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Measurement method of a half-wavelength voltage for Mach-Zehnder optical modulators in wireless communication and broadcasting systems

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

MEASUREMENT METHOD OF A HALF-WAVELENGTH VOLTAGE FOR MACH-ZEHNDER OPTICAL MODULATORS IN WIRELESS COMMUNICATION AND BROADCASTING SYSTEMS

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103/74/PAS	103/81/RVD

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INTRODUCTION

A variety of microwave-photonic devices are used in wireless communication and broadcasting systems. An optical modulator is an interface which converts an electronic signal into an optical signal. In the field of optical fibre communication systems, the IEC 62007 series "Semiconductor optoelectronic devices for fibre optic system applications" has been published. In the field of wireless systems, specifications of inter-modulation and composite distortion of modulators have been an important issue and have typically been negotiated between users and suppliers. During an International Meeting on Microwave Photonics, a proposal was announced to address standardizations for key-devices for Radio over Fibre (RoF) systems.

The RoF system is comprised mainly of two parts; one is the RF to photonic converter (E/O), and the other is photonic to RF converter (O/E). Radio waves are converted into an optical signal at E/O, and the signal is transferred into the optical fibre, and then the radio waves are regenerated at O/E. The nonlinear distortion characteristics of both E/O and O/E are important for the performance of the system. Semiconductor photodiodes are commonly used for O/E. Several types of optical modulator are used for E/O, such as Mach-Zehnder modulators, electro-absorption modulators and directly modulated LDs.

This PAS has been prepared in order to provide industry standard measurement methods for evaluating electro-optic material based Mach-Zehnder optical modulators to be used in wireless communication and broadcasting systems. When the optical modulation index (OMI) is calculated from the half-wavelength voltage measurement results, the intermodulation distortion of the Mach-Zehnder optical modulator can be obtained. In this PAS, the measurement method of the half-wavelength voltage for Mach-Zehnder optical modulators is described. The details of calculations of the second order intermodulation distortion (IM2) and the third order intermodulation distortion (IM3) are described in Annex B.

MEASUREMENT METHOD OF A HALF-WAVELENGTH VOLTAGE FOR MACH-ZEHNDER OPTICAL MODULATORS IN WIRELESS COMMUNICATION AND BROADCASTING SYSTEMS

1 Scope

This PAS gives a measurement method of half-wavelength voltage applicable to Mach-Zehnder optical modulators in wireless communication and broadcasting systems. In addition, this method is also effective for the estimation of the intermodulation distortion of Mach-Zehnder optical modulators.

– Frequency range: 10 MHz to 30 GHz.

– Wavelength band: 0,8 μm, 1,0 μm, 1,3 μm and 1,5 μm.

– Electro-optic material based Mach-Zehnder optical modulators and their modules.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 62007-1, *Semiconductor optoelectronic devices for fibre optic system applications - Part 1: Specification template for essential ratings and characteristics*

IEC 62007-2 *Semiconductor optoelectronic devices for fibre optic system applications - Part 2: Measuring methods*