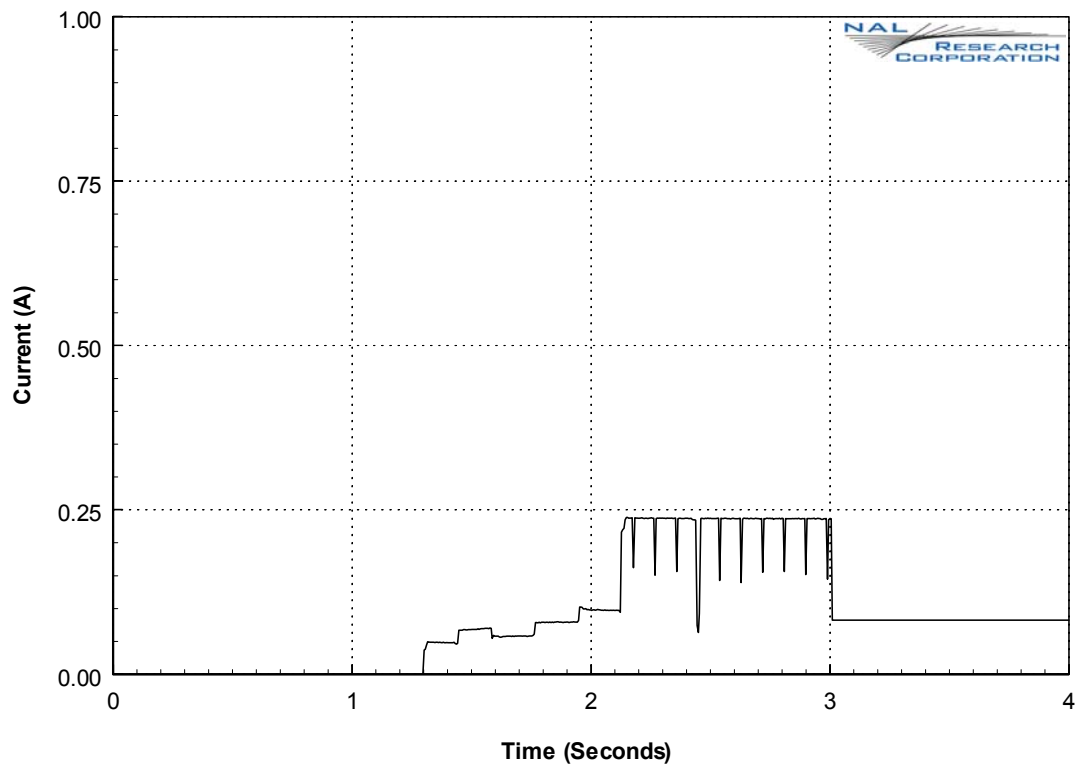


Figure 3. Minimum current drawn by model 9601-D during power-up at 4.0V input.

Case #2: 4.5V Input

Figures 4, 5 and 6 display the average, maximum and minimum current plots for the modem 9601-D, respectively, during power-up. The input DC voltage to the 9601-D was measured at a constant 4.503V during the tests. The power-up current spike reaches a maximum of $\sim 1.7\text{A}$ as shown in Figure 5. Thus, for input voltage of 4.5VDC, a power supply capable of producing about 2.0A must be provided in order to power-up the 9601-D properly.

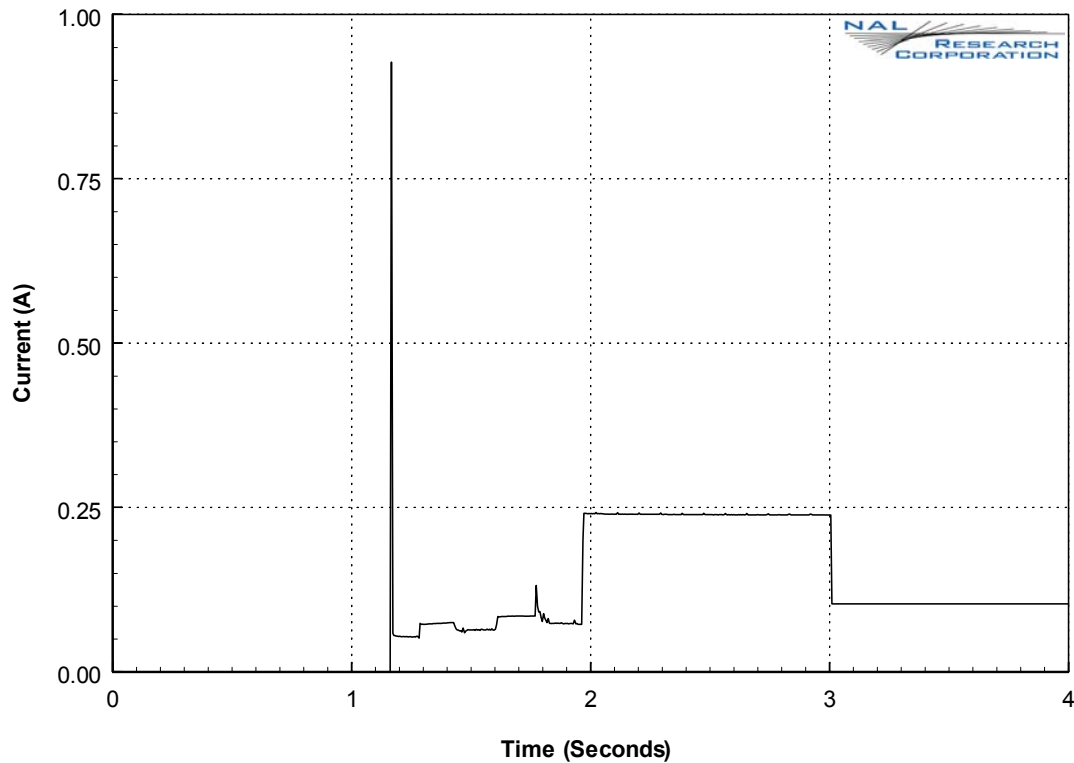


Figure 4. Average current drawn by model 9601-D during power-up at 4.5V input.

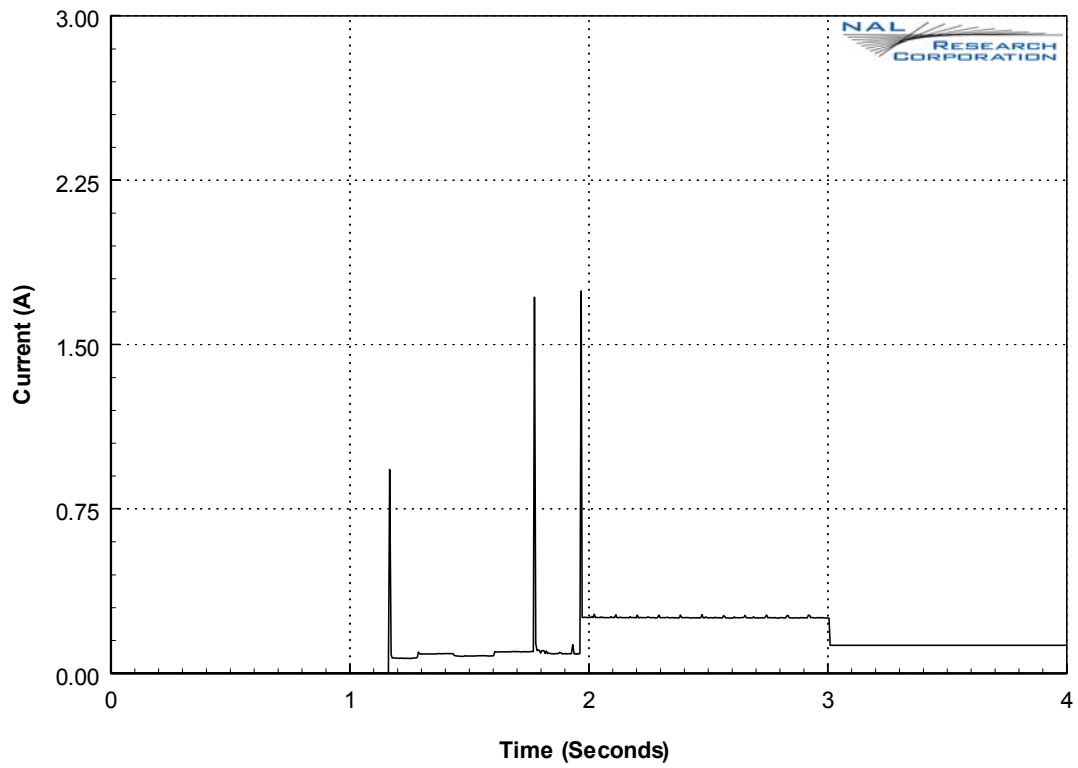


Figure 5. Maximum current drawn by model 9601-D during power-up at 4.5V input.

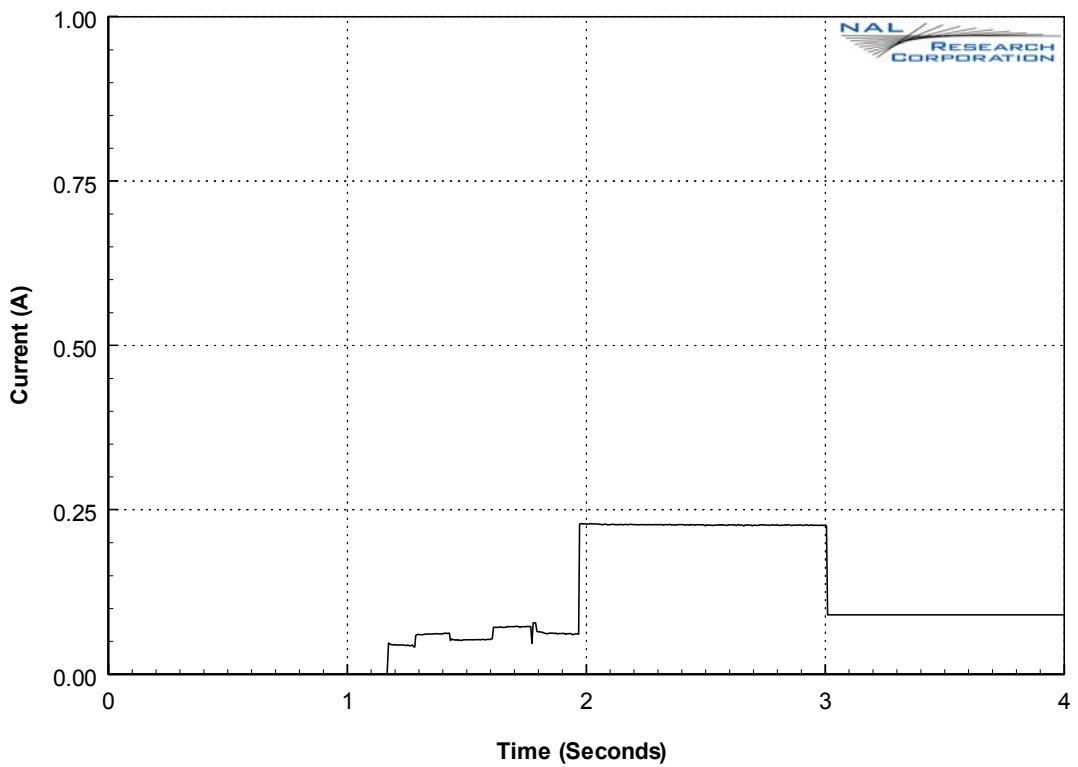


Figure 6. Minimum current drawn by model 9601-D during power-up at 4.5V input.

Case #3: 5.0V Input

Figures 7, 8 and 9 display the average, maximum and minimum current plots for the modem 9601-D, respectively, during power-up. The input DC voltage to the 9601-D was measured at a constant 5.004V during the tests. The power-up current spike reaches a maximum of $\sim 1.7\text{A}$ as shown in Figure 8. Thus, for input voltage of 5.0VDC, a power supply capable of producing about 2.0A must be provided in order to power-up the 9601-D properly.

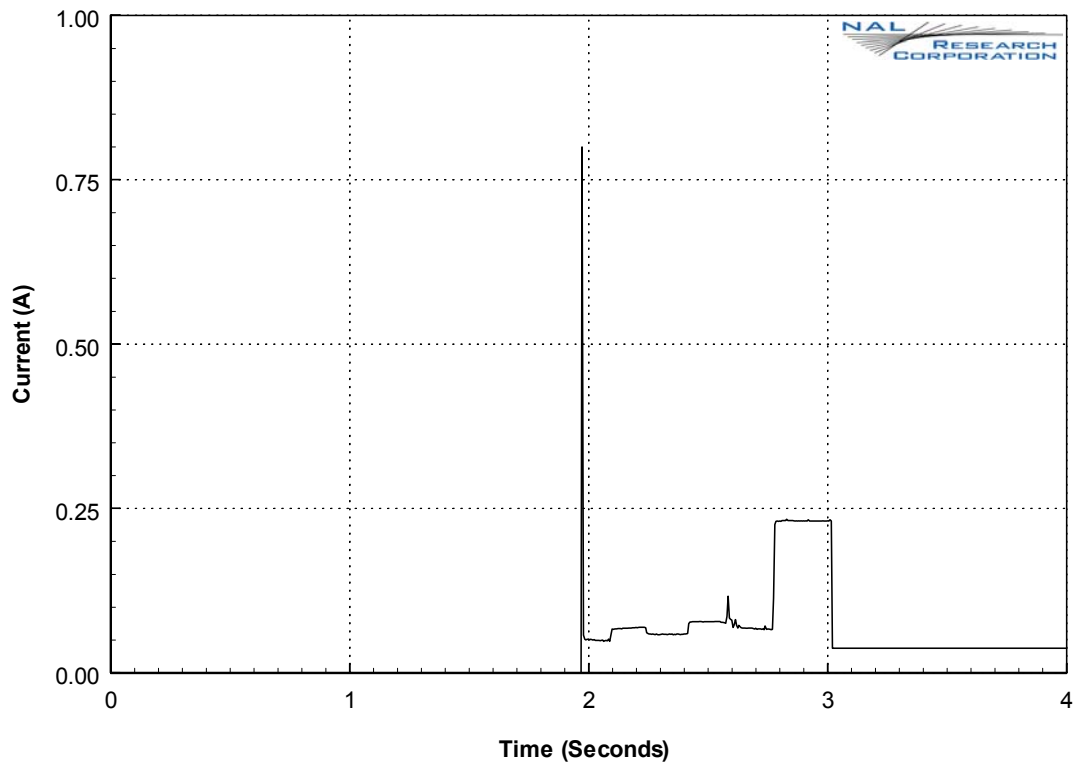


Figure 7. Average current drawn by model 9601-D during power-up at 5.0V input.

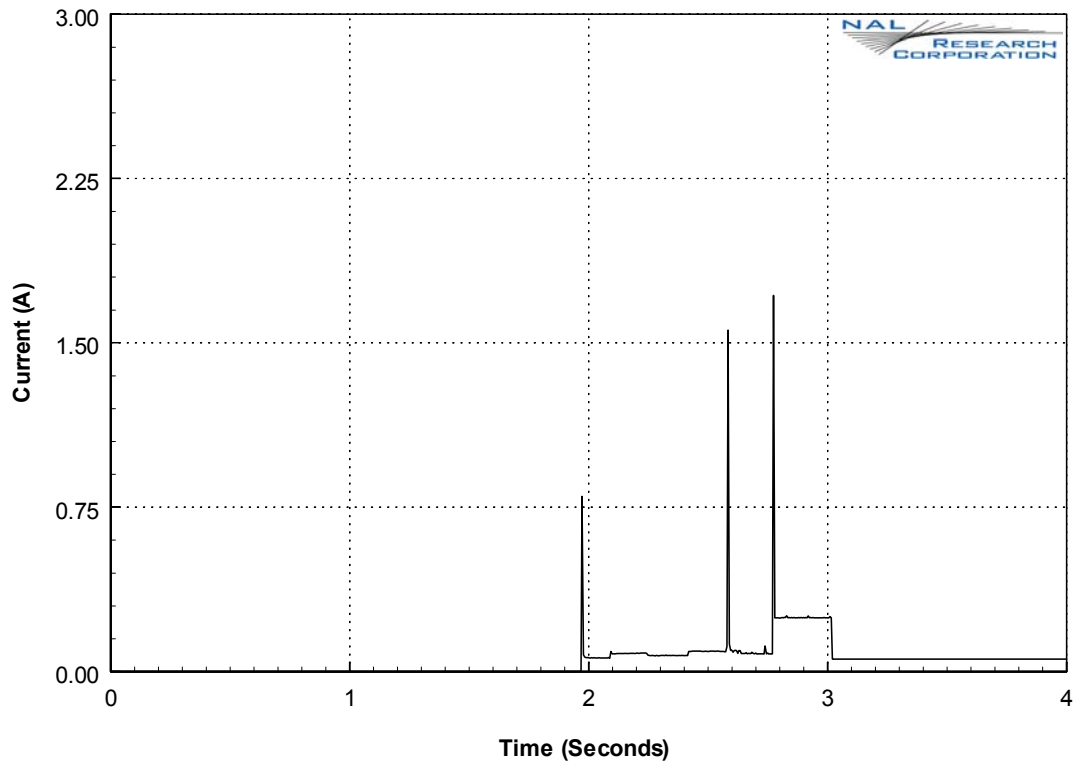


Figure 8. Maximum current drawn by model 9601-D during power-up at 5.0V input.

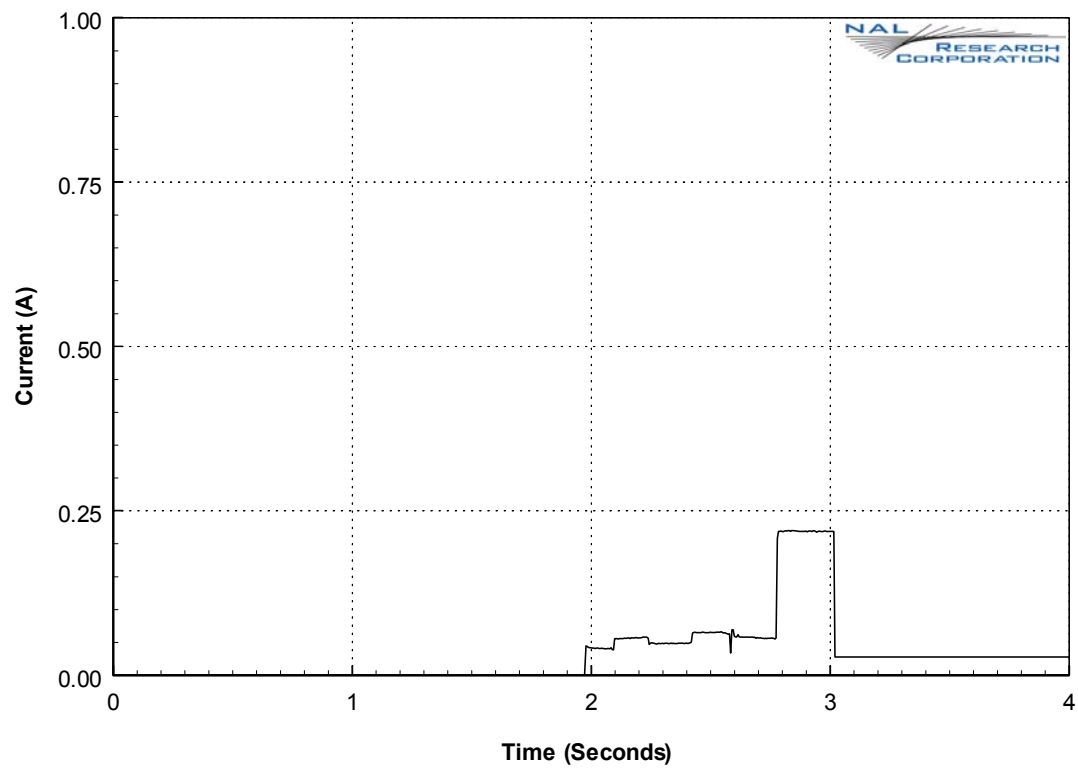


Figure 9. Minimum current drawn by model 9601-D during power-up at 5.0V input.

Case #4: 5.5V Input

Figures 10, 11 and 12 display the average, maximum and minimum current plots for the modem 9601-D, respectively, during power-up. The input DC voltage to the 9601-D was measured at a constant 5.504V during the tests. The power-up current spike reaches a maximum of $\sim 1.5\text{A}$ as shown in Figure 11. Thus, for input voltage of 5.5VDC, a power supply capable of producing about 2.0A must be provided in order to power-up the 9601-D properly.

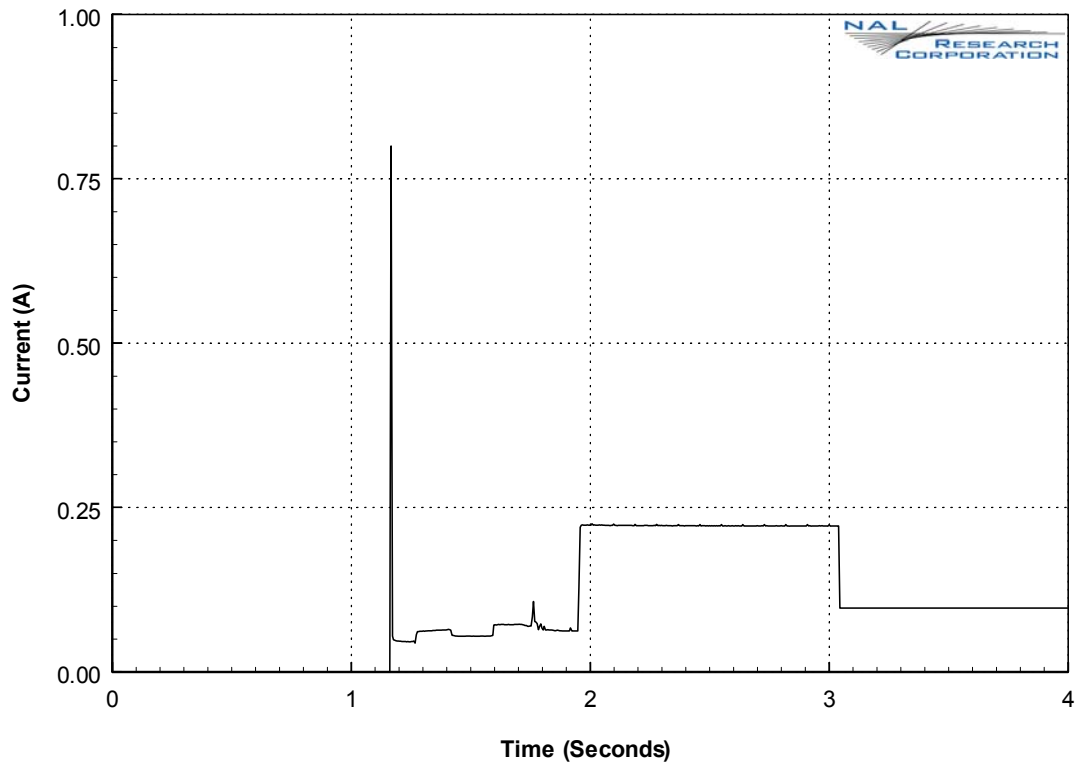


Figure 10. Average current drawn by model 9601-D during power-up at 5.5V input.

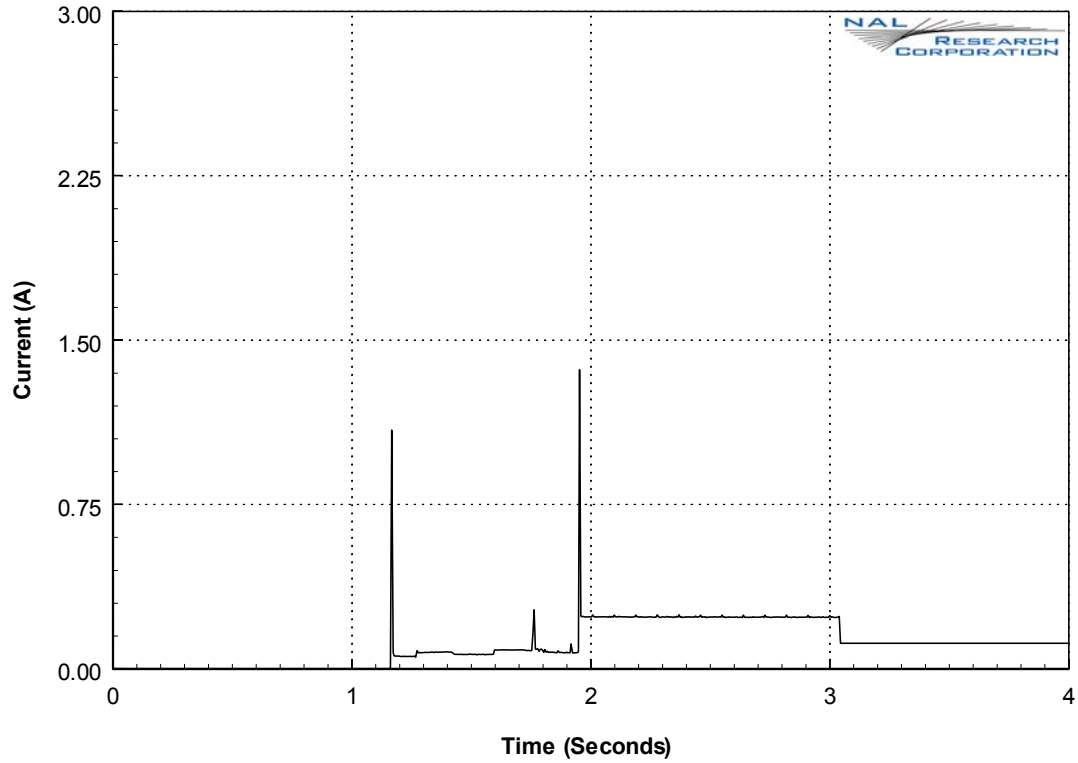


Figure 11. Maximum current drawn by model 9601-D during power-up at 5.5V input.

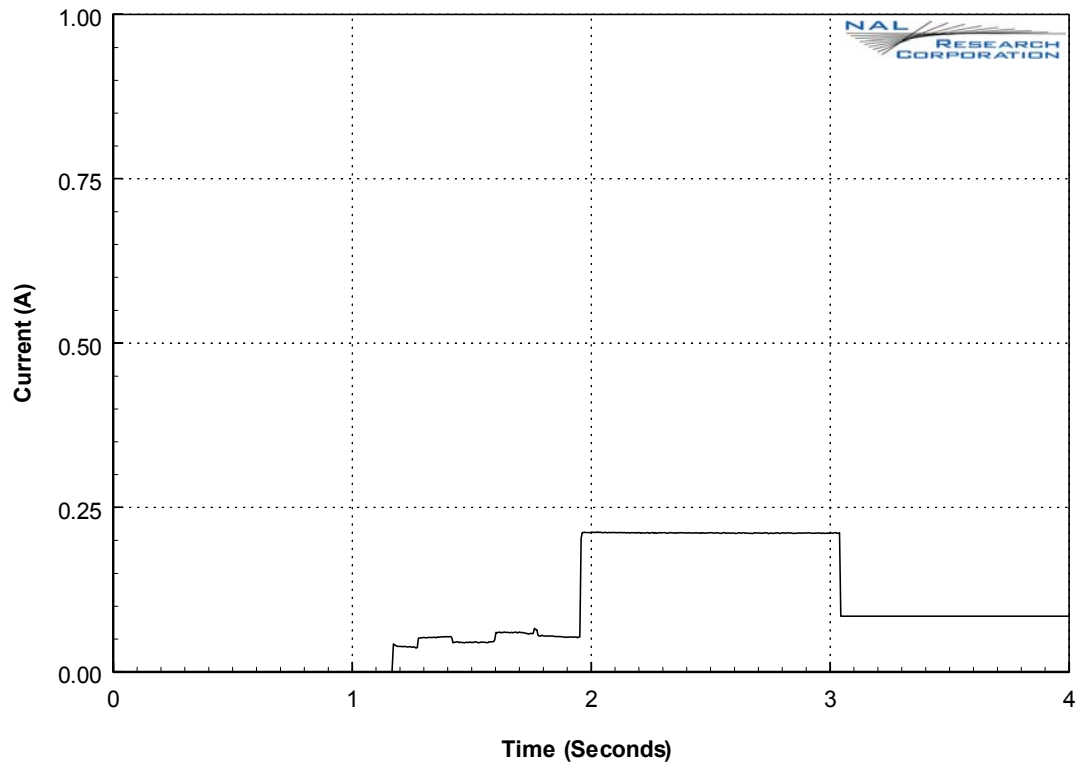


Figure 12. Minimum current drawn by model 9601-D during power-up at 5.5V input.

3.0 CURRENT DRAWN DURING STANDBY

Case #1: 4.0V Input

Figures 13, 14 and 15 display the average, maximum and minimum current plots for the modem 9601-D, respectively, during standby mode. The input DC voltage to the 9601-D was measured at a constant 4.004V during the tests. The overall average current drawn during standby is 79mA and the overall average power consumption is 316mW.

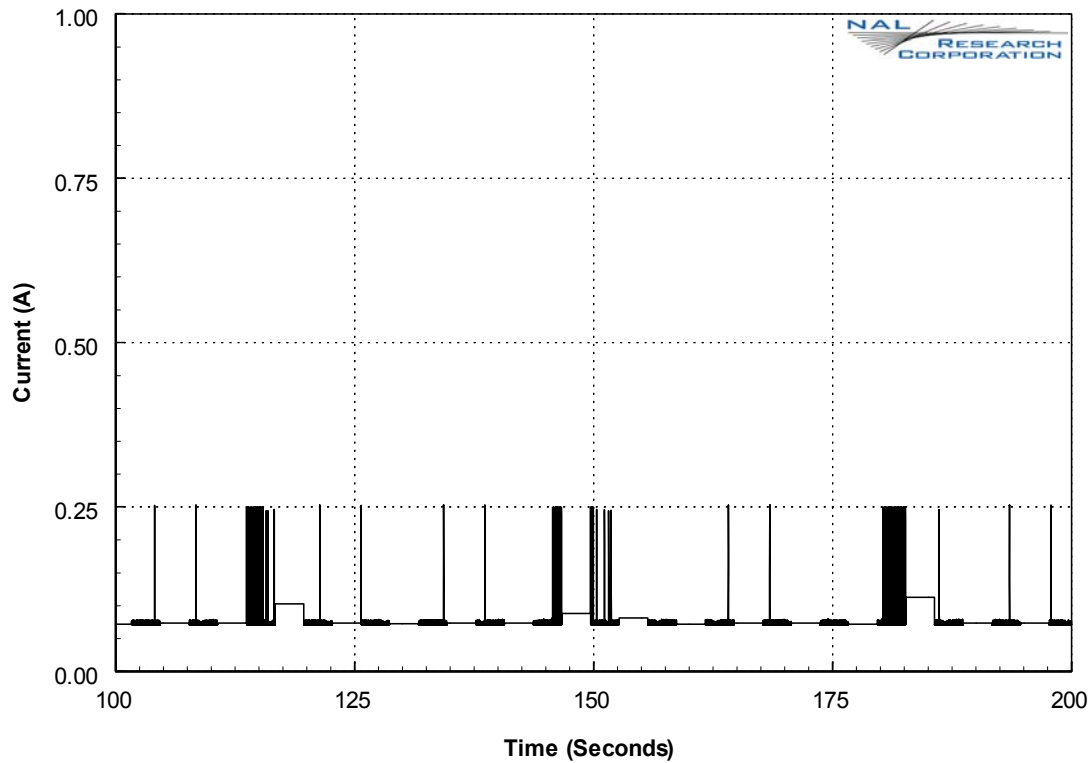


Figure 13. Average current drawn by model 9601-D during standby at 4.0V input.

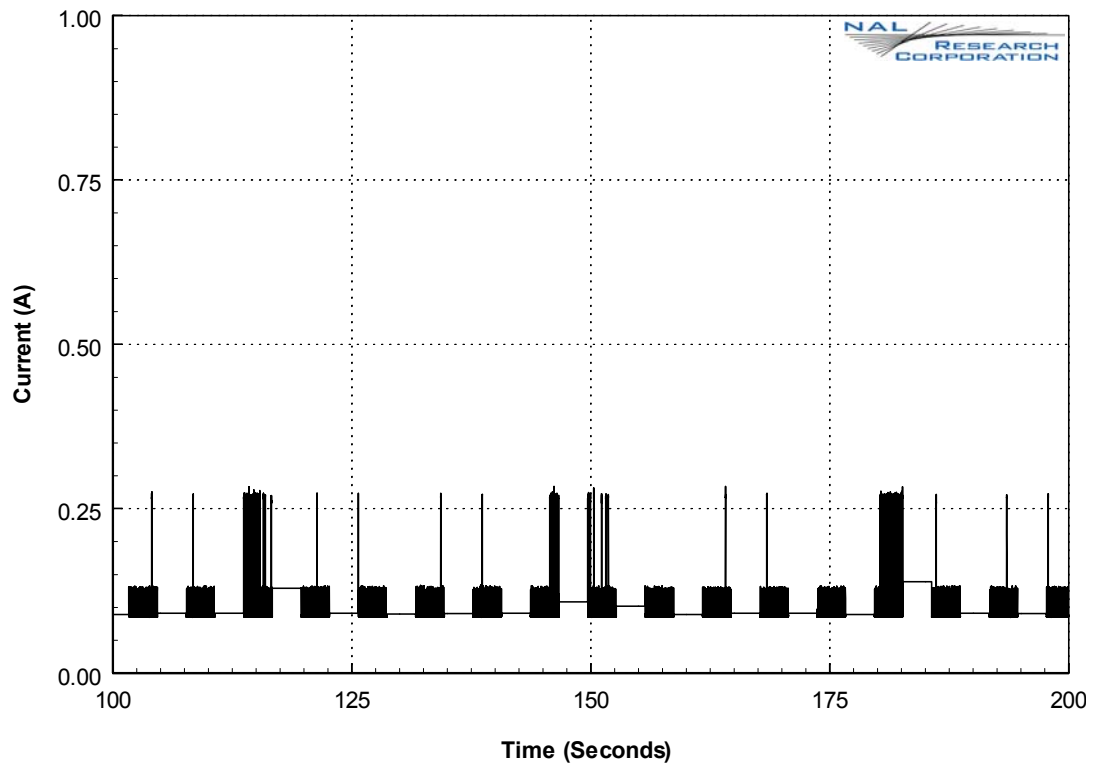


Figure 14. Maximum current drawn by model 9601-D during standby at 4.0V input.

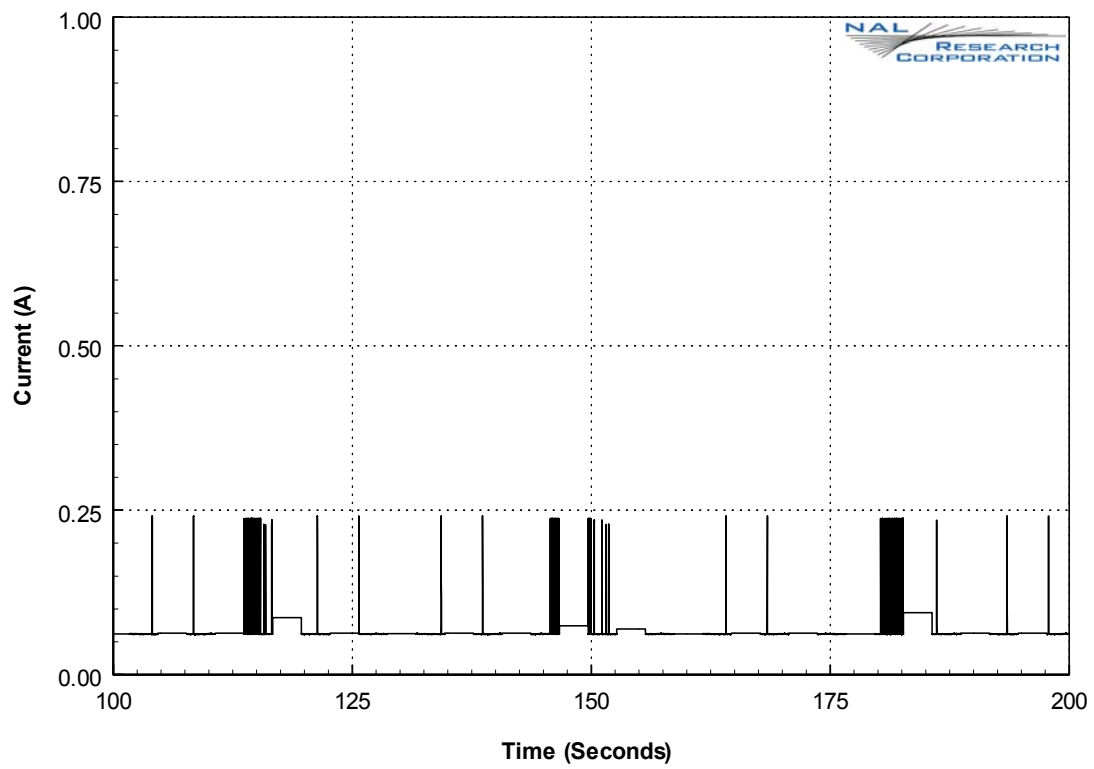


Figure 15. Minimum current drawn by model 9601-D during standby at 4.0V input.

Case #2: 4.4V Input

Figures 16, 17 and 18 display the average, maximum and minimum current plots for the modem 9601-D, respectively, during standby. The average input DC voltage to the 9601-D was measured at constant 4.404V during the tests. The overall average current drawn during standby is 75mA and the overall average power consumption is 330mW.

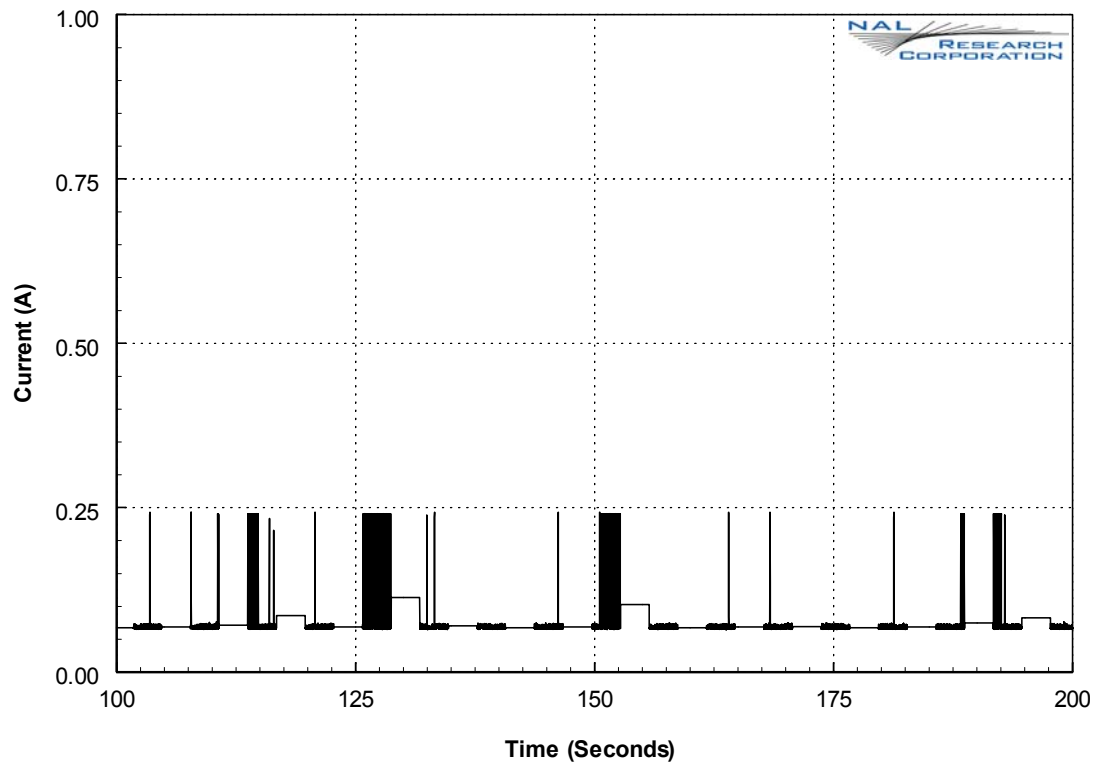


Figure 16. Average current drawn by model 9601-D during standby at 4.4V input.

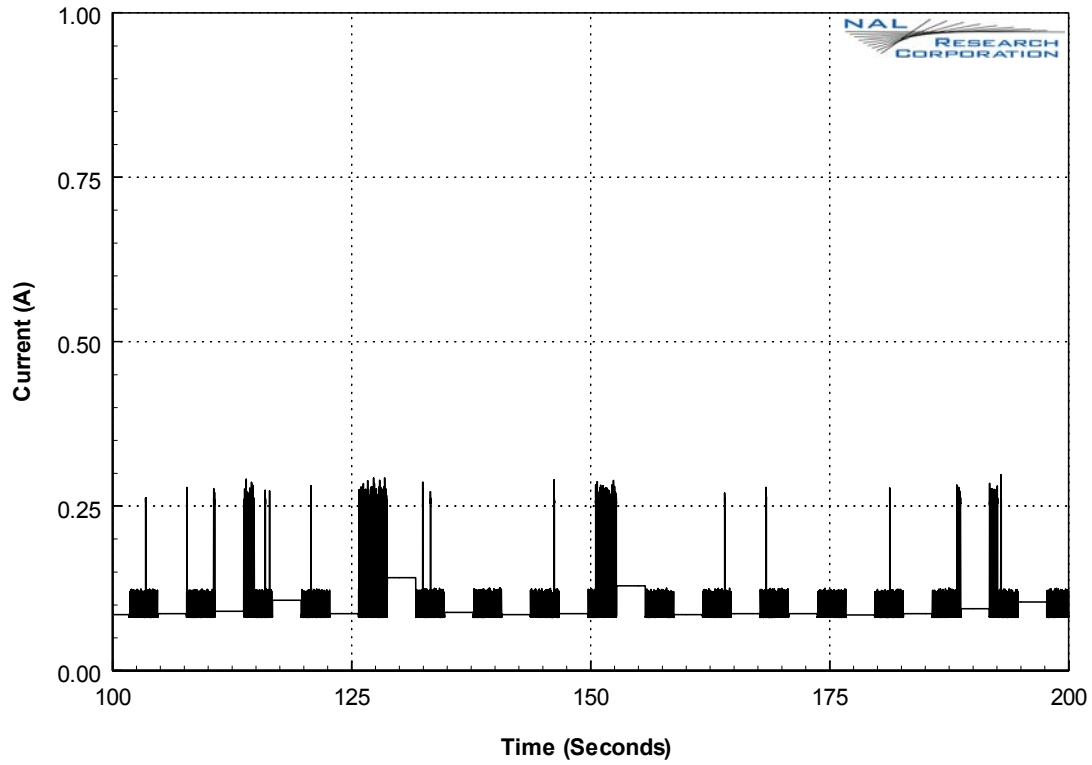


Figure 17. Maximum current drawn by model 9601-D during standby at 4.4V input.

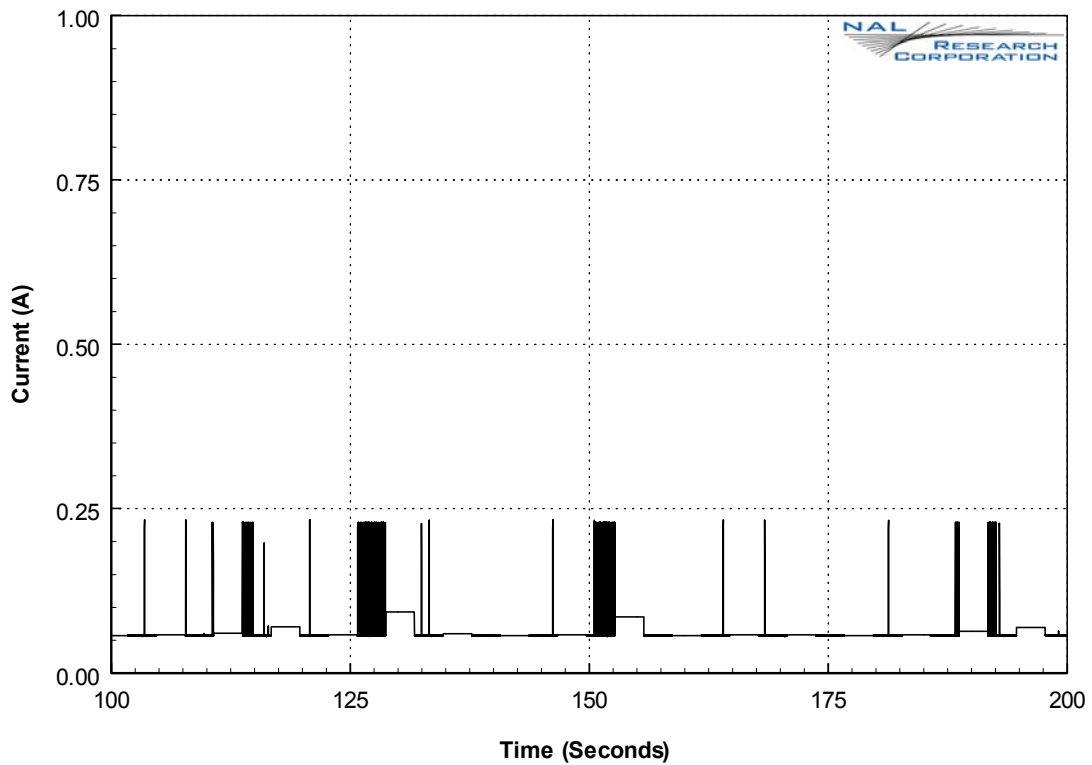


Figure 18. Minimum current drawn by model 9601-D during standby at 4.4V input.

Case #3: 4.8V Input

Figures 19, 20 and 21 display the average, maximum and minimum current plots for the modem 9601-D, respectively, during standby. The input DC voltage to the 9601-D was measured at a constant 4.803V during the tests. The overall average current drawn during standby is 71mA and the overall average power consumption is 340mW.

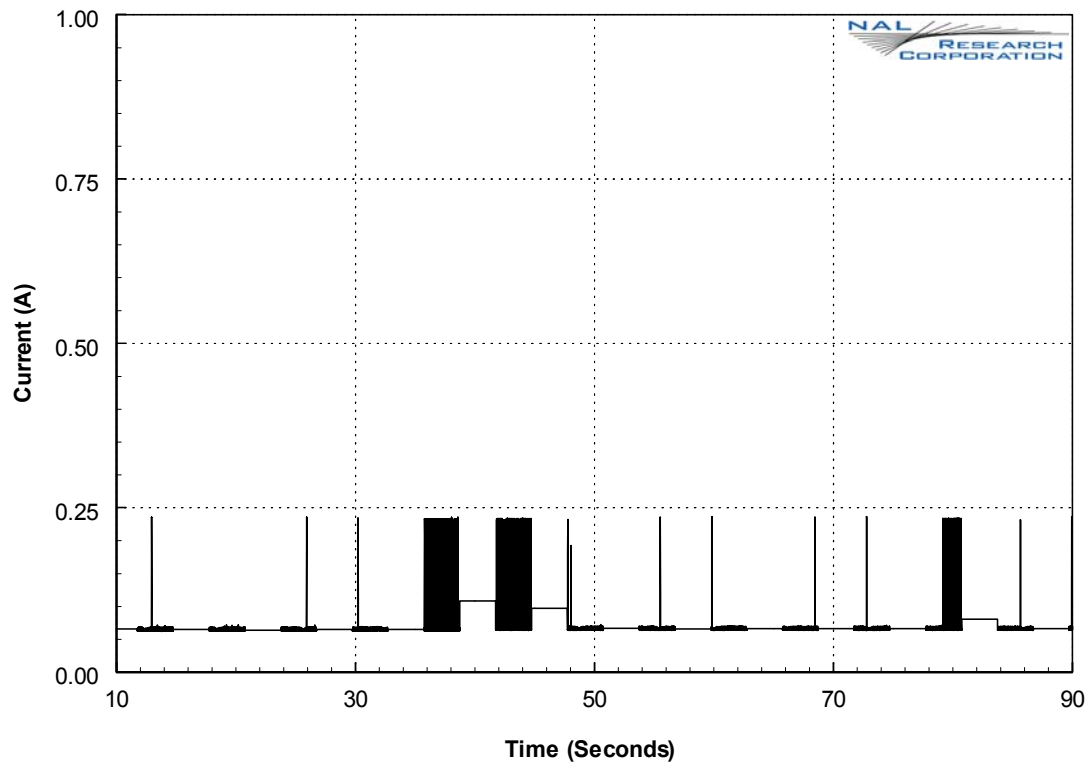


Figure 19. Average current drawn by model 9601-D during standby at 4.8V input.

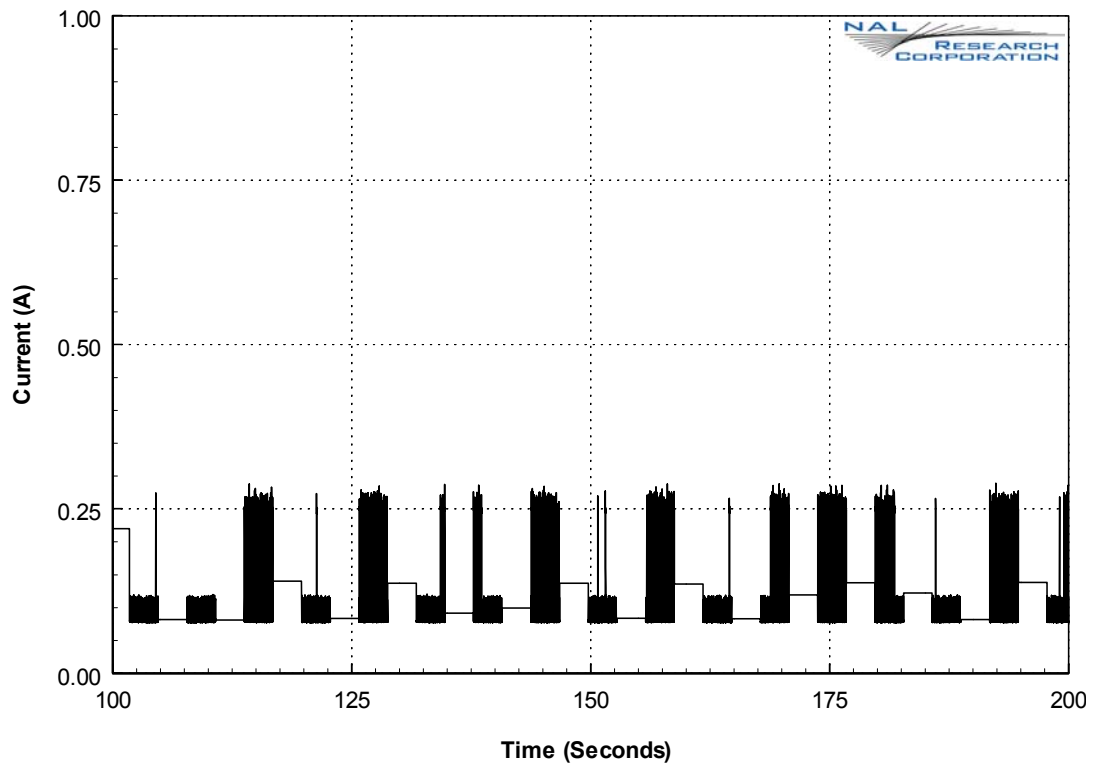


Figure 20. Maximum current drawn by model 9601-D during standby at 4.8V input.

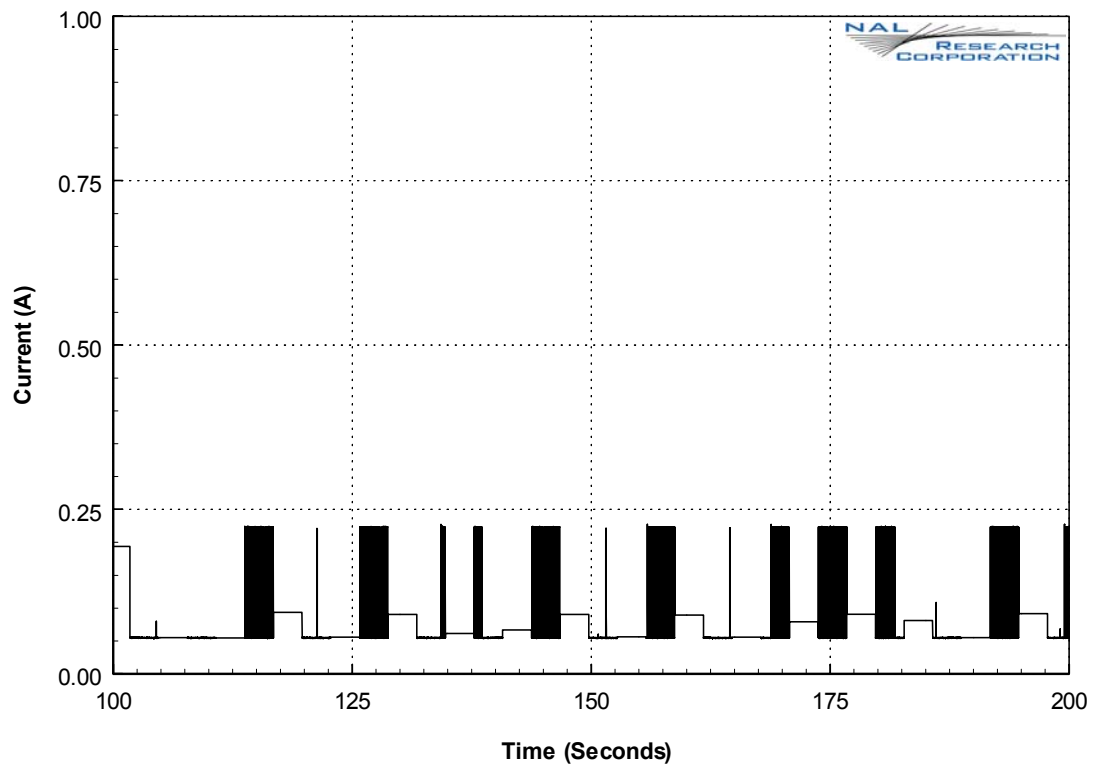


Figure 21. Minimum current drawn by model 9601-D during standby at 4.8V input.

Case #4: 5.0V Input

Figures 22, 23 and 24 display the average, maximum and minimum current plots for the modem 9601-D, respectively, during standby. The input DC voltage to the 9601-D was measured at a constant 5.004V during the tests. The overall average current drawn during standby is 68mA and the overall average power consumption is 340mW.

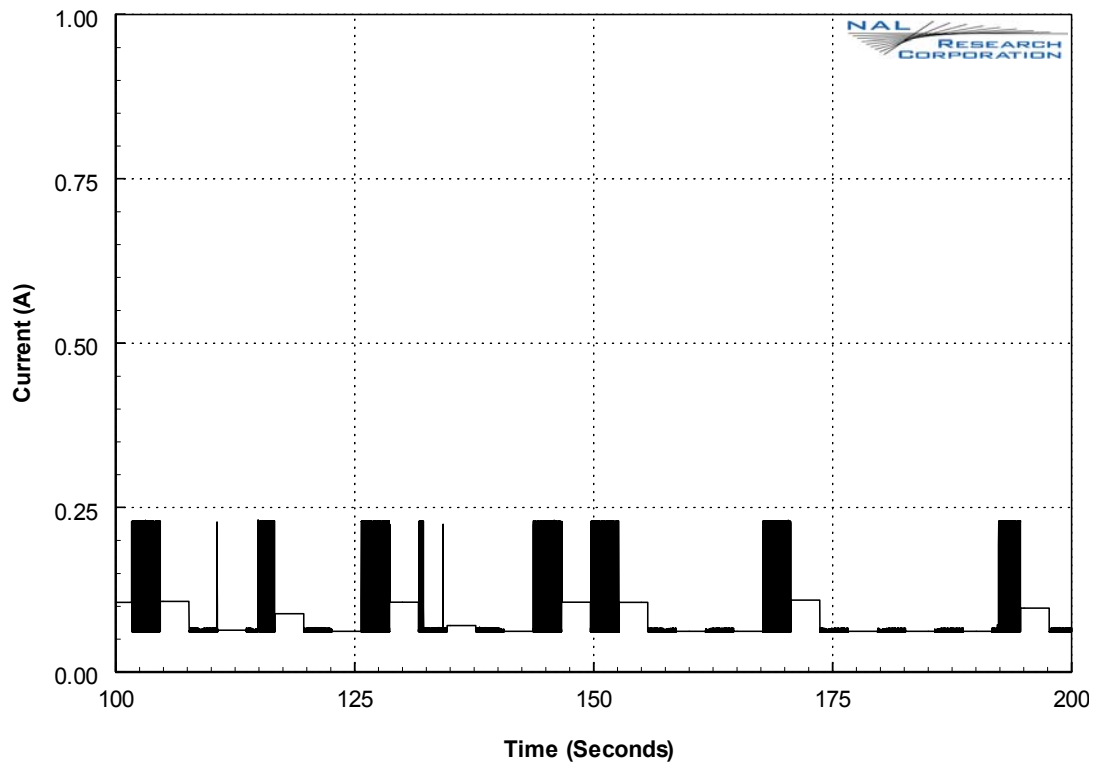


Figure 22. Average current drawn by model 9601-D during standby at 5.0V input.

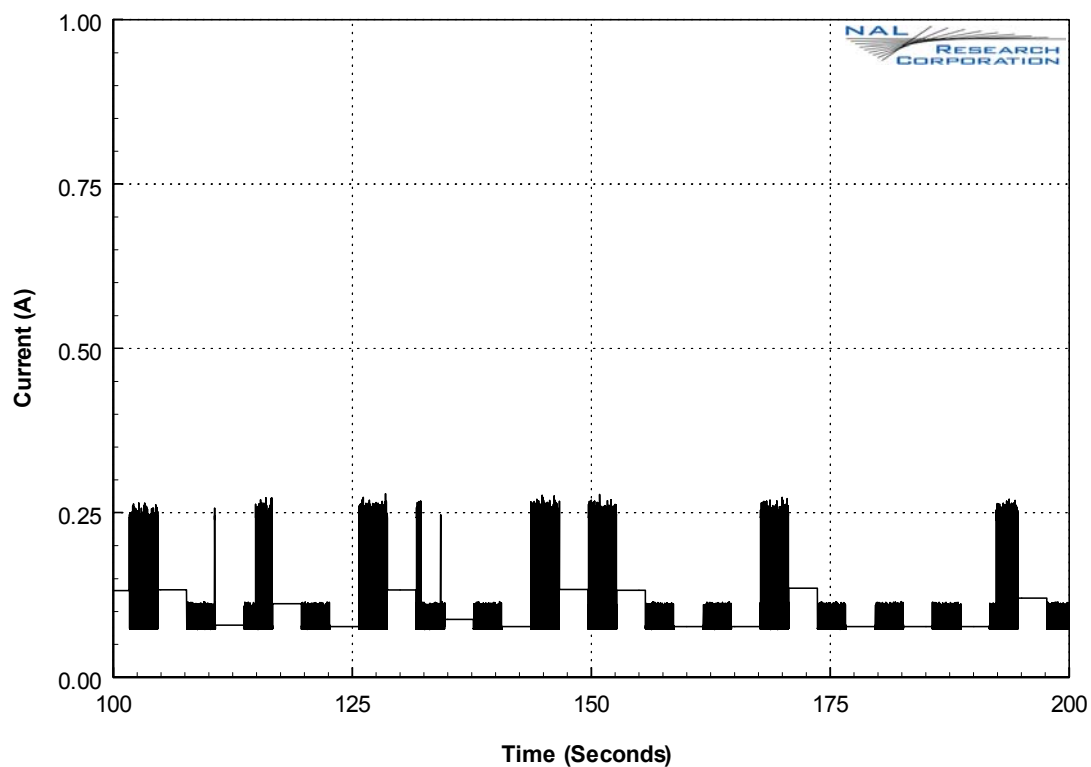


Figure 23. Maximum current drawn by model 9601-D during standby at 5.0V input.

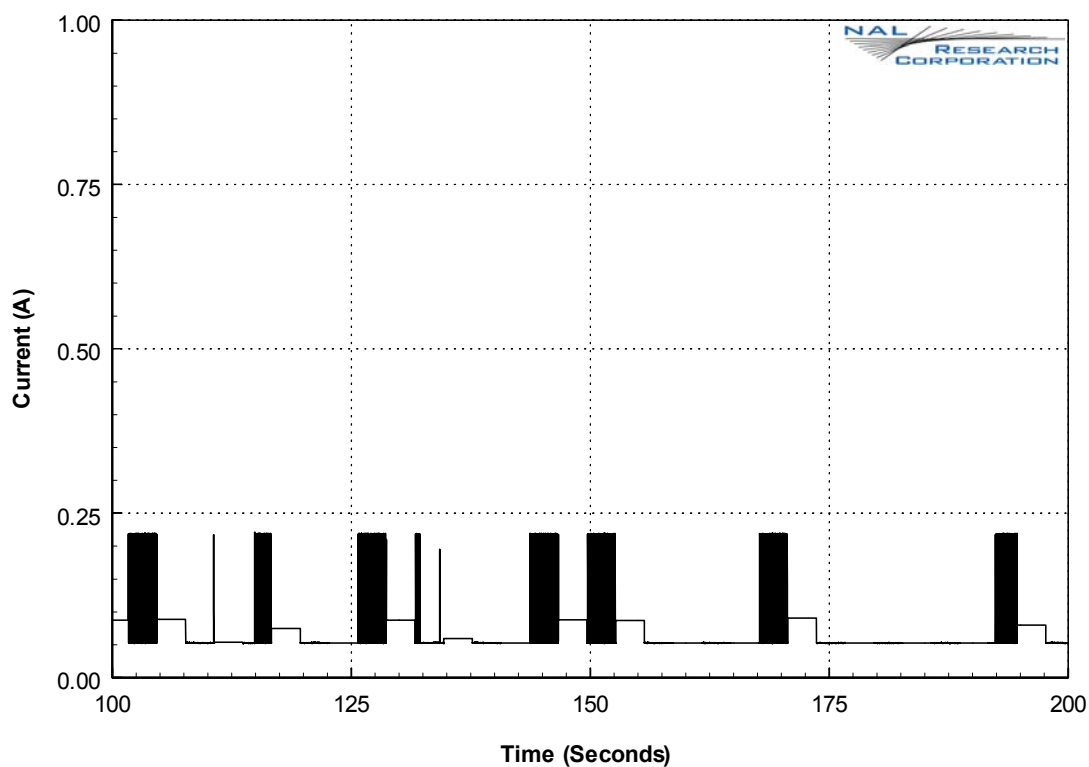


Figure 24. Minimum current drawn by model 9601-D during standby at 5.0V input.

Case #5: 5.2V Input

Figures 25, 26 and 27 display the average, maximum and minimum current plots for the modem 9601-D, respectively, during standby. The input DC voltage to the 9601-D was measured at a constant 5.204V during the tests. The overall average current drawn during standby is 66mA and the overall average power consumption is 343mW.

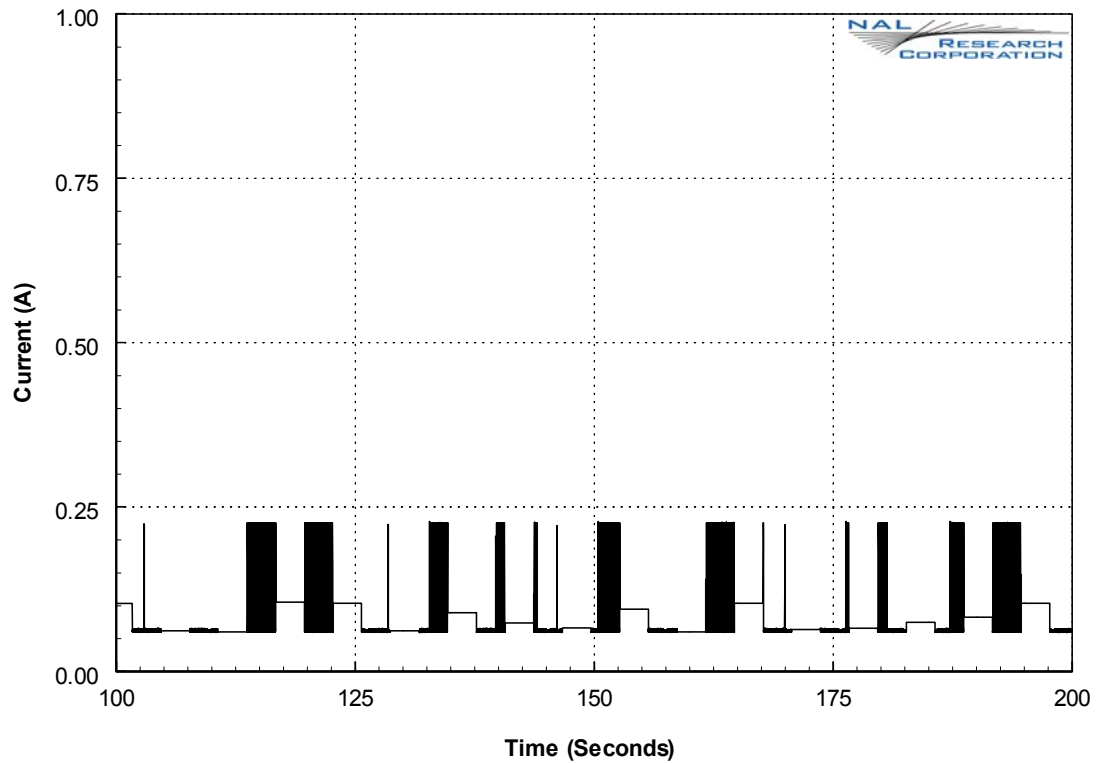


Figure 25. Average current drawn by model 9601-D during standby at 5.2V input.

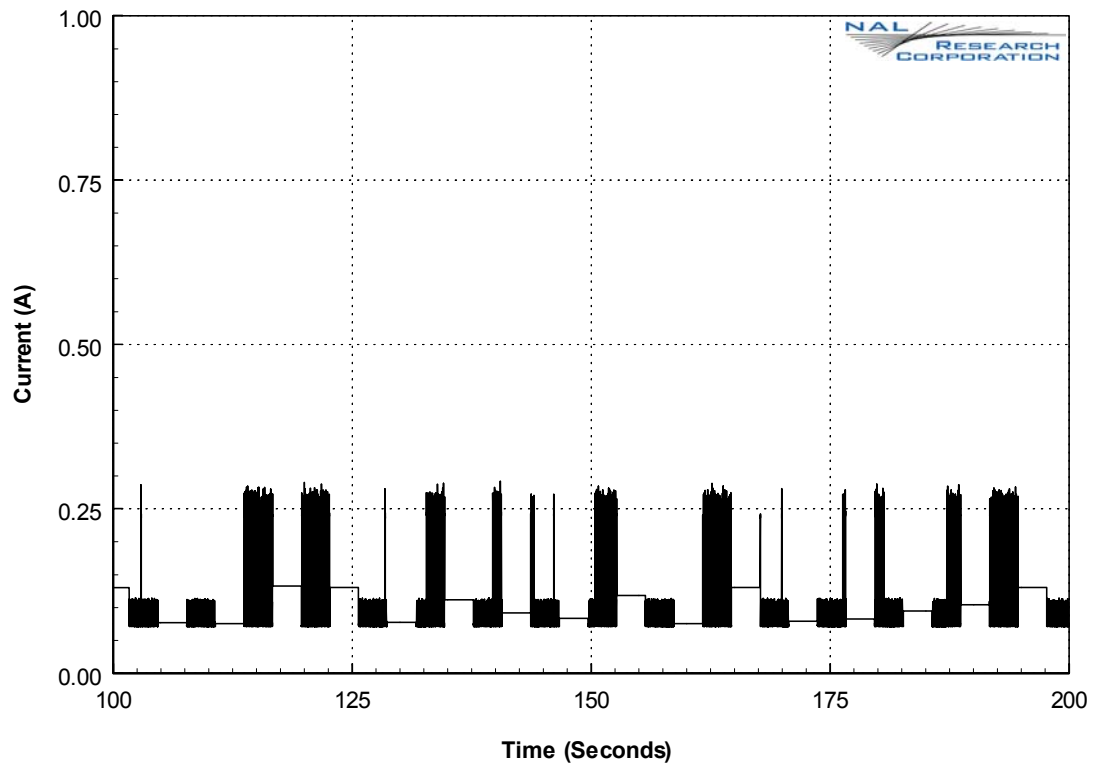


Figure 26. Maximum current drawn by model 9601-D during standby at 5.2V input.

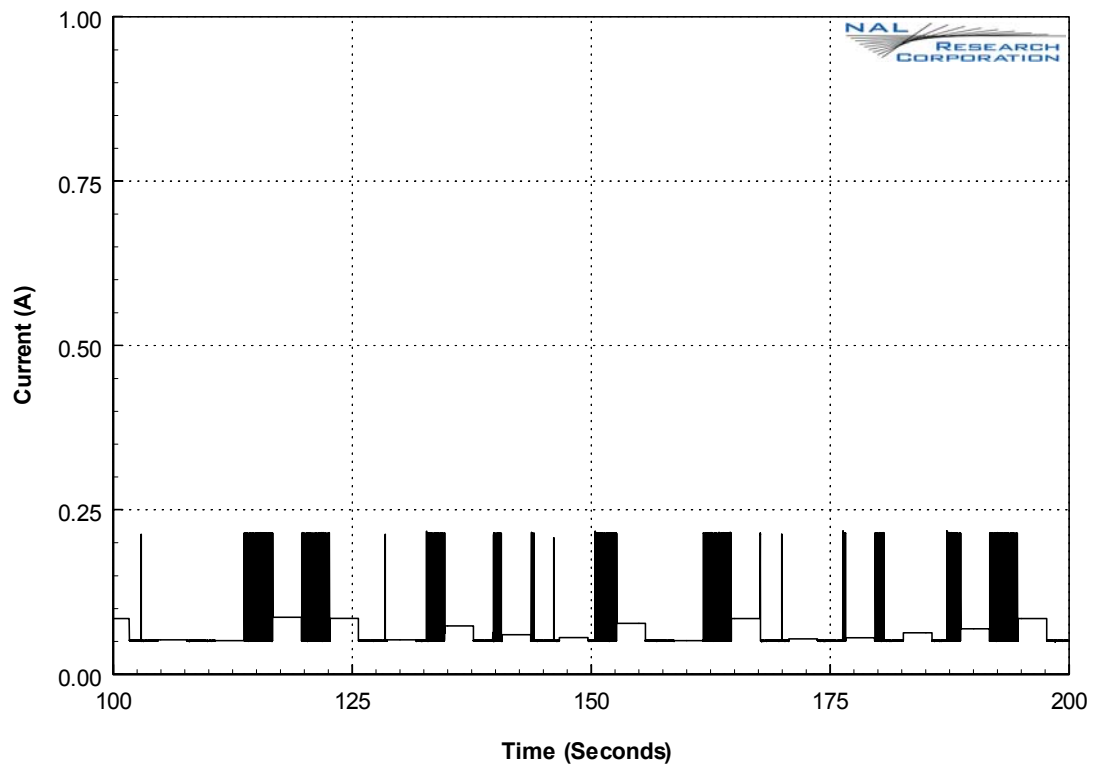


Figure 27. Minimum current drawn by model 9601-D during standby at 5.2V input.

Case #6: 5.5V Input

Figures 28, 29 and 30 display the average, maximum and minimum current plots for the modem 9601-D, respectively, during standby. The input DC voltage to the 9601-D was measured at a constant 5.504V during the tests. The overall average current drawn during standby is 63mA and the overall average power consumption is 347mW.

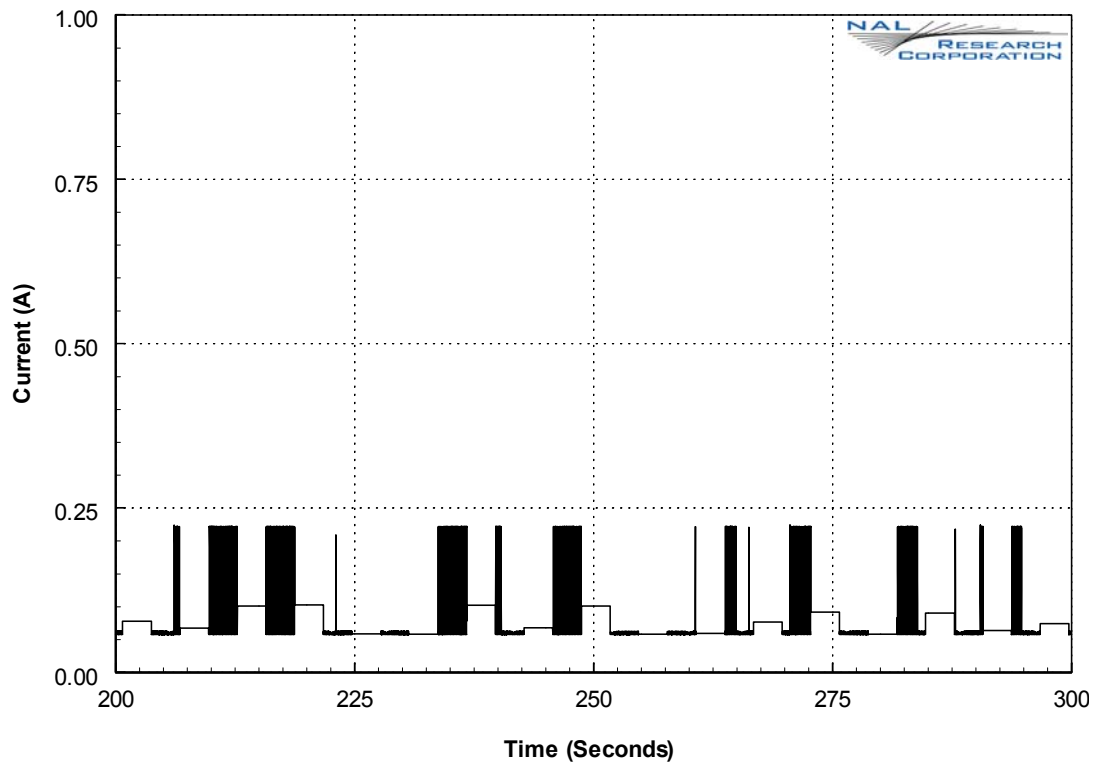


Figure 28. Average current drawn by model 9601-D during standby at 5.5V input.

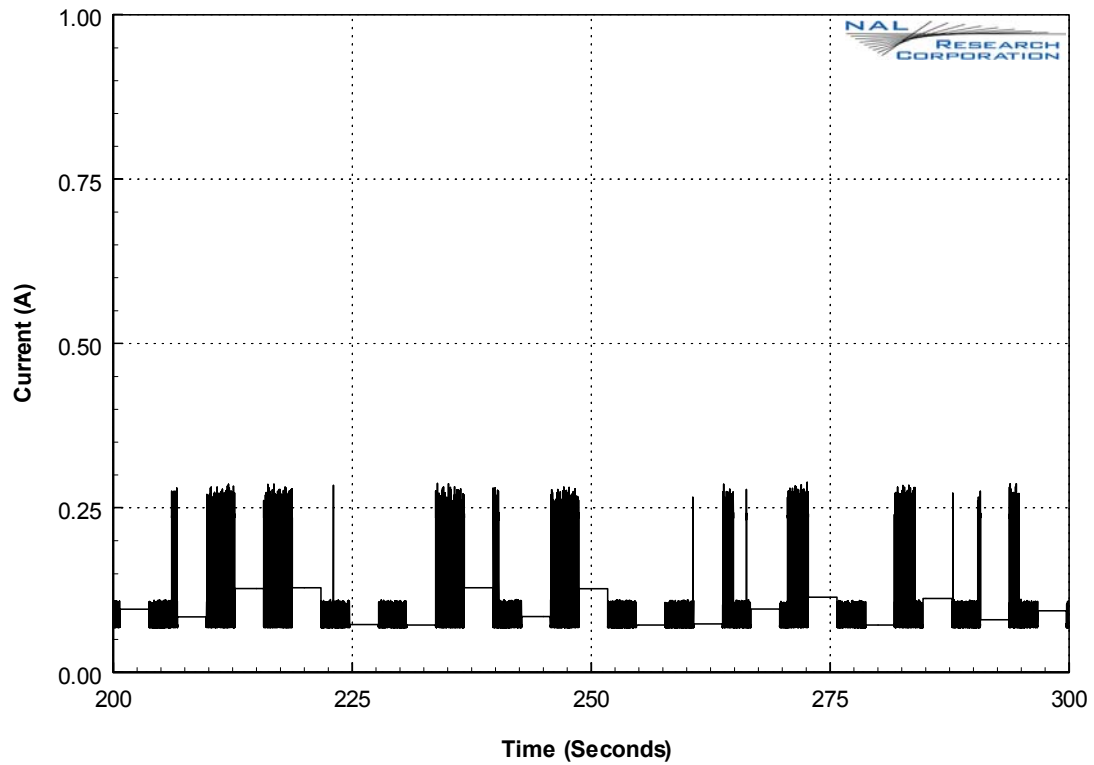


Figure 29. Maximum current drawn by model 9601-D during standby at 5.5V input.

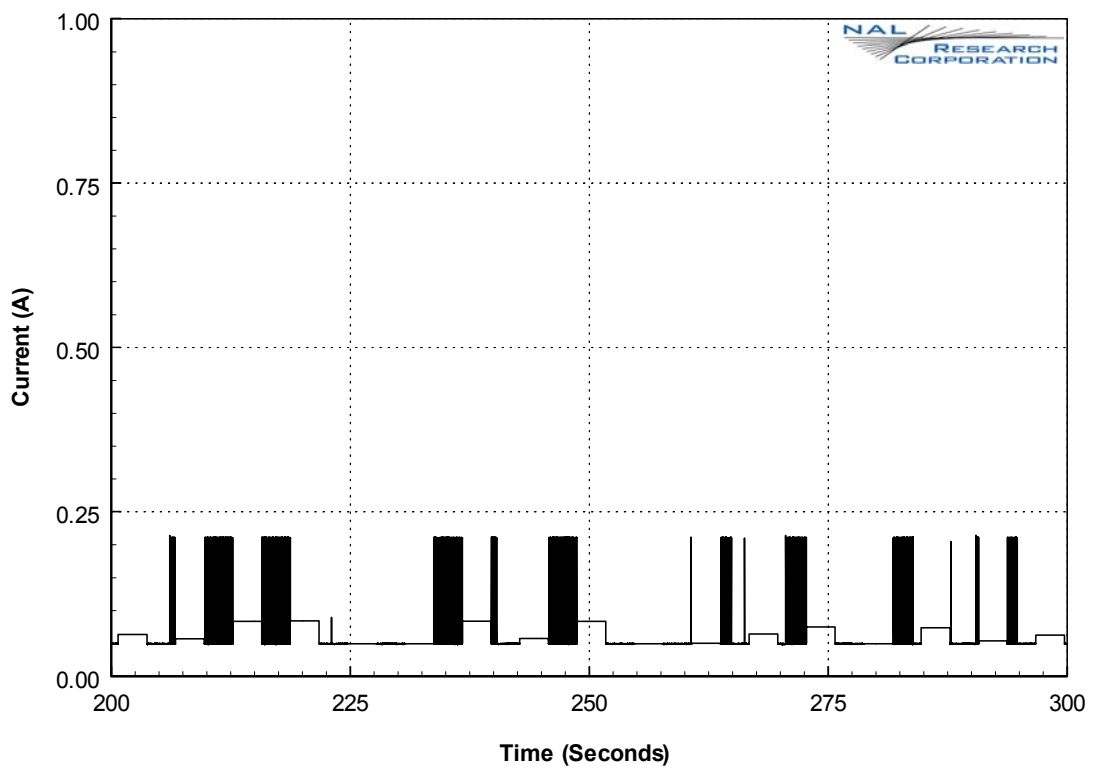


Figure 30. Minimum current drawn by model 9601-D during standby at 5.5V input.

Figure 31 displays a plot of voltage versus current of the 9601-D during standby. The line was generated by curve fitting through data points of the six cases above.

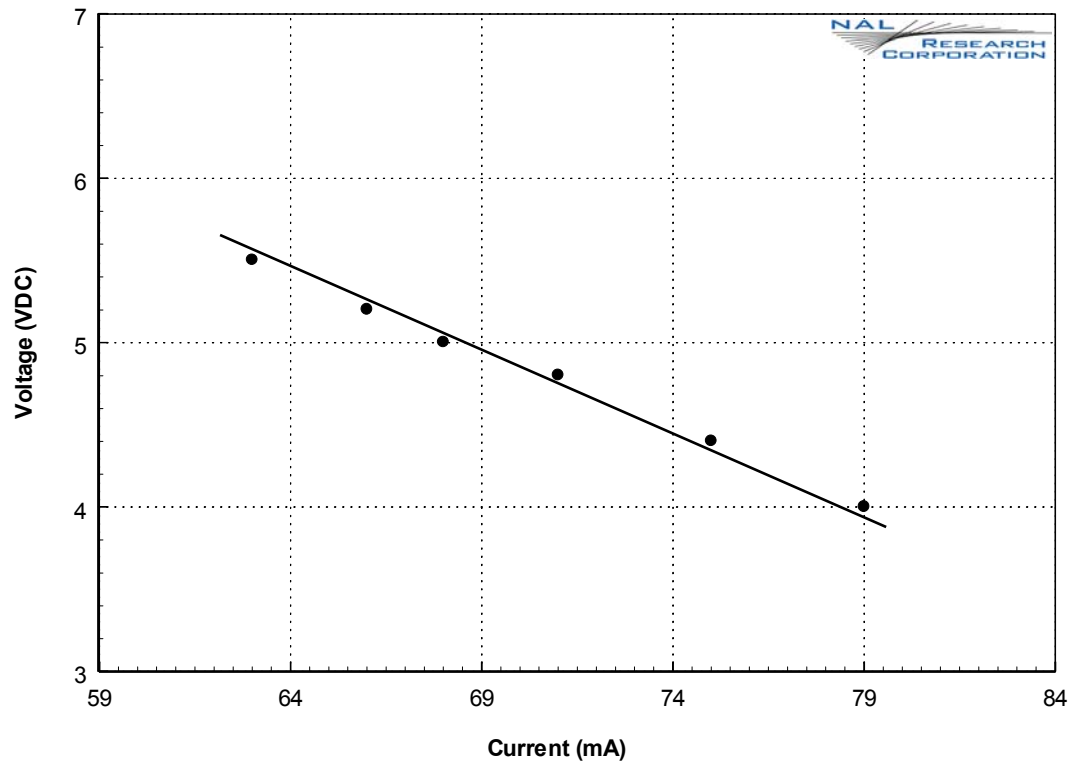


Figure 31. Voltage vs. current plot of the 9601-D during standby.

4.0 CURRENT DRAWN DURING SLEEP

Figures 32, 33 and 34 display the average current plots for the modem 9601-D at 4VDC, 4.5VDC, and 5.0VDC, respectively, during sleep mode. Pin 1 of modem 9601-D-N was “float” instead of held high. The overall average current drawn during sleep mode for 4VDC, 4.5VDC, and 5.0VDC are 0.10mA, 0.097mA and 0.082mA, respectively.

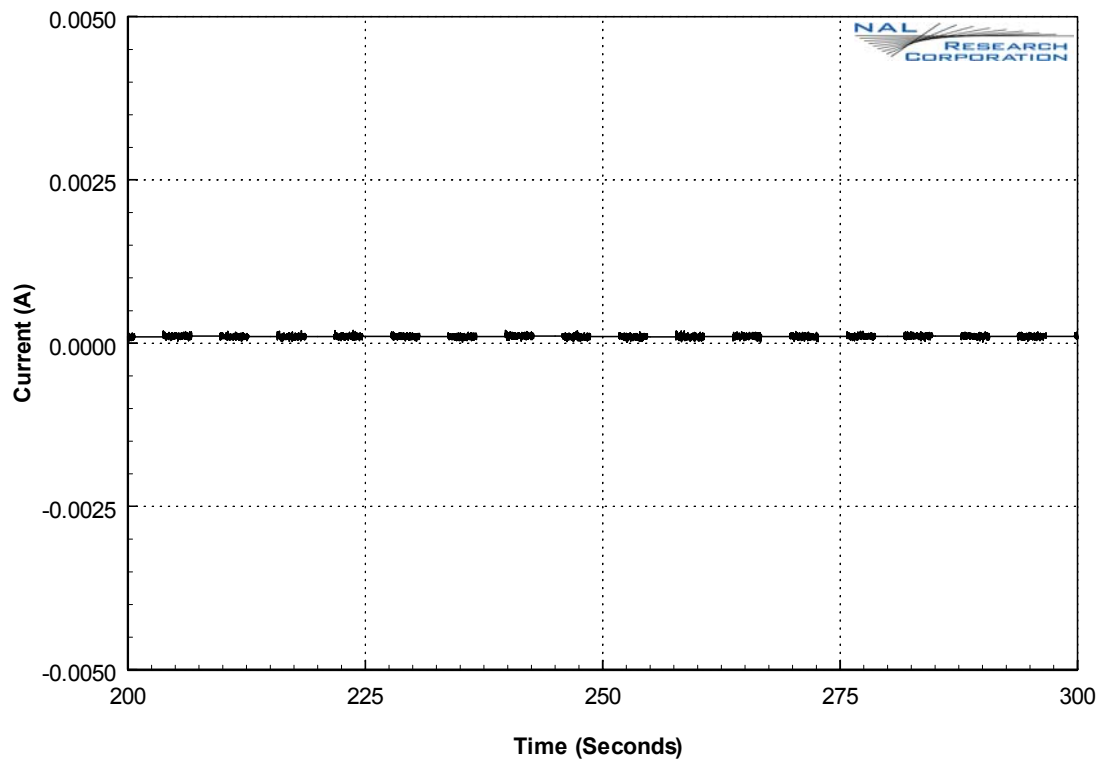


Figure 32. Average current drawn by model 9601-D during sleep at 4.0V input.

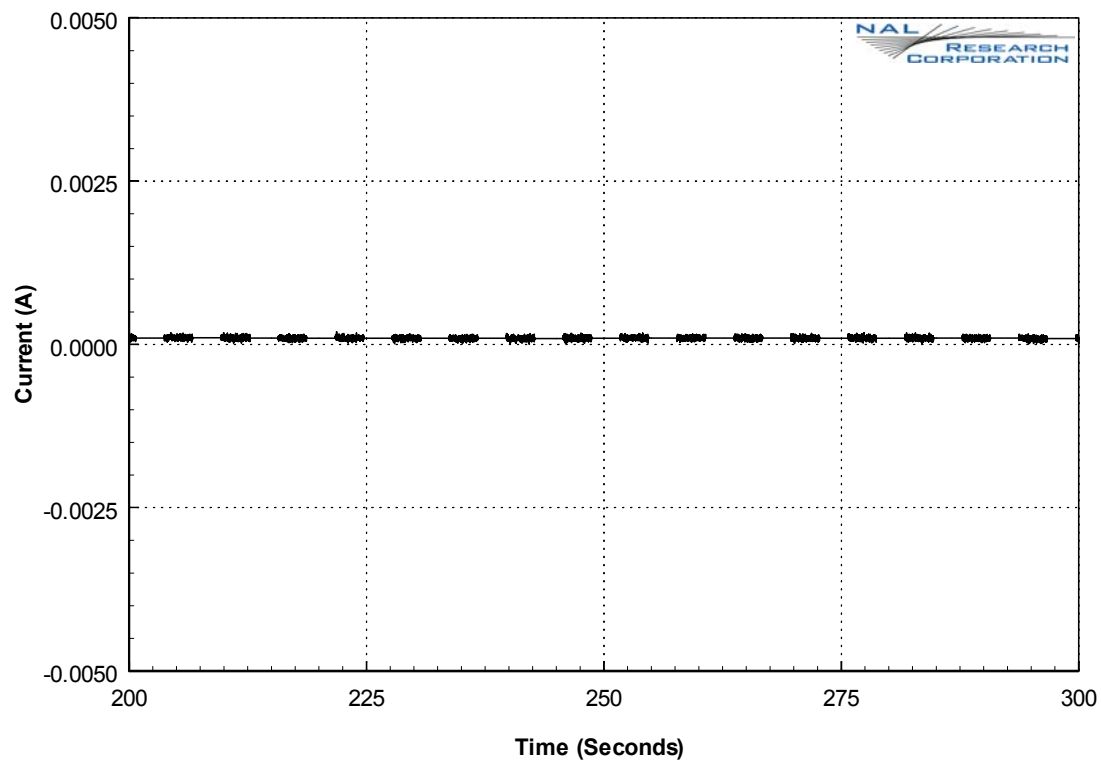


Figure 33. Average current drawn by model 9601-D during sleep at 4.5V input.

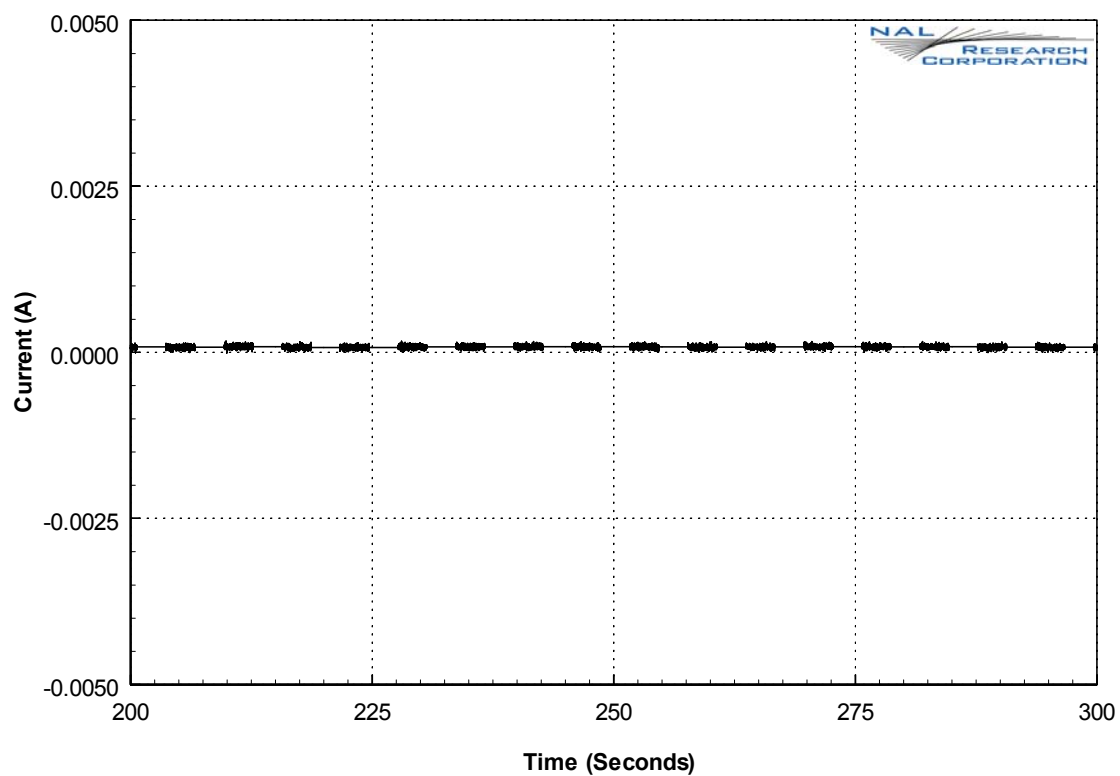


Figure 34. Average current drawn by model 9601-D during sleep at 5.0V input.

5.0 CURRENT DRAWN DURING SHORT-BURST DATA (SBD)

Case #1: 4.0V Input

Figures 35, 36 and 37 display the average, maximum and minimum current plots for the modem 9601-D, respectively, during an SBD session. The input DC voltage to the 9601-D was measured at a constant 4.004V during the tests. The overall average current drawn during an SBD session is 131mA and the overall average power consumption is 524mW.

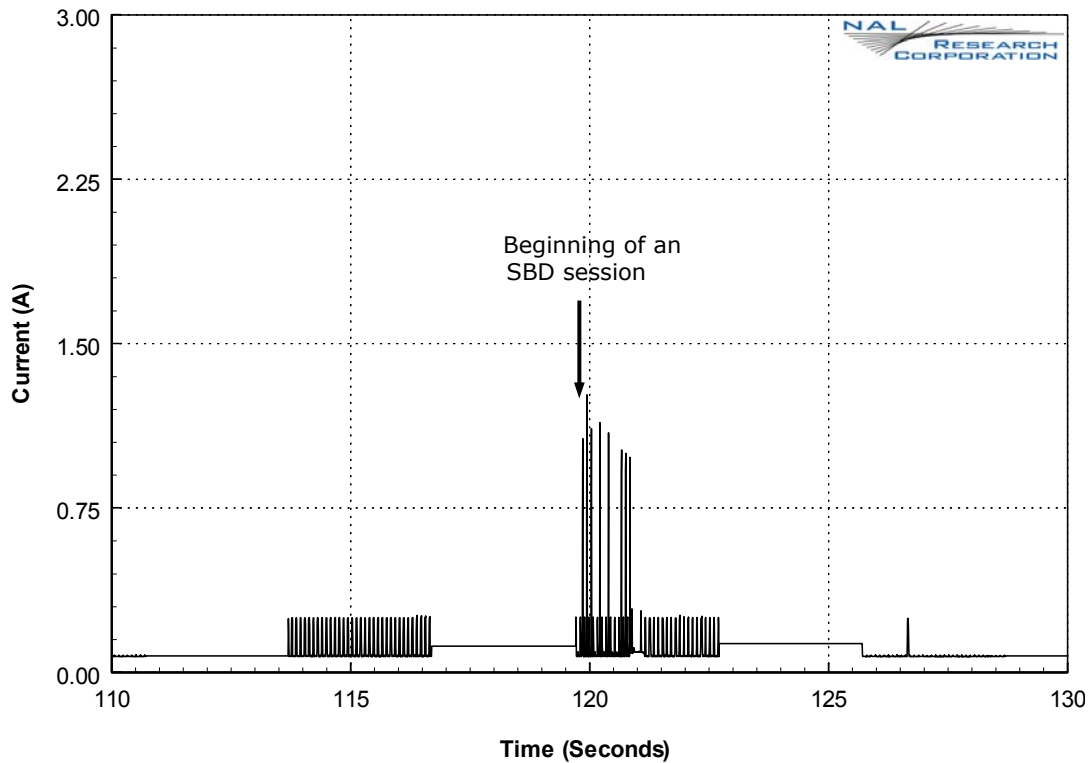


Figure 35. Average current drawn by model 9601-D during SBD at 4.0VDC input.

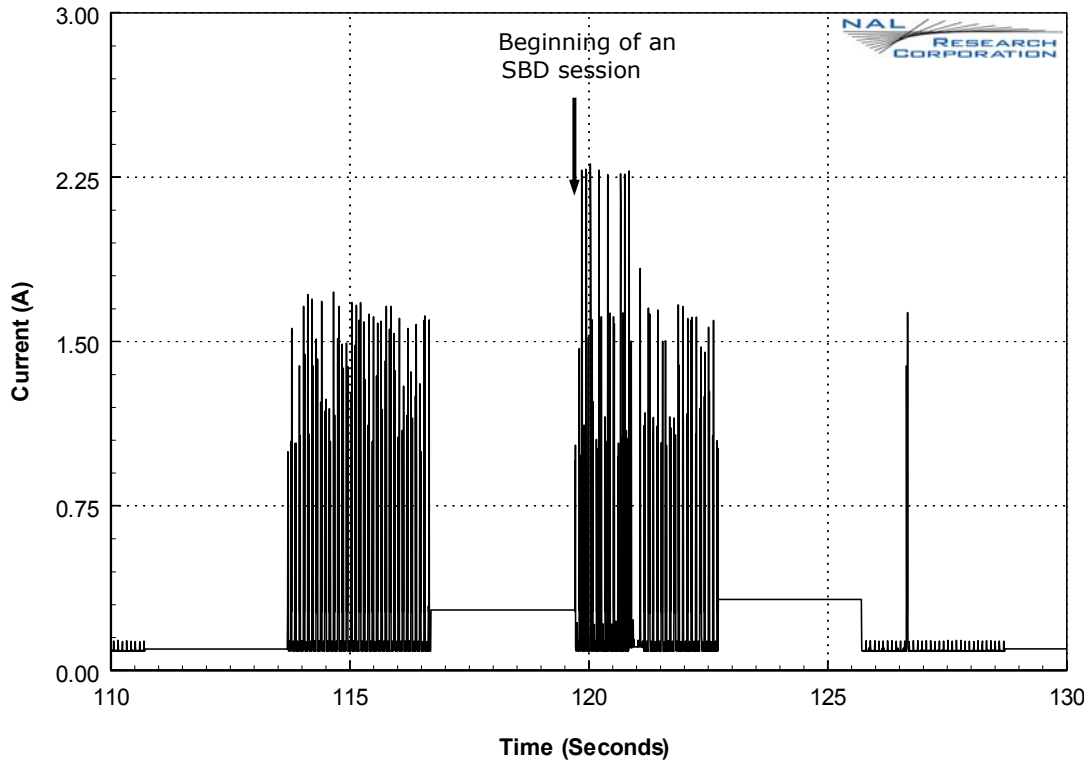


Figure 36. Maximum current drawn by model 9601-D during SBD at 4.0VDC input.

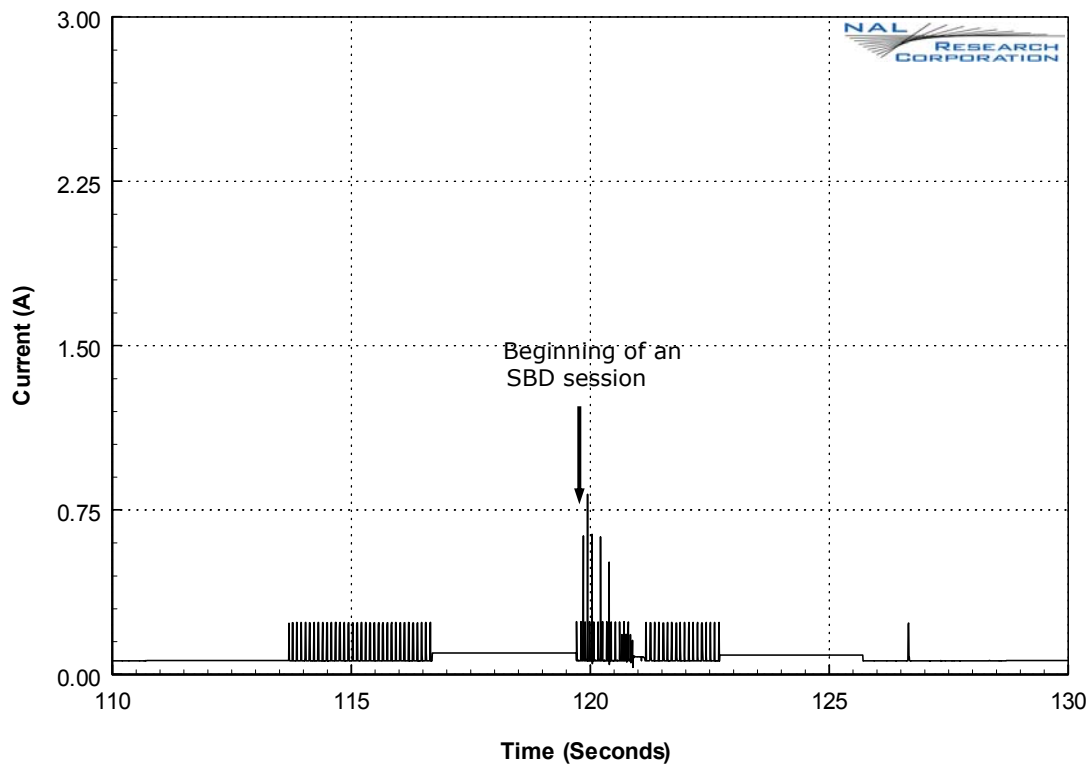


Figure 37. Minimum current drawn by model 9601-D during SBD at 4.0VDC input.

Case #2: 4.4V Input

Figures 38, 39 and 40 display the average, maximum and minimum current plots for the modem 9601-D, respectively, during an SBD session. The average input DC voltage to the 9601-D was measured at 4.403V while the maximum input DC voltage was measured at 4.439V. The overall average current drawn during an SBD session is 127mA and the overall average power consumption is 559mW.

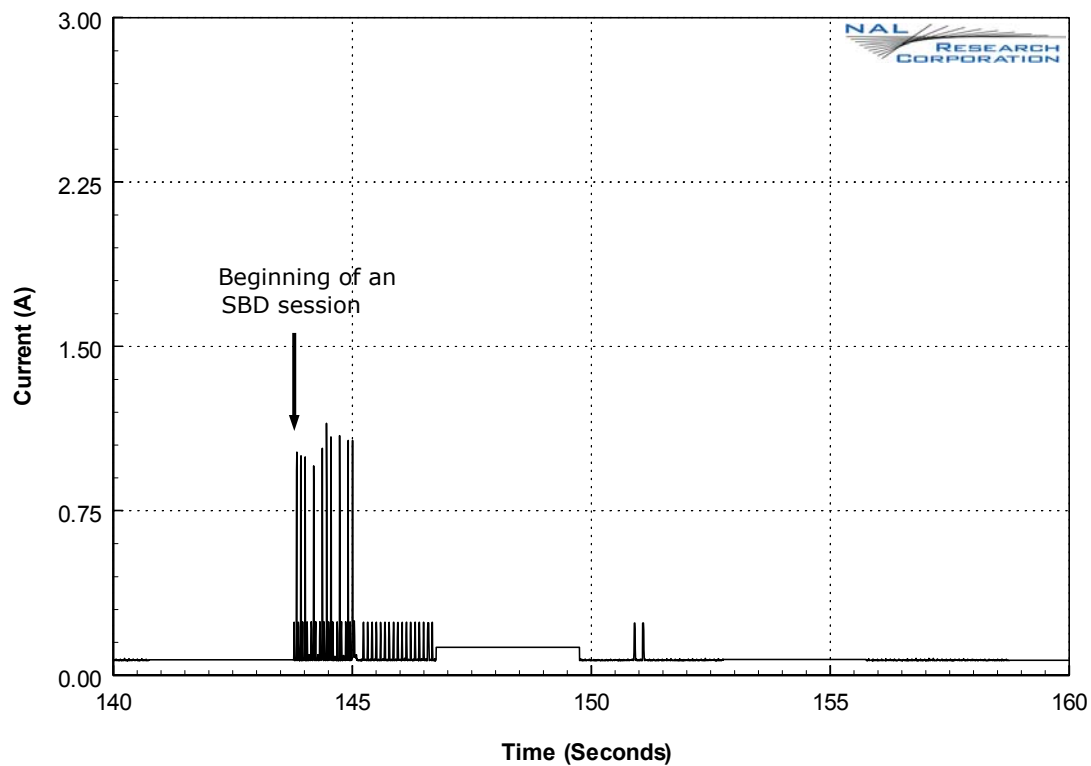


Figure 38. Average current drawn by model 9601-D during SBD at 4.4VDC input.

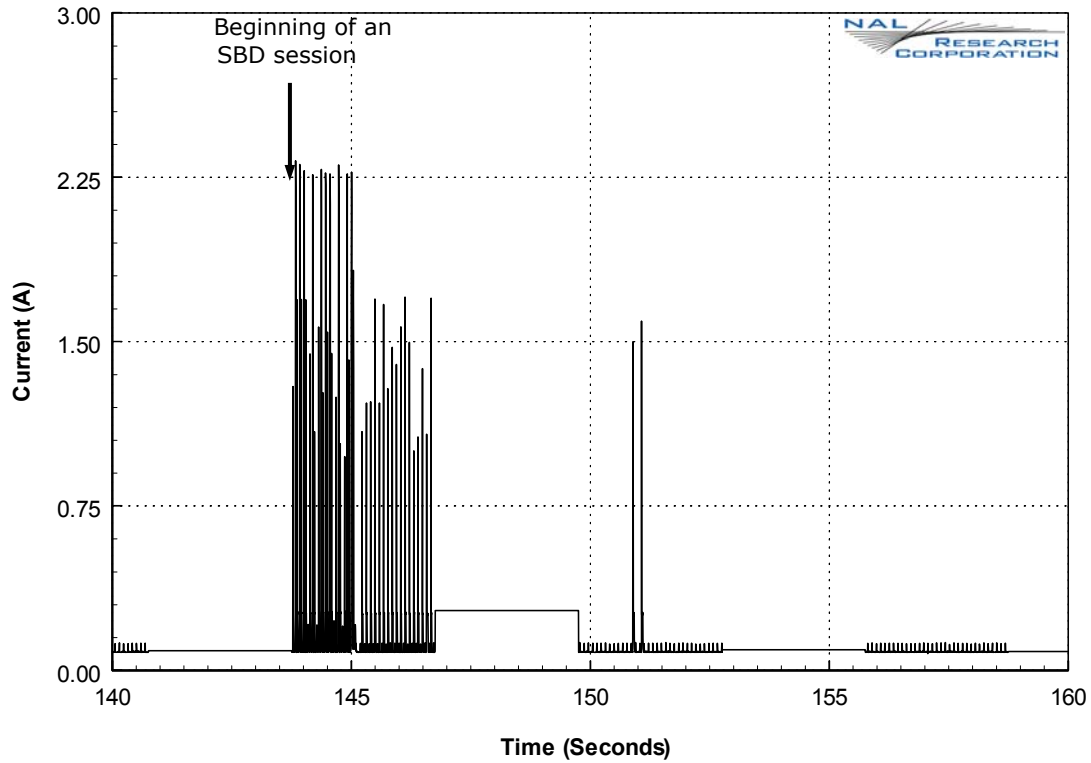


Figure 39. Maximum current drawn by model 9601-D during SBD at 4.4VDC input.

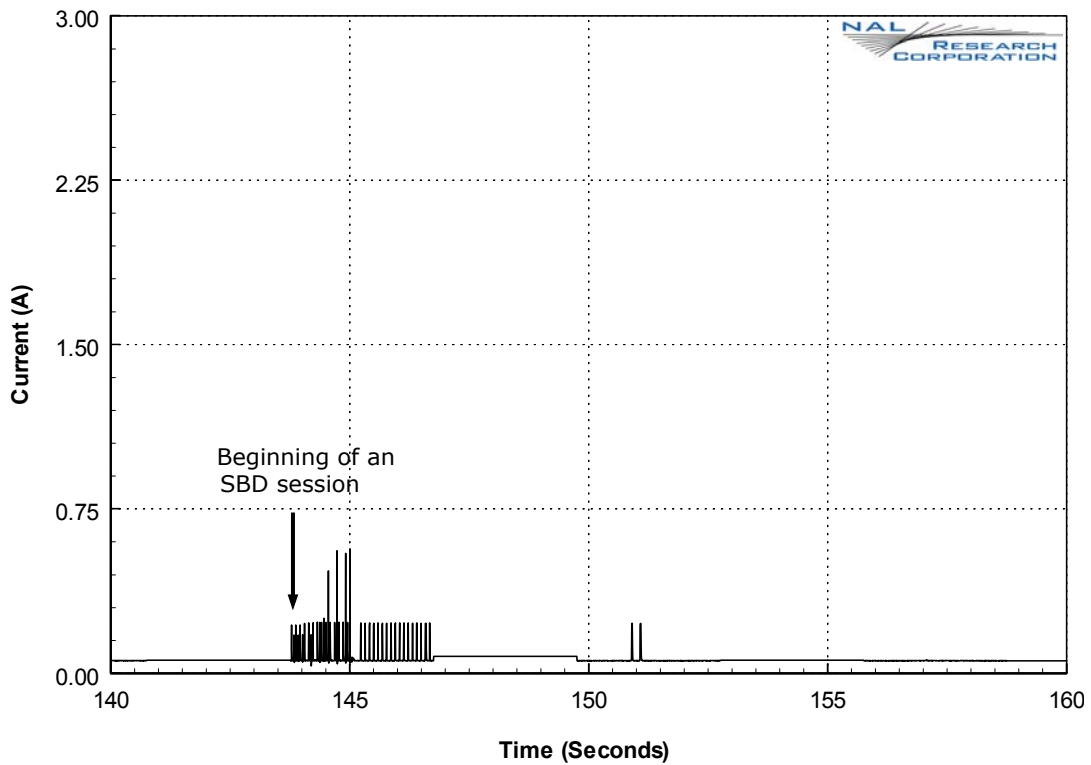


Figure 40. Minimum current drawn by model 9601-D during SBD at 4.4VDC input.

Case #3: 4.8V Input

Figures 41, 42 and 43 display the average, maximum and minimum current plots for the modem 9601-D, respectively, during an SBD session. The input DC voltage to the 9601-D was measured at constant 4.805V during the tests. The overall average current drawn during an SBD session is 138mA and the overall average power consumption is 663mW.

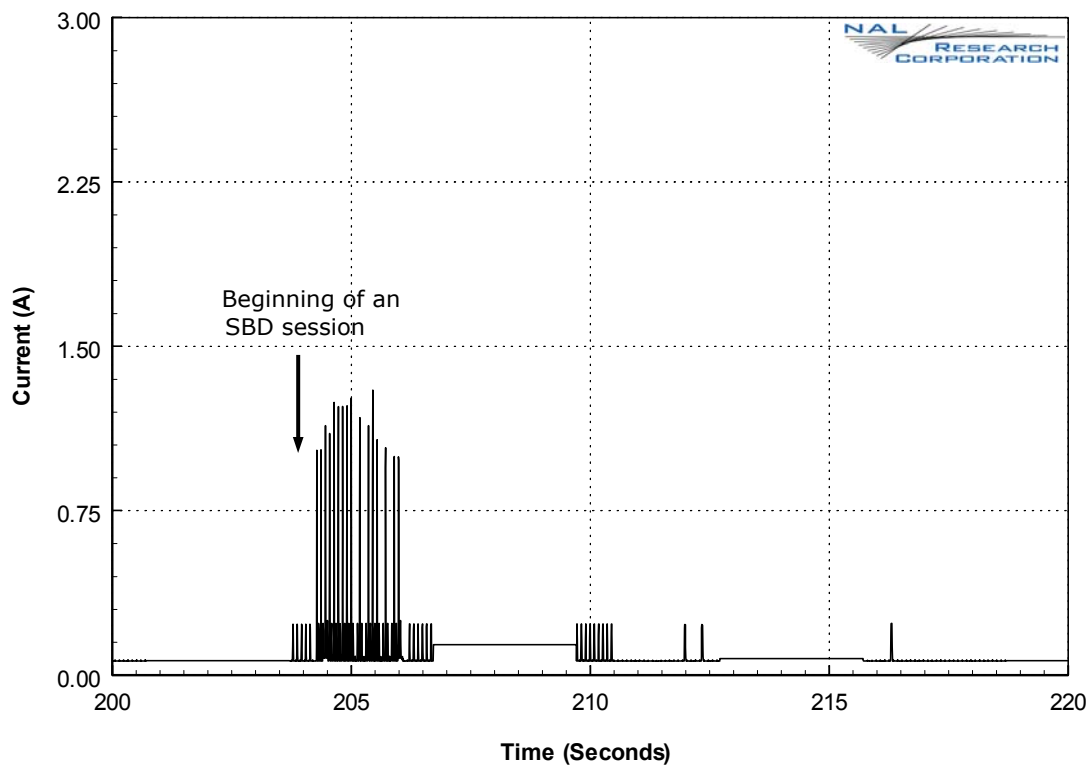


Figure 41. Average current drawn by model 9601-D during SBD at 4.8VDC input.

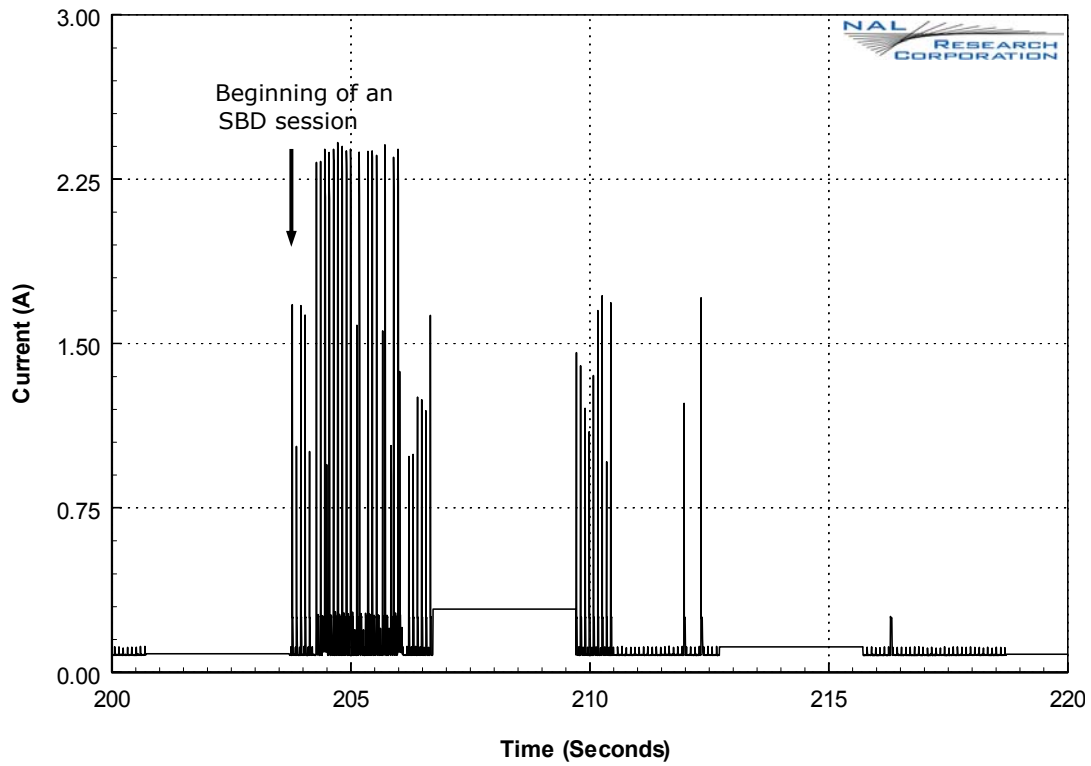


Figure 42. Maximum current drawn by model 9601-D during SBD at 4.8VDC input.

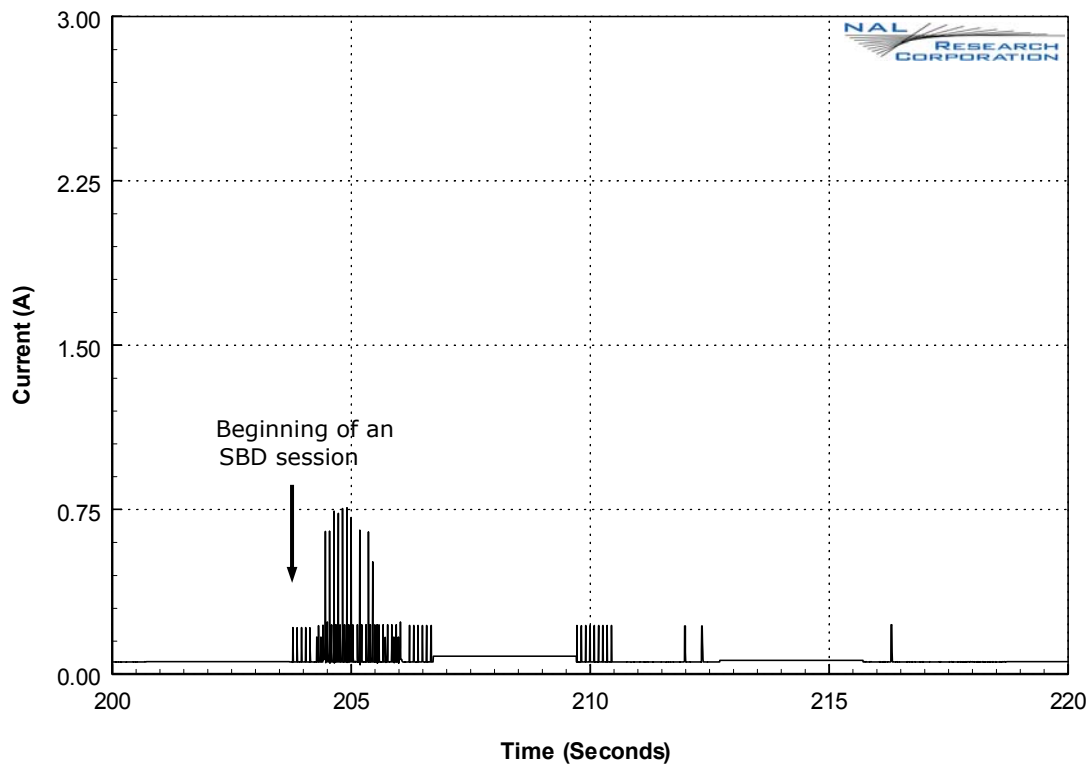


Figure 43. Minimum current drawn by model 9601-D during SBD at 4.8VDC input.

Case #4: 5.0V Input

Figures 44, 45 and 46 display the average, maximum and minimum current plots for the modem 9601-D, respectively, during an SBD session. The average input DC voltage to the 9601-D was measured at 5.004V while the maximum input DC voltage was measured at 5.005V. The overall average current drawn during an SBD session is 146mA and the overall average power consumption is 731mW.

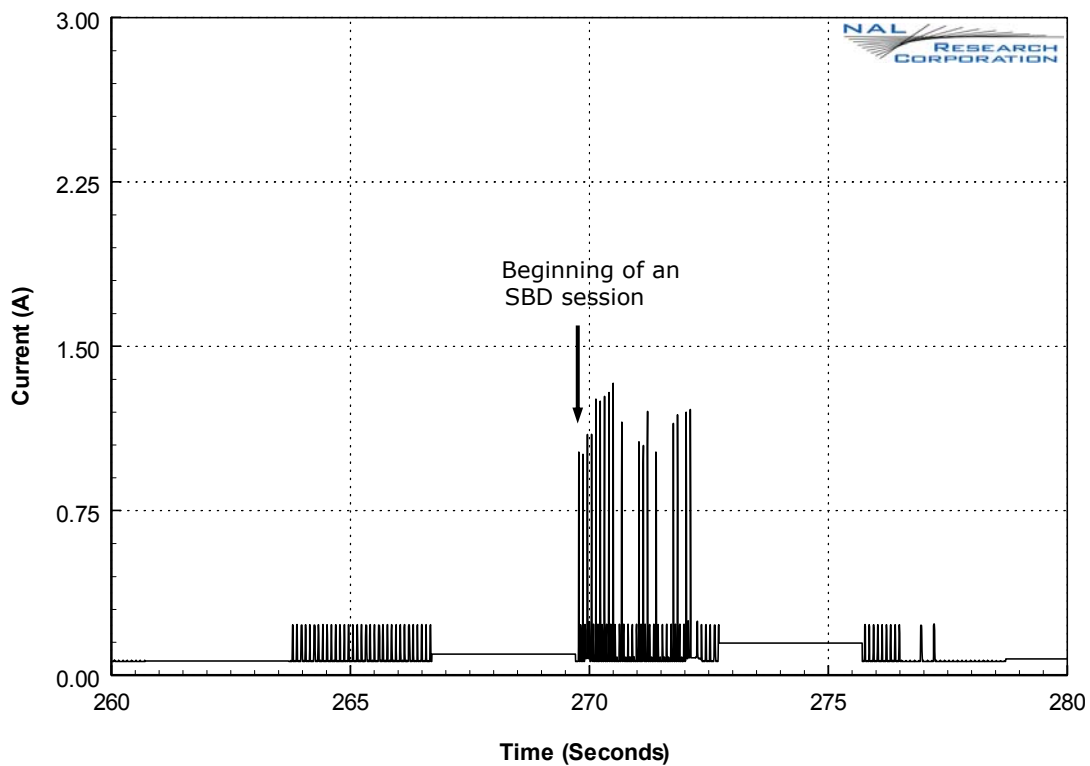


Figure 44. Average current drawn by model 9601-D during SBD at 5.0VDC input.

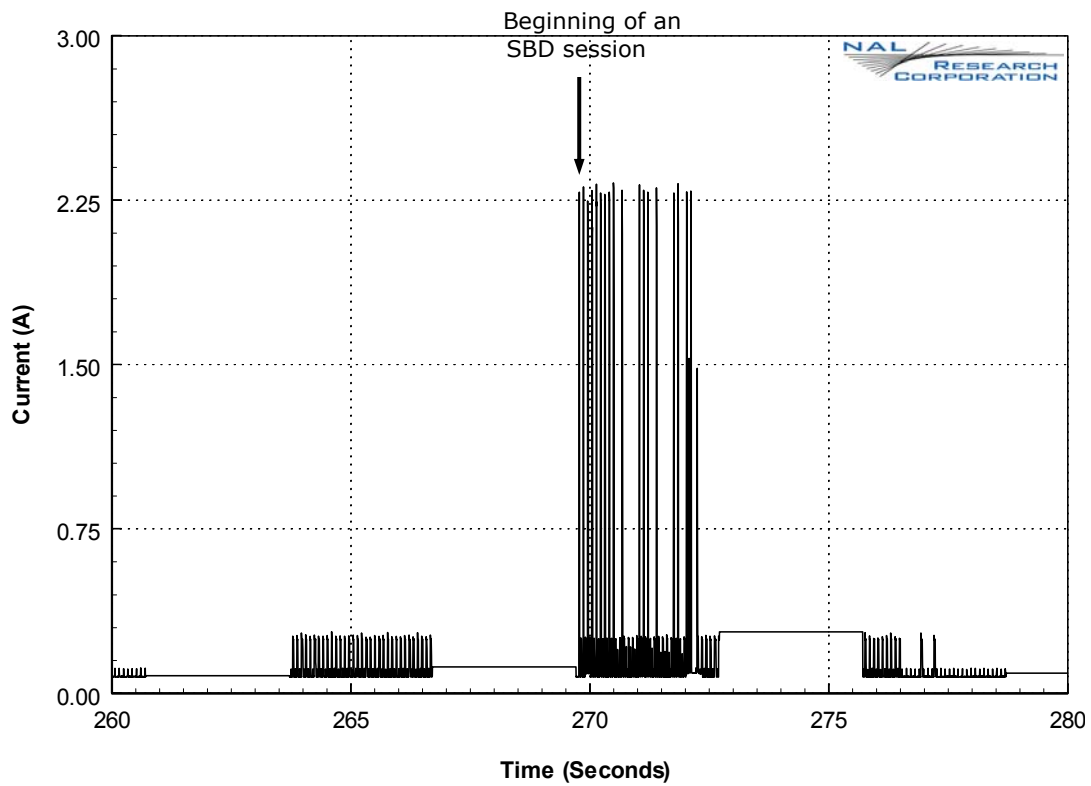


Figure 45. Maximum current drawn by model 9601-D during SBD at 5.0VDC input.

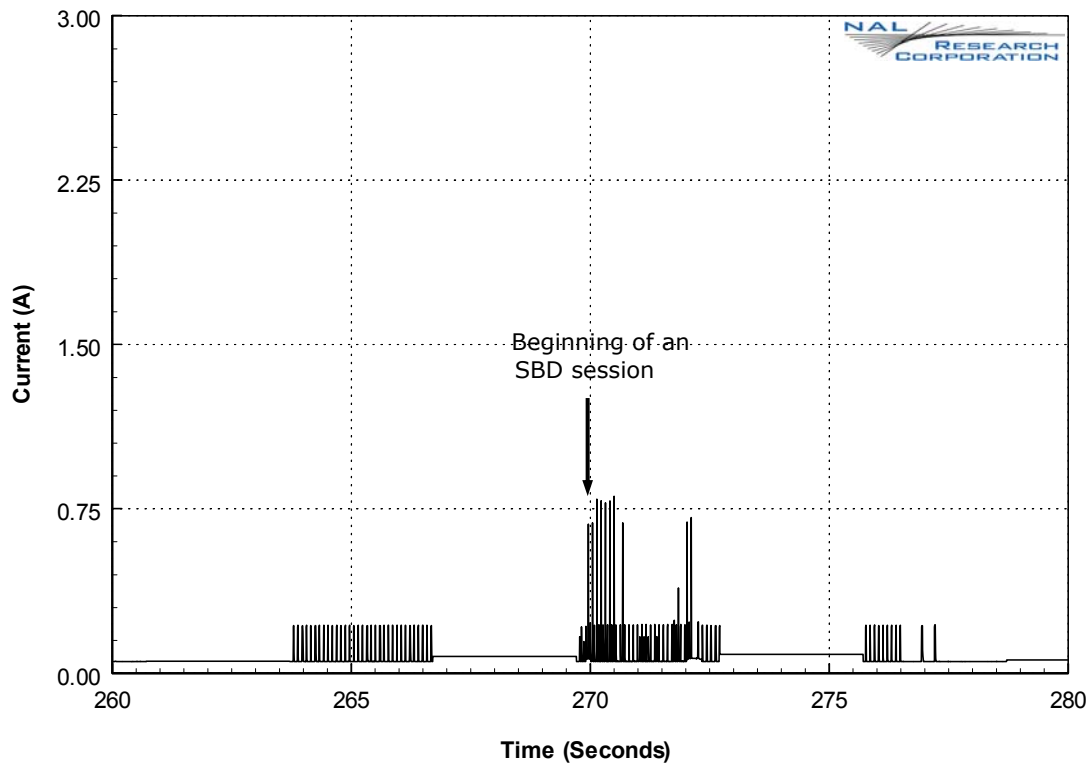


Figure 46. Minimum current drawn by model 9601-D during SBD at 5.0VDC input.

Case #5: 5.2V Input

Figures 47, 48 and 49 display the average, maximum and minimum current plots for the modem 9601-D, respectively, during an SBD session. The average input DC voltage to the 9601-D was measured at 5.203V while the maximum input DC voltage was measured at 5.204V. The overall average current drawn during an SBD session is 142mA and the overall average power consumption is 739mW.

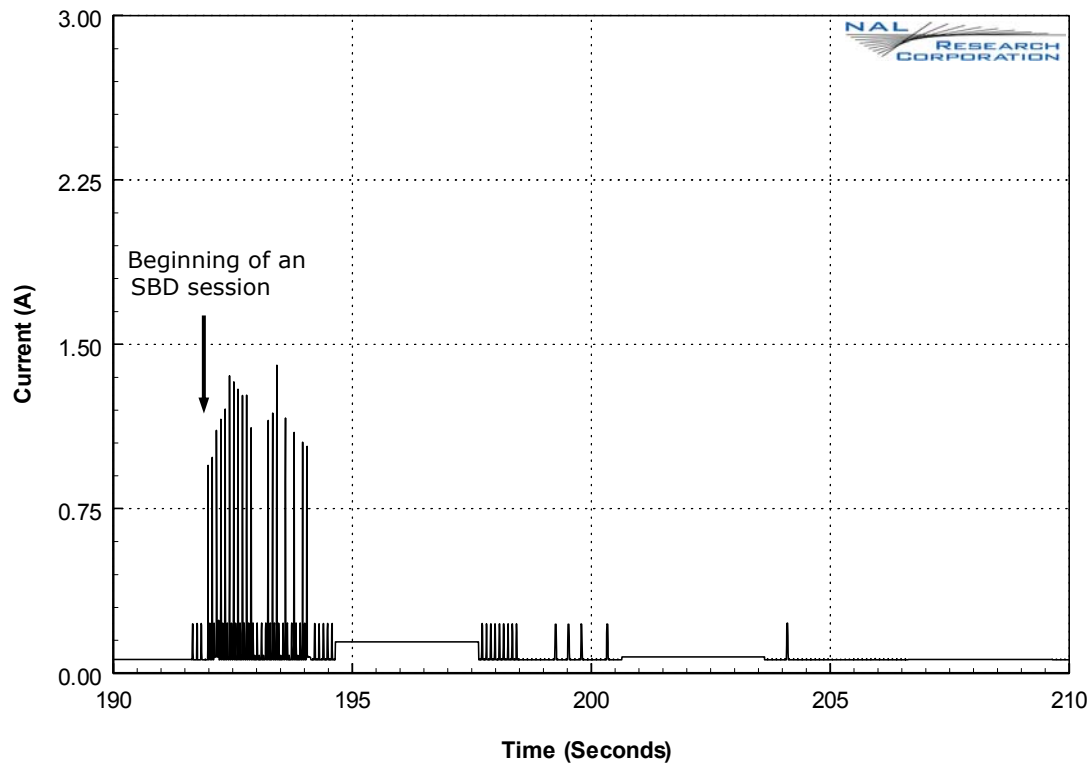


Figure 47. Average current drawn by model 9601-D during SBD at 5.2VDC input.

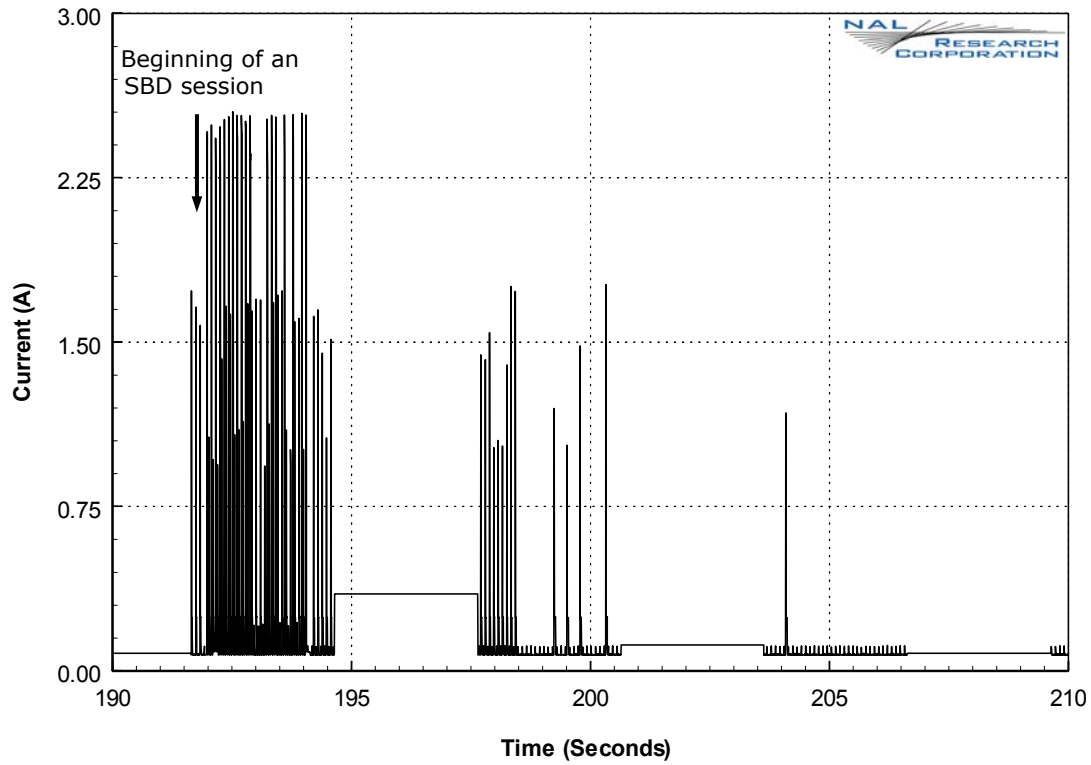


Figure 48. Maximum current drawn by model 9601-D during SBD at 5.2VDC input.

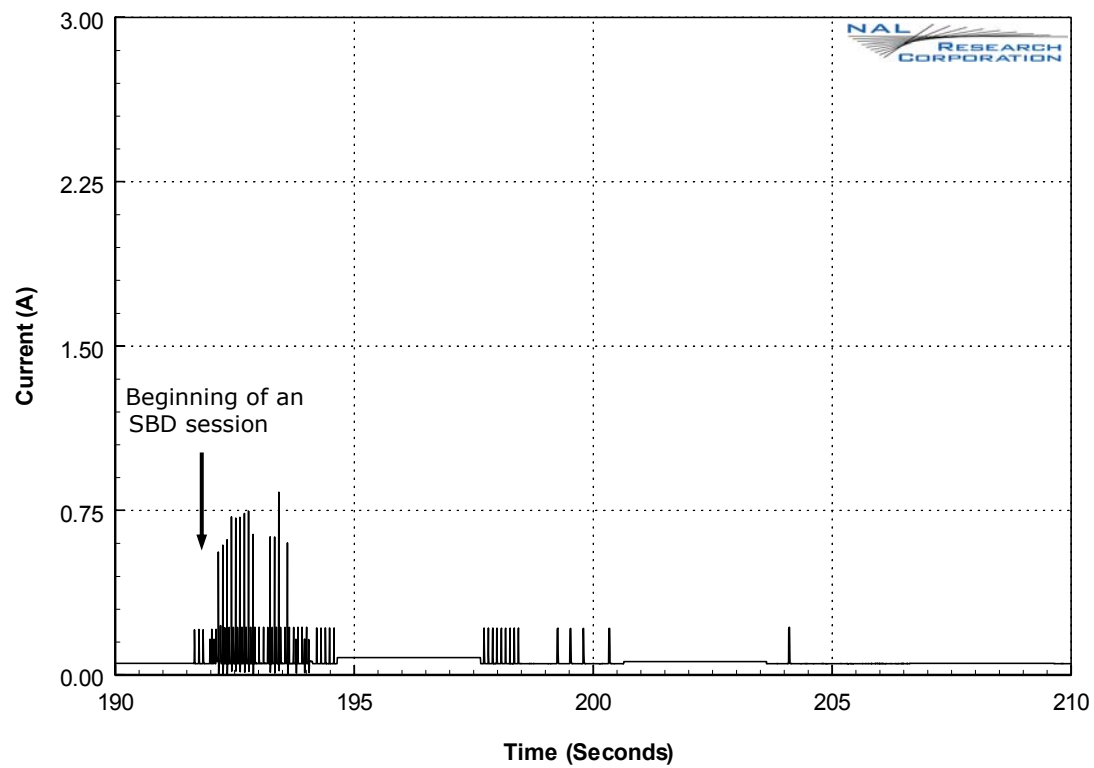


Figure 49. Minimum current drawn by model 9601-D during SBD at 5.2VDC input.

Case #6: 5.5V Input

Figures 50, 51 and 52 display the average, maximum and minimum current plots for the modem 9601-D, respectively, during an SBD session. The average input DC voltage to the 9601-D was measured at 5.505V while the maximum input DC voltage was measured at 5.591V. The overall average current drawn during an SBD session is 155mA and the overall average power consumption is 853mW.

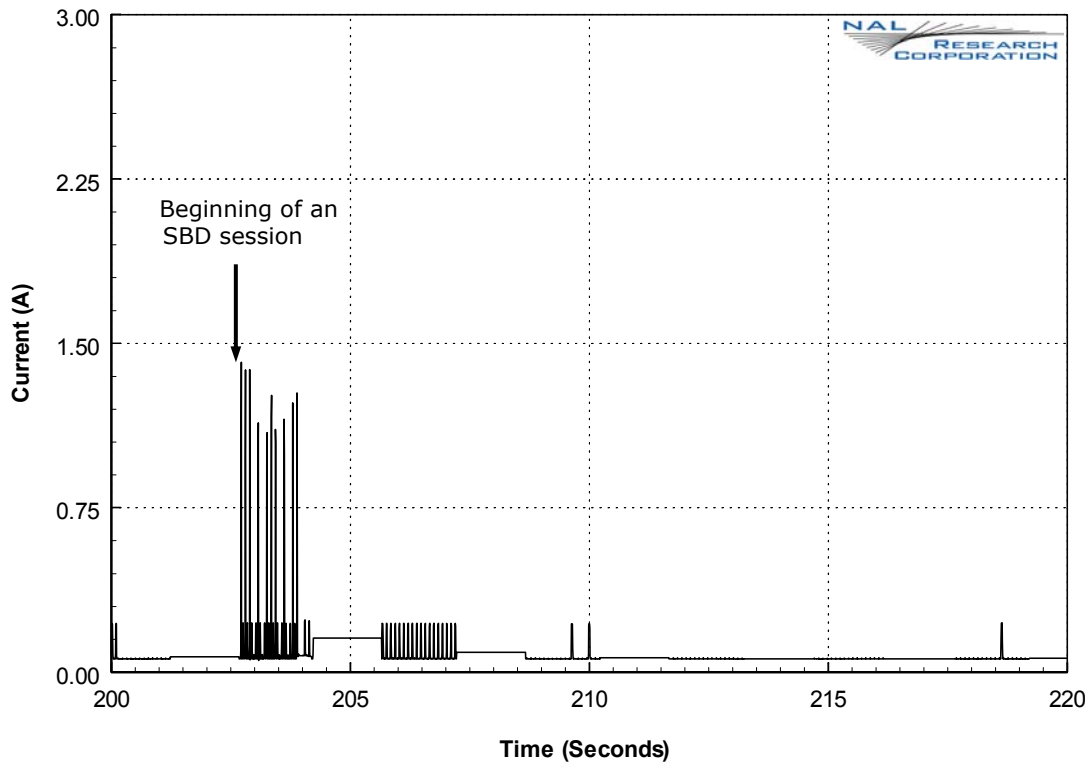


Figure 50. Average current drawn by model 9601-D during SBD at 5.5VDC input.

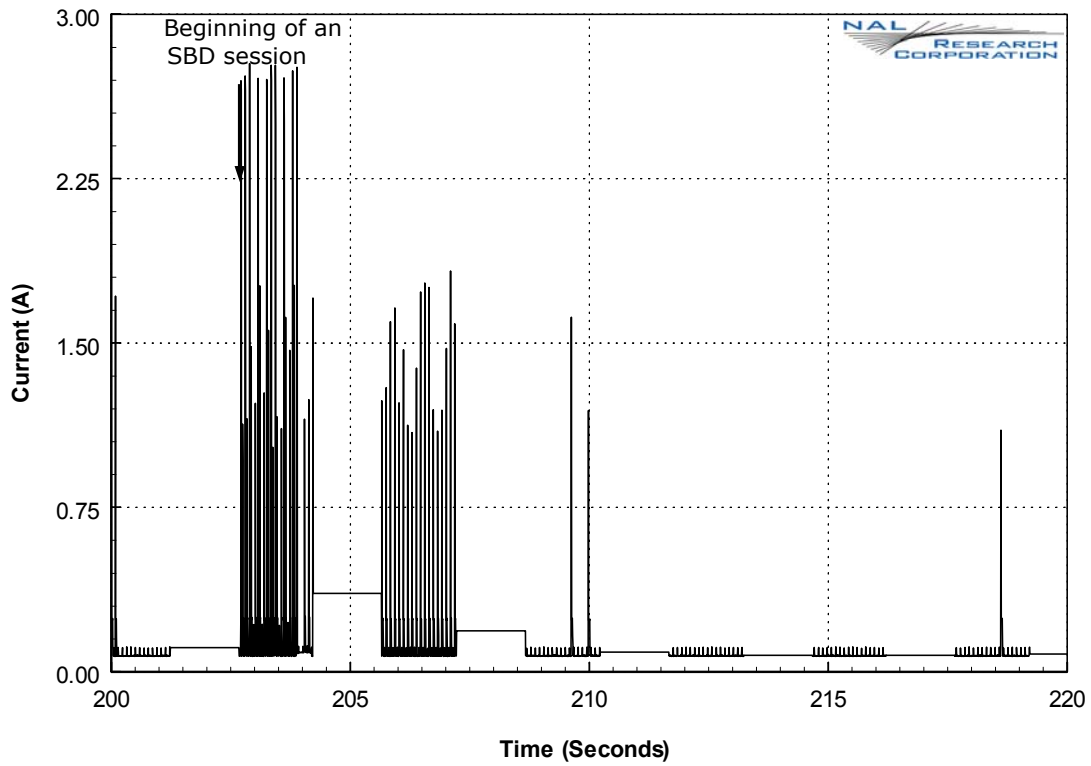


Figure 51. Maximum current drawn by model 9601-D during SBD at 5.5VDC input.

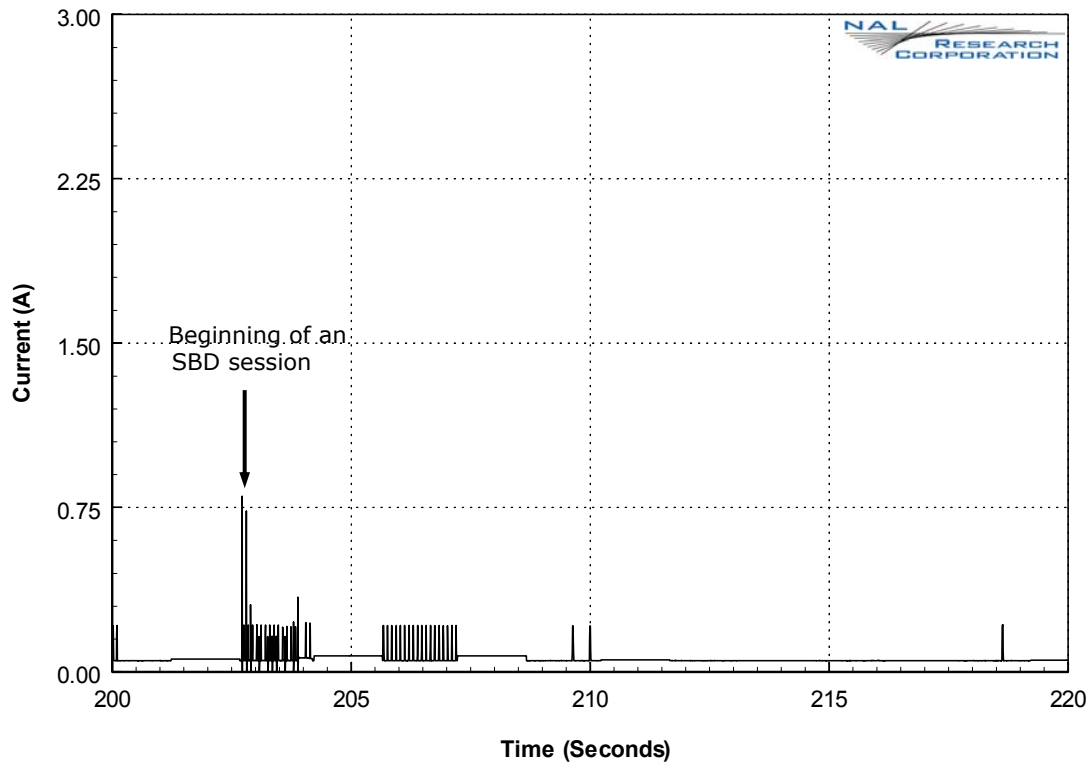


Figure 52. Minimum current drawn by model 9601-D during SBD at 5.5VDC input.

Figure 53 displays a plot of voltage versus current of the 9601-D during an SBD session. The line was generated by curve fitting through data points of the six cases above.

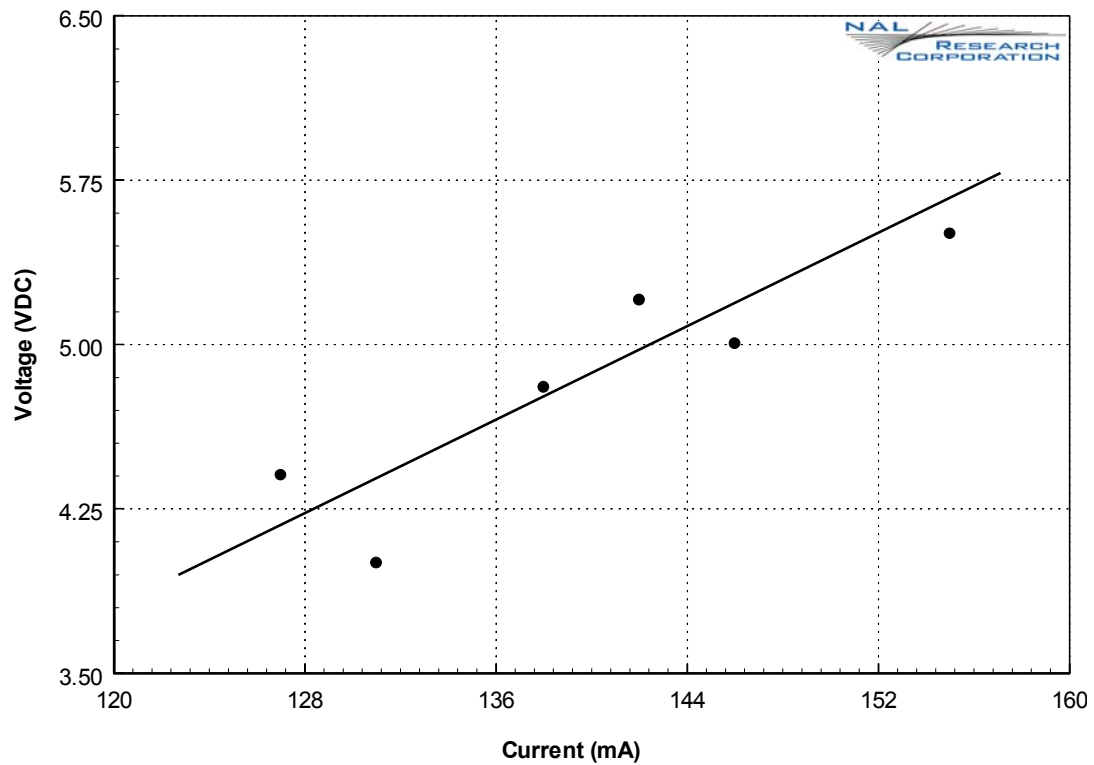


Figure 53. Voltage versus current plot of the 9601-D during an SBD session.