



EGUsphere, author comment AC1  
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## Reply on RC1

Maximilian Schaper et al.

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Author comment on "Radio frequency interference detection and mitigation in the DWD C-band weather radar network" by Maximilian Schaper et al., EGU sphere,  
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### Regarding the general comment:

All requested issues are addressed below and improvements to the English language have been made.

### Regarding the specific comments:

Line 78: It is correct, that the computation of SQI does not involve the correlation of the Rx-signal with the Tx-signal, but the so called "coherence" with the Tx-pulse is intrinsic to the retrieved moment. When calculating the radar moments from IQ-data the Tx-phase is crucial. Therefore, the random phase of each Tx-pulse is recorded (random each pulse due to magnetron drift). During processing, the measured IQ-data is shifted in phase to cohere to the Tx-pulse, which has a major impact on the resulting moments, as it effects the separation of signal and noise. This step is necessary as the auto correlation lag one is not calculated by shifting a single pulse (IQ time series) in range, but by correlating successive pulses in the range gate. Therefore, a reasonable correlation can only be retrieved, if both Rx-signals are correctly aligned based on their individual Tx-phase. To achieve this, each Rx-pulse has to be coherent to its Tx-pulse. In particular, this effect is commonly used to identify and eliminate 2nd and multi trip echoes. If the utilized Tx-phase does not match the Rx-signal, the signal appears as white noise in the power spectrum due to its random phase. A meaningful signal is only retrieved if the measured IQ-data is shifted correctly to cohere to the Tx-pulse. In other words, a non-coherent Rx-pulse will always lower the retrieved SQI, even though the calculation is done by solely correlating successive pulses. As such, any external interference signal will be non-coherent to the transmitted radar pulse and thereby, it will increase the spectral width and reduce the SQI. On the other hand, a coherent external signal would be interpreted as valid weather signal with a high SQI. - Clarified marked sentence: "SQI quantifies the coherence..." to "SQI effectively quantifies the coherence...".

Line 81: added reference to range gates, now: "...about 50 pulses are aggregated within one ray for each range gate..."

Line 93: "uncorrected reflectivity" highlights the fact that there are no filters applied at all, added: "In (a) uncorrected reflectively (UZ) is shown, which is derived from the received

power without applying a clutter filter or a thresholding."

Line 100: The SQI and STD thresholds are taken from the definition used in the GAMIC signal processor ENIGMA. There they are used to identify and flag external interference. No further effort was taken to verify the chosen values as the detection seems reasonable (see RHunt verification). Therefore I am not able to provide any further statistical insight. However, it is important to note that, as of now, one can not find the "YY%" as requested in the question "...while YY% of RFI signals are below the SQI threshold and above the STD threshold.", because as of now there are no continuously available, independent data to verify if an RFI signal was/is present. Only the chosen thresholds of SQI and STD yield the classification of RFI contaminated rays based on the radar data itself.

Figure 3: The dashed lines at SNR of 0 dB and 20dB mark the limits for "persistent" and "strong" RFI sources regarding the RFI class (see also table 1). Added: "Dashed lines in the left panel correspond to RFI class SNR limits (persistent and strong)."

Figure 4: TSG references the built-in "test signal generator" used to calibrate the receive path of the radar. Added: "Also shown is the test signal generator (TSG), which is used to calibrate each receive path."

Figure 8: The amount of disturbance caused by RFI sources (percentage of compromised rays) is accumulated in each bin. The result is then scaled by the total percentage of caused disturbance. The plotted unit is therefore a scaled percentage (percent scaled by total percent).

Line 385: rewrote the sentence for clarification: "In order to relate the pure number of detected RFI sources to an actual threat to data quality caused by them, the disturbance caused by each RFI source is evaluated as a daily mean fraction of disturbed rays."

Figure 9: " $a^{-1}$ " means each year and the value is thereby the inclination of the fitted line.

Line 479: This is a spelling issue, now: "12,960 RFI ray boxes" instead of "12.960 RFI ray boxes"

Line 481: This is a spelling issue, now: "about 6,000" instead of "about 6.000"

### **Regarding the technical comments:**

Changed American "ze" spelling to "se" everywhere.

Changed "chapter" to "section" everywhere.

Changed all mentions of DFS to dynamic frequency selection.

Replaced "RFIs" with "RFI sources" everywhere.

Replaced "WIFI" with "Wi-Fi" everywhere.

Changed spelling of "short-lived" and "long-lived" everywhere.

Line 7-189: Added all suggestions.

Changed redundant mentions of "Isen (ISN)" to "ISN".

Line 226: Changed as suggested.

Line 246: I would prefer to keep it spelled out here, as this is where the DFS is explained in detail.

Line 251-267: Added all suggestions.

Changed redundant mentions of "Hohenpeißenberg (MHP)" to "MHP".

Line 281-356: Added all suggestions.

Figure 7: Changed legends of Figure 7 and Figure 8 as suggested.

Line 359-373: Added all suggestions.

Line 391: rewrote as suggested, now: "...for which an active mitigation process is expected to identify the RFI source."

Figure 9: Here the values shown are accumulated - changed legend to: ">= moderate (S >= 0)", ...

Line 408-411: Added all suggestions.

Line 422: Sentence kept as is: here "on average several weeks" is meant not "an average of several weeks"

Line 422-458: Added all suggestions.

Figure A1: Changed as suggested.

Line 510: Sentence kept as is: here a distance in the time dimension is meant

Line 530-540: Added all suggestions.