TESTING LABORATORY

Name ..... :	Certification Entity for Renewable Energies, S.L. (CERE Testing Laboratory)
Address ..... :	C/ Monturiol 15. 28906. Getafe - Madrid - España.
Conducted (tested) by..... :	Otto Intriago
Test Date ..... :	28/04/2021; 12/11/2021
Issue Date..... :	23/03/2022

SITE TEST

Name ..... :	Certification Entity for Renewable Energies, S.L.
Address ..... :	C/ Monturiol 15. 28906. Getafe - Madrid - España.

LICENCE HOLDER

Name ..... :	Huawei Technologies Colombia S.A.S.
Address ..... :	Cra 68ª No. 24B-10. Plaza Claro, Tower 2, 10th floor.

APPLICANT

Name ……:	Huawei Technologies Colombia S.A.S.
Address ……..:	Cra 68ª No. 24B-10. Plaza Claro, Tower 2, 10th floor.

APPLIED SPECIFICATIONS

This protocol is based on the standard ..... :	**Comisión de Regulación de Energía y Gas: Resolución No. 148 de 2021**. Por la cual se adiciona un Capítulo Transitorio al Anexo General del Reglamento de Distribución contenido en la Resolución CREG 070 de 1998, para permitir la conexión y operación de plantas solares fotovoltaicas y eólicas en el SDL con capacidad efectiva neta o potencia máxima declarada igual o mayor a 5 MW y se dictan otras disposiciones. • Clause: 11.2.4

SAMPLES CHARATERISTICS

Apparatus type/ Installation ..... :	Three-Phase Solar Inverter
Manufacturer/ Supplier/ Installer ..... :	Huawei
Trademark..... :	HUAWEI
Models..... :	SUN2000-185KTL-H1
Serial Number..... :	6T1979046065 Y
Firmware version..... :	V300R001
Rated Characteristics ..... :	Pn: 175,00 kW, Pmax: 185,00 kW, 800VAC, 60Hz & 126,30A See point 2 of this test report, “General Information”

Performed by:	Approved by:
Otto Intriago (Testing Engineer)	Alberto Martín (Technical Manager)

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1. SCOPE

Certification Entity for Renewable Energies, S.L. (CERE Testing Laboratory) has been contracted by **Huawei Technologies Colombia S.A.S.** in order to perform the testing according to the network connection standards specified in page 1 “Applied specifications”.

2. GENERAL INFORMATION

2.1. Tested item: Particular characteristics.

Input	500 – 1500 Vdc, max 1500Vdc
Output	800 Vac,
Class of protection against electric shock	Class I
Degree of protection against moisture	IP66
Type of connection to the main supply	3W + PE
Cooling group	Smart Air Cooling
Modular	No
Internal Transformer	No
Climatic Condition	-25 ºC~ 60 ºC

2.2. Rating plate:

2.3. Summary of inspection and test results:

All the tests and checks have been performed in accordance with the reference Standard as specified previously.

The results obtained apply only to the particular sample tested that is the subject of the present test report. The most unfavourable result values of the verifications and tests performed are contained herein.

Throughout this report a comma is used as the decimal separator.

Version	**Modifications**
0	Initial report

The present test report cannot be copied partially without the express written consent of the Testing Laboratory.

Two setups were used to perform the tests:

- Setup 1 was used to perform LVRT (28/04/2021)
- Setup 2 was used to perform HVRT (12/11/2021)

NOTE: Accredited activities can be found into the accreditation scope.

WEATHER CONDITIONS

Temperature: 23,00 - 24,60 ºC Humidity: 25,40 – 35,20 %HR

3. TEST EQUIPMENT LIST / MEASUREMENT UNCERTAINTY & TEST SETUP

3.1. Test Equipment List:

CERE'S EQUIPMENT LIST
Set up 1

No.	TEST EQUIPMENT	MANUFACTURER / MODEL	CODE Nº	CALIBRATION DATE	
				LAST	DUE
1	Power Analyzer	ZES ZIMMER / LMG500	**CERE_001**	13/05/2020	13/05/2022
2	AC Current Sensor	ZES ZIMMER / L45-Z10	**CERE_002 CERE_003 CERE_004**	13/05/2020	13/05/2022
3	Multimeter	FLUKE / 179	**CERE_008**	26/10/2020	26/10/2021
4	Weather station	VELLEMAN / WS8472	**CERE_012**	22/10/2020	22/10/2021

Set up 2

No.	TEST EQUIPMENT	MANUFACTURER / MODEL	CODE Nº	CALIBRATION DATE	
				LAST	DUE
1	Power Analyzer	Dewesoft / SIRIUS	**CERE_180**	18/05/2021	18/05/2023
2	AC Current Sensor	LEM / IT 700-S	**CERE_212 CERE_213 CERE_214**	13/05/2020	13/05/2022
3	Multimeter	FLUKE / 179	**CERE_008**	02/11/2021	02/11/2022
4	Weather station	VELLEMAN / WS8472	**CERE_012**	22/10/2021	22/10/2022

3.2. Measurement Uncertainties:

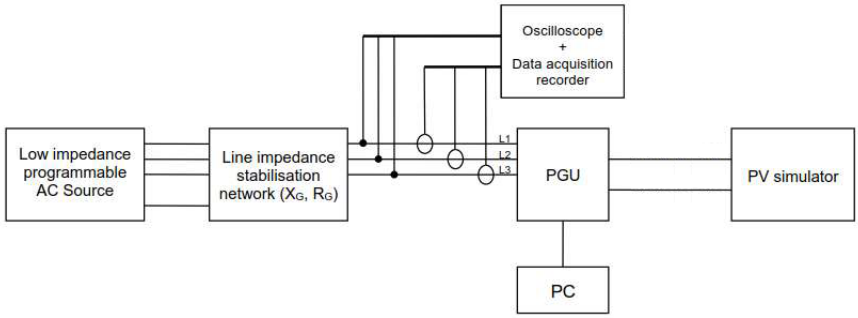
Setup 1

Voltage measurement uncertainty	±0,46 %
Current measurement uncertainty	±0,78 %
Power measurement uncertainty	±0,38 %
Frequency measurement uncertainty	±0,12 %

Setup 2

Voltage measurement uncertainty	±0,26 %
Current measurement uncertainty	±0,29 %
Power measurement uncertainty	±0,26 %
Frequency measurement uncertainty	±0,12 %

3.3. Test set up:



Current sensors and voltage probes have been connected to the output and/or input of equipment under test (EUT) according to each test requirement.

All the tests described in the following pages have been performed using this specified test setup.

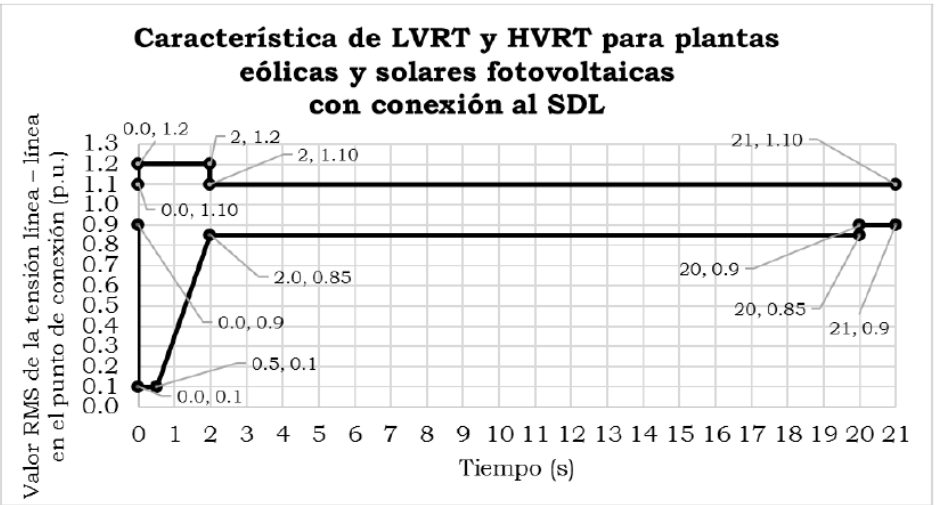
4. RESUME OF TEST RESULTS

4.1. Chapter of the Standard

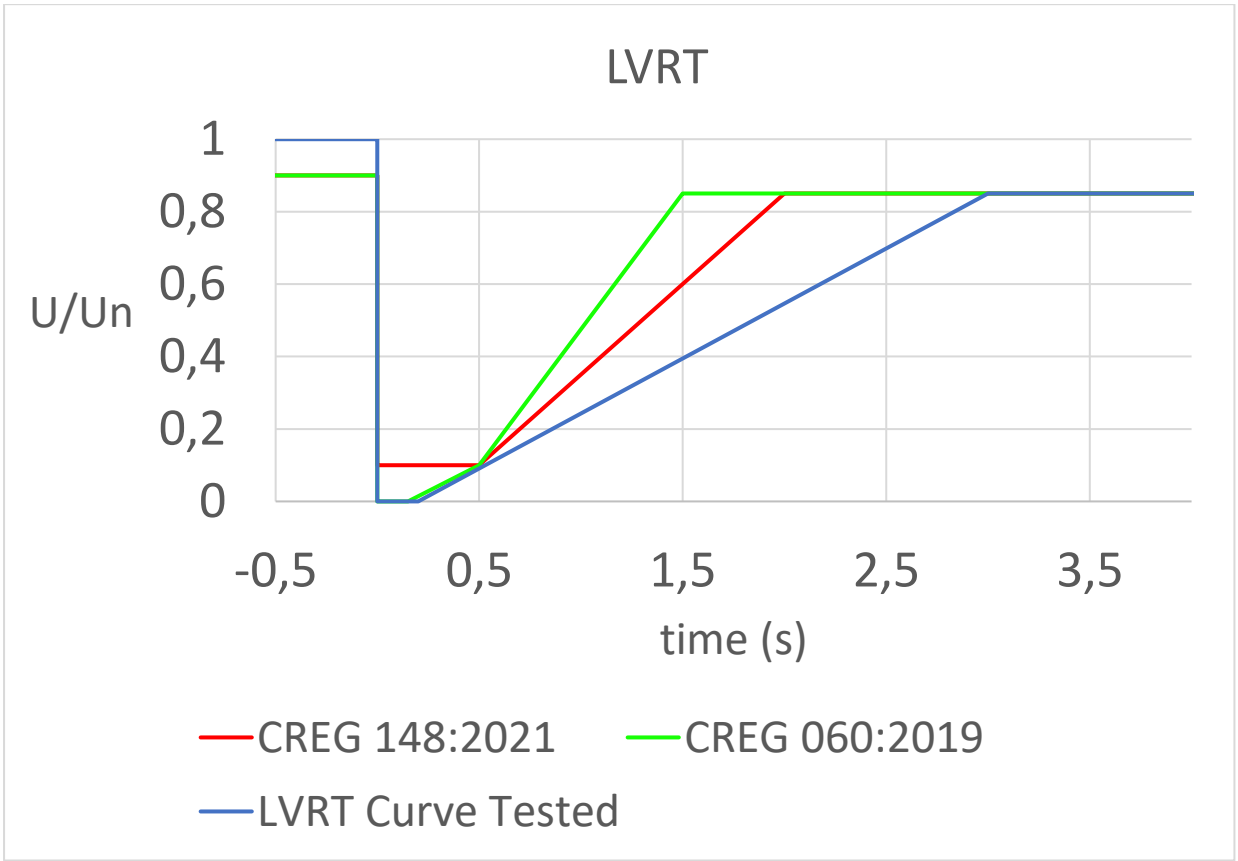
Test Nº	Test Description:	Standard Reference
5.1	LVRT & HVRT	11.2.4 (Características de depresiones de tensión y sobretensiones)

5. TEST RESULTS

5.1. LVRT & HVRT



Note: LVRT tests performed to match with CREG 148:2021 and CREG 060:2019 requirements, as shown in the picture below.



LVRT									
Fault type	Load	Voltage Level desired (%)	Voltage measured (%)	Time minimum (ms)	Time measured (ms)	Kf desired	Iqpos measured (%)	Iq neg measured (%)	Iq injection time (ms)
800 V (or reference V) 60 Hz									
3P	100%	0 ± 5%	5,21%*	200,00	240,00	2	94,84%	0,11%	20,00
1P	100%	0 ± 5%	7,82%*	200,00	233,80	2	51,68 %	48,79 %	20,00
3P	No Load	0 ± 5%	2,16%	200,00	237,00	--	--	--	-
1P	No Load	0 ± 5%	3,63%	200,00	244,00	--	--	--	-
3P	100%	20 ±5%	20,47%	700,00	900,00	2	100,71%	0,12%	40,00
1P	100%	20 ±5%	73,46%	700,00	880,00	2	51,39%	50,30%	20,00
3P	100%	50 ±5%	50,71%	1300,00	2004,00	2	93,33%	-0,14%	20,00
1P	100%	50 ±5%	84,77%	1300,00	1870,40	2	32,77 %	31,64 %	40,00
3P	100%	85 ± 5%	84,93%	2000,00	3022,70	2	30,04%	0,12%	40,00
1P	100%	85 ± 5%	94,99%	2000,00	3006,00	2	0,17%	0,97%	40,00

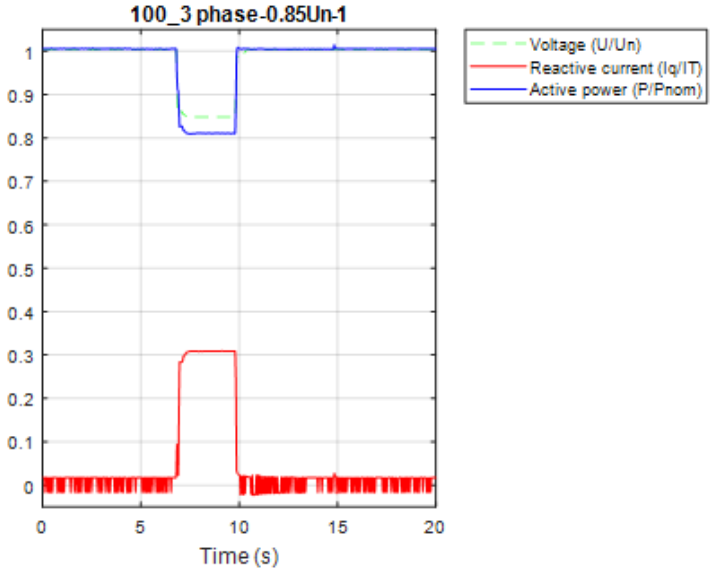
(*) Voltage level above desired due to inverter´s current injection. “No Load” tests performed to verify LVRT conditions.

Note 3: Minimum time interval between 2 consecutives LVRT of 300 ms, by manufacturer declaration (Certificate no. 19-0650_0 based on FGW TR 4 Rev.09).

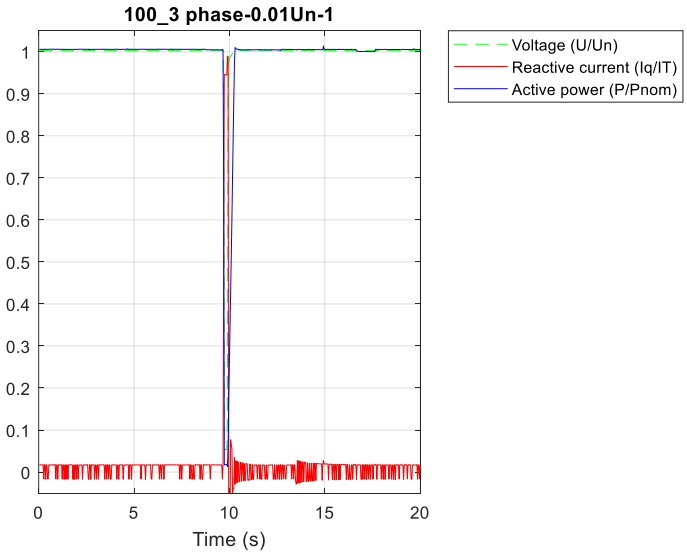
HVRT									
Fault type	Load	Voltage Level desired (%)	Voltage measured (%)	Time minimum (ms)	Time measured (ms)	Kf desired	Iqpos measured (%)	Iq neg measured (%)	Iq injection time (ms)
800 V (or reference V) 60 Hz									
3P	100%	120 ± 5%	119,44%	2000,00	2014,65	1,77	-32,08%	0,12%	40,00

Note 4: Configurable reactive power injection within the voltage tolerance, after fault recovery between 0s and 5s, by manufacturer declaration.

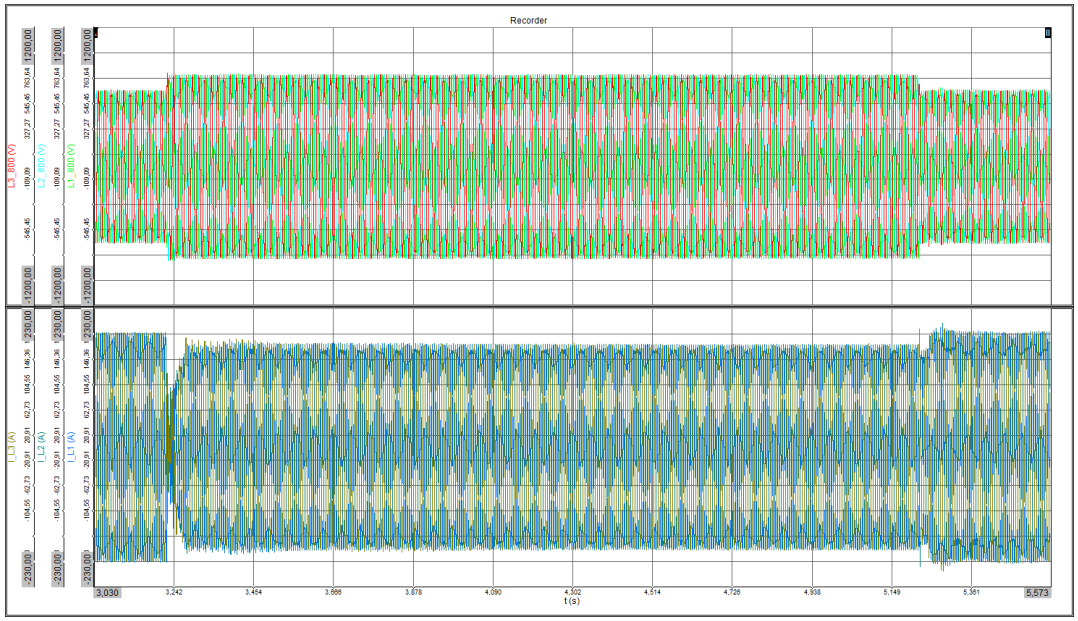
Graphic-Fault type LVRT 3P-0,85



Graphic-Fault type LVRT 3P_0,01



Graphic-Fault type HVRT



6. PICTURES

7. ELECTRICAL SCHEME