

European Electromagnetic Compatibility Directive Applied to Astronomical Observatories

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Abstract : The Cherenkov Telescope Array Project (CTA) aims to build two different observatories of Cherenkov Telescopes, located in Cerro del Paranal, Chile, and La Palma, Spain. These facilities are used in this paper as a case study to investigate how to apply standard Directives on Electromagnetic Compatibility to astronomical observatories. Cherenkov Telescopes are able to provide valuable information from both Galactic and Extragalactic sources by measuring Cherenkov radiation, which is produced by particles which travel faster than light in the atmosphere. The construction requirements demand compliance with the European Electromagnetic Compatibility Directive. The largest telescopes of these observatories, called Large Scale Telescopes (LSTs), are high precision instruments with advanced photomultipliers able to detect the faint sub-nanosecond blue light pulses produced by Cherenkov Radiation. They have a 23-meter parabolic reflective surface. This surface focuses the radiation on a camera composed of an array of high-speed photosensors which are highly sensitive to the radio spectrum pollution. The camera has a field of view of about 4.5 degrees and has been designed for maximum compactness and lowest weight, cost and power consumption. Each pixel incorporates a photo-sensor able to discriminate single photons and the corresponding readout electronics. The first LST is already commissioned and intends to be operated as a service to Scientific Community. Because of this, it must comply with a series of reliability and functional requirements and must have a Conformité Européen (CE) marking. This demands compliance with Directive 2014/30/EU on electromagnetic compatibility. The main difficulty of accomplishing this goal resides on the fact that Conformité Européen marking setups and procedures were implemented for industrial products, whereas no clear protocols have been defined for scientific installations. In this paper, we aim to give an answer to the question on how the directive should be applied to our installation to guarantee the fulfillment of all the requirements and the proper functioning of the telescope itself. Experts in Optics and Electromagnetism were both needed to make these kinds of decisions and match tests which were designed to be made over the equipment of limited dimensions on large scientific plants. An analysis of the elements and configurations most likely to be affected by external interferences and those that are most likely to cause the maximum disturbances was also performed. Obtaining the Conformité Européen mark requires knowing what the harmonized standards are and how the elaboration of the specific requirement is defined. For this type of large installations, one needs to adapt and develop the tests to be carried out. In addition, throughout this process, certification entities and notified bodies play a key role in preparing and agreeing the required technical documentation. We have focused our attention mostly on the technical aspects of each point. We believe that this contribution will be of interest for other scientists involved in applying industrial quality assurance standards to large scientific plant.

Keywords : CE marking, electromagnetic compatibility, european directive, scientific installations

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