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Dew Point and Relative-Humidity Smart Measuring System

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Octavian Postolache ; P. M. B. Silva Girao ; J. M. Dias Pereira ; Helena Geirinhas Ramos All Authors

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Abstract:
In this paper, a new design and implementation of an air dew-point smart measuring system are presented. The system also implements a relative-humidity sensing structure, based on dew point (DP) and ambient-temperature measuring channels acquired data, and its design suits particularly laboratory applications. The DP is detected on the surface of a chilled mirror using an optical system. The main elements of the measuring system are a bifurcated-fiber bundle, a laser diode, and a narrowband optical detector. Mirror cooling is made using a current-mode-powered Peltier heat pump. The current control is performed using a digital controller implemented using a data-acquisition board programmed with LabVIEW software

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I. Introduction

Humidity is the water vapor contained in the air at a particular temperature. The measurement of the quantity of water vapor is made using different types of devices such as wet and dry bulb, hair or cellulose hygrometers [1], thin-film capacitance hygrometers [2], and relative-humidity (RH) sensors. A second class of humidity-measuring devices is based on dew-point continuous reading includes the solution-conductivity-type hygrometers and condensation on chilled-surface-type hygrometers [3], [4]. This last measuring technique is particularly interesting because of the range ($T_{DP} = [200; 365]K$ $RH = [1; 100]\%$) and inaccuracy ($\epsilon_{TDP} = [0.2; 0.4]K$, $\epsilon_{RH} = 1\%$ for $RH = [20; 90]\%$).

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