Description of document:	Consumer Product Safety Commission (CPSC) Safety Risks from Lithium Batteries 2018-2019
Requested date:	2019
Release date:	30-September-2024
Posted date:	04-November-2024
Source of document:	FOIA Request Secretary of the Commission U.S. Consumer Product Safety Commission 4330 East West Highway Bethesda, MD 20814 Fax: 301-504-0127 Email: CPSCFOIARequests@cpsc.gov CPSC e-FOIA Public Access Link Website

United States
Consumer Product Safety Commission

September 30, 2024

Via Email

RE: Freedom of Information Act Request #19-F-00347: a copy of each CPSC memorandum concerning lithium batteries, for example, risks from Lithium batteries catching on fire, in products such as vape pens, scooters, phones, laptops, automobiles, etc., or plans to look into this topic. I limit my request to records since October 1, 2018. Please omit records already posted on the CPSC public website; I am interested in internal documents.

Thank you for your Freedom of Information Act (FOIA) request seeking records from the U.S. Consumer Product Safety Commission (CPSC). The Office of Hazard Identification and Reduction searched its records using the search terms provided in your request. CPSC believes that it has taken reasonable steps to ensure the accuracy of the information.

Enclosed is a copy of the records responsive to your request, contained in CPSC, with certain excisions explained below. CPSC considered the foreseeable harm standard when reviewing these records and applying FOIA exemptions. Portions of the enclosed records are being withheld pursuant to FOIA Exemptions 3, and 5, 5 U.S.C. §§ 552(b)(3), (b)(5); section 6(b)(1) of the Consumer Product Safety Act (CPSA), 15 U.S.C. § 2055(b)(1). CPSC considered the foreseeable harm standard when reviewing these records and applying FOIA exemptions.

Exemption 3. FOIA Exemption 3 permits withholding from disclosure matters that are specifically exempted from disclosure by another statute. In applying FOIA Exemption 3, we are also relying on CPSC's regulations at 16 C.F.R. § 1101.33(b) and section 6(b)(1) of the CPSA, which require that CPSC will not disclose information when it would not be fair in the circumstances. It would not be fair in the circumstances to disclose a firm's name when the company has requested confidentiality, and such records are protected from disclosure pursuant to 16 C.F.R. 1101.33(b).

Exemption 5. FOIA Exemption 5 permits withholding from disclosure inter-agency and intra-agency memoranda that would not be available, by law, to a party other than an agency in litigation with the agency. We are withholding portions of the responsive records under this exemption. The staff memoranda and analyses being withheld are pre-decisional and deliberative, consisting of recommendations, opinions, suggestions, and analyses of technical and/or legal staff. It would not be in the public interest to disclose these materials because disclosure would impair the frank exchange of views necessary for such matters.

FOIA Administrative Procedures

Right to appeal. According to the CPSC's regulations implementing the FOIA at 16 C.F.R. § 1015.7, a partial denial of access to records may be appealed. If you are not satisfied with the response to this request, you may administratively appeal in writing, addressed to FOIA APPEAL, Office of the General Counsel, ATTN: Division of Information Access, U.S. Consumer Product Safety Commission, 4330 East West Highway, Room 820, Bethesda, MD 20814-4408.

Your appeal must be postmarked or electronically transmitted (cpscfoiarequests@cpsc.gov) within 90 days of the date of the response to your request. You may also fax your appeal to 301-504-0127. You may contact us Monday – Friday from 8:00AM – 4:30PM ET, by telephone at 1-800-638-2772, by fax to 301-504-0127, or by email to cpsc-foia@cpsc.gov.

Before filing a formal appeal with the CPSC, you may contact me or CPSC's FOIA Public Liaison, Robert Dalton (rdalton@cpsc.gov), via email or at 1-800-638-2772, for any further assistance, or to discuss any aspect of your request. Assistance may include guidance on possible reformulation of your request or an alternative time frame for processing the request.

Right to Mediation. Additionally, you may contact the Office of Government Information Services (OGIS) at the National Archives and Records Administration to inquire about the FOIA mediation services they offer. The contact information for OGIS is as follows: Office of Government Information Services, National Archives and Records Administration, 8601 Adelphi Road-OGIS, College Park, MD 20740-6001; email: ogis@nara.gov; telephone: 202-741-5770; toll free: 1-877-684-6448; fax: 202-741-5769.

Fees. No fees were charged.

Sincerely,

ABIOYE MOSHEIM OYEWOLE

Digitally signed by ABIOYE MOSHEIM OYEWOLE
Date: 2024.09.30 15:15:42 -04'00'

Abioye Mosheim Oyewole
Assistant General Counsel
Office of the General Counsel
Division of Information Access
301-504-7454
aoyewole@cpsc.gov

Enclosures:

Congressional Responses Draft Memo
DOUGS Standards Revision for Li ion Batteries
CPSC Laptop Batteries Evaluation
Draft Lithium Battery Safety Working Group
Emobility Device Staff Efforts
EXC Congressional Oversight Memo Draft
Incident Report
LIB Updates FY 2018

Measures we will use for congressional memo:

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Measures we will use for congressional memo:

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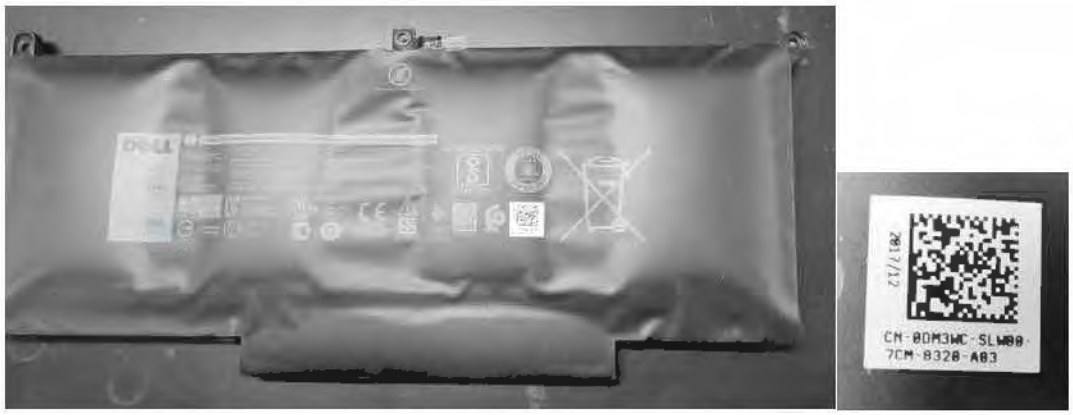
Evaluation of Battery Packs from CPSC Laptops

April 5, 2021

EXIT requested ESEF staff to assess 18 laptop batteries that had varying degrees of swelling. Two laptops were also provided. There were three models (in two configurations) of the laptop batteries. Staff does not know the history of the use of the batteries.

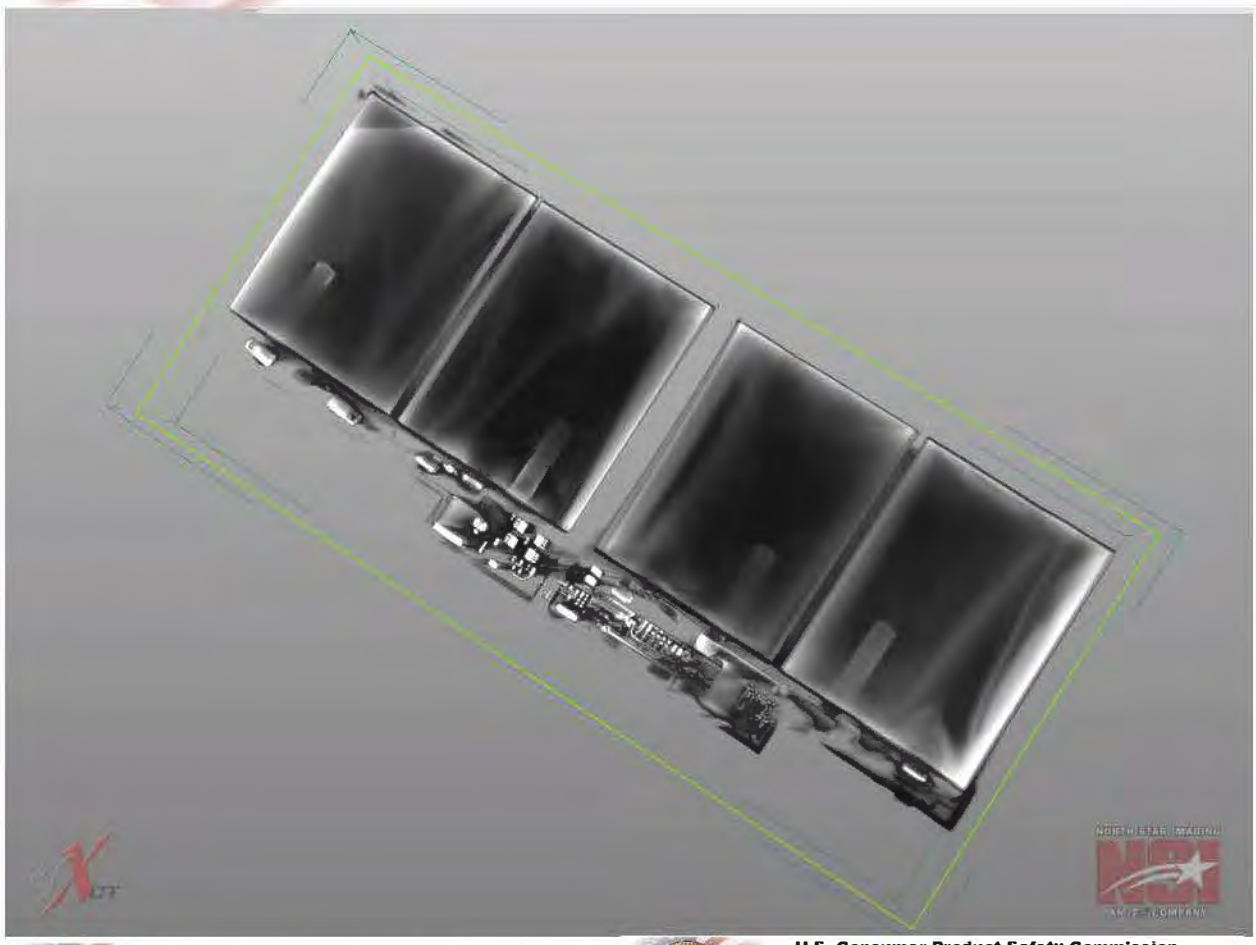
Type FYG3T
Rated 60 Wh

These two Type FYG3T battery packs, shown in top photo below, have date codes of 2018/01 and 2017/12 (QR Code shown below), thus slightly over 3 years old. The prismatic cells are in a 2S-2P configuration battery, i.e., two cells in a series-parallel arrangement. The second photo shows the visibly evident cell swelling of all four cells in the packs.



The worst of each type was selected for CT imaging. The CT scans of the battery pack show nothing abnormal in the construction of the battery packs. Scan images, in second photo below, show a side cross section of two cells from one of the packs with expansion of the windings or "jelly-roll" and swelling of the pouch, typically associated with gas build-up within the cell pouch. Separation of the windings diminishes the capacity of the cell.

U.S. Consumer Product Safety Commission
National Product Testing and Evaluation Center
Rockville, Maryland



U.S. Consumer Product Safety Commission
National Product Testing and Evaluation Center
Rockville, Maryland

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National Product Testing and Evaluation Center
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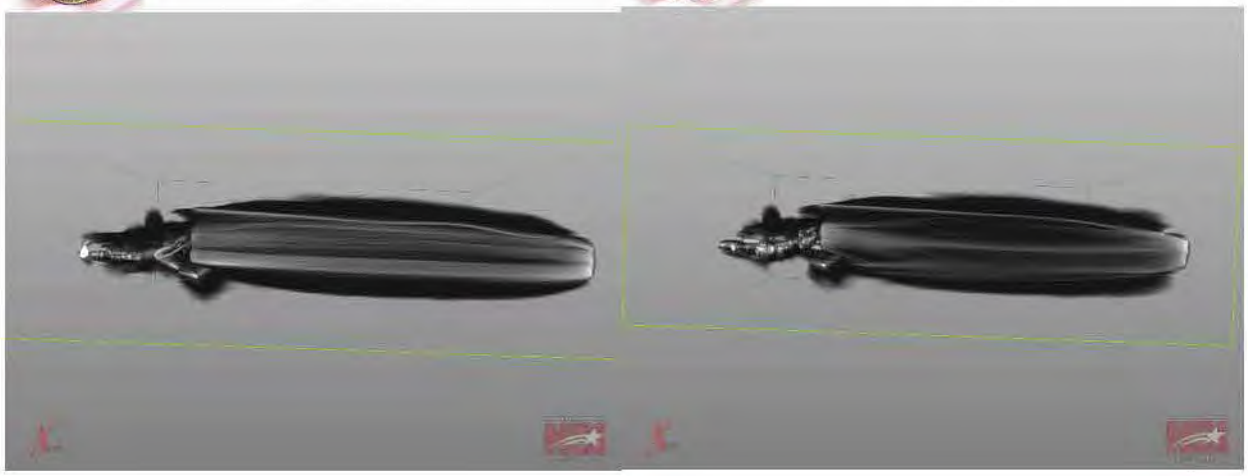
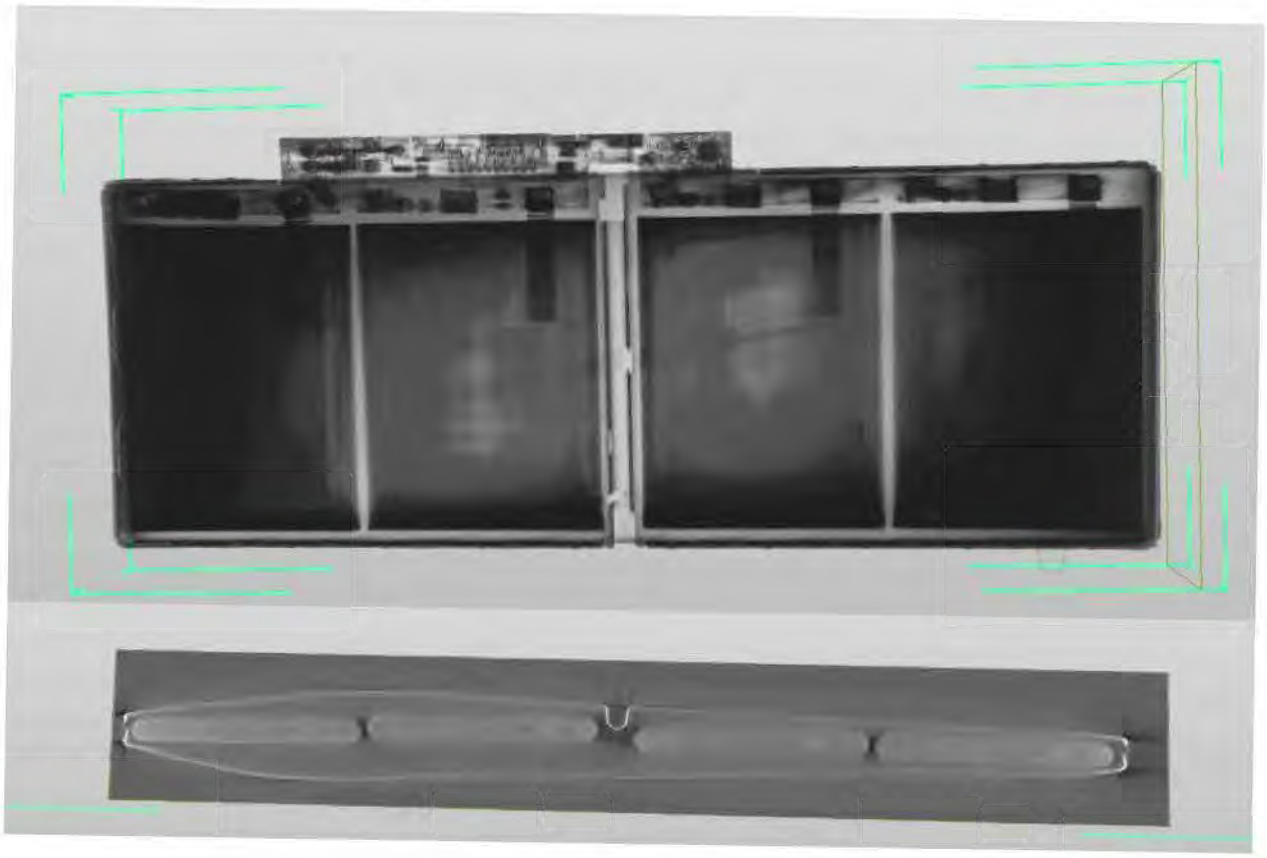


Type6MT4T
Rated 62 Wh

There were six battery packs that all have 16/08 date codes, thus about 4 ½ years old. These cells are also connected in a 2S-2P arrangement.

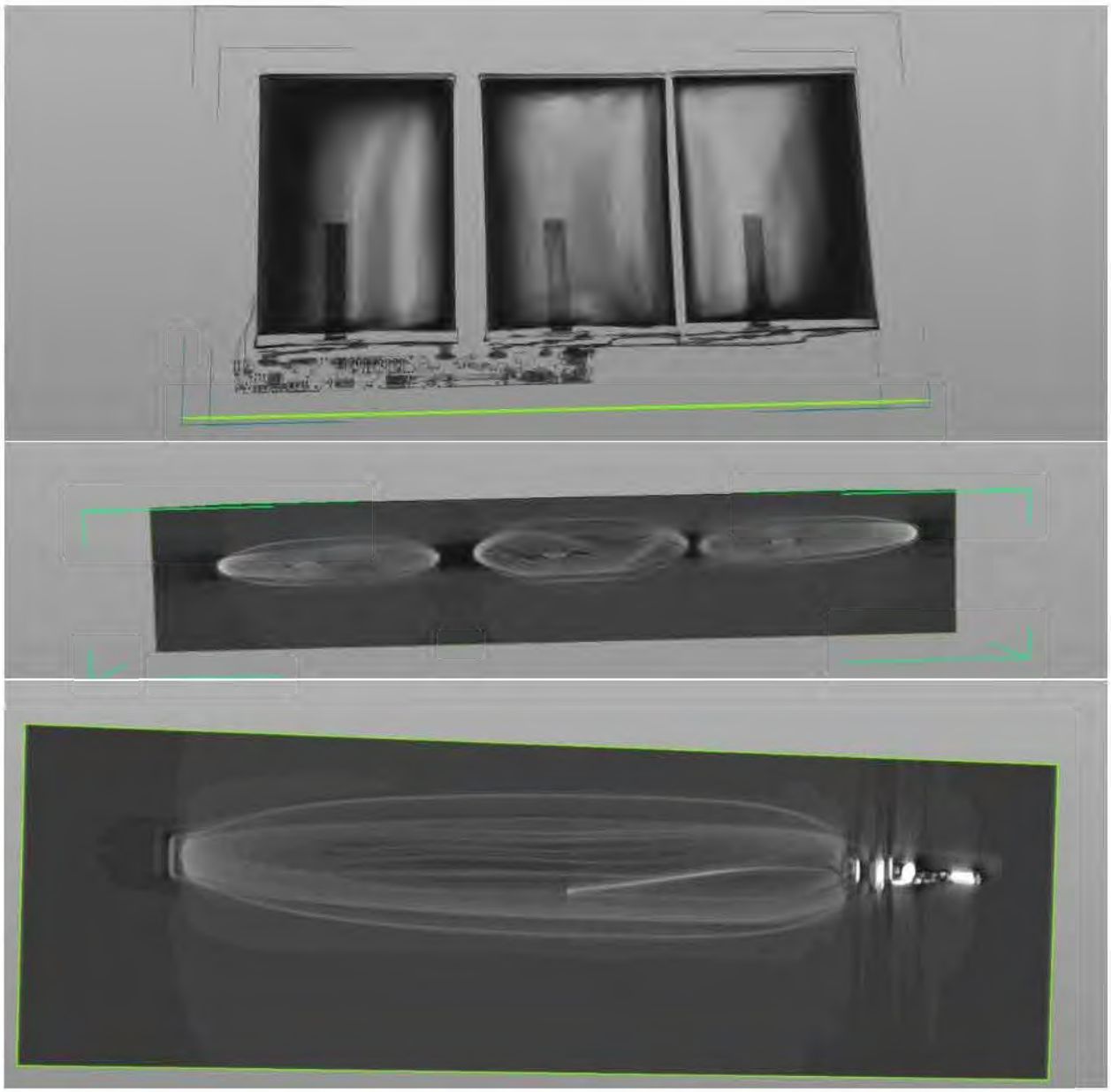
CT scans of the battery pack show nothing abnormal in the construction of the cells. The scan images show swelling within the battery packs. In this case, the "jelly-roll" did not separate. The gas build-up caused the battery pack to swell.



Type DJ1J0
Rated 42 Wh

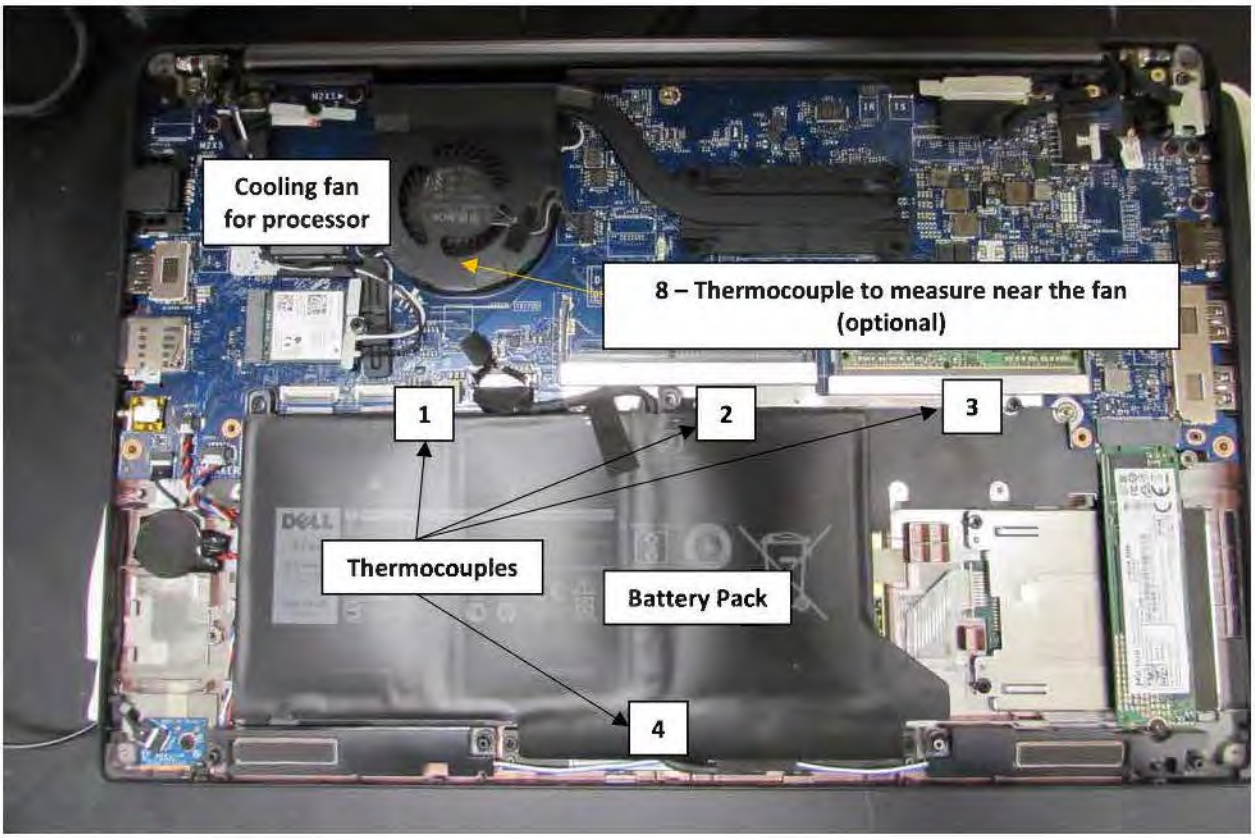
There are 10 Type DJ1J0 battery packs with 5 packs having 06/2017 date codes and 5 packs having 09/2017 date codes, thus about 3 ½ years old. These packs have three cells connected in series.

The CT scans of the battery packs show nothing abnormal in the construction of the battery packs. The CT images below show a view of all three cells across, then a view of a cross section of all three looking down into the cells and then a cross section looking into the side of one cell. In this case, the "jelly-roll" had separated, typically associated with gas build-up within the cell, causing the pouch to swell.



Laptops

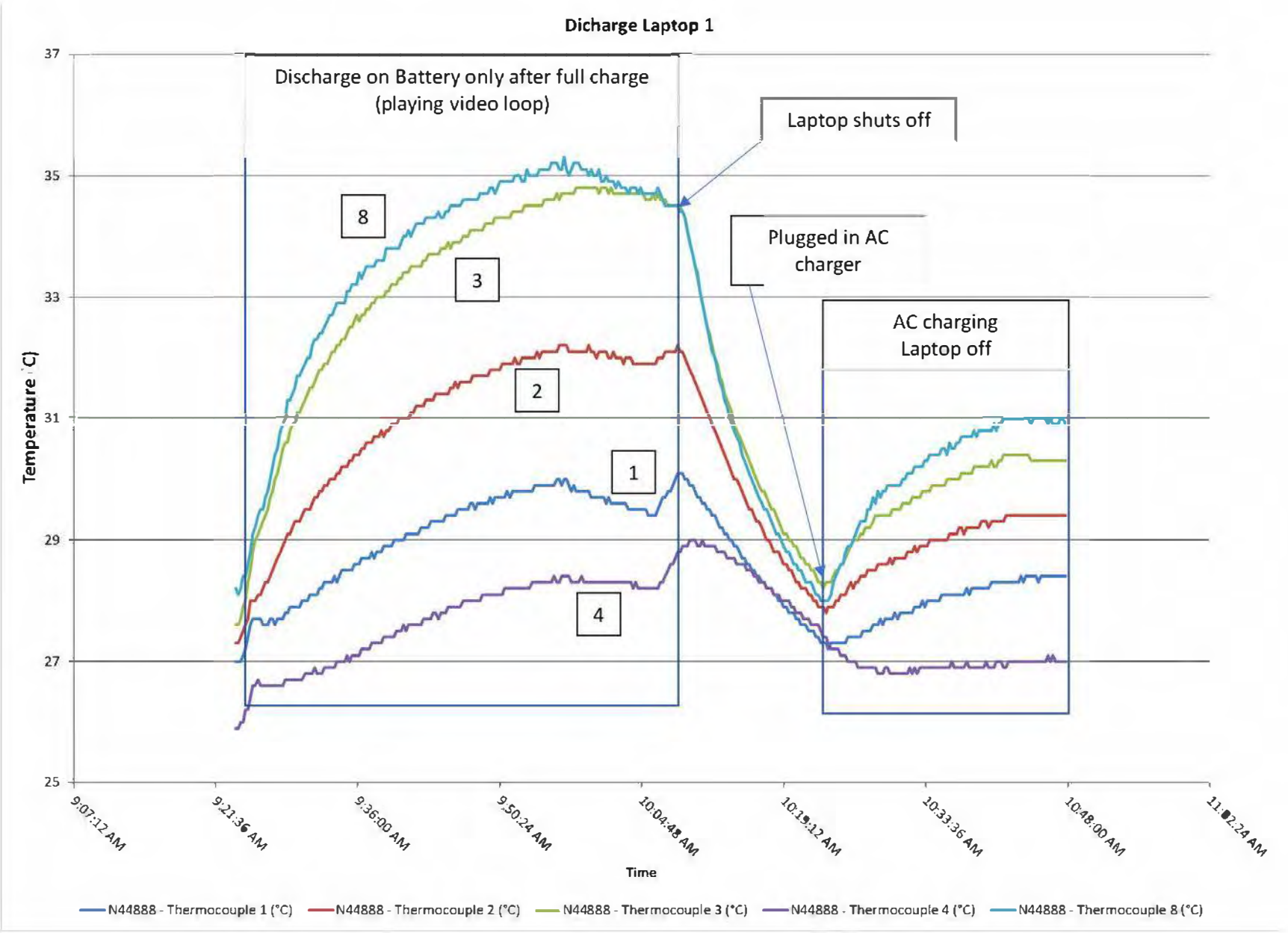
The two laptops provided had battery pack DJ1J0 type already installed in them. The battery packs within the laptops showed some minor swelling, but were not as severe as the loose battery packs provided.

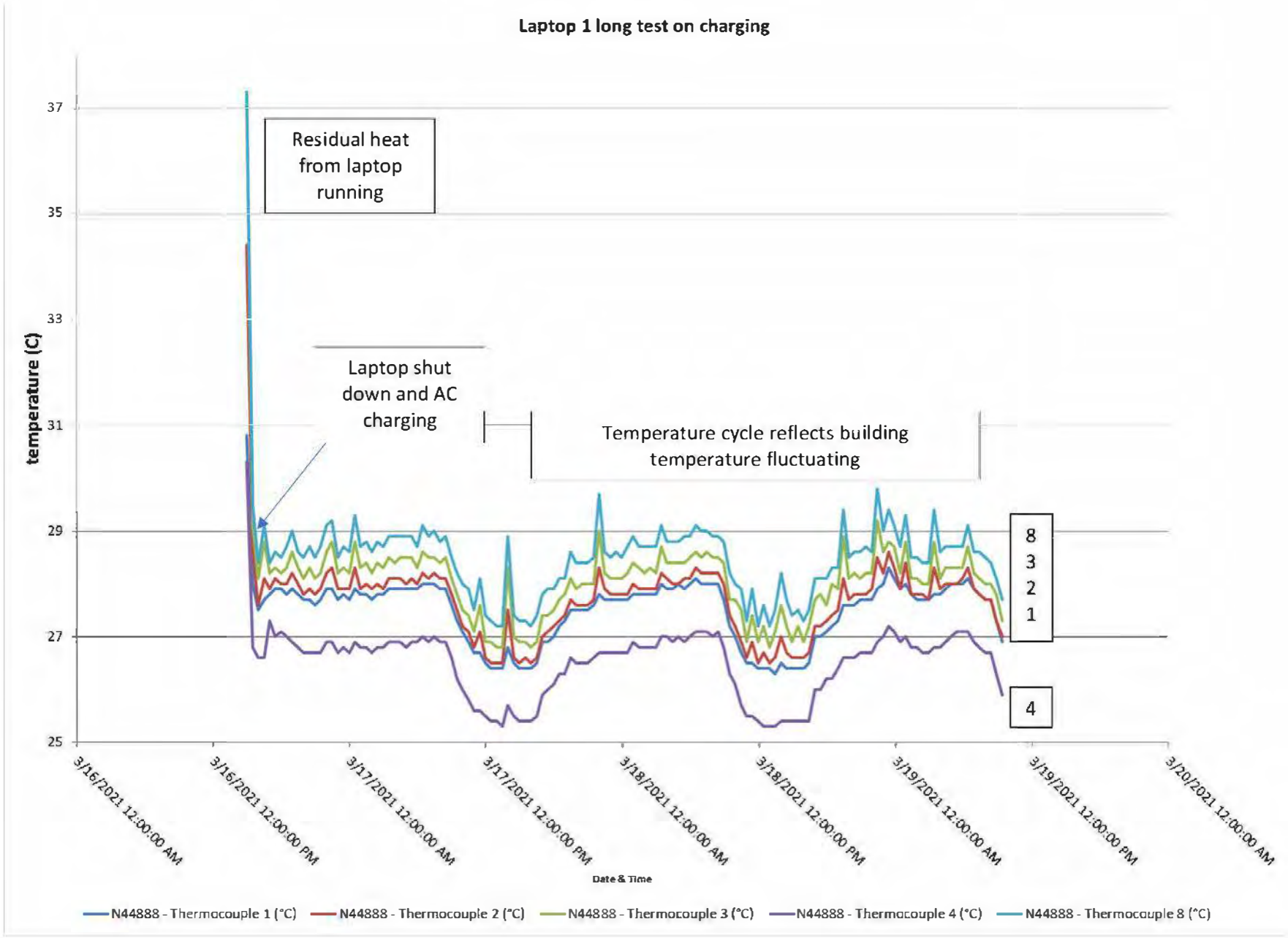


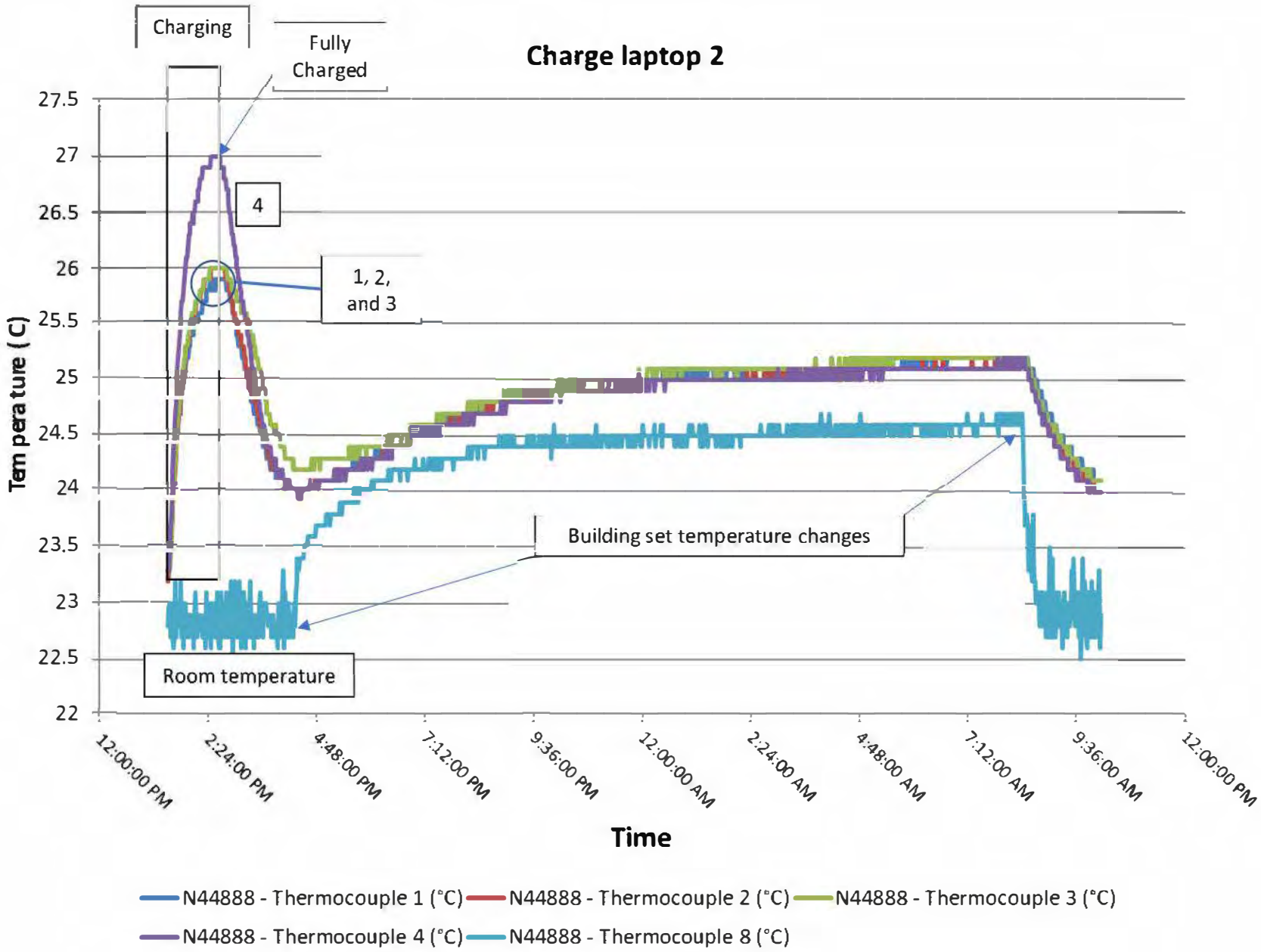
Laptop 1 – Thermocouple location

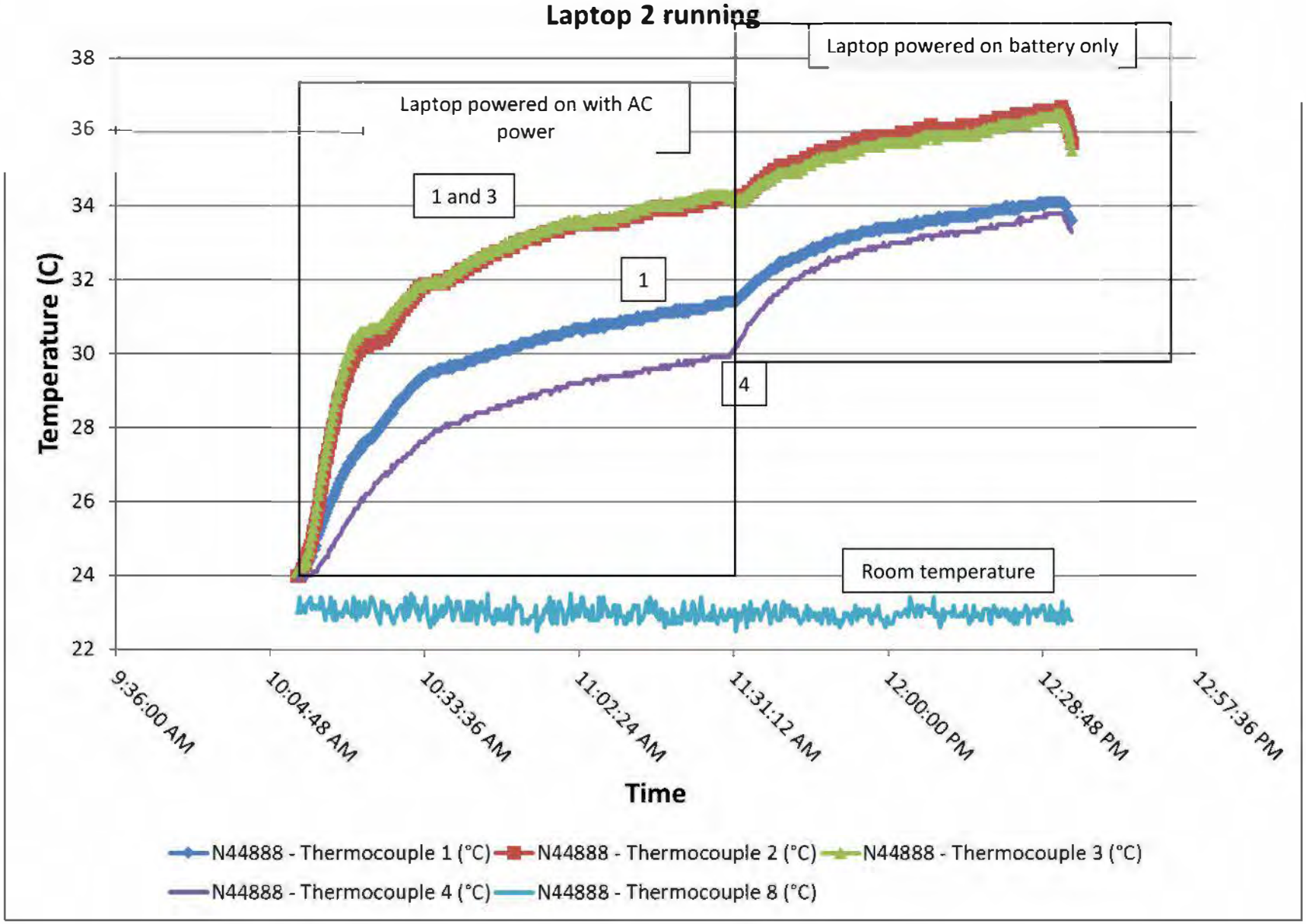
The existing battery packs that were in the laptops were tested. Type K thermocouples were placed within the laptop as shown above to measure internal temperatures with a data acquisition system under a variety of conditions. The laptop were charged and discharged operated from battery). The vents on the bottom of the laptop were blocked in some tests, but the temperature only increased about 5° C. A video playing loop was used to create a higher load on the battery and generate heat from the laptop's components. The graphs below show the thermocouple outputs under various operating conditions. The top graph shows the temperatures for a discharge, rest and recharge (no load) operating profile. The second graph shows the temperatures over several days with laptop plugged into a charger. The third graph shows a discharged laptop getting charged then powered from charger. The last graph shows the temperatures for the laptop charging and then operating from battery. None of the recorded temperatures exceeded 40°C. Typically, the cells should not be exposed to temperatures above 45° C for extended periods.[1]

[1] http://www.benzoenergy.com/blog/post/the-safe-temperature-for-lithium-ion-battery.html#:~:text=After%2045%20degrees%20Celsius%2C%20the,45%20is%20the%20maximum%20point.
https://batteryuniversity.com/learn/article/charging_at_high_and_low_temperatures


Dicharge Laptop 1
Discharge on Battery only after full charge
(playing video loop)
Laptop shuts off
Plugged in AC
charger
AC charging
Laptop off
8
3
2
1
4
37
35
33
31
29
27
25
Temperature (°C)
9:07:12 AM
9:21:36 AM
9:36:00 AM
9:50:24 AM
10:04:48 AM
10:19:12 AM
10:33:36 AM
10:48:00 AM
Time
N44888 - Thermocouple 1 (°C)
N44888 - Thermocouple 2 (°C)
N44888 - Thermocouple 3 (°C)
N44888 - Thermocouple 4 (°C)
N44888 - Thermocouple 8 (°C)


Laptop 1 long test on charging
Residual heat from laptop running
Laptop shut down and AC charging
Temperature cycle reflects building temperature fluctuating
8
3
2
1
4
temperature (C)
37
35
33
31
29
27
25
3/16/2021 12:00:00 AM
3/16/2021 12:00:00 PM
3/17/2021 12:00:00 AM
3/17/2021 12:00:00 PM
3/18/2021 12:00:00 AM
3/18/2021 12:00:00 PM
3/19/2021 12:00:00 AM
3/19/2021 12:00:00 PM
3/20/2021 12:00:00 AM
Date & Time
N44888 - Thermocouple 1 (°C)
N44888 - Thermocouple 2 (°C)
N44888 - Thermocouple 3 (°C)
N44888 - Thermocouple 4 (°C)
N44888 - Thermocouple 8 (°C)


Charging
Fully Charged
Charge laptop 2
4
1, 2, and 3
Building set temperature changes
Room temperature
Tem pera ture (C)
27.5
27
26.5
26
25.5
25
24.5
24
23.5
23
22.5
22
12:00:00 PM
2:24:00 PM
4:48:00 PM
7:12:00 PM
9:36:00 PM
12:00:00 AM
2:24:00 AM
4:48:00 AM
7:12:00 AM
9:36:00 AM
12:00:00 PM
Time
N44888 - Thermocouple 1 (°C)
N44888 - Thermocouple 2 (°C)
N44888 - Thermocouple 3 (°C)
N44888 - Thermocouple 4 (°C)
N44888 - Thermocouple 8 (°C)


Laptop 2 running
Laptop powered on battery only
Laptop powered on with AC power
1 and 3
1
4
Room temperature
Temperature (C)
38
36
34
32
30
28
26
24
22
9:36:00 AM
10:04:48 AM
10:33:36 AM
11:02:24 AM
11:31:12 AM
12:00:00 PM
12:28:48 PM
12:57:36 PM
Time
N44888 - Thermocouple 1 (°C)
N44888 - Thermocouple 2 (°C)
N44888 - Thermocouple 3 (°C)
N44888 - Thermocouple 4 (°C)
N44888 - Thermocouple 8 (°C)

Typical Causes of Swelling

Lithium-ion polymer cells can swell due to many reasons. Common causes of battery swelling include:

1. Overcharge conditions, which accelerate parasitic reactions between the electrodes and electrolyte, with release of heat and gases.
2. Poor cell quality and design with low anode to cathode stoichiometric ratios or particulate contamination
3. Mechanical damage to electrodes induced either during cell assembly or from the product application
4. Excessive operating temperatures
5. Deep discharge of cells

Poor Quality or Damaged Battery

A poorly made (low-quality or cheap) battery sometimes just doesn't perform correctly. Errors in its chemical reaction can cause the gas to build up, and each time you charge or try to use your device, more gas is released. It is difficult to determine if this is the case. The battery packs are 3 to 4 years old.

Extreme Temperatures

Many experts suggest this is the most common reason for a swollen battery. A study in the Electrochemical Society by the (b)(3):CPS Energy Development Team of (b)(3):CPS (b)(3) Co., Ltd looked into the swelling properties of lithium-ion batteries. It showed that when stored at 194°F (90°C) for four hours, the batteries expanded. The most swelling occurred in batteries that were fully charged. The laptops did not exhibit any extreme temperatures during the testing.

Elevated Temperatures

Elevated temperatures can decrease the life expectancy of the battery pack. Elevated temperatures causes the transfer between the layers within the cell to be less efficient, thus causing the life expectancy to decrease and possibly gas build-up in the battery pack.

Deep Discharge

When a lithium-ion cell goes into deep discharge, it is in a highly de-intercalated state. When the battery is deep discharged, the protective passivation layer on the anode called the Solid Electrolyte Interphase (SEI) layer decomposes, with new electrode and electrolyte surfaces coming in contact and new SEI layer is formed. These reactions may lead to gas formation.

Batteries

January 4, 2018

U.S. Consumer Product Safety Commission (CPSC) staff is participating in voluntary standard activities related to batteries in consumer products, including:

ANSI/CAN/UL 2272 - *Electrical Systems for Personal E-Mobility Devices*
ANSI/NEMA C18 - *Safety Standards for Primary, Secondary and Lithium Batteries*
ASTM F2951 - *Standard Consumer Safety Specification for Baby Monitors*
ASTM F963 - *Standard Consumer Safety Specification for Toy Safety*
IEEE 1625 - *Standard for Rechargeable Batteries for Multi-Cell Computing*
IEEE 1725 - *Standard for Rechargeable Batteries for Mobile Telephones*
UL 1642 - *Standard for Safety for Lithium Batteries*
UL 2054 - *Standard for Household and Commercial Batteries*
UL 2056 - *Outline of Investigation for Safety of Power Banks*
UL 2595 - *Outline of Investigation for Safety of Power Banks*
UL 2595 – *Standard for Safety for General Requirements for Battery-Powered Appliances*
UL 4200A - *Standard for Safety for Products that Incorporate Button or Coin Cell Batteries Using Lithium Technologies*
UL 60065 - *Standard for Audio, Video, and Similar Electronic Apparatus–Safety Requirements*

CPSC staff has received consumer complaints and manufacturer and retailer reports involving hazards associated with batteries and battery chargers. Potential hazards include overheating, fire, electrical shock from battery chargers, thermal burns, exposure to alkaline battery electrolytes, and high-velocity ejected internal components of batteries. Reports indicate incidents have occurred while the product is in use, in storage, and during battery charging. There have been a number of recalls involving lithium-ion batteries/battery packs/battery chargers used in cellular telephones, portable computing products, personal electronic products, and electric scooters (hoverboards). There have also been a number of recalls involving other types of batteries used in products such as battery-powered ride-on toys and portable battery-powered tools.

The use of batteries in consumer products continues to grow exponentially. With the proliferation of batteries and the miniaturization of portable products, manufacturers have sought to increase battery operating times while reducing size and weight of the battery and the battery-powered product. This has led to battery chemistries that pack higher energy in smaller packages. High-energy chemistry batteries include lithium ion, lithium ion polymer, and lithium metal batteries that are thinner, smaller, and lighter weight and contain more energy than traditional rechargeable and non-rechargeable batteries. Although conventional battery chemistries, such as lead acid, pose fire and explosion hazards, the combination of high-energy volatile chemistry packed into a small volume requires special safeguards to minimize potential hazards. High-energy density batteries need enhanced safety systems and additional care when using and handling, both in or when removed from the product; and batteries must be properly tested with the product, in its intended use and with the charger as a system.

CPSC staff recommends:

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Additional Information

Safety Alerts:

- Fidget Spinners Safety | CPSC.gov
- Hoverboards | CPSC.gov
    - CPSC Hoverboard Safety Alert
    - Letters to Manufacturers, Importers, and Retailers of Self-Balancing Scooters
- CPSC Releases Tips on Notebook Computer Use
- Cell Phone Batteries: CPSC, CTIA Working Together to Keep Consumers Safe

Voluntary Standard and Code Activities:

- Correspondence to UL STP 2272, December 20, 2016, CPSC staff comment on Proposed Effective Date for UL 2272
- Correspondence to UL STP 2272, June 13, 2016, CPSC staff recommendations for UL 2272.
- Correspondence to UL STP 4200A, November 18, 2014, CPSC staff comments on UL 4200A.
- Correspondence to UL STP 4200A, June 9, 2014, CPSC staff comments UL 4200A.
- Correspondence to UL STP 60065, January 18, 2013, CPSC staff comment on UL 60065.
- Correspondence to UL STP 4200A, July 20, 2012, CPSC staff comments UL 4200A.
- Correspondence to UL STP 60065, June 8, 2012, CPSC staff comment on Future Effective Date, Annex I, UL 60065.
- Correspondence to UL STP 60065, July 29, 2011, CPSC staff comment on UL 60065
- Correspondence to ASTM F15.22 and ASTM 963, February 25, 2008, Rechargeable batteries and toys.
- Correspondence to UL, February 25, 2003, CPSC staff recommendations for batteries for use in smoke alarms.
- Correspondence to UL, September 6, 2002, CPSC staff recommendations for batteries for use in smoke alarms.
- CPSC staff comments to UL/ANSI Ballot, July 28, 1999, CPSC staff comments on UL 1989, Standby Batteries.
- Correspondence to Chairman, ASTM F15.22, July 12, 1999, CPSC staff comments on F963 Toy Safety regarding battery-operated ride-on toys.
- Correspondence from Chairman, ASTM F15.22, July 9, 1999, Response to staff letter of May 20, 1999.
- Correspondence to Chairman, ASTM F15.22, May 20, 1999, CPSC staff comments on F963 Toy Safety regarding battery-operated ride-on toys.

CPSC Staff Reports, Memoranda and Contracts:

- Final Report on Lithium Batteries Used in Residential Smoke Alarms, December 2, 2002.
- Preliminary Test Results on Lithium Batteries Used in Residential Smoke Alarms, June 28, 2002.

Contact ANSI, ASTM, IEEE, or UL:

- For further information concerning ANSI C18 battery standards contact Khaled Masri at NEMA

- For further information concerning ASTM voluntary standards contact Len Morrissey at LMorrissey@astm.org or ASTM International at http://www.astm.org
- For further information concerning IEEE 1725 (1625), *Standard for Rechargeable Batteries for Mobile Telephones* (MultiCell Computing) please contact IEEE-SA Liaison
- For further information concerning UL battery safety standards contact UL at batteries@ul.com

Contact CPSC:

- For additional information or to comment, please contact cpsc-os@cpsc.gov
- Join a voluntary standards Email Subscription List

2/5/2019

Lithium Battery Safety Working Group

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Staff Efforts to Address E-mobility Device Fire Incidents

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U.S. CONSUMER PRODUCT SAFETY COMMISSION

FOR OFFICIAL USE ONLY

PROPRIETARY

UNAUTHORIZED DISCLOSURE PROHIBITED

UNITED STATES
CONSUMER PRODUCT SAFETY COMMISSION
BETHESDA, MD 20814

Memorandum

Date:

TO : Data Intake and Injury Information Branch (EPDSI), Rm 506

FROM :

SUBJECT : Incident Data Submitted under Sec. 15(b)

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Attachment:

A recall is anticipated

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High Energy Density Battery Project Update FY 2019

Doug Lee – EXHR- 04/04/19– Draft 4

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