Comment 1:

"The authors must clarify the environmental conditions under which the dataset was gathered."

Ans: The experimental conditions have been clarified in the manuscript. The dataset was collected under controlled laboratory conditions with fixed reader-tag geometry and without intentionally introducing external reflectors or environmental disturbances. This enabled isolation of corrosion-induced RFID variations from environmental effects. We have already mentioned this in the paper in lines 180–181 that measurements were conducted in a typical indoor office environment containing metallic furniture and other sources of multipath clutter [7]. However, we have now explicitly explained this in more detail between lines 182–187.

Addressed in the manuscript:

"All RFID measurements were acquired under controlled laboratory conditions. During data acquisition, the relative positions of the RFID reader, antenna, and test samples were maintained constant to minimise geometric variability. No intentional metallic or dielectric reflectors were introduced into the reader–tag path. Therefore, the dataset primarily captures variations caused by corrosion progression rather than environmental perturbations."

Comment 2:

"Introduce a discussion or a baseline test demonstrating how the classifier performs when an external geometric reflector (such as a moving metallic or dielectric object) is placed near the transmission path."

Ans: We agree that nearby metallic or dielectric objects can influence RFID measurements through multipath propagation, reflection, and signal scattering. A dedicated baseline experiment using controlled external reflectors would indeed provide valuable quantitative insight into the robustness of classifiers under environmental perturbations. However, the objective of this study was to evaluate corrosion progression under controlled laboratory conditions, where the positions of the RFID reader, antenna, and test samples were kept fixed to minimise geometric variability and isolate corrosion-induced changes. Consequently, environmental reflector effects were intentionally excluded from the experimental design.

To address this limitation, we have now explicitly discussed the potential influence of surrounding objects in Section 4.1 and cited established RFID propagation studies demonstrating how nearby conductive or dielectric objects affect RFID link performance.

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Addressed in the manuscript (Section 4.1, lines 420–424):

"RFID measurements are inherently influenced by the surrounding electromagnetic environment. Previous RFID propagation studies have shown that nearby conductive or dielectric objects can introduce multipath scattering, reflection, and blockage effects that alter received signal strength

and backscatter performance. Consequently, an external reflector placed near the reader–tag path may affect measured RFID features independently of corrosion [26]."

Reference [26]: Griffin, J.D.; Durgin, G.D. Complete link budgets for backscatter-radio and RFID systems. IEEE Antennas and Propagation Magazine 2009, 51, 11–25.

Comment 3:

"Provide proof of structural robustness against spatial misalignment."

Ans: The manuscript now explicitly discusses the influence of reader-tag alignment and polarisation mismatch on RFID measurements. To isolate corrosion effects, a fixed measurement geometry was maintained throughout dataset acquisition.

Addressed in the manuscript (Section 3.1, Dataset Acquisition, lines 187–191):

"RFID system performance depends on the relative geometry between reader and tag antennas. Variations in alignment can change antenna coupling and polarisation matching, leading to variations in received signal strength and communication reliability. Previous RFID studies have identified polarisation mismatch and geometric orientation as important contributors to RFID link variability [2,7,11]."

Comment 4:

"The authors should evaluate or explicitly discuss the system's sensitivity boundaries: what happens to the classification accuracy when the reader antenna is tilted."

Ans: We agree that reader antenna orientation may influence RFID measurements through polarisation mismatch effects. This limitation has now been acknowledged in the manuscript. Since antenna orientation remained fixed during all measurements, the reported classification accuracy reflects corrosion discrimination rather than orientation-induced variability.

Addressed in the manuscript (Section 3.1, Dataset Acquisition, lines 191–198):

" Also, antenna tilt can alter the polarisation relationship between the reader and RFID tag. RFID link-budget studies have shown that polarisation mismatch introduces additional signal attenuation and may reduce received power levels. Consequently, significant reader antenna tilt may influence feature values used by the classifier [22]. Since the present experiments were conducted using a fixed antenna orientation and reader and sample positioning were maintained constant throughout data acquisition, therefore, classification results represent corrosion-induced variability under fixed geometric conditions."

Reference [22] (Jouali, R.; Ouahmane, H.; Khan, J.; Liaqat, M.; Bhaij, A.; Ahmad, S.; Haddad, A.; Aoutoul, M. Improved stable read range of the RFID tag using slot apertures and capacitive gaps for outdoor localization applications. Micromachines 2023, 14, 1364) has been newly added to the reference list to support this discussion.

Comment 5:

"For an NDT application, understanding the underlying electromagnetic physics is crucial."

Ans: We thank the reviewer for this important observation. To address this concern, we have added a discussion explaining the physical basis of RFID corrosion sensing. Specifically, corrosion alters the electromagnetic properties of the steel substrate, including conductivity, magnetic permeability, surface roughness, and corrosion-product morphology. These changes affect the interaction between the RFID tag antenna and the metallic surface, leading to variations in impedance matching, coupling efficiency, and backscatter response. Consequently, the RFID-derived features used by the machine learning model are linked to corrosion-induced electromagnetic changes rather than representing purely empirical indicators. We have incorporated this explanation in Section 4.1 and cited prior RFID corrosion studies that demonstrate the influence of conductivity and permeability changes on RFID sensing performance, including two newly added references.

Addressed in the manuscript (Section 4.1, lines 411–418):

"The physical basis of RFID corrosion sensing arises from the interaction between the tag antenna electromagnetic field and the corroding metallic substrate. As corrosion develops, the local conductivity, magnetic permeability, surface roughness, and corrosion-product morphology of the steel surface change [7,10,24]. These changes modify the antenna boundary conditions, impedance matching, coupling efficiency, and backscatter response of the RFID tag [25]. Therefore, variations in RFID-derived features are not purely empirical but originate from corrosion-induced changes in the electromagnetic interaction between the tag antenna and the steel substrate. Previous LF RFID corrosion studies have similarly shown that conductivity and permeability variations in corrosion layers influence RFID impedance matching and sensing performance [10,24]."

Two new references were added to support this discussion: reference [24] (Sunny, G.A. Passive low frequency RFID for non-destructive evaluation and monitoring. PhD thesis, Newcastle University, 2017) and reference [25] (Soodmand, S.; Zhao, A.; Tian, G.Y. UHF RFID system for wirelessly detection of corrosion based on resonance frequency shift in forward interrogation power. IET Microwaves, Antennas & Propagation 2018, 12, 1877–1884).

Comment 6:

"The paper fails to explain* why *certain features (e.g., specific frequency channels or read rate thresholds) carry higher weights during feature selection."

Ans: We thank the reviewer for this valuable comment. To improve the physical interpretability of the machine learning model, we have added a discussion explaining the significance of the most influential RFID features. In particular, we clarify that forward power (threshold power) is physically meaningful because it represents the minimum reader power required to activate the RFID tag. Corrosion-induced changes in conductivity, magnetic permeability, and surface morphology can modify the antenna impedance and coupling conditions between the tag and the metallic substrate. These changes affect power-transfer efficiency and consequently alter the activation power required for successful tag operation. Therefore, the high importance assigned to forward power is consistent with established RFID link-budget theory, where impedance mismatch and coupling efficiency directly influence delivered tag power and read performance. This explanation has been added to the manuscript to provide a clearer connection between feature importance and the underlying sensing physics.

Addressed in the manuscript (Section 4.3, lines 565–572):

"Forward power is physically meaningful because it represents the reader power required to activate the RFID tag. Corrosion-induced changes in conductivity, permeability, and surface morphology modify the tag antenna impedance and coupling conditions. This alters the power-transfer efficiency between the reader and tag, meaning that more severely corroded samples may require higher activation power. Therefore, the high importance assigned to forward power is consistent with RFID link-budget theory [26], where impedance mismatch and antenna coupling directly affect delivered tag power and read performance."