6.7 WEATHER RADARS AND RADIO FREQUENCY INTERFERENCES

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Radio frequency interferences are affecting weather radars around the world and this problem is becoming increasingly more frequent. In Europe, the major radar networks are in the C band and they share the frequency band with other telecommunication systems such as Radio Local Area Network and Hyper-LAN access points for broadband internet communications. Through collaborative experiments and identifying the SSIDs we were able to determine the source of the interference as Hyper-LAN access points. This paper will present the results from these experiments.

It appears that the coexistence of weather radars and telecommunication systems is increasingly causing more cross contamination, not only by frequency-sharing radio sources but also by antennas working in frequency bands far from the radar operating frequency. This is especially true for the case of X-band weather radars. In fact, since a couple of years, the X-band radar managed by Arpa Piemonte is experiencing increasing occurrence of interferences, which is starting to impact on the radar measurements. Therefore, we have made that into a pilot study platform for interferences.

The analysis of the interferences received during the month of October 2017 showed a daily pattern, with interferences detected mostly between 7am and midnight local time. This typical pattern seems related to out-of-band emissions of some transmitting towers, since no other civil communications are allowed in the X-band. In particular, the analysis focused on a possible relation with the 4G mobile communications working in the 1.8GHz band, which could give out-of-band emissions exactly at the X-band radar operating frequency (9.37 GHz). Comparing the transmitting towers locations available in the regional database of electromagnetic sources managed by Arpa Piemonte with the directions of the interferences received by the X-band radar, it is likely that the radio frequency interferences are caused by mobile telecommunication transmitting towers. Furthermore, those transmitting tower do not operate the 1.8 GHz 4G systems from midnight to 6am to reduce power consumption unless the other 4G carriers, such as 0.8GHz and 2.6GHz, cannot handle the mobile communications in the coverage area. This hypothesis is currently being verified with in-field measurement, to assess a possible relation with the 4G mobile communications working in the 1.8GHz band. Given the increasing number of X-band radars deployed in Europe, Asia and the United States, such as the Dallas Fort Worth X-band radar network, the coexistence of the these smaller radars with telecommunications system is an important task and is the main focus of this work.

In addition, Arpa Piemonte and Colorado State University are developing techniques to identify the radio frequency interferences sources, using the regional database of electromagnetic sources, and with in-field measurements. Based on this we are in the process of developing mitigating solutions. This paper will present quantitative analysis of the interference strength direction and long-term variability. A map of the 1.8 GHz band towers along with simple models for interference zones will be presented. In addition, preliminary results for cooperative experiments to positively identify the major source of interference at X band will also be presented.