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Investigation on RFI in weather radars at C and X band

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One of the main challenges in weather radar data quality is electromagnetic interference. Often weather radars operate in frequency bands close to, or shared with, other telecommunication systems. This is the case of C and X-band weather radars managed by Arpa Piemonte, the environmental protection agency of Piemonte region, Italy and the X-band weather network of Dallas Fort Worth (USA). The amount of interferences received by these radars are affecting the data quality, especially for polarimetric observations. In Italy, like in most European countries, operational weather radars operate at C-band, around 5.6GHz, sharing the frequency band with Radio Local Area Network (RLAN) and Wireless Local Area Network. These telecommunication systems are continuously increasing in rural areas as broadband Internet access points. The coexistence of C-band weather radar and WLAN is nowadays a primary topic in the weather radar community [1].

Concerning the X-band weather radar managed by Arpa Piemonte, electromagnetic interferences started several years ago and their amount is increasing. The analysis of the interferences received during the month of October 2017 showed a day-night pattern, with interferences received from approximately 6 a.m. to 24 p.m. Since the number X-band radars deployed both in Europe and in the United States is constantly increasing, , the coexistence of the weather radars with telecommunications system requires further investigations.

Electromagnetic interference may produce deep impact on dual-polarization radar retrievals, leading to biased quantitative precipitation estimate. In particular, the hydrometeor classification algorithms, e.g. based on Bechini and Chandrasekar [2], may show limits in the identification of the received echoes in case of interfering signals. The interference may be recognized as clutter and those data can be removed and not considered for quantitative estimations and post-processing analysis. In some cases, nevertheless, echoes generated by interfering sources may have polarimetric features close to weather echoes ones. In fact, the analysis of RFI polarimetric features, collected during a six-days measurement campaign, showed that in many instances the collected RFIs have polarimetric signatures that cannot be clearly distinguished from weather echoes.
This paper gives a survey on the electromagnetic interference in weather radars located in North-West Italy and in Dallas Fort Worth (USA), investigating the key-features and the nature of the interfering signals. A new enhanced interference mitigation tool, based on the interfering signals features, is currently being implemented and preliminary results will be shown.

References

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