ULTRAVIEW EM/GAMMALERT

RF Directed Energy Weapon and Gamma/TGF Alert

PRELIMINARY User Manual – May 1, 2025

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Introduction

The EM/GAMMALERT is a pocket-sized multi-threat warning and logging device which, in addition to use as a general-purpose ionizing radiation (gamma and x-ray) monitor, alerts users to *pulsed* electromagnetic (EM) energy and ionizing radiation not detectable with prior portable devices, including Terrestrial Gamma Bursts/Flashes (TGB/TGFs), which may pose a long-term health risk to frequent airline passengers and crew. The unit also **detects and records intense electromagnetic radiation, as used in microwave jammers and directed energy weapons (DEWs)**, an emerging risk speculated as a modality in "Havana Syndrome".

The EM/GAMMALERT immediately notifies users of nearby RF/microwave DEW activity, and ionizing radiation that might not otherwise be observed, enabling evasive action. Designed for first responders, the general public, military and government personnel, the unit emits audible and visible alarms, indicating whether a radiation vs an EM event is detected. Enabling a more complete level of situational awareness than formerly possible in a pocket unit, these 4-ounce units are widely deployable, facilitating accelerated research to determine the degree of threat, if any, which both TGBs/TGFs and microwave bursts may pose.

These devices can be economically carried by large numbers of airline travelers, to enable detection, logging and global analysis of TGBs to study whether or not these lightning-induced events occur with sufficient amplitude and incidence to constitute a health hazard.

The EM/GAMMALERT (Patent Pending) can be operated over three levels:

1) As a standalone device to instantly warn the user of EM / DEW or nuclear events, and automatically log (record time waveforms) up to 1000 events in on-board flash memory.

2) It may be then connected, via USBC-to-USBA* cable, to any computer running Windows11 ™ or 10 or macOS, to display the captured events as time-aligned EM and gamma intensity waveforms, for analysis and estimation as to threat type.

3) User-selected data collected on each PC may be uploaded to a publicly accessible global database on a server at Ultraview, enabling research and recognition of possible emerging threats. A global SQL database query panel enables individual waveforms to be displayed in detail, or groups of waveforms to be displayed in a waterfall display.

Concurrent EM/RF and Radiation and Detection in the EM/GAMMALERT

The EM/GAMMALERT's ionizing radiation detectors (one of which is scintillator-enhanced) and four EMP antenna/detectors simultaneously operate, and events detected by all of these detectors are stored concurrently, as they occur, and in a time-aligned manner, in the device's on-board flash memory, for easy concurrent waveform display via any computer, via USB.

***Note: The EM/GAMMALERT may not be connected directly via a USBC-to-USBC cable, to a USBC socket on a host computer, but may be connected via a USBC-to-USBA cable, plugged into a USBA-to-USBC adapter that is plugged into the host's USBC jack.**

High-Level Electromagnetic Energy (EM) Detection

The EM/GAMMALERT contains four embedded antennas in the exposed portion of the PCB on each side of the case. These antennas feed fast high dynamic range circuits to detect EMP and DEW bursts as short as 500 nanoseconds which, although detectable by large conventional spectrum analyzers and receivers, are too short for classification by prior portable microwave field meters. The EM/GAMMALERT emits a beep, and illuminates the ☢ (EM) LED in RED if a hazardous level of EM is detected, such as from a DEW. This RED LED remains lit until reset by pressing the 

button. Lower EM levels, e.g. from a nearby transmitting towers, momentarily illuminate the ☢ (EM) LED in GREEN.

Ionizing Radiation Detection

The EM/GAMMALERT contains two high-speed radiation detectors - a sensitive CsI(Tl) (thallium-doped cesium iodide) scintillator-enhanced PIN 4-photodiode cluster feeding a picoampere-bias amplifier, and a second PIN photodiode with high dynamic range, not overloaded by intense radiation. Together these detect irradiance up to 300 mW/cm^2 and energy 0.01-40 MeV, covering X-ray and Gamma, characterizing not only traditional ionizing radiation levels from a nuclear accident or event, but also intense millisecond-scale lightning-induced TGBs, which may pose a potential health risk. The unit emits an audible beep, and illuminates the ☢ (γ) LED RED if a hazardous ionizing radiation level has been detected, even if for under 1ms. This RED LED remains lit until reset by pressing the 

button. Lower radiation levels, as occur from nuclear fallout or ordinary background events, momentarily illuminate the ☢ (γ) LED in GREEN, and emit a beep. The user may later connect the EM/GAMMALERT to a computer, via a USB-C cable, to view the event(s) in detail**. Alternatively, the EM/GAMMALERT may be left continually connected to any computer for real-time display of events as they come in.**

Internal Storage for up to 1000 EM / Gamma intensity waveforms

In addition to generating the immediate LED/beep alarms described above, the EM/GAMMALERT concurrently stores both the ionizing and EM energy waveforms of each of up to 1000 events in its internal flash for later retrieval to, and display on, any computer.

Local-PC and Worldwide Data Aggregation, Display and Global Hazard Recognition

The EM/GAMMALERT can optionally be connected via its USB cable, to a host computer running Windows 10/11™ or macOS. The GUI software displays the time waveforms for each event, from which threat-type classification (e.g. TGB, steady gamma, EMP or continuous EM/DEW) may be estimated. The waveforms are also automatically stored, in time-aligned and in time-indexed fashion, in a local user-searchable SQL database on this computer.

If the EM/GAMMALERT is left plugged into a host computer, the GUI displays real-time event waveforms in as they are detected, enabling rough hazard estimation. Users may upload event waveforms of concern to an openly accessible global SQL database for time-correlation with other instruments, for worldwide hazard-trend recognition. Query-selected waveforms from either the local or global database may be displayed individually, or as a waterfall display.

Use of the EM/GAMMALERT in Standalone (pocket) Mode

0) First, install the EM/GAMMALERT host computer software per instructions in Appendix A.

1) **KEEP IT CHARGED. Charge ASAP if middle LED flashes red or is not illuminated, as unit will no longer detect or store events until re-charged.**
Using the supplied USB cable, plug the EM/GAMMALERT into the USB port on any charger or computer (computer may need to be powered up while charging the Darcon100). When charging, the CON and CHG LEDs light. When the on-board lithium battery has been fully charged (requires approximately 2 hours), the CHG LED turns off. Battery life is 2-3 days between charges, so the unit should be charged every two days. The EM/GAMMALERT may be on or off during charging. To view events and/or collect new events while the unit is charging after being discharged, it is necessary to press the Mode switch (top Button in Fig. 1), so that three (or 2 in ground mode) flashes are seen every couple of seconds.

2) **SET THE OPERATING MODE (Top Pushbutton in Figure 1)**  .
The mode switch allows selecting three states: Off, Airplane mode, Ground Mode, Radiation + high-accuracy EM (if triggered), and high accuracy EM-only. The EMPRAD-6 toggles to the next mode on each switch press. Modes, and corresponding number of green flashes (repeated every two seconds) of the middle LED are as follows:

   1) **OFF** mode: single green LED flash every two seconds.

   2) **AIRPLANE** mode: 2 flashes. **Only this mode <u>may be used on commercial flights</u>. No beep is emitted after events. This mode detects gamma radiation with high sampling rate, and EM events with low sampling rate – ideal for studying TGFs.**

   3) **GROUND** mode: 3 flashes. **In Ground mode, a beep is also emitted after every event**, whether low or high energy. **This mode detects gamma radiation with high sampling rate, and EM events with low sampling rate – intended to provide balanced awareness of ionizing radiation and EM threats, such as DEWs.**

   4) **EM-OPTIM (EM Optimized)** mode: 4 flashes. This EM-focused mode concurrently detects EM and ionizing radiation modes, just as in Airplane and Ground modes described above, **but once an EM event begins to be detected, it temporarily switches into an "EM-only" mode, which acquires signals from the four EM channels at a 32 times higher sampling rate, enabling the display and high sampling rate logging of RF/EM bursts as short as 500ns in length**. This mode is ideal for alerting and logging RF/Microwave DEW and jammer events. It continues sampling the EM channel at high rate until no more EM is detected, at which time it

reverts back to sampling ionizing radiation at high sampling rate, and EM at low rate. Figure 4 shows an example of EM waveforms collected using this mode.

5) **EM-ONLY** mode: 5 flashes. This mode is like 4 above, but doesn't sample ionizing radiation at all, and instead maximally samples its EM antennas at 32 times the speed. This is the preferred mode when concerned with detecting the nearby RF/microwave DEWs or jammers deployment. Figure 4 shows an example of EM waveforms collected

If the battery is low, the middle right LED flashes red and eventually goes out. The unit must then be charged promptly, as **event detection and storage will cease until the battery is charged.** Once the internal battery voltage has reached at least 3.25V, the unit may be used during charging by pressing the mode switch, to set it to Airplane or Ground mode. Before disconnecting the USB cable, the unit should be allowed to fully charge, at which point the CHG LED will turn off.

6) **RESET RED LED AFTER A SEVERE EVENT (Bottom Pushbutton in Figure 1)**

In the event that a high level of ionizing or EM radiation is detected, the corresponding LED (top=☢(γ) or bottom=EM) will illuminate, **and stay lit**, **in RED**. To extinguish these LEDs, press this bottom switch (This will *not* affect the event data stored in the unit).

7) **LET THE UNIT RUN --- BE SURE TO USE AIRPLANE MODE IF ON AN AIRPLANE!**
If the Mode switch is used to select either Airplane or Ground mode, the unit will indicate that it is working, via the sporadic occurrence of GREEN flashes of the ☢ (γ) LED, usually every few minutes, in response to background radiation events. Brief audible beeps will also be heard if the unit is in Ground mode. If the unit is operated in an aircraft, the flashes will typically occur 20 times more frequently than when on the ground.

Cautions When Using on an Airplane

1) The EM/GAMMALERT is safe to use on an airplane. It does not emit any nuclear or any other ionizing radiation whatsoever. It is heavily shielded and also does not produce any detectable RFI/EMI – far less than a Wi-Fi or Bluetooth device. THE UNIT SIMPLY **DETECTS** ("Listens for") energy – IT DOES NOT EMIT. Nevertheless, to ensure that the EM/GAMMALERT does not produce any sound that could alarm a person unfamiliar with its purpose, **it *must* be placed in Airplane Mode (two flashes every two seconds on middle right LED) before being brought on an airplane or through the baggage X-ray.** Unless prohibited by authorities, it may generally be left in carry-on baggage as it passes through the X-ray machine. Once the unit has passed through security and is later brought out at the departure gate, the red top (γ) LED will usually be illuminated, as a confirmatory indication that the unit is working and has successfully detected the moderate level of radiation produced by the baggage X-ray. Of interest, the X-ray intensity waveform may be displayed while waiting for one's flight by connecting it to any laptop or other computer and running the Darcon GUI. The LED should be reset by pressing the bottom pushbutton on the EM/GAMMALERT (resetting the LED does not erase any of the data stored in the unit).

2) In the event that TSA or other security officials question the purpose of the device while going through security, the inspector may be assured that it produces no radiation. However, in the event that security personnel nevertheless prohibit bringing the unit onto the airplane, it is recommended that a small jiffy-bag or other padded envelope be present in your carry-on luggage, along with a sufficient number of postage stamps to enable the unit to be mailed, to avoid forfeiture of the device.

3) **On a commercial airplane, the unit must be operated in <u>Airplane Mode only</u>**. While the unit produces virtually no EMI/RFI even in GROUND mode, it will beep every time an event occurs (even harmless background events (which are ~20 times more frequent at 30,000 feet), and such beeping/chirping may annoy nearby passengers, and could potentially cause unfounded concern by cabin crew unfamiliar with this type of device. The **unit also may be turned off completely by pressing the Mode switch until the unit produces just a single flash every two seconds**. Of course, if the unit is in the OFF mode, it will not be able to detect the possible TGFs that are the very events the unit is intended to capture while flying near thunderstorms.

Cautions When Shipping the EM/GAMMALERT

The EM/GAMMALERT contains a built-in 3.7V 750mAh lithium polymer (Li-Po) battery. It may be safely shipped, pursuant to US DOT regulations*, as its total capacity is only 2.78 Watt-hours. However, **prior to shipping the unit, it must be allowed to discharge to under 30%. This status will be ensured if the battery is discharge to the point where the middle right LED is either off or flashing red. Also, the unit must be shipped in a hard container, such as a corrugated cardboard box (not a padded bag).**

* https://www.phmsa.dot.gov/sites/phmsa.dot.gov/files/2021-09/Lithium-Battery-Guide.pdf

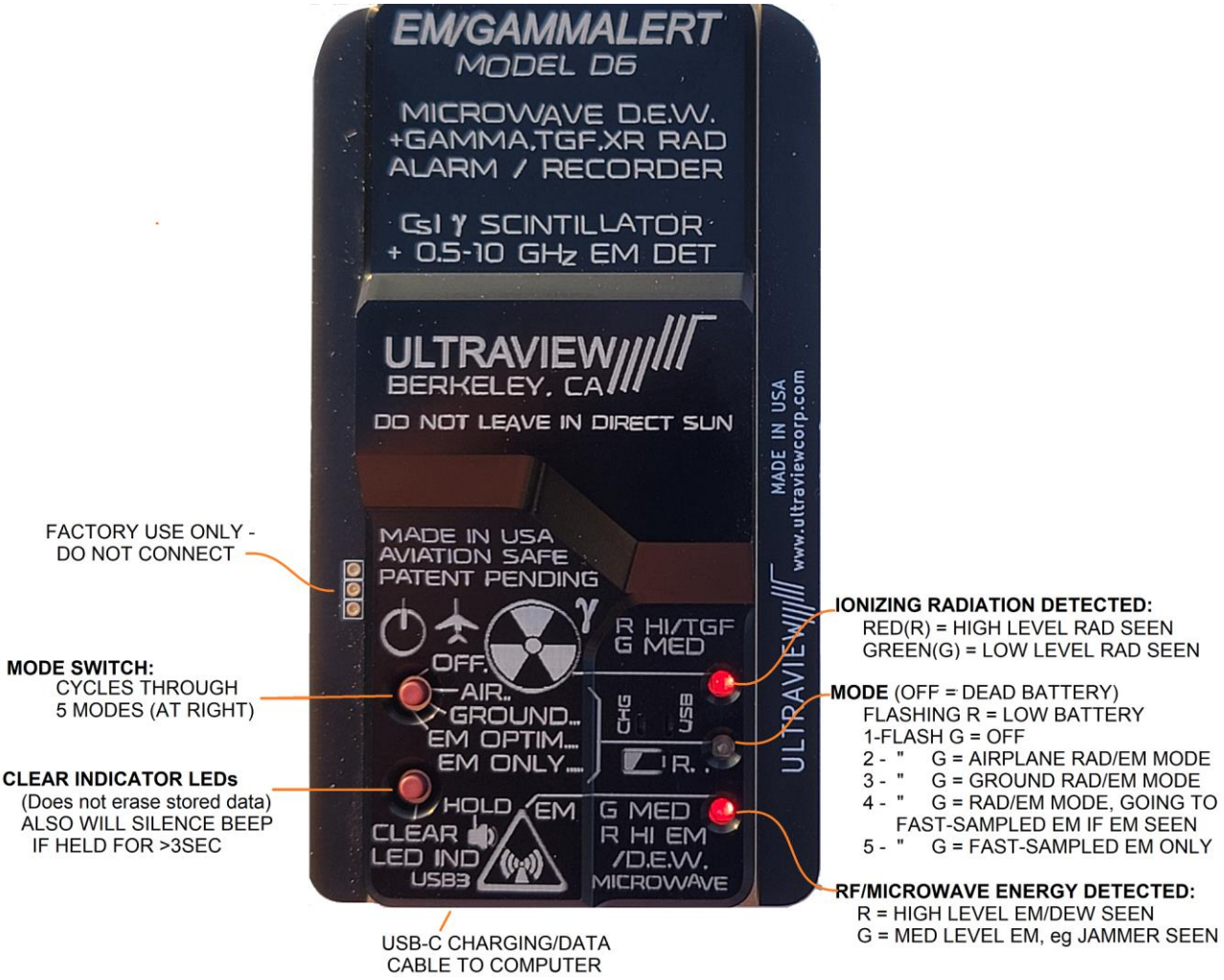


Figure 1. Front panel switch, connector and indicator usage. **Mode 2** (Airplane, with no sound alarm) and **Mode 4** (RAD/EM Mode transitioning automatically to fast-sampled EM if EM seen) are the two preferred modes for most uses.

Optionally loading events from EM/GAMMALERT into a computer

1) **Optionally connect the unit to any host computer and upload the captured data.** At any time, the EM/GAMMALERT may be connected to a USB port* on the host computer to upload its captured ionization radiation and EM radiation intensity event waveforms.

   This can be accomplished by double-clicking on the "DARCON100" GUI icon  , which will cause all acquired events to be stored in an SQL database on the host computer. Events can then be displayed, in sequence by using the mouse wheel or the "4" and "6" keys to scroll up and down through up to 1000 stored event waveforms, each of which may be up to 200 milliseconds in length, as shown in the Control and Event display window in Figure 2. Event number and event time (in both UTC and local time) are shown on top. Further examination of the database may be made using the SQL shell pSQL, which may be invoked from the search window next to the toolbar on the host PC.

   Settable trigger threshold sliders for EM (Electromagnetic), High Sensitivity Ionizing ("Scint") and High Dynamic Range ((Hi DR) Ionizing radiation are shown at left. **Normally these sliders should be left at the factory set values displayed when you first open the GUI program**. In general, the blue Scint slider should be set to a value between 800 and 1000, and the red Scint slider should be set to approximately 20. The red LG (low gain radiation detector) slider should be set to 2100. The blue EM slider should be set to 200 and the red EM slider should be set to 500. Intensity waveforms for all four EM detectors as well as Scint and Hi DR detectors are displayed using color-coded traces, whose display waveforms may be selectively enabled using the Waveform Plot Enable check-boxes shown in Figure 2.

   During the time the EM/GAMMALERT is charging (or when it is fully charged) from a host computer's USB the GUI provides a convenient battery voltage display near the lower right of the window. At this time, events stored in the EM/GAMMALERT's flash will automatically transfer into the database in the host. If new events are detected while the GUI is running, they will automatically be stored in the local database, and will automatically appear in the waveform window if the "Auto update display" box is checked.

   If the date and time in the time box (near the bottom right of the GUI windows) appear to be incorrect, the time may be updated from the host by clicking the "set time" box.

***Note: The EM/GAMMALERT should be connected to a USBA jack on the host computer using the supplied USBC-to-USBA cable. It may not be connected directly via a USBC-to-USBC cable, to a USBC socket on a host computer, but may be connected to a USBC jack on the host, by using the supplied USBC-to-USBA cable, plugged into a USBA-to-USBC adapter that is in turn plugged into the host computer's USBC jack.**

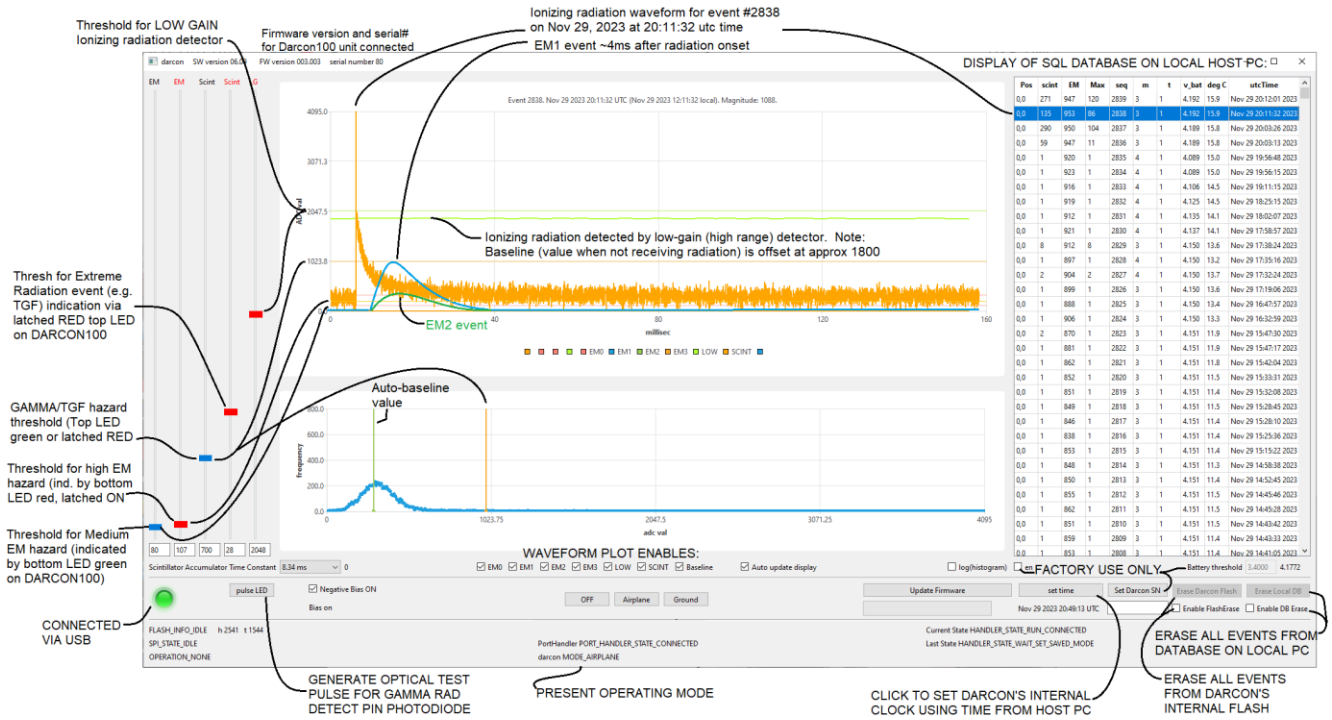
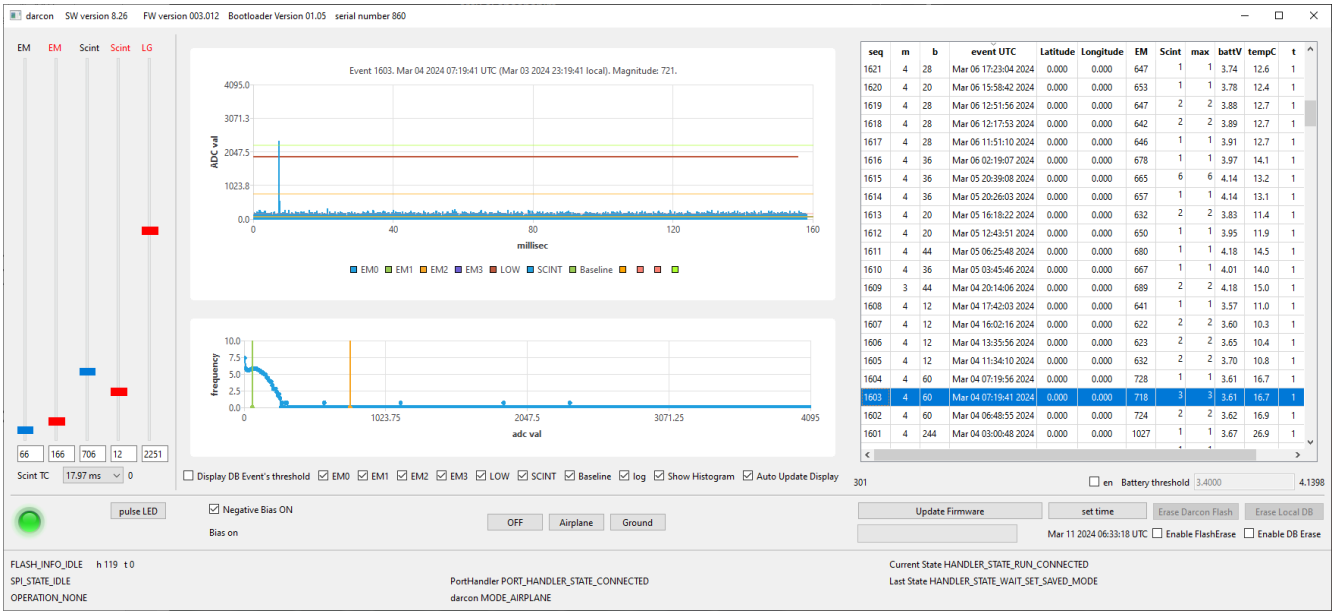


Figure 2. Control and Event display window. Event number and event time (UTC and local time) are shown on top. Settable trigger threshold sliders for EM, High Sensitivity ("Scint") and High Dynamic Range (Hi DR) Ionizing radiation are at left. Envelope waveforms for all 4 EM detectors as well as Scint and Hi DR detectors are displayed using color-coded traces.



seq	m	b	event UTC	Latitude	Longitude	EM	Scint	max	battV	tempC	t
1621	4	28	Mar 06 17:23:04 2024	0.000	0.000	647	1	1	3.74	12.6	1
1620	4	20	Mar 06 15:58:42 2024	0.000	0.000	653	1	1	3.78	12.4	1
1619	4	28	Mar 06 12:51:56 2024	0.000	0.000	647	2	2	3.88	12.7	1
1618	4	28	Mar 06 12:17:53 2024	0.000	0.000	642	2	2	3.89	12.7	1
1617	4	28	Mar 06 11:51:10 2024	0.000	0.000	646	1	1	3.91	12.7	1
1616	4	36	Mar 06 02:19:07 2024	0.000	0.000	678	1	1	3.97	14.1	1
1615	4	36	Mar 05 20:39:08 2024	0.000	0.000	665	6	6	4.14	13.2	1
1614	4	36	Mar 05 20:26:03 2024	0.000	0.000	657	1	1	4.14	13.1	1
1613	4	20	Mar 05 16:18:22 2024	0.000	0.000	632	2	2	3.83	11.4	1
1612	4	20	Mar 05 12:43:51 2024	0.000	0.000	650	1	1	3.95	11.9	1
1611	4	44	Mar 05 06:25:48 2024	0.000	0.000	680	1	1	4.18	14.5	1
1610	4	36	Mar 05 03:45:46 2024	0.000	0.000	667	1	1	4.01	14.0	1
1609	3	44	Mar 04 20:14:06 2024	0.000	0.000	689	2	2	4.18	15.0	1
1608	4	12	Mar 04 17:42:03 2024	0.000	0.000	641	1	1	3.57	11.0	1
1607	4	12	Mar 04 16:02:16 2024	0.000	0.000	622	2	2	3.60	10.3	1
1606	4	12	Mar 04 13:35:56 2024	0.000	0.000	623	2	2	3.65	10.4	1
1605	4	12	Mar 04 11:34:10 2024	0.000	0.000	632	2	2	3.70	10.8	1
1604	4	60	Mar 04 07:19:56 2024	0.000	0.000	728	1	1	3.61	16.7	1
1603	4	60	Mar 04 07:19:41 2024	0.000	0.000	718	3	3	3.61	16.7	1
1602	4	60	Mar 04 06:48:55 2024	0.000	0.000	724	2	2	3.62	16.9	1
1601	4	244	Mar 04 03:00:48 2024	0.000	0.000	1027	1	1	3.67	26.9	1

Figure 3. Typical single ionizing radiation event, from background radiation. Such normal events, which result in a brief GREEN flash of the ☢ (γ) LED (and a beep if in ground mode), may be ignored.

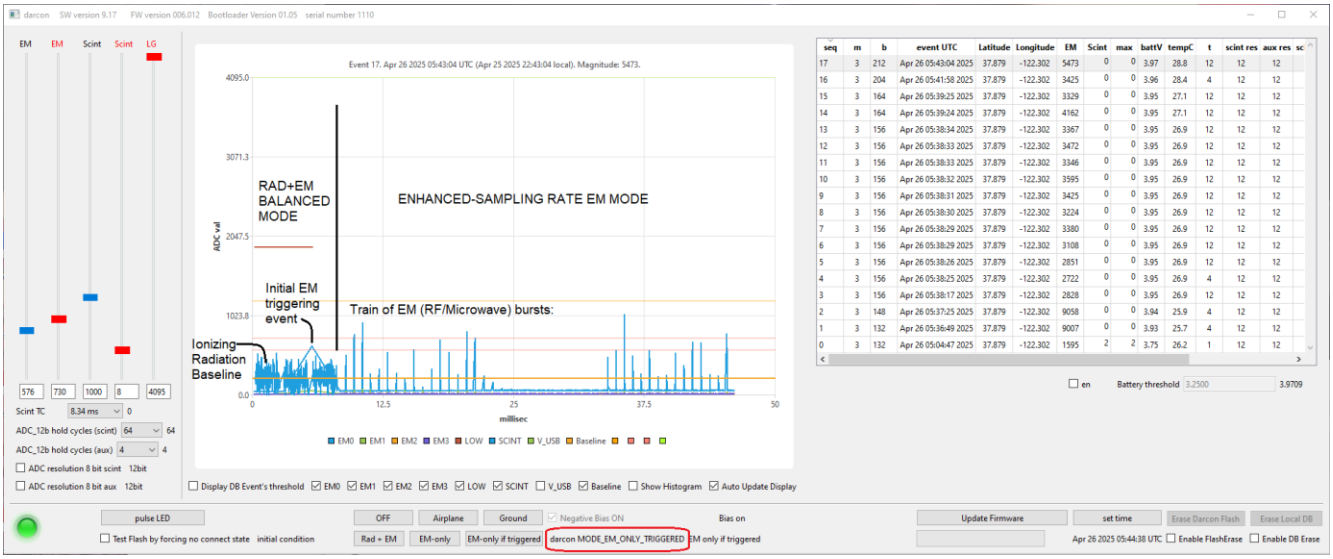


Figure 4. Use of EM-OPTIM mode, in which unit automatically transitions from balanced radiation+EM mode, into high sampling-rate EM mode on receipt of high intensity EM energy. Pulse trains displayed here consists of 300 nanosecond-wide bursts repeating 1600 times/second, each burst containing a train of 500 million 90 picosecond-wide EM pulses per second. Also shown is list of events in the local database on the host PC.

Optionally uploading a selected (extreme) event from a local computer into the global cloud database

Normal background events, like those in Figure 3 above**, must *not* be uploaded into the global database**. However, **events which light the (γ) LED and/or (EM) LED <u>in *RED*</u>** may be examined using the local computer GUI and **if, a threat is believed to have occurred**, that event may be uploaded to the global database, using the following steps:

1) Be sure the local computer to which the EM/GAMMALERT has an internet connection, and that the global database GUI (e.g. mainwindowQML_v1p8) is installed.

2) Highlight the severe event to upload, by clicking on that event in the database list. Confirm that the event's waveforms appear on the left side, as shown in Figure 5.

3) Right click on that event in the list. A map window will appear. Zoom out this map, and pan to the region where the Darcon100 detected the event. Then zoom in again and move the red symbol to the precise event location. Then hit "OK" to upload it to the global database. When reporting future events from this location without having to pan, the pulldown on the map window may be opened, and this (prior) location selected.

4) Confirm that the event then appears in the global database, as described in the next section and shown in Figure 6.

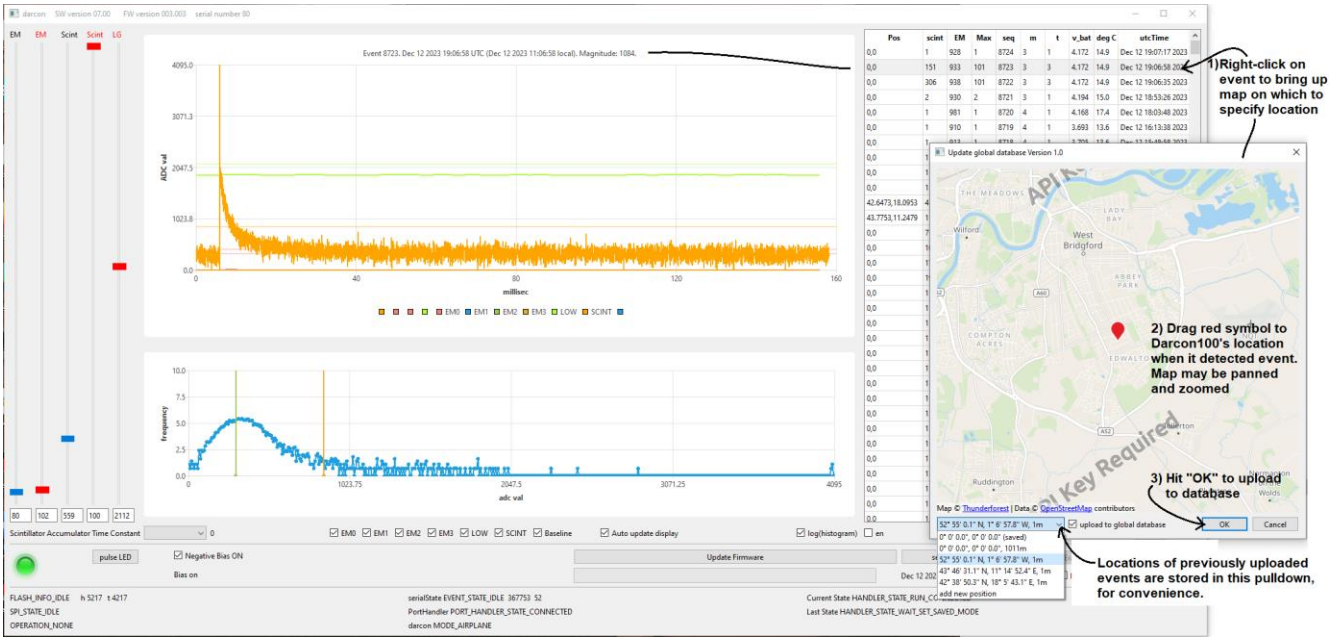


Figure 5. To load an event believed to be a threat, right click on the event in the database list. A local map will appear, which can be zoomed and panned to place the red balloon at the event's location. Also, previously uploaded events from this computer can be retrieved using the pulldown at the map's lower left. **Upload to the global database will occur once the "OK" box is clicked on the map.**

Optionally displaying events in global database

To view the global database (DB) double-click the  icon. A window will appear, showing:

1) The map, which can be zoomed from the entire world to the individual street level.

2) The database query panel, consisting of user-settable range fields, enabling viewing of selectable EM/GAMMALERT units by ID#, event date range, geographic region (min and max latitude and longitude) and other parameters. If the square box next to a parameter is not checked, the search includes all possible values (no selectivity) for that parameter. **Once parameters are set, a query (search and display of DB items meeting the parameter limits) can be made by clicking the DB Query button.**

3) The global event list (lower right) lists all events which meet the criteria set via the database query panel. From this list, any event may be selected by clicking on it, which will result in the waveform data being displayed in the lower left of the window.

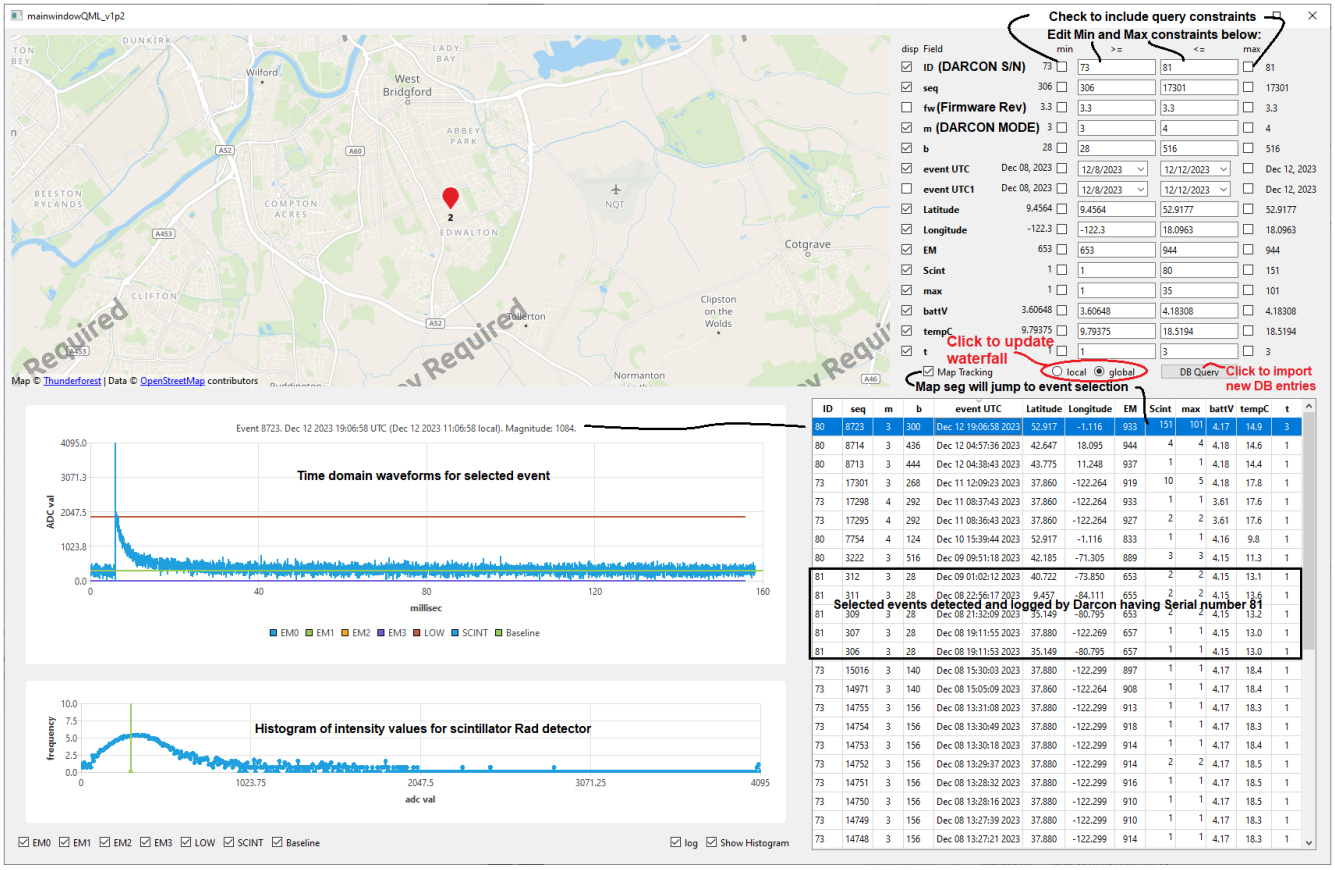


Figure 6. Global Event display window. Markers (📍) on map show locations of recent events, which can be selectively displayed using standard SQL shell PSQL. Event number and event time (UTC and local) are shown on top of waveform display. Color-coded intensity waveforms are displayed for all four EM detectors as well as Scint and Hi DR gamma detectors. Clicking the “Local” or “global” circle will update a separate waterfall display (see Figure 6) with the events previously selected.

Displaying multiple event waveforms in waterfall format

It is possible to display, a series of events from either the computer's local database or, alternatively, from the global database. Event ranges may be selected using the data parameter window (e.g. upper right in Figure 5), by event UTC time, sequence number, longitude or latitude, or other parameters. The parameter fields may be edited to constrain the range of selected events. **The parameter range's check boxes must be checked to have the constraints be included in the search**. Any time a parameter is changed, the applicable "local" or "global" circle must be re-clicked to update the waterfall display.

Figure 6 is a representative 3D display of a range of events constrained by sequence number range in the database on a user's local computer. The graph may be rotated or tilted by clicking the right mouse button over the desired grab point on the graph volume. The mouse wheel may be used to zoom in or out. "Subtract Baseline" must be selected for acceptable display accuracy, as the internal baselines of the photodetectors change with ambient temperature. The graph initially displays all 150 milliseconds of each event waveform shown, but the time range can be constrained (zoomed in on) using the "Time range ms" max and min sliders at the upper right of the graph window. The graph also initially displays all of the events in the specified range, but it is possible to constrain the range using the "Row range" min and max sliders. Finally, the amplitude range may be constrained or zoomed using the "ADC range" sliders. It is possible to bring the baseline below the graph bottom, so as to threshold the peaks of interest. Clicking the left mouse button over a point of interest in the graph's waveforms will annotate the event number, time (in the waveform) and amplitude.

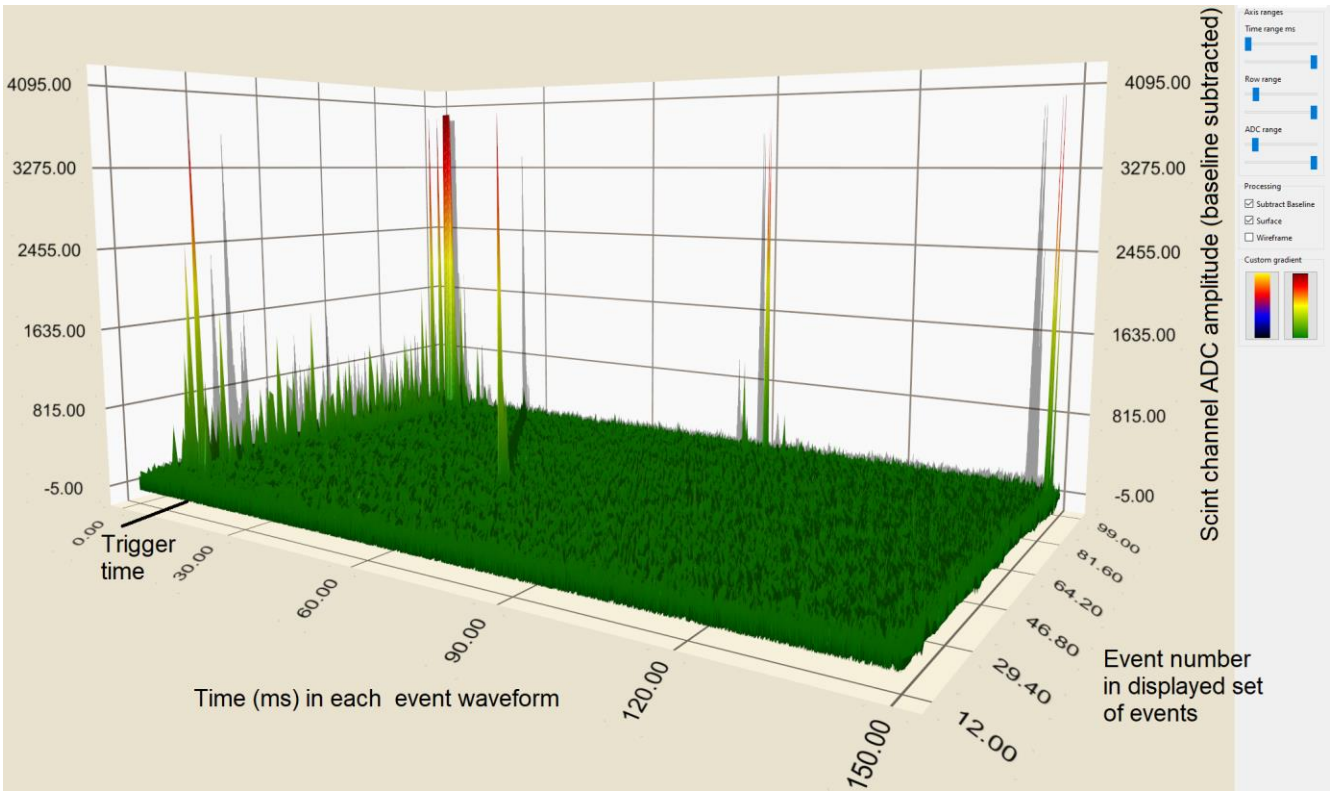


Figure 6. Waterfall graph of DB-queried events in the computer's local DB.

Displaying waterfall display of multiple event waveforms from selected units at other geographic locations in global database

Figure 7 illustrates a display of selected events from the global database. In this example, a normal background gamma radiation spike is displayed at the upper left of the graph, while long-duration X-ray intensity waveforms are displayed, for two different EM/GAMMALERT units that went through different carry-on-baggage screening units. In one case, the X-ray intensity was of sufficient intensity to saturate the radiation detector, while in the other case the envelope may be measured, as shown separately in blue for this single-event selected from the database event list at right.

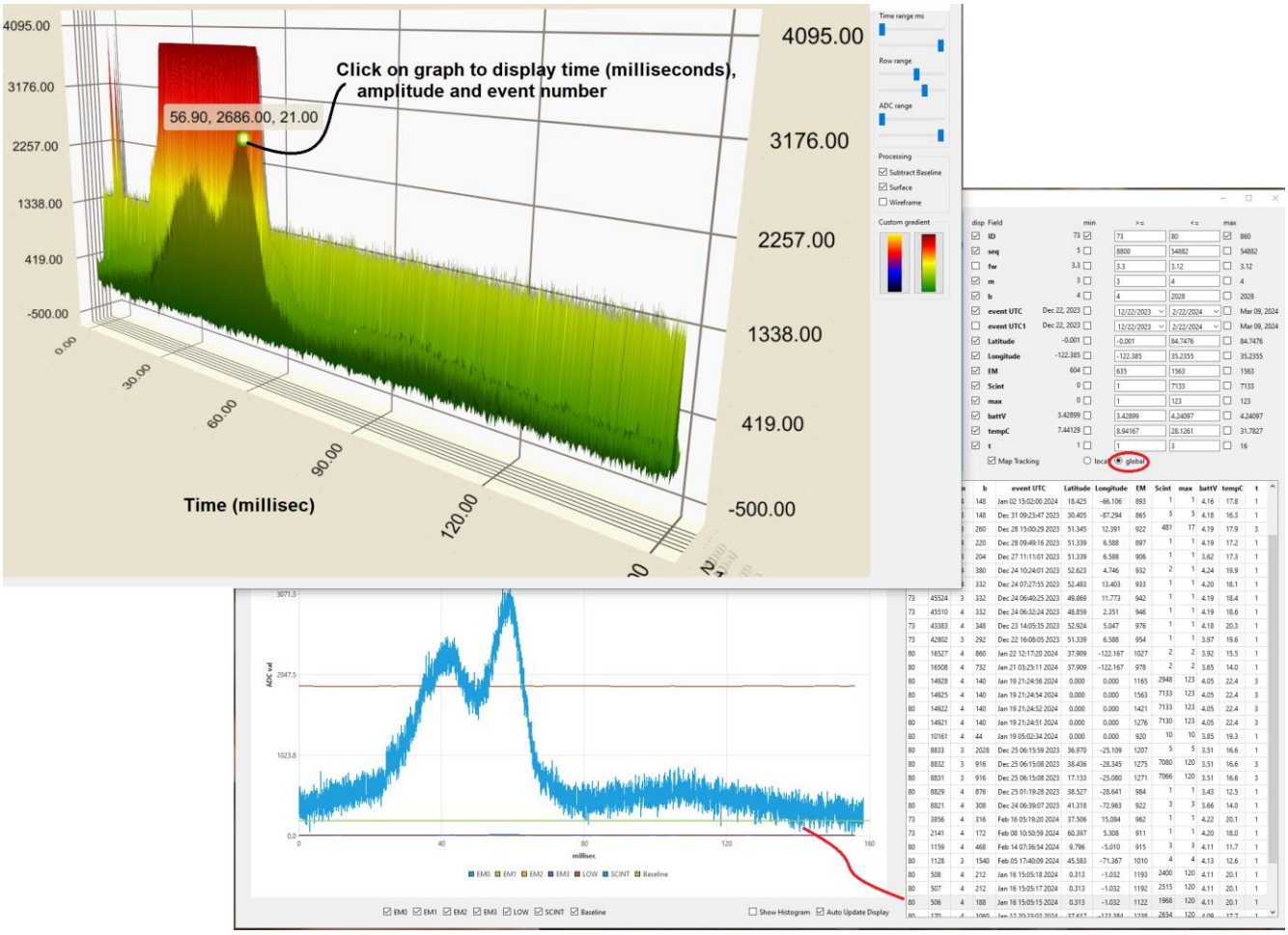
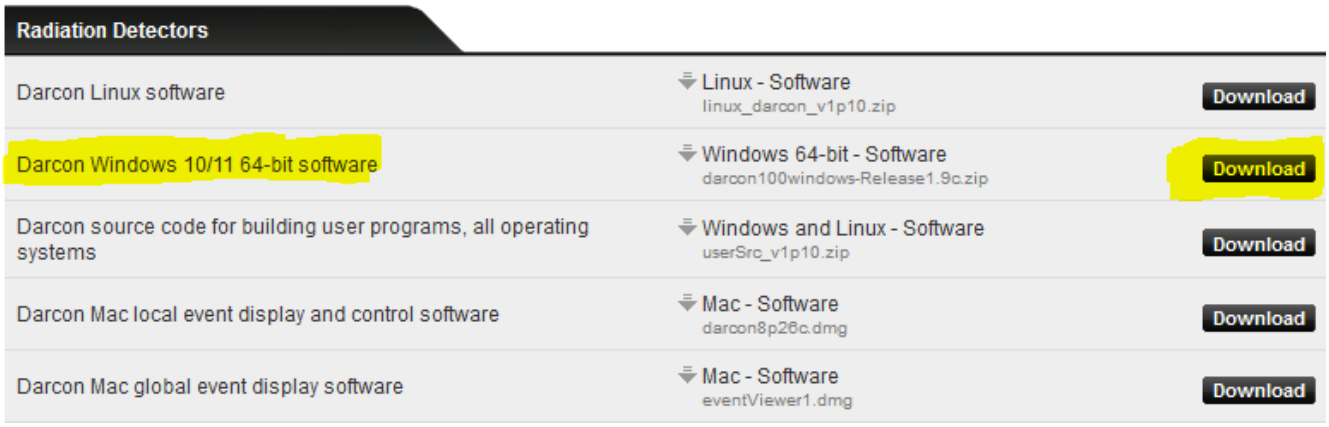


Figure 7. Global database selection window (bottom, right), showing a selected X-ray event waveform in blue, while concurrently that event and other events in the DB selection range are displayed in waterfall format (top, left). A single background radiation spike is also shown at the very top left of the 3D waterfall graph.

Appendix A: Software Installation for Windows™ 10/11 64-bit:

1) Download the release from “Product Downloads” on the Ultraview support website https://www.ultraviewcorp.com/downloads.php and click the Download button for “Darcon Windows 10/11 64-bit software” in the Radiation Detectors section.



2) Extract the .zip file onto your local hard drive. Do this by double-clicking on the .zip file and then moving the resulting folder to the place of your choice, such as C:

3) Navigate to the install subdirectory of the above folder.

4) Right click 'INSTALL.bat' and select 'open’ (you may need to click on “Run anyway” on a menu that may come up).

5) Plug in the darcon device to a USB port on the computer

6) Navigate to device manager (type “device manager” in the Search window)

7) Navigate to 'Other devices/CP2102N USB to UART Bridge Controller
Or, in some systems, navigate to “Ports(COM&LPT)/Silicon Labs CP201x USB to UART Bridge(COMx)

8) Right click and select 'update driver'

9) Select “Browse for file” or “Browse my computer for drivers”

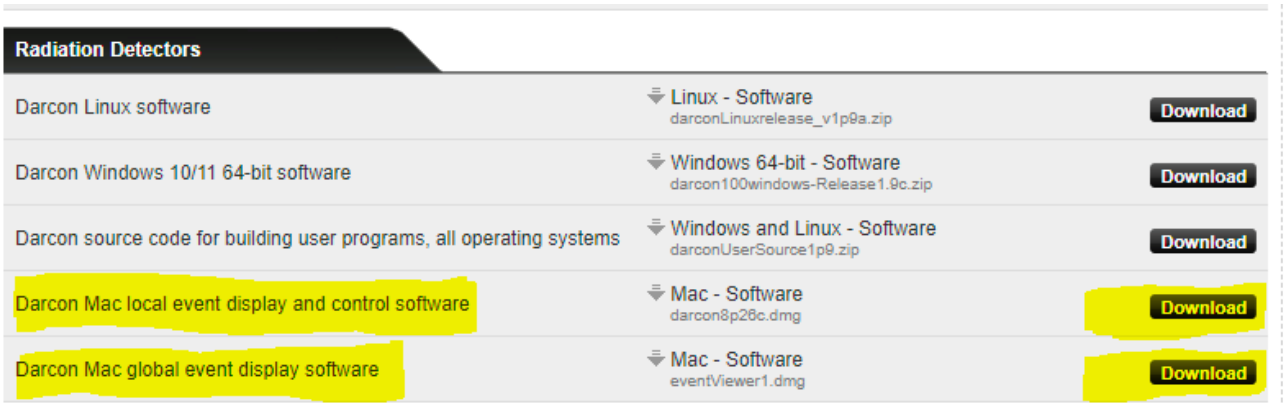
10) Browse to the unzipped location of (2) above, and then navigate down into the driver directory and click OK. Then click ‘Next’.

11) Double click on the desktop icon  (shortcut 'run_darcon.bat)' to run the GUI for controlling the EM/GAMMALERT and downloading event waveform data from it.

12) Optionally Double click on the desktop icon  (shortcut ‘worlddatabase.bat’) to run the GUI for viewing events in the global event database.

Appendix B: < FUTURE > Software Installation for macOS™:

1) Download the release from “Product Downloads” on the Ultraview support website https://www.ultraviewcorp.com/downloads.php . The two software utilities for the Darcon are in the highlighted region of the page shown below:



Radiation Detectors		
Darcon Linux software	Linux - Software darconLinuxrelease_v1p9a.zip	Download
Darcon Windows 10/11 64-bit software	Windows 64-bit - Software darcon100windows-Release1.9c.zip	Download
Darcon source code for building user programs, all operating systems	Windows and Linux - Software darconUserSource1p9.zip	Download
Darcon Mac local event display and control software	Mac - Software darcon8p26c.dmg	Download
Darcon Mac global event display software	Mac - Software eventViewer1.dmg	Download

Click the Download button for “Darcon Mac local event display and control software”. This will download a file with a name similar to “darcon8p26c.dmg”, which is the GUI for controlling the Darcon100 connected to the host, and displaying its collected events.

If you would like to also install the global event database viewer for viewing of selected events uploaded by others, click the Download button for “Darcon Mac global event display software”. This will download a file with name similar to “eventViewer1.dmg”.

2) Open each of these dmg files (double click on each) and put the two .app files where you want them (e.g. Applications).

3) Open a terminal in the folder where you placed the above two .app files. Assuming, for example, you that the files were placed in the Applications folder, type the following three lines, which will remove these apps from quarantine:

```
cd /Applications
xattr -d com.apple.quarantine ./darcon8p26c.app
xattr -d com.apple.quarantine ./eventViewer1.app
```

4) At this point the applications should be runnable, if a Darcon100 is plugged into a USB port. Double click the respective program icon to run the desired program.  runs the GUI for controlling the Darcon and downloading its events, while  runs the GUI for viewing events in the global event database. When running the latter program, two windows will open, the first is a global map and database selection program, and the second window, which may initially be hidden behind the first window, is a waterfall plot of the selected events. These icons may be moved to the desktop or other desired location.

Appendix C: Software Installation (Linux)

1) Download the latest release from http://ultraviewcorp.com/downloads.php

2) Extract the .zip file onto your local hard drive.

3) Run the following pre-installation package installation commands from a terminal:
sudo apt update
sudo apt install qt6-base-dev
sudo apt install libxcb-cursor0
sudo apt install libpq5
sudo usermod -a -G dialout <username>

4) Run the icon scripts from a terminal: createlinkDB.sh and createlinkDarcon.sh. These scripts may need to be run as super user.

5) reboot

6) Open all programs and run Darcon100 or navigate to the extracted file location and run ./darcon8p26. The compiled binary used in the linux release was built on Ubuntu 22.04.

Appendix D: Modifying and Recompiling the Software (for developers only)

Software Modification (Windows™ 10/11)

Install Qt open source version 6.5.3 or greater.
Additional install options (REQUIRED): charts, location, positioning, serial port.

Navigate to the darcon_GUI_r3p05 directory and open the .pro (qt project) file in Qt creator.

Select 'debug' build option when asked for kit choices.

Make changes then click build and run.

If operation outside of the Qt build development environment is desired, the directory structure of the provided executable can be replicated (DLL's, subdirectories) from the installed Qt directory OR if using the same version of Qt (6.5.1) the new executable can simply be dropped into the working directory.

Software Modification (macOS™)

Open a terminal (command-N).

Run the command:/bin/bash -c "$(curl -fsSL https://raw.githubusercontent.com/Homebrew/install/HEAD/install.sh)" to install home-brew. At the end of the brew installation there will be instructions to run 2 additional scripts, and the scripts will be provided under the bold text: **Next steps**. Copy and paste these scripts, from the terminal, into your terminal. They can be run as a single command and should look like:
(echo; echo 'eval' “$(/opt/homebrew/bin/brew_shellenv)"') >> /Users/User/.zprofile”
eval “$(/opt/homebrew/bin/brew_shellenv)”
Still in the terminal, run the command: “brew instal libpq”

Next run the command: echo 'export PATH="/opt/homebrew/opt/libpq/bin:$PATH"' >> ~/.zshrc

Next, From App Store download x-tools and install. You need to run once to approve license. Only macOS tools needed.

Go to qt.io and download qt online installer for macOS. Run the qt unified installer you just downloaded. On some Macs Rosetta may need to be installed.

When installing Qt make sure to select custom installation, select version 6.5.3 (or greater), and choose options charts, location, positioning, serial port. It is important to be running this as a normal user and allowing Qt to install to your home folder.

Now with Qt installed, navigate to the project directory and double click the darconxxx.pro (project) file.

Select the configuration Desktop 6.5.3.

Run the opened project by clicking the green "play" triangle on the bottom left section of the qt creator window.

The program will now run from the qt creator IDE.

To run the binary in the .app directly, we must first edit the plist as described in the other files, plist_notes file in the project.

Software Modification (Linux)

Install Qt open source version 6.5.3 or greater.
Additional install options (REQUIRED): charts, location, positioning, serial port.
Navigate to the darcon_GUI_r3p05 directory and open the .pro (qt project) file in Qt creator.
Select 'debug' build option when asked for kit choices.
Make changes then click build and run.

Appendix E: Updating firmware on an EM/GAMMALERT

It should not be necessary to frequently upgrade the firmware on your EM/GAMMALERT. However, due to the experimental nature of a device of its type, and the evolving nature of the state of understanding of the TGF and DEW phenomena which the unit is designed to detect, it may be necessary to download firmware releases in the future – a process that is very simple, as each time the DARCON100 GUI () is run (while the EM/GAMMALERT is connected using the USB cable), the GUI program will check (over the internet) for any new firmware release, notify the user of any new release, and ask for permission to update the firmware. Simply clicking “Yes” at the prompt will cause the update to start. Within a few seconds the progress bar below the Update Firmware will indicate download status. **The EM/GAMMALERT unit should never be disconnected, nor should its controls be touched, nor should the GUI be exited until this update is completed.**

1. Warranty

Ultraview Corporation hardware, software and firmware products are warranted against defects in materials and workmanship for a period of two (2) years from the date of shipment of the product. During the warranty period Ultraview Corporation shall at its option, either repair or replace hardware, software or firmware products which prove to be defective. Ultraview products are only supported with Ultraview provided firmware and software, any modifications made by customers are not supported and are not covered under warranty. This limited warranty does not cover damage caused by misuse or abuse by customer, and **specifically excludes damage caused by dropping the unit or allowing it to get wet.**

While efforts have been made to design the product to reliably detect gamma radiation and microwave energy at the levels that would pose a hazard to human health, Ultraview does not guarantee that said hazards will in fact be detected in all situations. Nor does Ultraview guarantee that false notifications ("false alarms") will not occur. Due to the complex and sparsely researched nature of the phenomena of TGFs, and in view of the currently unknown etiology of Havana Syndrome, the product may or may not detect the underlying energy behind these phenomena. All units are tested for sensitivity to microwave energy by using an Ultraview Ultracomb-8G GaN pulse generator and Vivaldi antenna generating a frequency comb spanning from approximately 250MHz to >10GHz. While this range is believed to include the spectral range that would likely be used in a directed energy microwave weapon or other microwave attack device, it is currently not known if energy in this frequency range is the cause of "Havana Syndrome", or even if microwaves (vs, for example, sonic energy) are the modality used. Similarly, while the product is well tested detecting background gamma radiation at levels far below those expected in a TGF, the phenomenon of TGFs near airplanes is rare and little-researched, and it may be possible for the product to produce "false alarms" in some cases. Before making conclusions as to the nature of any alarm indication by the unit, the unit should be connected to a computer, and the energy waveforms examined and, if desired, uploaded to the Ultraview global event database for further analysis. As more data is accumulated for these events, a better estimation capability is likely to be developed.

Users are encouraged to connect the EM/GAMMALERT devices to a computer frequently and run the GUI software, to allow automatic updates to be made, enabling improved accuracy and utility of the product. Further, **the user is strongly encouraged to promptly download, and examine, events at the earliest safe time after a red-LED-indicated error is indicated**.

While Ultraview Corporation hardware, software and firmware products are designed to function in a reliable manner, Ultraview Corporation does not warrant that the operation of the hardware, software or firmware will be uninterrupted or error free. Ultraview products are not intended for use as critical components in life support systems, aircraft, military systems or other systems whose failure to perform can reasonably be expected to cause significant injury to humans. Ultraview expressly disclaims liability for loss of profits and other consequential damages caused by the failure of any product, and recommends that customer purchase spare units for applications in which the failure of any product would cause interruption of work or loss of profits, such as industrial, shipboard or military equipment. In no way will

Ultraview Corporation’s liability exceed the amount paid by the customer for the product.

This limited warranty is in lieu of all other warranties expressed or implied. The warranties provided herein are buyer’s sole remedies. In no event shall Ultraview Corporation be liable for direct, special, indirect, incidental or consequential damages suffered or incurred as a result of the use of, or inability to use these products. This limitation of liability remains in force even if Ultraview Corporation is informed of the possibility of such damages.

Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation and exclusion may not apply to you. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

SPECIFICATIONS:

Electromagnetic (EM) Detection Section

Overall frequency receptivity range:	400 MHz to 10 GHz
Nominal sensitivity (adjustable):	50 V/M to 500 V/M
Minimum detectable EM burst length:	Single pulse – 100us Pulse train – 0.5us (99.9% detection probability for train of at least 100 pulses).

Ionizing Radiation Detection Section

Overall energy receptivity range:	0.01-40 MeV (Hard X-ray through Gamma)
Nominal sensitivity (adjustable):	0.01-300 mW/cm^2
Nominal factory threshold (typ.):	1 background event per hour at ground level, 20 background events per hour at 30,000 feet
Minimum detectable low-level gamma Radiation burst length:	25 microseconds typical
Minimum differentiable ultra-high-level Gamma burst (TGB) length:	1.5 milliseconds

Conditions Which May Cause False Alarm Indication:

Dropping unit or banging it into hard surfaces
Operating unit at above 40C ambient temp.
Rapid ambient temperature rise >10C / minute
Setting slider thresholds to lower than values specified on Page 7 of this manual.
Opening the case, which will impair ultra-high light seal, and **will further void Warranty!**

Computer Interface

USB interface:	USB 3.0/3.1
Power draw from host USB port:	800mA max while charging, 100mA nominal

USB-C cable: Use included **USB-C to USB-A Cable** to connect to computer
Do not use USB-C to USB-C cable. May use USBC/USBA adapter at host end.

Environmental and Mechanical:

Dimensions (L x W x D)	9.2 x 5.5 x 1.4 cm
Weight, not including USB cable:	86 grams (3 ounces) approx.
Ambient operating temperature range:	0 to 35 degrees Celsius. False alarms may occur if unit is operated above 40C. **Do not leave unit in direct sunlight, which may raise temperature of black case to levels that will cause it to malfunction**.
Storage temperature range:	-20 to 45 degrees Celsius
Humidity range:	20% to 80 % **NON-CONDENSING** **Do not immerse unit or allow rain, snow, or water or other liquid spray to contact unit.**

REFERENCES:

Selected References on Airborne TGBs/TGFs:

Stephan, K.D.; Shmatov, M.L. Hazards to Aircraft Crews, Passengers, and Equipment from Thunderstorm-Generated X-rays and Gamma-Rays. *Radiation* **2021**, *1*, 162-173. https://doi.org/10.3390/radiation1030015

J.M. Maia, R.M. Curado da Silva, J. Mingacho, Evaluation of effective dose for gamma-rays of terrestrial gamma-ray flashes in aviation: spectral- and atmosphere-effects, Radiation Physics and Chemistry, Volume 215, 2024, 111332, ISSN 0969-806X, https://doi.org/10.1016/j.radphyschem.2023.111332.

https://www.faa.gov/data_research/research/med_humanfacs/oamtechreports/2020s/2021/202108

https://ui.adsabs.harvard.edu/abs/2021PhRvD.104d3012D/abstract

https://agupubs.onlinelibrary.wiley.com/doi/full/10.1029/2020GL089749

Lyu, F., Zhang, Y., Lu, G. *et al.* Recent observations and research progresses of terrestrial gamma-ray flashes during thunderstorms. *Sci. China Earth Sci.* 66, 435–455 (2023). https://doi.org/10.1007/s11430-022-1026-y https://link.springer.com/article/10.1007/s11430-022-1026-y

Mailyan, B.G., Nag, A., Dwyer, J.R. *et al.* Gamma-Ray and Radio-Frequency Radiation from Thunderstorms Observed from Space and Ground. *Sci Rep* 10, 7286 (2020). https://doi.org/10.1038/s41598-020-63437-2 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7190649/, https://www.nature.com/articles/s41598-020-63437-2

Petrov, N.I. Synchrotron mechanism of X-ray and gamma-ray emissions in lightning and spark discharges. *Sci Rep* 11, 19824 (2021). https://doi.org/10.1038/s41598-021-99336-3 https://www.nature.com/articles/s41598-021-99336-3

Pallu, M., Celestin, S., Trompier, F., & Klerlein, M. (2023). Radiation risk assessment associated with terrestrial gamma ray flashes for commercial flights. *Journal of Geophysical Research: Atmospheres*, 128, e2022JD037569. https://doi.org/10.1029/2022JD037569

Celestin, S., W. Xu, and V. P. Pasko (2015), Variability in fluence and spectrum of high-energy photon bursts produced by lightning leaders, *J. Geophys. Res. Space Physics*, 120, 10,712–10,723, doi:10.1002/2015JA021410.

Jeffrey M. Chaffin, David M. Smith, Jeff Lapierre, Steve Cummer, John Ortberg, Antonio Sunjerga, Amirhossein Mostajabi, Marcos Rubinstein, Farhad Rachidi Mountaintop Gamma Ray Observations of Three Terrestrial Gamma-Ray Flashes at the Säntis Tower, Switzerland With Coincident Radio Waveforms First published: 25 January 2024 https://doi.org/10.1029/2023JD039761

Østgaard, N., Neubert, T., Reglero, V., Ullaland, K., Yang, S., Genov, G., et al. (2019). First 10 months of TGF observations by ASIM. *Journal of Geophysical Research: Atmospheres*, 2019; 124: 14024–14036. https://doi.org/10.1029/2019JD031214

Cummer, S. A., Lu, G., Briggs, M. S., Connaughton, V., Xiong, S., Fishman, G. J., and Dwyer, J. R. (2011), The lightning-TGF relationship on microsecond timescales, *Geophys. Res. Lett.*, 38, L14810, doi:10.1029/2011GL048099.

https://www.nature.com/articles/d41586-021-00395-3

Selected References on “Havana Syndrome” and Possible Microwave Basis:

Foster KR, Garrett DC, Ziskin MC. Can the Microwave Auditory Effect Be "Weaponized"? Front Public Health. 2021 Dec 23;9:788613. doi: 10.3389/fpubh.2021.788613. PMID: 35004589; PMCID: PMC8733248.

https://www.nationalacademies.org/news/2020/12/new-report-assesses-illnesses-among-us-government-personnel-and-their-families-at-overseas-embassies

Selected References on EMP and Gamma Flux during Nuclear Weapon Deployment:

High-Altitude Electromagnetic Pulse Waveform Application Guide, CESER Technical Analysis Report, US DOE Office of Cybersecurity, Energy Security and Emergence Response, July 2023 https://www.energy.gov/sites/default/files/2023-08/CESER-Waveform-Application-Guide-2023-07_0.pdf

Nominal High-Altitude Electromagnetic Pulse (HEMP) Waveforms Technical Report to Defense Threat Reduction Agency, January 2019 https://apps.dtic.mil/sti/pdfs/AD1067769.pdf

https://apps.dtic.mil/sti/pdfs/AD1097009.pdf