



Edition 1.0 2017-07

TECHNICAL REPORT



Transmitting equipment for radiocommunication – Radio-over-fibre technologies for spectrum measurement – 100-GHz spectrum measurement equipment

INTERNATIONAL ELECTROTECHNICAL COMMISSION

ICS 33.060.20; 33.180.01

ISBN 978-2-8322-4554-5

Warning! Make sure that you obtained this publication from an authorized distributor.

CONTENTS

FC	REWC	PRD	4			
1	Scop	e	6			
2	Norn	native references	6			
3	Term	ns, definitions and abbreviated terms	6			
	3.1	Terms and definitions	6			
	3.2	Abbreviated terms	6			
4	Background to measurement over 100 GHz					
	4.1	General	7			
	4.2	IEEE 802.11ad wireless devices	7			
	4.3	Automotive radar	7			
	4.4	Airport ground radar	7			
	4.5	Mobile backhaul	8			
	4.6	Uncompressed HD signal transmission				
5	Spec	trum measurement over 100 GHz	8			
	5.1	Overview				
	5.2	100-GHz spectrum analyser system configuration				
	5.3	Key technologies				
	5.3.1					
	5.3.2					
	5.3.3					
	5.4	Performance of 100-GHz spectrum analyser				
	5.4.1					
	5.4.2					
	5.4.4 Spectrum measurement					
	5.4.6					
	5.4.7					
6		surement examples				
U	6.1	120-GHz mm-wave link				
	6.2	FM CW radar signal observation				
	6.3	Summary of measurement examples				
Ril		phy				
יוט	bilogra	711y				
- :.	auro 1	External appearance of a 100 CHz appetrum analyses	0			
	_	- External appearance of a 100-GHz spectrum analyser				
	-	- 100-GHz spectrum analyser block diagram				
	-	- Fabry-Perot tunable filter				
Fi	gure 4 -	- Pre-selector frequency characteristics	10			
Fi	gure 5 -	- S21 transmission characteristics	11			
Fig	gure 6 -	- RoF Sig Gen block diagram	11			
Figure 7 – Comparison of harmonic component levels						
	Figure 8 – Level calibration system1					
		- Standard deviation of calibration				
	-	- Calibration result				
	_	- Spectrum measurement				
1 19	guit il	Openium measurement				

Figure 12 – Image response	14
Figure 13 – Image response comparison	15
Figure 14 – Displayed average noise level	16
Figure 15 – Third order intercept point	16
Figure 16 – TOI measurement result	17
Figure 17 – Residual spurious response	18
Figure 18 – Measurement system block diagram	18
Figure 19 – 120-GHz mm-wave link measurement results	19
Figure 20 – Experimental system block diagram	20
Figure 21 – Observed 5-GHz BW 5-µs chirp signal at 10-GHz span	20
Table 1 – Design specifications	9
Table 2 – Measured image response	15
Table 3 – SPA setting at residual response measurement	17
Table 4 – 120-GHz mm-wave link specifications	18
Table 5 – SPA setting at 120-GHz mm-wave link measurement	19
Table 6 – SPA settings FM CW radar	20

INTERNATIONAL ELECTROTECHNICAL COMMISSION

TRANSMITTING EQUIPMENT FOR RADIOCOMMUNICATION – RADIO-OVER-FIBRE TECHNOLOGIES FOR SPECTRUM MEASUREMENT – 100-GHZ SPECTRUM MEASUREMENT EQUIPMENT

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

The main task of IEC technical committees is to prepare International Standards. However, a technical committee may propose the publication of a technical report when it has collected data of a different kind from that which is normally published as an International Standard, for example "state of the art".

IEC TR 63100, which is a Technical Report, has been prepared by IEC technical committee 103: Transmitting equipment for radiocommunication:

The text of this Technical Report is based on the following documents:

Enquiry draft	Report on voting
103/157/DTR	103/163/RVDTR

Full information on the voting for the approval of this Technical Report can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "http://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.

A bilingual version of this publication may be issued at a later date.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

TRANSMITTING EQUIPMENT FOR RADIOCOMMUNICATION – RADIO-OVER-FIBRE TECHNOLOGIES FOR SPECTRUM MEASUREMENT – 100-GHZ SPECTRUM MEASUREMENT EQUIPMENT

1 Scope

This document describes 100-GHz spectrum measurement methods using RoF technologies. It covers the background to measurement over 100 GHz, the configuration of a spectrum analyser, the key technologies, such as mm-wave tunable filter, and RoF-technologies-based local oscillator, and provides some measured examples.

2 Normative references

There are no normative references in this document.