Preliminary Field Measurements Indicating Spatial Variation in Ambient Gamma Radiation Along a Roadside Verge,

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Summary:

This document records a short, structured field investigation into ambient gamma radiation along a roadside verge and adjacent public footpath. The investigation was undertaken following repeated informal observations of elevated count rates at specific points along the route.

Four measurement conditions were documented: a grass verge background reference location, a ground-level location where elevated readings were observed, a height comparison at that elevated location, and a westward control point along the same verge corridor.

The ground-level measurements at the bus stop verge segment showed count rates and dose values materially higher than those recorded at the nearby background reference and westward control locations. These elevated readings were sustained across multiple short time series observations and were supported by a fifteen-minute integrated spectrum.

A comparison measurement taken at approximately waist height at the same elevated location showed a reduction in count rate, dose rate, and spectral hardness toward background levels. This indicates that the observed elevation was more pronounced near ground level than at increased detector height.

No discrete photopeaks were resolved in any of the spectra acquired during this study. The measurements therefore document spatial and vertical variation in total count density and spectral hardness, rather than identification of specific radionuclides.

The work is exploratory in nature and limited to a single field session. It does not seek to establish source or mechanism. Its purpose is to document observed variation in a structured and transparent manner and to inform consideration of whether further assessment or monitoring may be appropriate.

1. Introduction

This document presents preliminary field measurements of ambient gamma radiation collected along a roadside verge and adjacent public footpath. The measurements were undertaken in response to repeated informal observations of elevated count rates at specific points along the route, prompting a short, structured field investigation.

The primary aim of the investigation was to determine whether these observations represented random fluctuation in background radiation or whether they reflected spatially localised and repeatable variations associated with near-ground conditions. To address this, measurements were conducted across multiple locations using consistent instrumentation, including a grassed verge background reference, measurements at locations of elevated readings, a comparison with increased detector height, and a control measurement further along the same verge.

The work is exploratory in nature and does not seek to identify sources, mechanisms, or potential impacts. Rather, it provides a documented set of observations intended to inform whether further assessment by the appropriate authorities is justified.

Prior to the measurements documented in this note, elevated gamma count rates were informally observed along the same general route during routine use of the instrument on the previous day. These observations prompted the structured measurements described in the main body of this document.

As the earlier observations were conducted under different environmental conditions and without a defined measurement protocol, they are included here for contextual completeness only and are not used in the analysis or interpretation of results presented above.

2. Methods

2.1 Instrumentation

- Device model: RadiaCode 103
- Firmware: 04.14
- Measurement mode: Standard ambient gamma monitoring mode (continuous counting and spectral acquisition)

2.2 Measurement approach

Measurements were conducted using the RadiaCode 103 in its standard ambient gamma monitoring mode, recording continuous count rate (counts per second), ambient dose rate (nSv/h), and gamma energy spectra over defined acquisition periods. Data were collected using a combination of short-duration observations and longer time-integrated measurements (up to 15 minutes) to improve statistical stability and facilitate comparison between locations.

For ground-proximate measurements, the detector was mounted on a wooden stick for ergonomic field use and to provide consistent positioning approximately 2 cm above the ground surface. This configuration was also used while walking along the verge to identify areas of elevated count rate by observing real-time counts per second.

For comparison, measurements were also taken with the detector positioned at approximately waist height. In this configuration, the stick was inverted and used as a support to hold the detector in a stable, elevated position. Following a 15-minute ground-proximate spectrum at a location of elevated readings, a 5-minute elevated (waist-height) measurement was acquired to assess changes in count rate and spectral characteristics with increased distance from the ground surface. The shorter acquisition time was considered sufficient to characterise relative changes in the ambient field at height.

Throughout the field session, the detector was oriented facing downward toward the ground for all near-surface measurements and was only reoriented for the elevated comparison. The detector was kept within the same thin plastic protective bag for the duration of the field study to ensure consistency and to minimise contamination or handling variability.

2.3 Location selection

The survey locations were selected following informal background observations made on the previous day that suggested locally elevated count rates along a specific section of the roadside verge. These Initial reconnaissances demonstrated similar spatial elevation patterns and are included for contextual reference in Appendix A.

Within the selected corridor, measurements were structured to include:

- a grassed verge background reference location,
- a verge segment exhibiting elevated readings,
- a detector height comparison at the elevated location, and
- a westward control point located several hundred metres along the same verge.

This structured selection was intended to distinguish localised near-ground effects from broader ambient background conditions.

2.4 Images & Screenshots

All site photographs were taken in situ on 9 February 2026 with GPS geotagging enabled. Original image files are retained in their native format within the project archive without alteration.

Screenshots of the RadiaCode application were captured contemporaneously during measurements to document real-time count rate, dose rate, and energy spectrum displays at the conclusion of each acquisition period. These screenshots are also retained in their original digital format.

Unedited source files and associated metadata are archived and may be made available to the relevant authorities upon reasonable request.

3. Results

3.1 Experiment 1 – Grass verge background reference

A background reference measurement was conducted on an undisturbed grass verge adjacent to the roadside, selected for the absence of visible surface disturbance, standing water, or exposed sediment. This location was used to characterise ambient background gamma radiation under conditions representative of vegetated ground cover within the study area.

Figure 1 - Context image for Experiment 1 – grass verge background reference location.

3.1.1 Time series observations

The measurement was performed with the detector positioned approximately 2 cm above ground level, oriented toward the surface, using the standard ambient gamma monitoring mode described in Section 2.2. A short-duration (two-minute) time series was acquired to establish baseline count rate and dose conditions, followed by an approximately 10-minute spectrum acquisition.

Observed count rates were approximately 4.5–5.5 CPS, with corresponding dose rates of ~60–80 nSv/h. Hardness values remained stable at approximately 1.0–1.2 throughout the acquisition period.

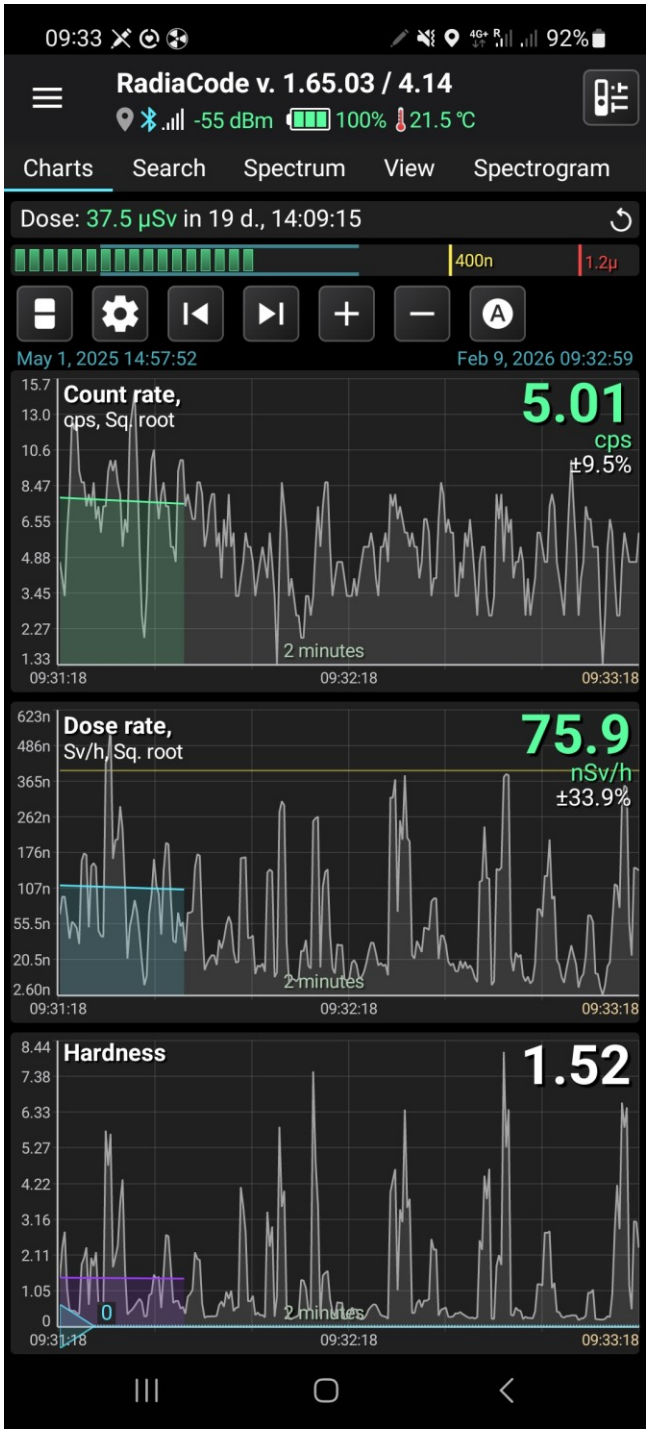


*Figure 2 - Two-minute time series showing real-time relationships between count rate (counts per second, CPS), ambient dose rate (nSv/h), and spectral hardness. (See appendix ** on Hardness)*

3.1.2 Integrated spectrum (10-minute accumulation)

A longer 10-minute spectrum was acquired at the same location.

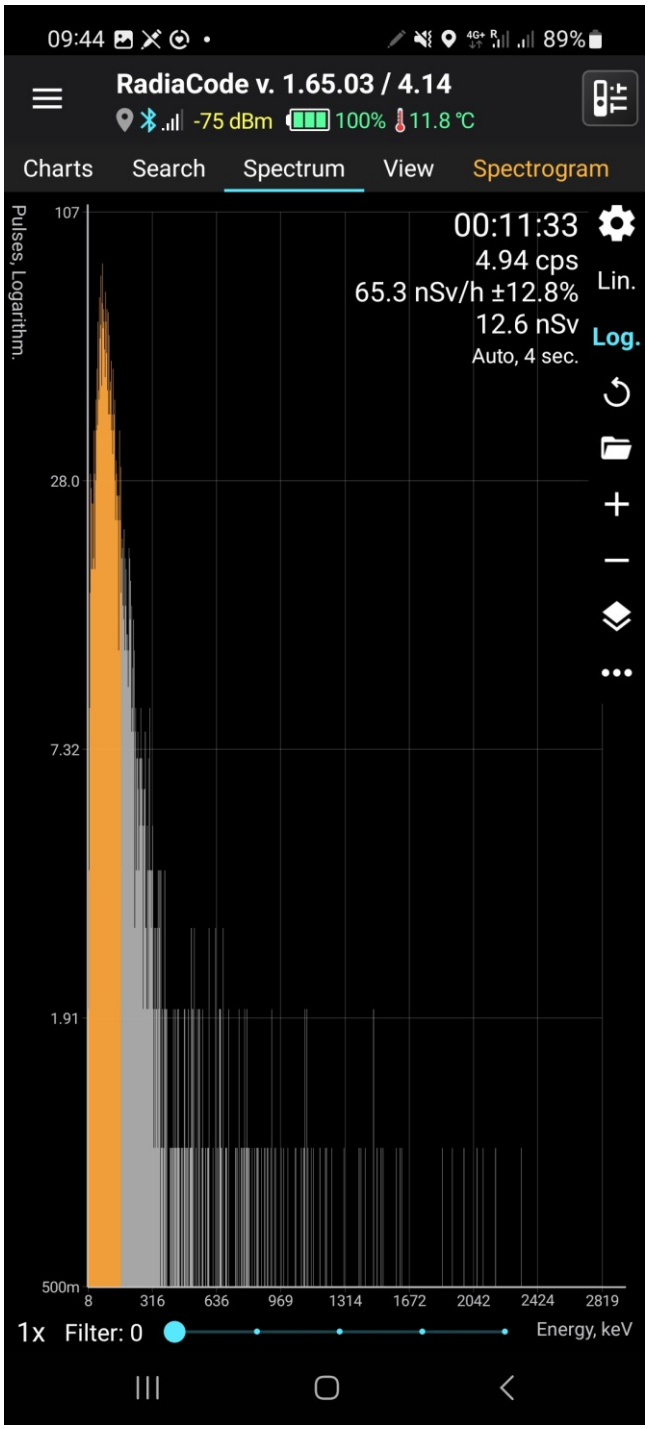


Figure 3 - Gamma energy spectrum from Experiment 1 acquired over an approximately 10-minute accumulation period (00:11:33; mean 4.94 CPS; 65.3 nSv/h).

The spectrum was dominated by low-energy counts and showed no prominent discrete photopeaks. This measurement provides a local background reference against which subsequent measurements at other verge locations are compared.

3.2 Experiment 2 – Elevated roadside verge measurement (Bus stop location)

A second measurement location (E2) was identified approximately a few hundred metres west of the background reference point, adjacent to the bus stop on Preston New Road (Little Plumpton), along the same grass verge corridor.

The location was identified during a walking survey using Search mode, where count rate increased relative to adjacent verge segments. The area presents similar general environmental conditions to the background site (vegetated verge, roadside proximity), allowing direct comparison under broadly comparable surface and weather conditions.

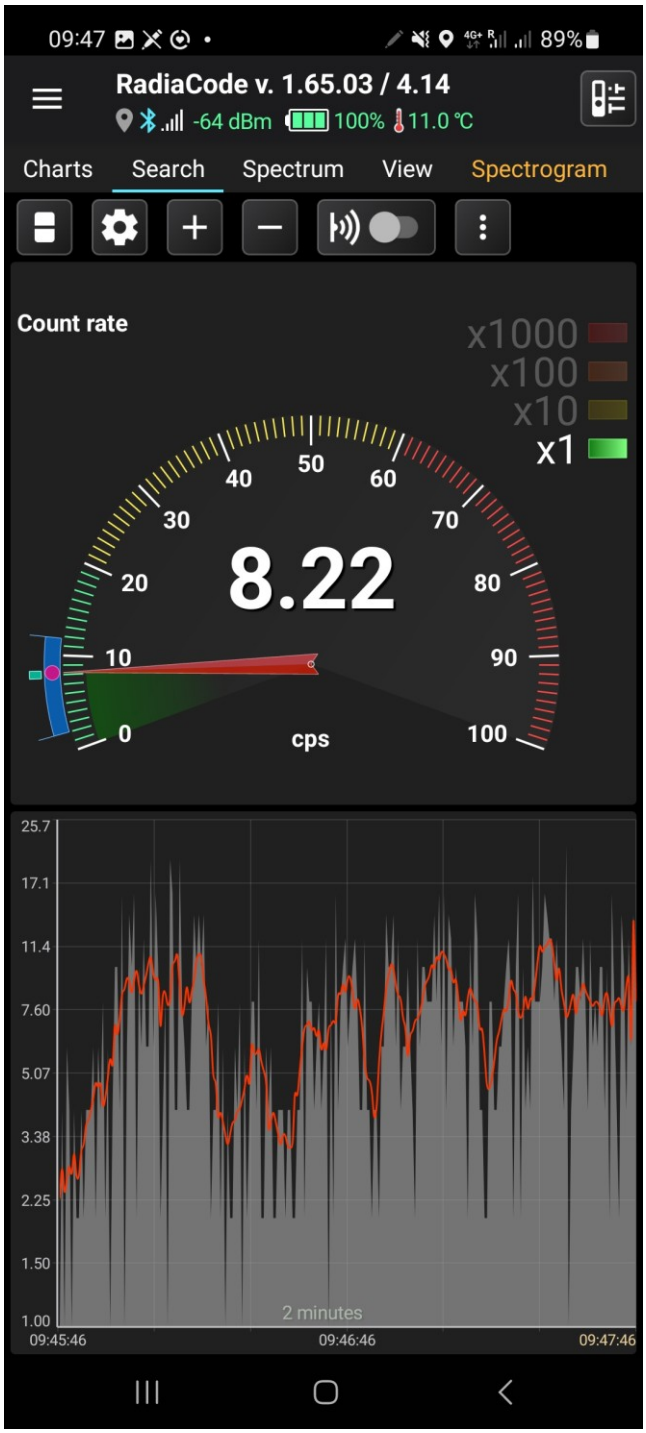


Figure 4 - Search mode graph showing elevated count rate at selected verge location.

Figure 5 - Context image of Experiment 2 location (bus stop verge, Preston New Road)

3.2.1 Time series observations

Three short-duration (approximately two-minute) time series were recorded during a 15-minute stationary observation period at near-ground level with the detector oriented toward the surface.

Representative results are shown in Figure 6.

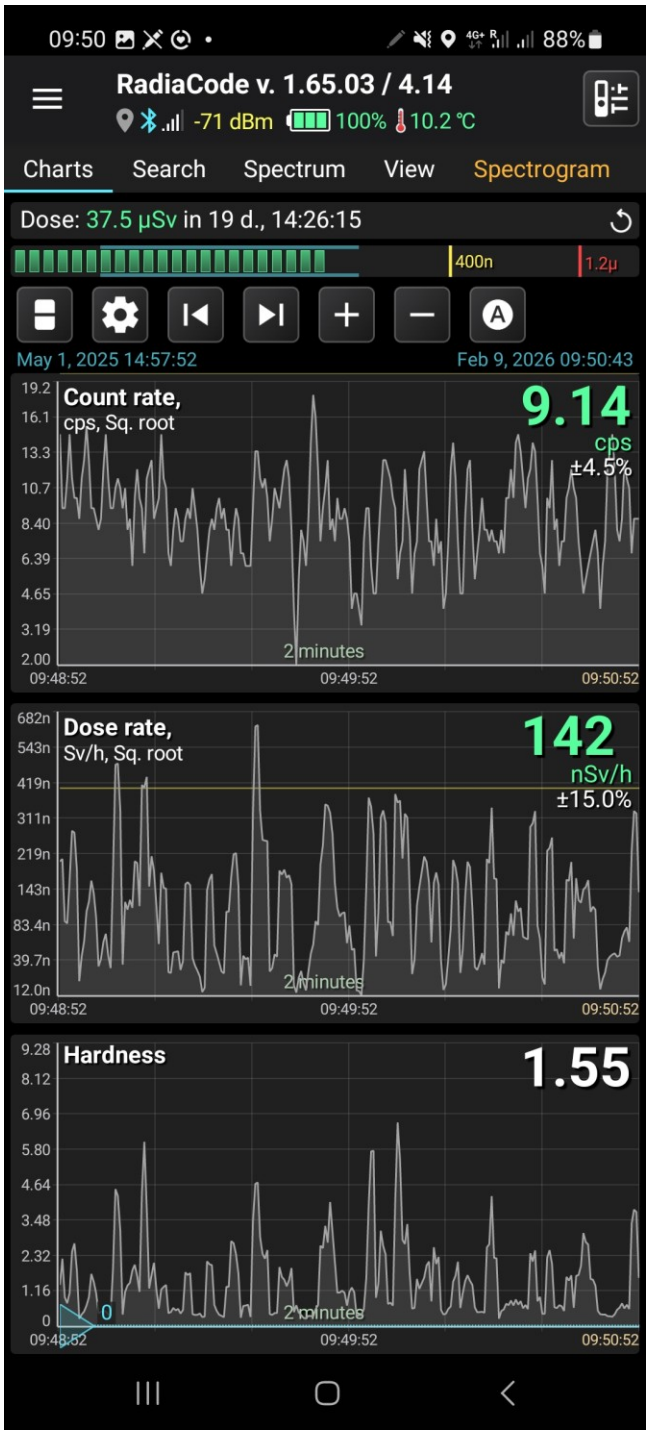


Figure 6 - Two-minute time series from Experiment 2 showing count rate, dose rate and hardness

Observed count rates during these intervals ranged between approximately 8–9.5 CPS, with corresponding dose rates typically between 130–150 nSv/h. These values are materially elevated relative to the background reference (Section 3.1), which averaged ~5 CPS and ~60–80 nSv/h under comparable acquisition settings.

3.2.2 Integrated spectrum (15-minute accumulation)

A 15-minute gamma spectrum was acquired at the same location with the detector positioned approximately 2 cm above ground level.

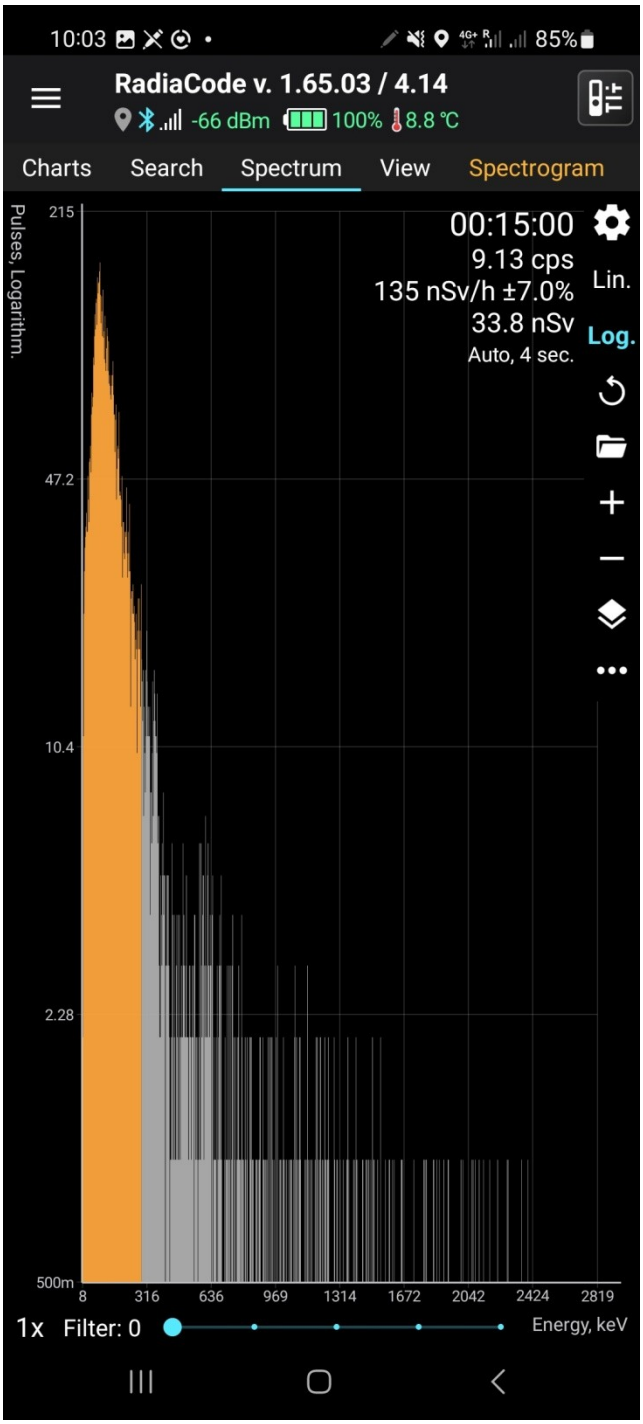


Figure 7 - Gamma energy spectrum at Experiment 2 (15-minute accumulation; mean ~9.1 CPS; ~135 nSv/h)

The integrated spectrum shows a clear increase in total counts across the low-energy region relative to the background reference. No dominant discrete photopeaks were resolved during the acquisition period; however, overall count density across the lower energy bands is visibly elevated.

The sustained increase in both CPS and dose rate relative to the background location indicates that the elevation observed in Search mode reflects a persistent local condition rather than transient statistical fluctuation.

3.3 Experiment 3 – Detector height comparison (waist-level measurement)

To assess whether the elevated readings observed at ground level in Experiment 2 were persistent at greater height, a follow-up measurement was conducted at the same location. The detector was positioned at approximately waist height (~0.8–1.0 m above ground level) and oriented horizontally toward the west.

3.3.1 Time series observations

A short-duration time series was recorded under otherwise similar environmental conditions.

Measured count rates during this interval were approximately 6 CPS, with corresponding dose rates around 60–70 nSv/h. These values were lower than those recorded at ground level during Experiment 2 and more closely aligned with the background reference measurements obtained in Experiment 1.

Hardness values during this interval were approximately 1.0–1.1, comparable to the background reference location and lower than those observed during the elevated ground-level measurements.

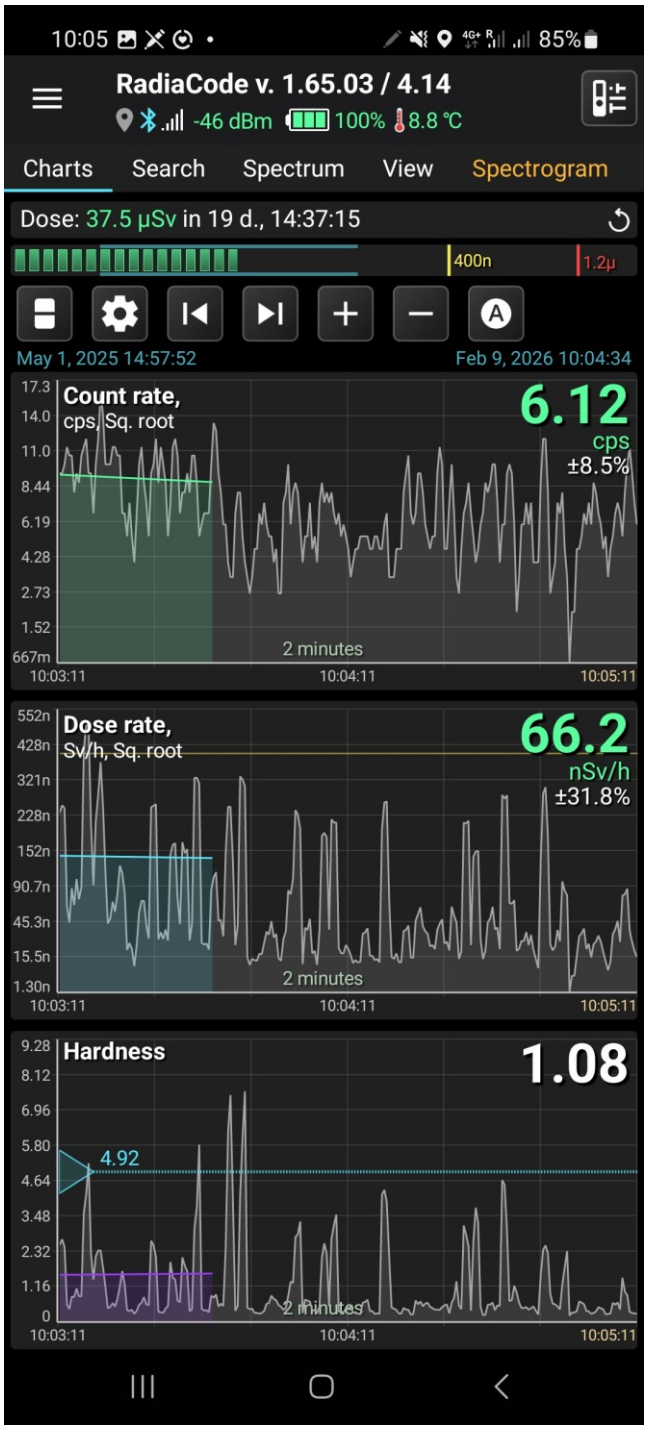


Figure 8 - Time series for waist-height measurement

3.3.2 Integrated spectrum (5-minute accumulation)

A five-minute spectrum was acquired at waist height following the time series observation.

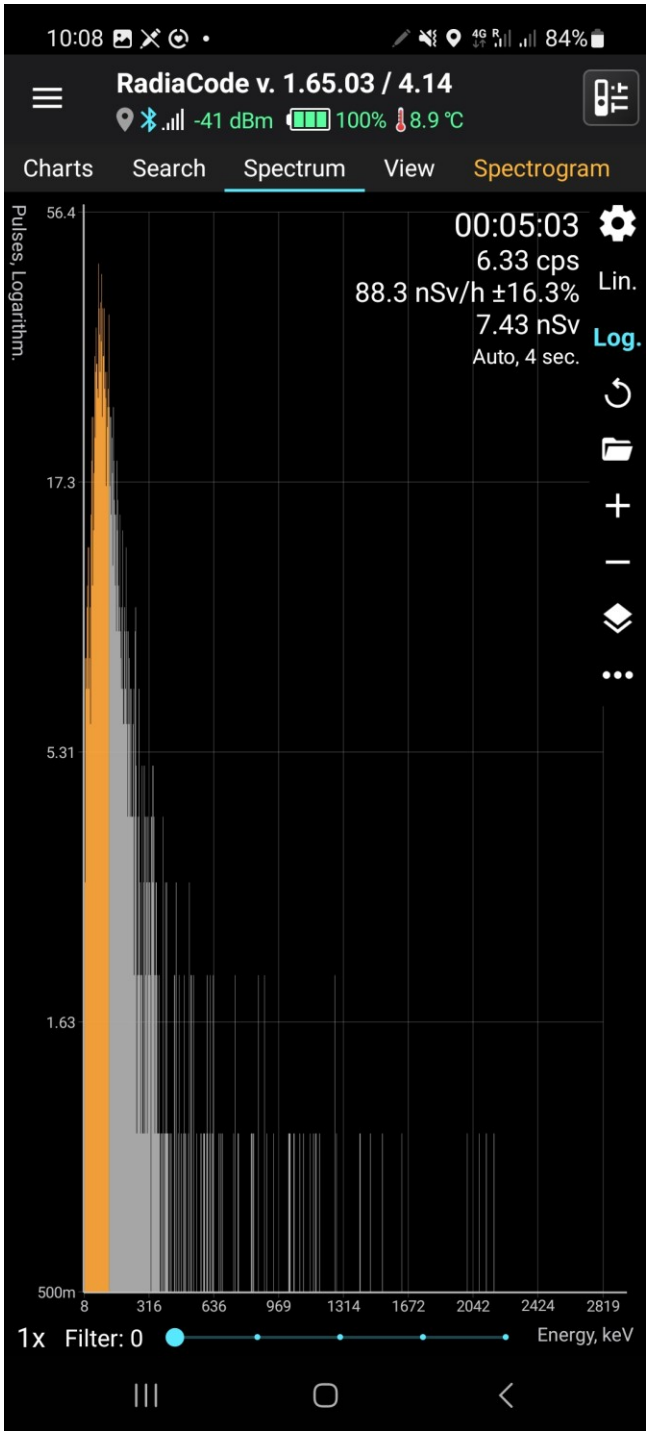


Figure 9 - Gamma energy spectrum, waist height

The spectrum was dominated by low-energy counts and did not display distinct discrete photopeaks over the acquisition period. Spectral character was consistent with background conditions and differed from the modest hardness increase observed during the elevated ground-level measurement.

Figure 10 - Context image for Experiment 4 showing westward control location along the verge corridor.

Context image showing detector position during waist-height measurement

These observations indicate that the elevated radiation levels recorded in Experiment 2 were more pronounced near ground level and diminished with increased detector height.

3.4 Experiment 4 – Westward control point (vegetated verge)

A control measurement was conducted further west along the same verge corridor, beyond the elevated bus stop location described in Section 3.2. This position was selected to provide a spatial comparison under broadly similar environmental conditions but outside the segment where elevated count rates had previously been observed. The location consisted of vegetated ground

adjacent to the footpath and hedge line, with no visible standing water, exposed sediment, or obvious surface disturbance at the measurement point.

Figure 11 - Context image for Experiment 4 showing westward control location along the verge corridor.

The detector was positioned near ground level, oriented toward the verge surface, and held stationary for the duration of measurement. Four short two-minute time series observations were recorded during the measurement window to assess short-term variability in count rate, dose rate, and hardness. A longer accumulated gamma energy spectrum was also acquired over approximately fifteen minutes to improve statistical stability.

3.4.1 Time series observations

Across the four short time series samples, count rates were consistently in the range of approximately 4.3 to 4.6 counts per second. Associated dose rates were typically between approximately 46 and 58 nSv/h. Hardness values during these observations were generally between approximately 1.07 and 1.25, comparable to those recorded at the grass verge background reference location in Section 3.1.

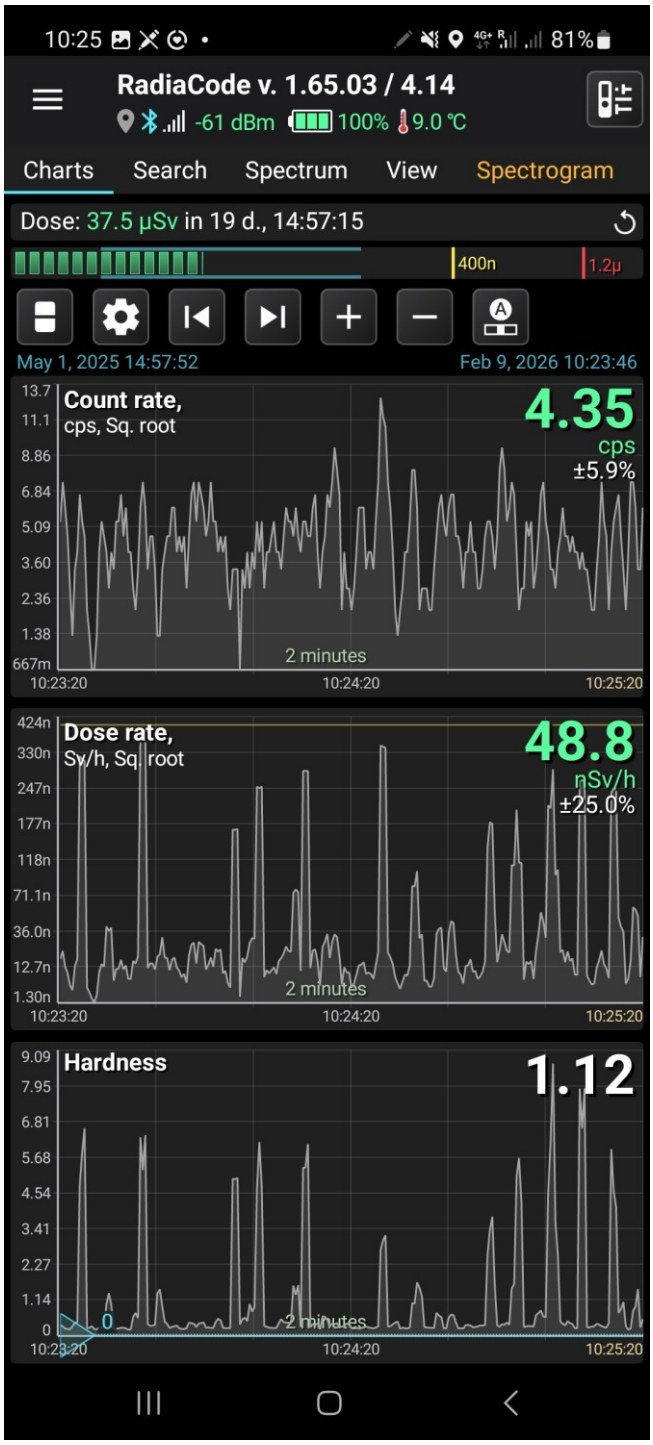


Figure 12 – Representative two-minute time series from Experiment 4 showing count rate, dose rate, and hardness.

3.4.2 Integrated spectrum (15-minute accumulation)

The fifteen-minute accumulated spectrum yielded a mean count rate of approximately 4.4 counts per second and a dose rate of approximately 48–50 nSv/h. The spectrum was dominated by low-energy counts with no clearly resolved discrete photopeaks over the acquisition period, consistent with natural background gamma radiation at vegetated ground level.

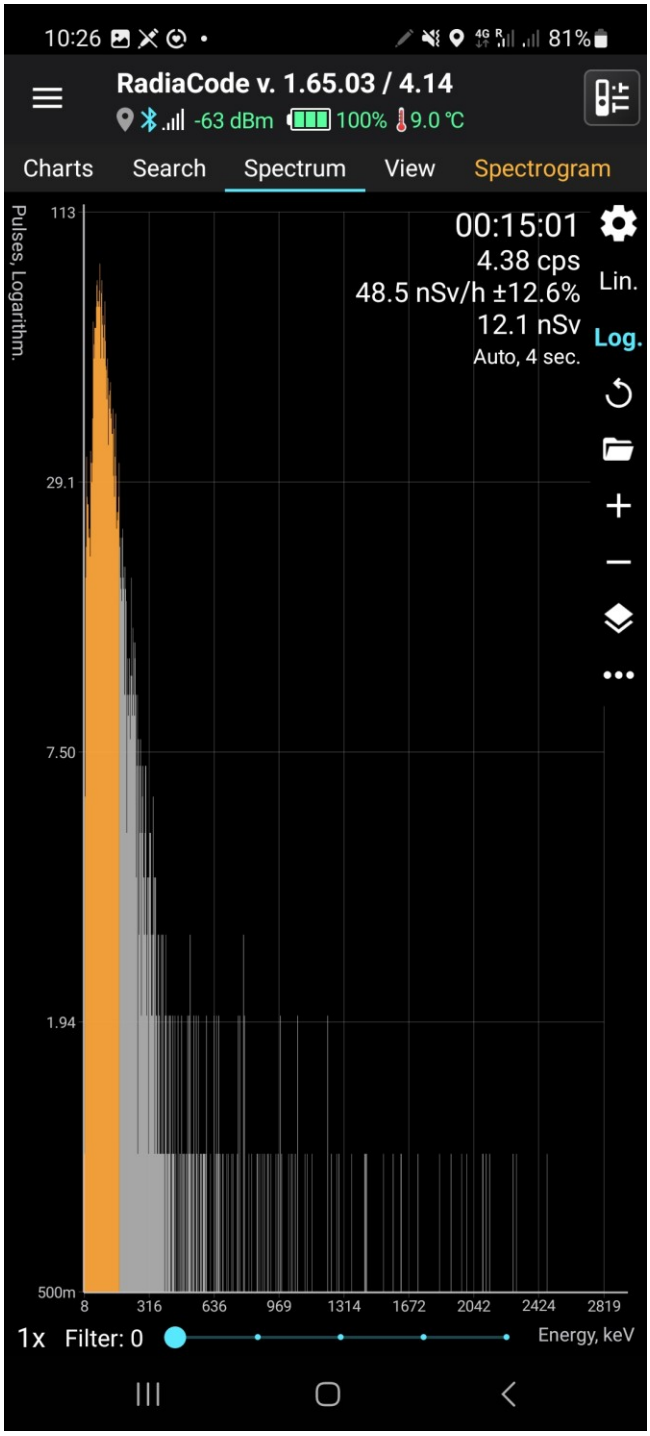


Figure 13 – Gamma energy spectrum accumulated over fifteen minutes at the westward control location.

Overall, the westward control point exhibited count rates, dose rates, and spectral hardness values consistent with local background conditions as established in Experiment 1. These results provide a spatial control for comparison with the elevated measurements recorded at the bus stop verge segment described in Section 3.2.

4. Observations and Limitations

The measurements presented in Section 3 demonstrate spatial variation in ambient gamma count rate and dose along a relatively short section of roadside verge. Elevated values were observed at one ground-level location (Experiment 2), while measurements taken at a background reference point (Experiment 1), at increased detector height (Experiment 3), and at a westward control point (Experiment 4) were consistent with typical local background conditions.

The elevated readings recorded at the bus stop verge segment were sustained across multiple short time series observations and were supported by a 15-minute integrated spectrum. The reduction in count rate and spectral hardness observed during the waist-height measurement suggests that the elevation was more pronounced near ground level than at increased detector height.

No discrete photopeaks were resolved in any of the spectra acquired during this study. The measurements therefore indicate differences in total count density and spectral hardness rather than identification of specific radionuclides.

The work described in this note is exploratory in nature and was conducted over a limited time period during a single field session. Environmental variables such as soil moisture, atmospheric radon concentration, and transient background variation were not independently measured. The instrument was not energy-calibrated in the field beyond factory settings, and no laboratory analysis of soil or vegetation samples was undertaken.

Additional elevated readings were informally observed at other low-lying points along the verge corridor during the same session; however, these locations were not systematically measured or recorded and are therefore not included in the evidential comparison.

Elevated count rates were also observed on the previous day during informal instrument use along the same general route. These observations occurred prior to the structured measurements documented in Section 3 and prompted the formalised survey. Overnight rainfall occurred between the informal observations and the structured field session described in this document.

Rainfall and surface moisture conditions can influence near-surface gamma measurements through changes in soil attenuation, radon progeny deposition, and surface water redistribution. No independent measurements of soil moisture, precipitation intensity, or atmospheric radon concentration were undertaken during either day. As such, while the temporal sequence of informal observations and subsequent rainfall is noted for contextual completeness, no causal inference is made regarding the role of precipitation in the variations observed.

The observations presented here are limited to documented count rate, dose rate, and spectral hardness differences under the conditions described. No conclusions are drawn regarding source, mechanism, or potential impact. The purpose of this section is to describe observed variation and to define the scope and limits of the measurements conducted. The instrument was used in its standard configuration without shielding or collimation.

5. Conclusion

This technical note documents a structured set of ambient gamma radiation measurements conducted along a roadside verge corridor following informal observations of elevated count rates. The measurements demonstrate that count rate and dose values at one ground-level location were materially higher than those recorded at a nearby vegetated background reference point and at a westward control location under comparable environmental conditions.

The elevated readings were sustained across multiple short time series observations and supported by a fifteen-minute integrated spectrum. A comparison measurement taken at waist height at the same elevated location showed a reduction in count rate, dose rate, and spectral hardness toward background levels. This indicates that the observed elevation was more pronounced near ground level and was not uniform within the surrounding air column.

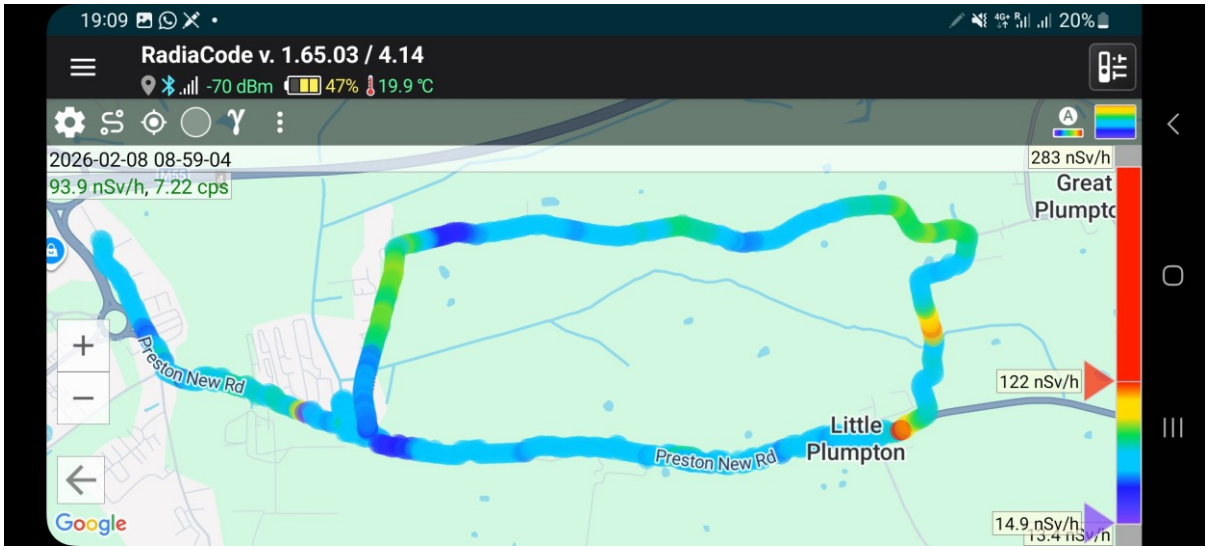
No discrete photopeaks were resolved in any of the spectra acquired during this study. The measurements therefore demonstrate spatial and vertical variation in total count density and spectral hardness rather than identification of specific radionuclides.

Within the context of the wider ongoing observational project, this note provides a documented example of localised near-surface radiological variation within a publicly accessible verge environment. The findings neither establish causation nor attribute source. They do, however, demonstrate that spatially structured differences in ambient gamma radiation can occur over short distances within the study area.

The purpose of this document is to place these observations on record in a structured and transparent manner. The results are presented to support consideration of whether any further formal monitoring or assessment is warranted.

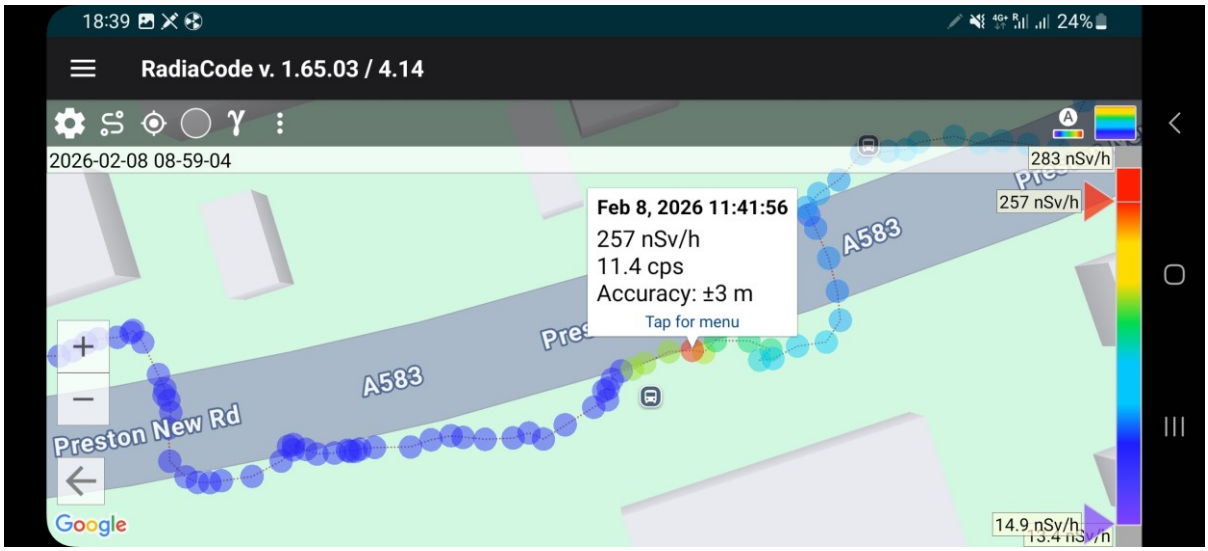
Appendix A – Prior Informal Observations (Contextual Only)

A.1 Initial Circular Route (08 February 2026)



Informal ambient gamma measurements were recorded along a circular route encompassing Preston New Road and Moss House Lane on the morning of 8 February 2026. Figure A1 shows a heatmap representation of count rate and dose rate collected during this session. Elevated readings appeared at several segments of the route, including a notable reading near the location that was later formally surveyed in Section 3.

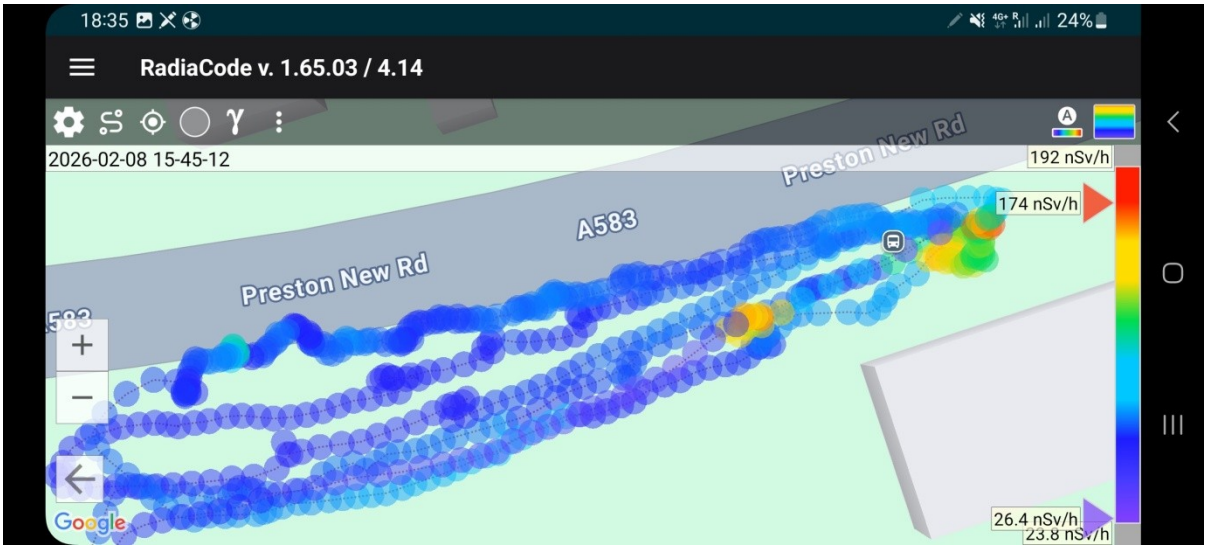
A.2 Elevated Readings Along Verge (08 February 2026)



Subsequent passes along the same road and footpath corridor in the afternoon of the same day confirmed repeatable elevated areas (Figure A2). These elevated readings were detected during

mobile survey mode and appeared spatially localised when compared against surrounding segments along the same general route.

A.3 Parallel Path Reconnaissance (08 February 2026)



Later on 08 February 2026, a more structured reconnaissance was conducted along parallel footpath segments to better localise the elevated readings (Figure A3). This repeat pass provided confirmation of the spatial distribution of higher count rate values and prompted the return visit next day to undertake the structured measurements documented in Section 3.

A.4 Environmental Context

Meteorological records for the region around Little Plumpton and Blackpool indicate light rain and drizzle around the mid-part of 8 February 2026, with similar conditions extending into 9 February 2026, consistent with local weather history for the period.

Visible surface water was present on roadway surfaces and verge locations on the morning of 9 February 2026 during the structured field session. No independent measurements of precipitation amount, soil moisture, or related meteorological variables were made. The purpose in noting the weather context is to document environmental conditions during and between the informal reconnaissance and structured measurements. No causal inference is made regarding the influence of rainfall on the observed radiation measurements.

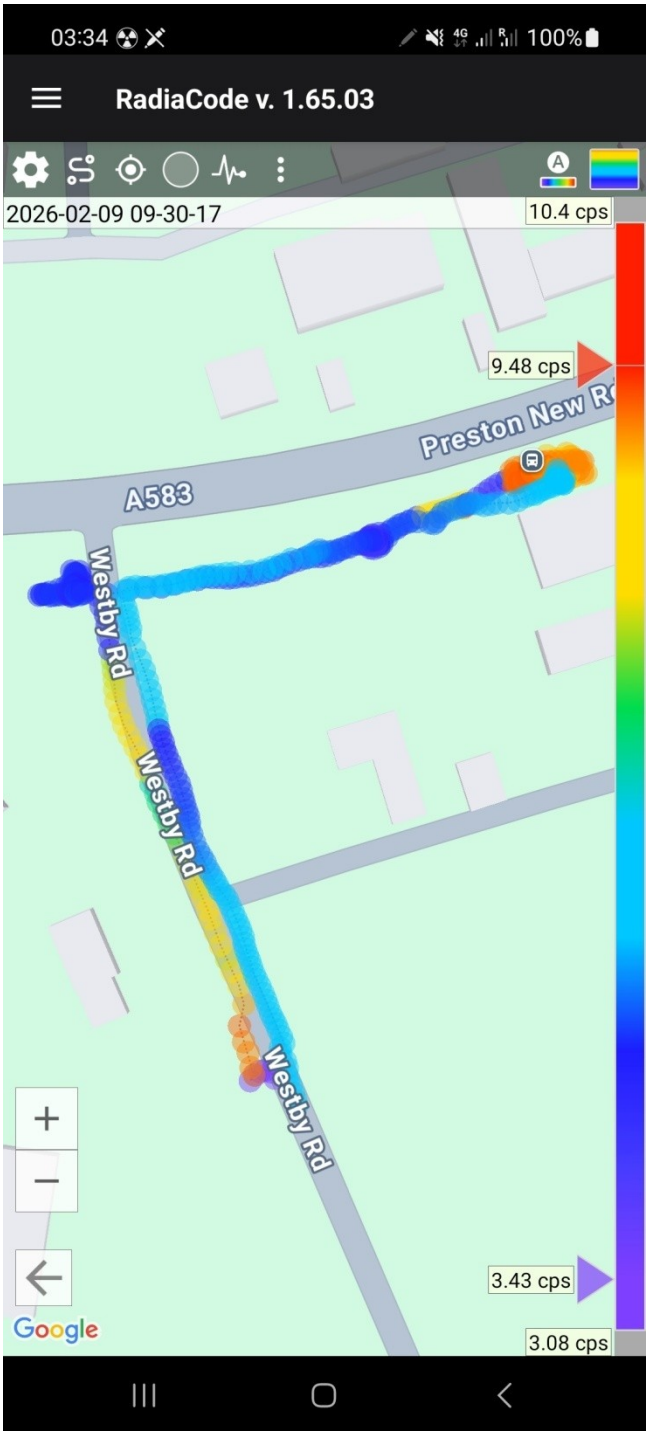
Appendix B – Spatial Track Map of Measurements (09 February 2026)0

Appendix B presents the recorded walking track and associated radiation measurements collected during the structured field session described in Section 3. The mapped points are derived from the phone's internal GPS logging and are approximate to within the accuracy indicated by the instrument at the time of recording.

Elevated count and dose values were observed preferentially along the west (downhill) side of Westby Road, consistent with the direction of surface water discharge from road camber. The east (uphill) side showed comparatively lower values during the same session.

Figure B1 shows the dose rate track along Preston New Road and Westby Road during the measurement session. Elevated readings are visible at the bus stop verge segment described in Experiment 2, with lower values recorded along adjacent sections of the route.

Figure B2 presents the corresponding count rate track over the same route and time window. Spatial patterns are broadly consistent with the dose rate distribution.



The southern segment of the route lies at a lower topographic elevation relative to the bus stop verge location. Wet surface conditions were observed along parts of the route at the time of measurement. No topographic survey or hydrological assessment was undertaken; these observations are noted for contextual completeness only.

The track map illustrates spatial variation observed during the session but does not represent a continuous calibrated survey. The purpose of this appendix is to provide visual context for the structured point measurements documented in Section 3.