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TECHNICAL REPORT

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Transmitting and receiving equipment for radiocommunication – Radio-over-fibre technologies for electromagnetic-field measurement – Part 3: Antenna near-field pattern measurement using optical techniques in terahertz-wave bands

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TRANSMITTING AND RECEIVING EQUIPMENT FOR RADIOCOMMUNICATION – RADIO-OVER-FIBRE TECHNOLOGIES FOR ELECTROMAGNETIC-FIELD MEASUREMENT –

Part 3: Antenna near-field pattern measurement using optical techniques in terahertz-wave bands

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Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this Technical Report is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

A list of all parts in the IEC 63099 series, published under the general title *Transmitting and receiving equipment for radiocommunication – Radio-over-fibre technologies for electromagnetic-field measurement*, can be found on the IEC website.

Future documents in this series will carry the new general title as cited above. Titles of existing documents in this series will be updated at the time of the next edition.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

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INTRODUCTION

This document provides technical information on the antenna near-field pattern measurement in terahertz-wave bands above 100 GHz, using optical techniques such as electro-optic (EO) frequency down-conversion. Two techniques are covered: a synchronous system based on a self-heterodyne technique, and an asynchronous system based on a phase noise-cancellation technique. The synchronous system is the vector network analyser (VNA) type system, which provides the RF signal to the antenna under test (AUT) and measures the amplitude and phase distributions of its radiation. In this system, the radio frequency (RF) and local oscillator (LO) signals are optically generated based on the self-heterodyne technique to realize the wide frequency tunability and precise phase measurements simultaneously. On the other hand, the asynchronous system applies to the AUT which integrates the transmitters where the measurement system cannot provide the RF signal to the AUT for the measurements. In this system, an optical frequency comb is used for the LO signal, and the electronics cancel residual frequency and phase noise between the RF and LO signals. Both systems employ the EO sensors for the field mapping which reduces the disturbance to the field compared with the waveguide-type probes employed in the conventional VNA-based measurement system.

TRANSMITTING AND RECEIVING EQUIPMENT FOR RADIOCOMMUNICATION – RADIO-OVER-FIBRE TECHNOLOGIES FOR ELECTROMAGNETIC-FIELD MEASUREMENT –

Part 3: Antenna near-field pattern measurement using optical techniques in terahertz-wave bands

1 Scope

This part of IEC 63099 provides technical information about the methods for an antenna near-field measurement in the terahertz-wave band. The methods are applied to the frequency bands above 100 GHz, which has potential for use in terahertz wireless communication. The methods consist in measuring the amplitude and phase distributions of the electromagnetic field at the near-field range of on-chip antenna devices which integrate RF and IF components. This document also gives examples of the far-field pattern calculated from the measured near-field pattern.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

IEEE Std 145™-2013, *IEEE Standard for Definitions of Terms for Antennas*