



A field assessment of a novel rain measurement system based on earth-to-satellite microwave links

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This work presents the performance of an innovative environmental monitoring system - Smart Rainfall System (SRS) - that estimates rainfall in real-time by means of the analysis of the attenuation of satellite signals (DVB-S in the microwave Ku band). SRS consists in a set of peripheral microwave sensors placed on the field of interest, and connected to a central processing and analysis node. It has been developed jointly by the University of Genova, with its departments DITEN and DICCA and the University spin-off "Artys Srl".

The rainfall intensity measurements accuracy and sensitivity performance of SRS are discussed, based on preliminary results from a field comparison experiment at the urban scale. The test-bed is composed by a set of preliminary measurement sites established since Autumn 2016 in the Genoa (Italy) municipality and the data collected from the sensors during a selection of rainfall events is studied. Point-scale rainfall intensity measurements made by calibrated tipping-bucket rain gauges constitute the reference for the comparative analysis of the system performance. The dynamic calibration of the reference rain gauges has been carried out at the laboratories of DICCA using an automatic calibration rig and the measurements have been processed taking advantage of smart algorithms to reduce counting errors. Additional information about the spatial distribution of precipitation have been provided by the WSR radar of Monte Settepani.

An objective of this investigation is the optimization of the specific attenuation model parameters for rain with respect to those recommended by the International Telecommunication Union standard ITU-R P.838-3. In addition, the experimental set-up allows a fine tuning of the retrieval algorithm and a full characterization of the accuracy of the rainfall intensity estimates from the microwave signal attenuation as a function of different precipitation regimes.