From: **Karen A Dow** kdow@mit.edu
Subject: Fw: Helium and your iPhone...
Date: May 11, 2020 at 10:15 AM
To: Peter H Fisher fisherp@mit.edu

KD

Peter,

Thought you might be interested in this.

Karen

From: nedm-bounces@caltech.edu <nedm-bounces@caltech.edu> on behalf of Cianciolo, Vince via nedm <nedm@caltech.edu>
Sent: Monday, May 11, 2020 9:49 AM
To: 'nedm@caltech.edu'
Subject: [nedm] Helium and your iPhone...

Hi All –

Thought this was probably relevant to EDM collaborators…

Helium can temporarily kill your iPhone

Imagine walking into a facility and your iPhone suddenly shutting off. In two different facilities, (Bldg. 7990 and Bldg. 7972) at least 12 staff and visitors reported that their iPhones or Apple Watches suddenly stopped working and would not turn back on. This curious case pulled in experts across the Lab -- and even an external consultant -- to investigate what was causing the phones to shut off.

A multidisciplinary team assembled to investigate the matter initially thought the phones were dying due to magnetic or radio frequency (RF) field pulses generated by activities within these facilities. The team added an outside consultant who specializes in non-ionizing radiation. After evaluating the work taking place in these facilities -- mainly work on a glovebox welding system in Bldg. 7990 -- the consultant and the rest of the team concluded that magnetic or RF fields could not be the problem.

Ultimately, an ORNL researcher put the team, assembled at the request of Nonreactor Nuclear Facilities Division Director Mike Pierce, on the right track. Josh Pierce, a polarization scientist who had worked in both affected facilities, told them about a common chemical denominator for work activities in both facilities -- helium.

Bldg. 7972, the High Flux Isotope Reactor's Cold Guide Hall, contains instruments that routinely use liquid helium dewars. Plus, at the time the iPhones shut off in Bldg. 7990, workers were performing welds within an inert atmosphere glovebox -- an operation that relies on 75% compressed helium. After a quick internet search, Josh found several other reports of iPhones shutting down after exposure to helium.

As it turns out, helium molecules can accumulate inside iPhones and interfere with the tiny components of their internal clocks. These clocks are responsible for powering the main processer. In recent models, Apple switched the material of these internal clocks from quartz to a material called MEMS, or microelectromechanical silicon. In a few tests published online, iPhone 6 and newer and Apple Watch Series 0 and newer all operate on MEMs-based clocks and are vulnerable to helium. Non-Apple users can breathe easy: Android phones do not use

and are vulnerable to helium. Non-Apple users can breathe easy: Android phones do not use MEMS and are unaffected by helium.

Apple actually addresses this issue in their user guide: "Exposing iPhone to environments having high concentrations of industrial chemicals, *including near evaporating liquified gasses such as helium,* may damage or impair iPhone functionality," the guide states.

The investigation team confirmed the issue with their own experiments involving helium and iPhones. Mike Pierce donated his old iPhone for testing in Bldg. 7990 near the glovebox where helium operations were taking place. As expected, the phone powered down, but after a few days of being plugged in, the sacrificial phone was able to charge and reboot. In fact, two of the 12 original phones that shut down powered back on after about a week of being off.

Employee safety was the primary concern. Above solving a technological inconvenience, the goal of the investigation was to find out if there were any safety risks to personnel.

"We wanted to ensure that any electromagnetic fields generated during welding operations could not harm workers or impact equipment or facility safety in 7990 or in future installations in NNFD facilities, especially since magnetic and RF fields can impact implanted medical devices such as pacemakers" says the Safety Services Division's Lori Manis.

The investigation team's willingness to think past the device damage and research the bigger picture exemplifies the *Safe Conduct of Research* principle of a questioning attitude: Always considering *what if?* can shed light on how to better protect against the unknown.

According to the Hazardous Material Management Information System, helium is used in more than 50 ORNL facilities, either in compressed gas tanks or in liquified form. iPhone and Apple Watch owners should be mindful their devices may be affected by helium gas, even in small amounts such as 2% concentrations. If your iPhone or Apple Watch does become unresponsive after being around helium operations, don't panic. Apple recommends that you leave the device unconnected from its charging cable so the helium can dissipate as the battery dies. Then, after a few days, it should charge and operate as usual. -- *Clint Keeton*

Cheers,
Vince

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