Prüfbericht-Nr.: *Test Report No.:*	**50349580 001**	**Auftrags-Nr.:** *Order No.:*	168155054	Seite 1 von 30 *Page 1 of 30*
Kunden-Referenz-Nr.: *Client Reference No.:*	405210	**Auftragsdatum:** *Order date.:*	06 Mar. 2020	
Auftraggeber: *Client:*	Kehua Hengsheng Co., Ltd. No.457, Malong Road, Torch High-tech Industrial Zone, Xiamen, Fujian 361000 P. R. China			
Prüfgegenstand: *Test item:*	PV Grid-Connected Inverter			
Bezeichnung / Typ-Nr.: *Identification / Type No.:*	SPI5K-B, SPI6K-B, SPI8K-B, SPI10K-B, SPI12K-B, SPI12K-BL, SPI15K-B, SPI17K-B, SPI20K-B			
Auftrags-Inhalt: *Order content:*	TUV Rheinland - EMC service			
Prüfgrundlage: *Test specification:*	IEC 61000-6-1:2005 IEC 61000-6-3:2006+A1			

Wareneingangsdatum: *Date of receipt:*	14 March 2019
Prüfmuster-Nr.: *Test sample No.:*	551501050390K5600001, 551501054170K5600001
Prüfzeitraum: *Testing period:*	Refer to test report
Ort der Prüfung: *Place of testing:*	Refer to section 2.1
Prüflaboratorium: *Testing laboratory:*	TÜV Rheinland (Shenzhen) Co., Ltd.
Prüfergebnis*: *Test result*:*	Pass

geprüft von / *tested by:*

09.03.2020	Felix Tao Senior Project Manager	
Datum *Date*	**Name/Stellung** *Name/Position*	**Unterschrift** *Signature*

kontrolliert von / *reviewed by:*

09.03.2020	Tongle Lee Technical Certifier	
Datum *Date*	**Name/Stellung** *Name/Position*	**Unterschrift** *Signature*

Sonstiges / *Other:*

Zustand des Prüfgegenstandes bei Anlieferung: Prüfmuster vollständig und unbeschädigt
Condition of the test item at delivery: Test item complete and undamaged

* Legende:	1 = sehr gut P(ass) = entspricht o.g. Prüfgrundlage(n)	2 = gut	3 = befriedigend F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	4 = ausreichend N/A = nicht anwendbar	5 = mangelhalt N/T = nicht getestet
Legend:	1 = very good P(ass) = passed a.m. test specifications(s)	2 = good	3 = satisfactory F(ail) = failed a.m. test specifications(s)	4 = sufficient N/A = not applicable	5 = poor N/T = not tested

TEST SUMMARY

5.1.1 HARMONICS ON AC MAINS
RESULT: *Pass*

5.1.2 VOLTAGE FLUCTUATIONS ON AC MAINS
RESULT: *Pass*

5.1.3 AC MAINS TERMINAL CONTINUOUS DISTURBANCE VOLTAGE
RESULT: *Pass*

5.2.1 RADIATED EMISSION
RESULT: *Pass*

6.2.1 RADIO-FREQUENCY ELECTROMAGNETIC FIELD AMPLITUDE MODULATED (RS)
RESULT: *Pass*

6.2.2 RADIO-FREQUENCY CONTINUOUS CONDUCTED (CS)
RESULT: *Pass*

6.2.3 POWER-FREQUENCY MAGNETIC FIELDS
RESULT: *Pass*

6.3.1 FAST TRANSIENTS (EFT)
RESULT: *Pass*

6.3.2 SURGE
RESULT: *Pass*

6.3.3 ELECTROSTATIC DISCHARGES (ESD)
RESULT: *Pass*

6.4.1 VOLTAGE DIPS AND INTERRUPTIONS
RESULT: *Not Applicable*

Contents

1. General Remarks

1.1 Complementary Materials

All attachments are integral parts of this test report. This applies especially to the following appendix:

Appendix 1: Test result

Appendix 2: Measurement uncertainties

2. Test Sites

2.1 Test Facilities

Zhangzhou Kehua Technology Co., Ltd.
Beidou Industrial Zone, Jinfeng Industrial District, Zhangzhou, Fujian, P. R. China

The Testing & Inspection Center of New United Group Co., Ltd.
No.68, Fenglin Road, Hi-Tech Industrial Zone, Wujin District, Changzhou, Jiangsu, China

EMTEK (Shenzhen) Co., Ltd.
Bldg. 69, Majialong Industry Zone, Nanshan District, Shenzhen, Guangdong, China

The tests at the test sites have been conducted under the supervision of a TÜV engineer.

2.2 List of Test and Measurement Instruments

Table 1: List of Test and Measurement Equipment

Kind of Equipment	Manufacturer	Type	S/N	Calibrated until
Conducted Emission (Kehua)				
EMI Test Receiver	Rohde & Schwarz	ESR3	102438	2019-08-09
L.I.S.N.	Schwarzbeck	NNLK 8130 RC	5004	2019-08-22
Pulse Limiter	Schwarzbeck	VTSD 9561-F PULSE LIMITER	239	2019-08-22
Radiated Emission (10m Chamber) (Kehua)				
EMI Test Receiver	Rohde & Schwarz	ESR3	102438	2019-08-09
Bilog Antenna	Schwarzbeck	VULB 9162	9162#178	2019-08-16
Low Noise Amplifier	Schwarzbeck	BBV 9743	00079	2019-08-17
Harmonics & Flicker (EMTEK)				
AC Power Source	TESEQ	NSG 1007-45/45KVA	1305A02873	2019-05-20
Signal Conditioning Unit	TESEQ	CCN 1000-3	1305A02873	2019-05-20
Three Phase Impedance Network	TESEQ	INA2197/37A	1305A02873	2019-05-20
Three Phase Impedance Network	TESEQ	INA 2196/75A	1305A02874	2019-05-20
Profline 2100 AC Switching Unit	TESEQ	NSG2200-3	A22714	2019-05-20
ESD (Kehua)				
ESD Tester	3Ctest	ESD-20G	ECO2712121	2019-08-27
Radio-Frequency Electromagnetic Field Amplitude Modulated (New United)				
Signal Generator	Rohde & Schwarz	SMB100A	DA-101	2020-02-15
Power Amplifier	Amplifier Research	1000W/1000A	DA-033	2019-05-21
Power Amplifier	Rohde & Schwarz	BBA150-E60	DA-102	2020-02-15
Power Amplifier	Rohde & Schwarz	BBA150-D110	DA-077	2019-05-21
High Gain Log-Periodic Antenna	Rohde & Schwarz	HL046	DA-010	2019-05-21
Horn Antenna	Schwarzbeck	BBHA 9120E	DA-075	2019-05-21
Power Meter	Rohde & Schwarz	NPR2	DA-107	2020-02-15
Directional Coupler	Amplifier Research	DC6280	DA-035	2019-05-21
EFT (Kehua)				
Burst Tester	LIONCEL	EFT-405CB	0161104	2019-08-19

Kind of Equipment	Manufacturer	Type	S/N	Calibrated until
Coupling Clamp	LIONCEL	EFTC	0161104	2019-08-19
Three Phase CDN	LIONCEL	CDN-4130P	0170301J	2019-08-19
Surge (Kehua)				
Surge Tester	LIONCEL	LSG-510CB	0161102	2019-08-19
Three Phase CDN	LIONCEL	CDN-5310P	0170201J	2019-08-19
Surge (New United)				
Integrated Wave Generator	EM TEST	compact NX5 bsp-1-300-16	DA-084	2019-10-30
Three-Phase Coupling Network	EM TEST	coupling NX5 bs-3-480-32	DA-085	2019-10-30
Radio-Frequency Continuous Conducted (New United)				
Conducted Disturbance Simulator	EM TEST	CWS500 N1.4	DA-082	2019-10-29
6db Attenuator	EM TEST	ATT 6/75	DA-049	2019-05-22
Current Loop	FCC	F-120-9A	DA-083	2019-10-30
EM Clamp	EM TEST	EM101	DA-055	2019-05-22
Power Frequency Magnetic Fields (New United)				
Integrated Wave Generator	EM TEST	UCS500 M6	DA-037	2019-05-22
Magnetic Field Coil	EM TEST	MS100	DA-040	2019-05-22
Current Transformer	EM TEST	MC2630	DA-041	2019-05-22
Automatic Regulator	EM TEST	MV2616	DB-025	N/A

3. General Product Information

3.1 Product Function and Intended Use

The EUTs are PV Grid-Connected Inverter used for residential, commercial and light-industrial environments.

Model list:

MODEL	INPUT	OUTPUT		
		Voltage	Current	Power
SPI5K-B	DC 200-1000V, 2*11A Max.	AC 380/400/415V	8.0A Max.	5kW
SPI6K-B	DC 200-1000V, 2*11A Max.	AC 380/400/415V	9.6A Max.	6kW
SPI8K-B	DC 200-1000V, 22/11A Max.	AC 380/400/415V	12.8A Max.	8kW
SPI10K-B	DC 200-1000V, 22/11A Max.	AC 380/400/415V	15.9A Max.	10kW
SPI12K-B	DC 200-1000V, 2*11A Max.	AC 380/400/415V	19.1A Max.	12kW
SPI12K-BL	DC 200-1000V, 2*22A Max.	AC 380/400/415V	19.1A Max.	12kW
SPI15K-B	DC 200-1000V, 2*22A Max.	AC 380/400/415V	23.9A Max.	15kW
SPI17K-B	DC 200-1000V, 2*22A Max.	AC 380/400/415V	27.1A Max.	17kW
SPI20K-B	DC 200-1000V, 2*22A Max.	AC 380/400/415V	31.9A Max.	20kW

Models SPI5K-B, SPI6K-B, SPI8K-B, SPI10K-B and SPI12K-B are identical except the type designation and power.
Models SPI12K-BL, SPI15K-B, SPI17K-B and SPI20K-B are identical except the type designation and power.

For details please refer to the Circuit Diagram & Instruction Manual.

3.2 Ratings and System Details

DC voltage range:	DC 200-1000V
Input current:	refer to section 3.1
Output voltage:	AC 380/400/415V
Frequency:	50/60Hz
Output current:	refer to section 3.1
Rated output power:	refer to section 3.1
Earthing:	Connected

3.3 Independent Operation Modes

The basic operation modes are:

A. On
   a. Maximum load
   b. Medium load
   c. Minimum load

B. Off

3.4 Noise Generating and Noise Suppressing Parts

Refer to the Circuit Diagram.

3.5 Submitted Documents

- Circuit Diagram
- Instruction Manual
- Rating Label

4. Test Set-up and Operation Modes

4.1 Principle of Configuration Selection

Emission: The equipment under test (EUT) was configured to measure their highest possible radiation level. The test modes were adapted accordingly in reference to the instructions for use.

Immunity: The equipment under test (EUT) was configured to have their highest possible susceptibility against the tested phenomena. The test modes were adapted accordingly in reference to the instructions for use.

4.2 Test Operation and Test Software

Test operation refers to test setup in chapter 5 & 6.
Pre-test in all operation modes, and find out the worst case for compliance test.
According to section 3.1, full tests were applied on models SPI12K-B and SPI20K-B.

4.3 Special Accessories and Auxiliary Equipment

The EUT was tested together with the following accessories:

Item	Manufacturer	Model	S/N
DC Power Supply	WAGO DINYI	WLPA-150KW	W20180626011
DC Power Supply	Chroma	62150H-1000S	62150H-1000S
DC Power Supply	Kehua	High Voltage DC Source	--

4.4 Countermeasures to achieve EMC Compliance

The test samples, which have been tested, contained the noise suppression parts as described in the Constructional Data Form or the Technical Construction File. No additional measures were employed to achieve compliance.

5. Test Results EMISSION

5.1 Emission in the Frequency Range up to 30 MHz

5.1.1 Harmonics on AC Mains

RESULT: **Pass**

Date of testing	:	2019-04-09
Test standard	:	IEC 61000-6-3:2006+A1
Test procedure	:	IEC 61000-3-12:2011
Limit	:	Table 3 of IEC 61000-3-12:2011
Measured harmonics	:	2 – 40
Tested port	:	AC Mains

Test setup

Test Voltage	:	AC 400V±2%, 50Hz
Operation Condition	:	According to Annex A of IEC 61000-3-12:2011
Operation mode	:	A
Earthing	:	Connected

Refer to attached Appendix 1.

5.1.2 Voltage Fluctuations on AC Mains

RESULT: **Pass**

Date of testing	:	2019-04-09 to 2019-04-10
Test standard	:	IEC 61000-6-3:2006+A1
Basic standard	:	IEC 61000-3-11:2000
Limit	:	Clause 5 of IEC 61000-3-11:2000
Tested port	:	AC Mains

Test setup

Test Voltage	:	AC 400V±2%, 50Hz
Operation Condition	:	According to Clause 6 of IEC 61000-3-11:2000
Operation mode	:	A
Earthing	:	Connected

Refer to attached Appendix 1.

5.1.3 AC Mains Terminal Continuous Disturbance Voltage

RESULT: **Pass**

Date of testing	:	2019-03-14
Test standard	:	IEC 61000-6-3:2006+A1
Frequency range	:	0.15 - 30MHz
Limits	:	Table 2 of IEC 61000-6-3:2006+A1
Kind of test site	:	10m Chamber
Tested port	:	AC Mains

Test setup

Mains Voltage	:	AC 400V, 50/60Hz
Operation Condition	:	Clause 4 of IEC 61000-6-3:2006+A1
Operation mode	:	A
Artificial hand	:	Not applied
Earthing	:	Connected

Note: The DC power input port of EUT isn't connected to a local DC power network or a remote local battery by a connecting cable exceeding a length of 30 m, hence Disturbance Voltage test is not applicable to this port.

Refer to attached Appendix 1.
(The minimum margin is 2.54dB)

5.2 Emission in the Frequency Range above 30 MHz

5.2.1 Radiated Emission

RESULT: **Pass**

Date of testing	:	2019-03-14
Test standard	:	IEC 61000-6-3:2006+A1
Frequency range	:	30 - 1000MHz *
Limits	:	Table 1 of IEC 61000-6-3:2006+A1
Kind of test site	:	10m Semi-Anechoic Chamber
Tested Port	:	Enclosure

Test setup

Input Voltage	:	DC 200-1000V
Operation Condition	:	Clause 4 of IEC 61000-6-3:2006+A1
Operation mode	:	A
Earthing	:	Connected

* The highest frequency generated or used in the EUT is below 108MHz, hence the upper frequency of this test is 1GHz.

Refer to attached Appendix 1.

6. Test Results IMMUNITY

6.1 Classification of apparatus

According to IEC 61000-6-1:2005, the EUTs shall be tested in accordance with table 1, 3 & 4, and comply with following performance criterion:

Continuous Disturbance

Power-Frequency Magnetic Fields	**Criterion A**
Radio-Frequency Electromagnetic Field Amplitude Modulated (RS)	**Criterion A**
Radio-Frequency Continuous Conducted (CS)	**Criterion A**

Transient Disturbance

Fast Transients (EFT)	**Criterion B**
Surge	**Criterion B**
Electrostatic Discharges (ESD)	**Criterion B**

Power Supply Alterations

Voltage Dips and Interruptions	**Criterion B & C**

6.2 Continuous Disturbances

6.2.1 Radio-Frequency Electromagnetic Field Amplitude Modulated (RS)

RESULT: **Pass**

Date of Testing	:	2019-03-26
Test Specification	:	IEC 61000-6-1:2005
Basic Standard	:	IEC 61000-4-3:2006+A1+A2
Criterion	:	A
Frequency Range	:	80 - 2,700MHz
Test Level	:	3V/m, 80 – 1000MHz 3V/m, 1.4 – 2.0GHz 1V/m, 2.0 – 2.7GHz (Unmodulated, r.m.s.)
Modulation	:	AM 80%, 1kHz sine-wave
Tested Port	:	Enclosure

Test setup

Input Voltage	:	DC 200-1000V
Operation Mode	:	A
Earthing	:	Connected
Ambient temperature	:	See Appendix 1
Relative humidity	:	See Appendix 1
Atmospheric pressure	:	See Appendix 1

Refer to attached Appendix 1.

6.2.2 Radio-Frequency Continuous Conducted (CS)

RESULT: **Pass**

Date of testing	:	2019-03-26
Test Specification	:	IEC 61000-6-1:2005
Basic Standard	:	IEC 61000-4-6:2008
Criterion	:	A
Frequency range	:	0.15 - 80 MHz
Source impedance	:	150Ω
Test level	:	3V (unmodulated, r.m.s.)
Modulation	:	AM 80%, 1kHz sine-wave
Sweep mode	:	automatic
Sweep rate	:	$<1.5\times10^{-3}$decade/sec.
Tested Port	:	AC Output, DC Input

Test setup

Input Voltage	:	DC 200-1000V
Operation Mode	:	A
Earthing	:	Connected
Ambient temperature	:	See Appendix 1
Relative humidity	:	See Appendix 1
Atmospheric pressure	:	See Appendix 1

Refer to attached Appendix 1.

6.2.3 Power-frequency Magnetic Fields

RESULT: **Pass**

Date of testing	:	2019-03-26
Test Specification	:	IEC 61000-6-1:2005
Basic Standard	:	IEC 61000-4-8:2009
Criterion	:	A
Test Frequency	:	50/60Hz
Test level	:	3A/m
Tested Port	:	Enclosure

Test setup

Input Voltage	:	DC 200-1000V
Operation Mode	:	A
Earthing	:	Connected
Ambient temperature	:	See Appendix 1
Relative humidity	:	See Appendix 1
Atmospheric pressure	:	See Appendix 1

Refer to attached Appendix 1.

6.3 Transient Disturbances

6.3.1 Fast Transients (EFT)

RESULT: **Pass**

Date of testing	:	2019-03-15
Test Specification	:	IEC 61000-6-1:2005
Basic Standard	:	IEC 61000-4-4:2004
Criterion	:	B
Test level	:	±0.5kV, ±1kV
Test duration	:	≥60sec
Rise time	:	5/50ns
Repetition frequency	:	5kHz
Tested Port	:	AC Output, DC Input

Test setup

Input Voltage	:	DC 200-1000V
Operation Mode	:	A
Earthing	:	Connected
Ambient temperature	:	See Appendix 1
Relative humidity	:	See Appendix 1
Atmospheric pressure	:	101kPa

Refer to attached Appendix 1.

6.3.2 Surge

RESULT: **Pass**

Date of testing	:	2019-03-15 to 2019-03-26
Test Specification	:	IEC 61000-6-1:2005
Basic Standard	:	IEC 61000-4-5:2005
Criterion	:	B
Source impedance	:	2Ω, 12Ω
Test level	:	±0.5kV, ±1kV, ±2kV
Number of surges	:	5 (for each combination of parameters)
Repetition rate	:	Max. 1/min
Tested Port	:	AC Output, DC Input

Test Setup

Input Voltage	:	DC 200-1000V
Operation Mode	:	A
Earthing	:	Connected
Ambient temperature	:	See Appendix 1
Relative humidity	:	See Appendix 1
Atmospheric pressure	:	101kPa

Refer to attached Appendix 1.

6.3.3 Electrostatic Discharges (ESD)

RESULT: **Pass**

Date of testing	:	2019-03-15
Test Specification	:	IEC 61000-6-1:2005
Basic Standard	:	IEC 61000-4-2:2008
Criterion	:	B
Charge voltage	:	±2.0kV, ±4.0kV, ±8kV (air discharge) ±2.0kV, ±4.0kV (contact discharge)
Number of discharges	:	>10
Tested Port	:	Enclosure

Test Setup

Input Voltage	:	DC 200-1000V
Operation Mode	:	A
Earthing	:	Connected
Ambient temperature	:	See Appendix 1
Relative humidity	:	See Appendix 1
Atmospheric pressure	:	101kPa

Refer to attached Appendix 1.

6.4 Power Supply Alterations

6.4.1 Voltage Dips and Interruptions

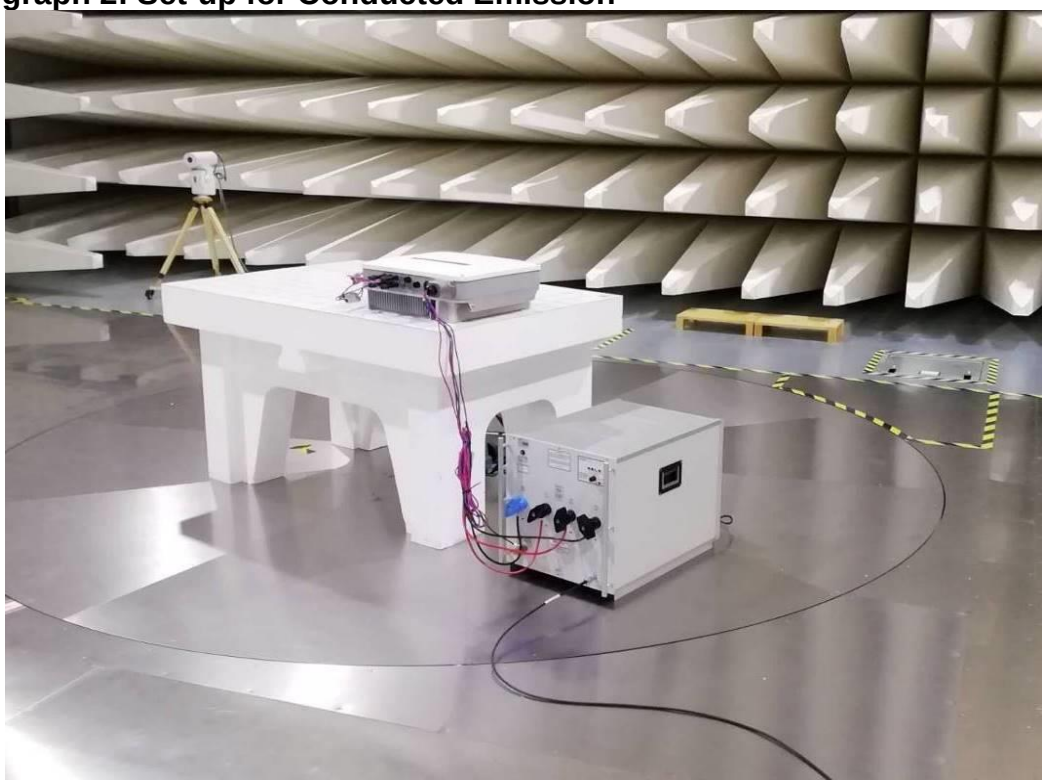
RESULT: **Not Applicable**

The EUT does not have AC input port, therefore the Voltage Dips and Interruptions test is not applicable.

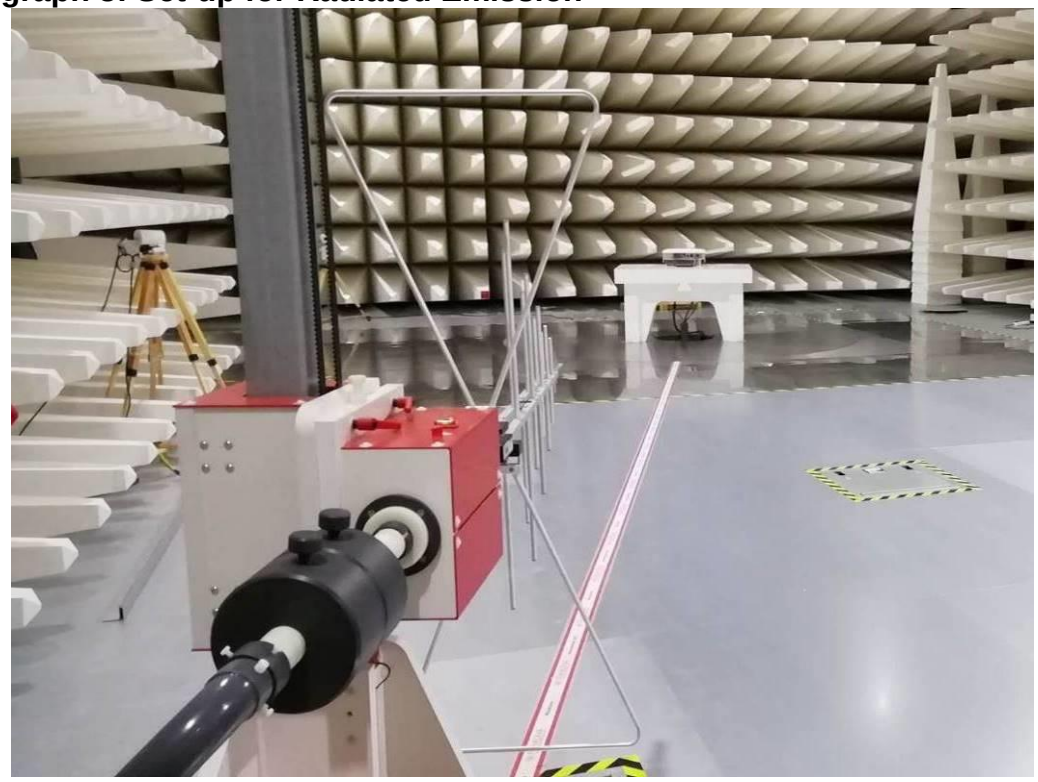
7. Photographs of the Test Set-Up

Photograph 1: Set-up for Harmonics & Voltage Fluctuations

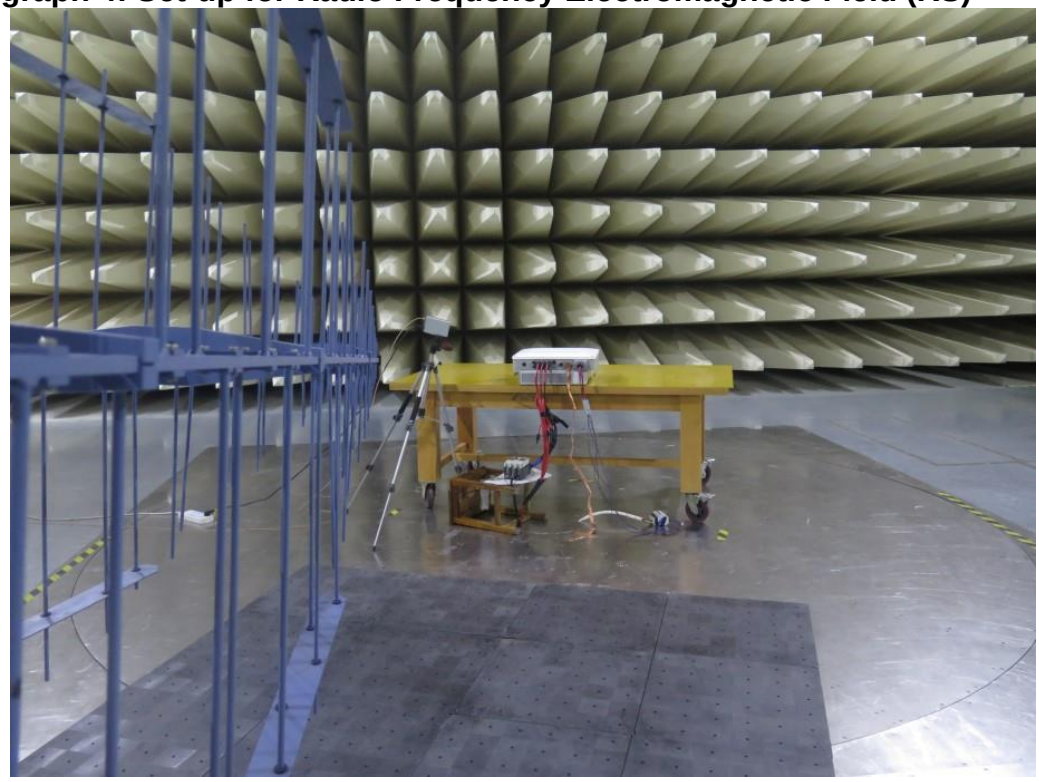
Photograph 2: Set-up for Conducted Emission

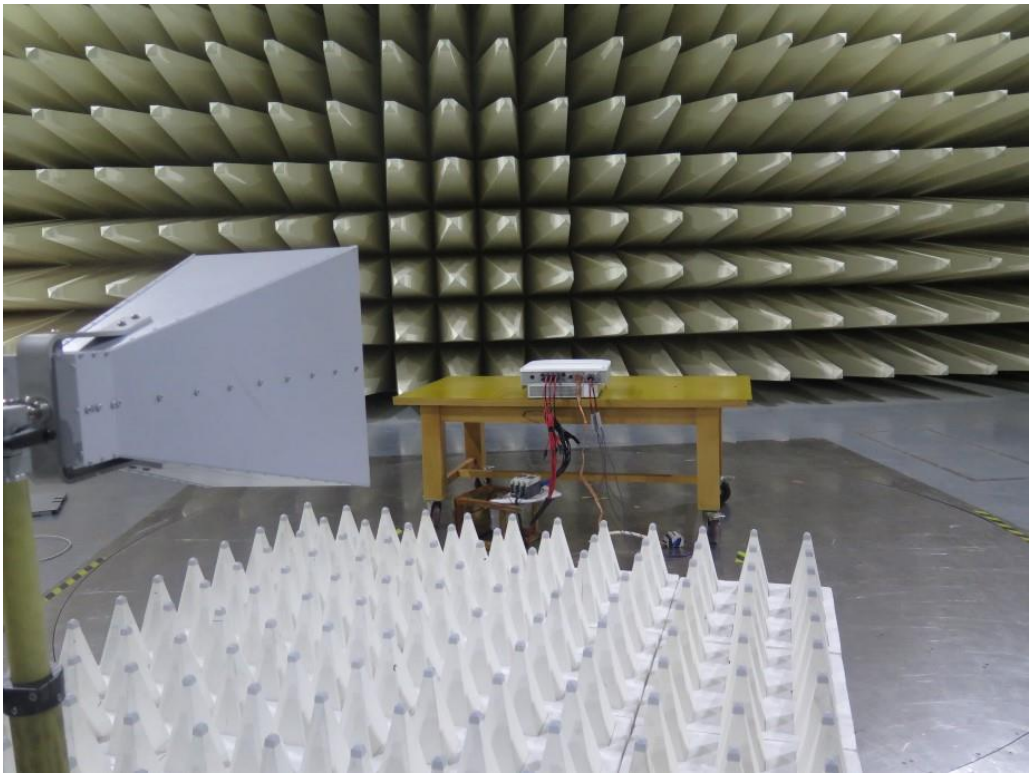


Photograph 3: Set-up for Radiated Emission

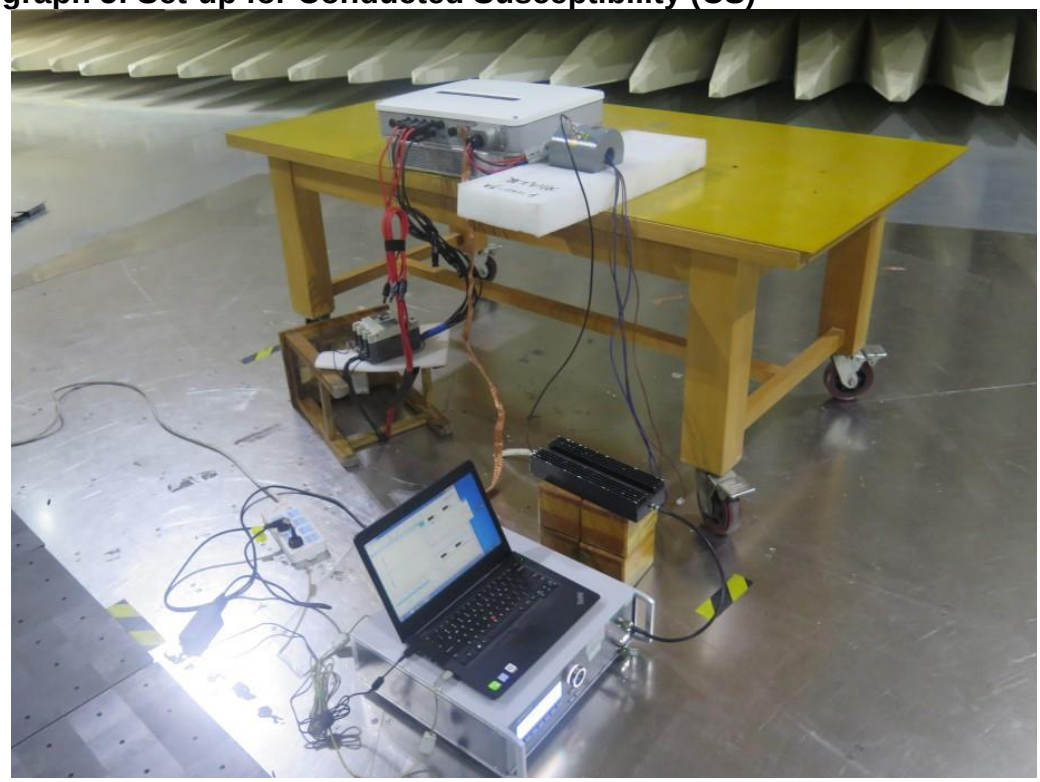


Photograph 4: Set-up for Radio Frequency Electromagnetic Field (RS)

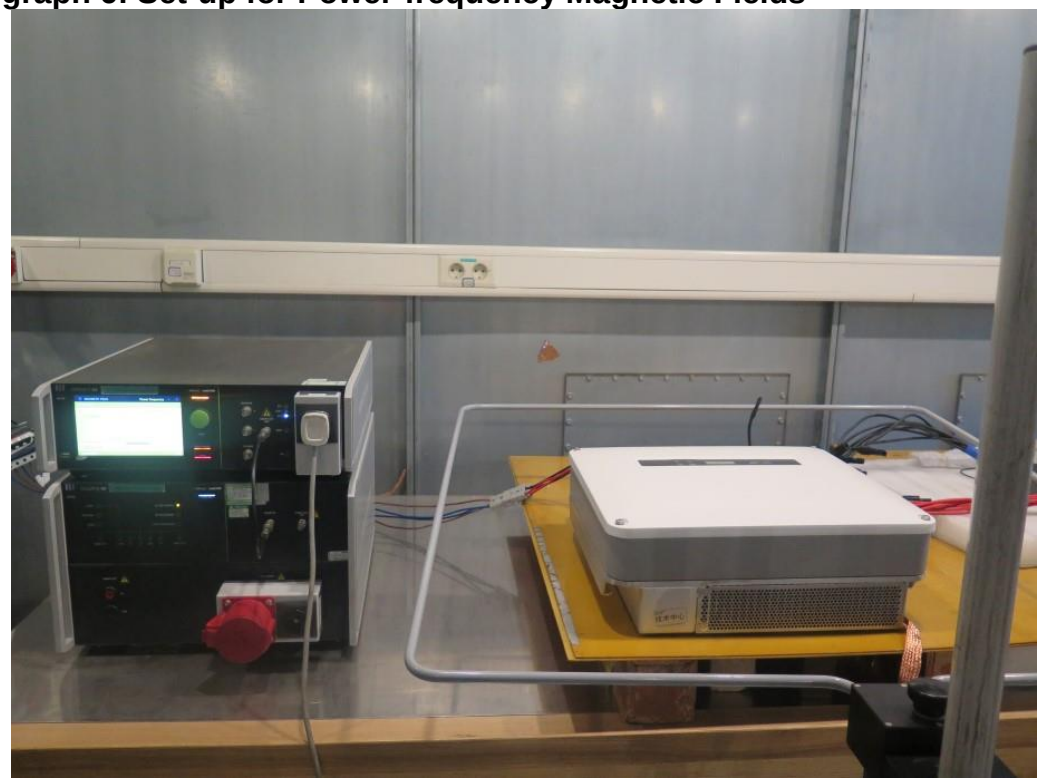




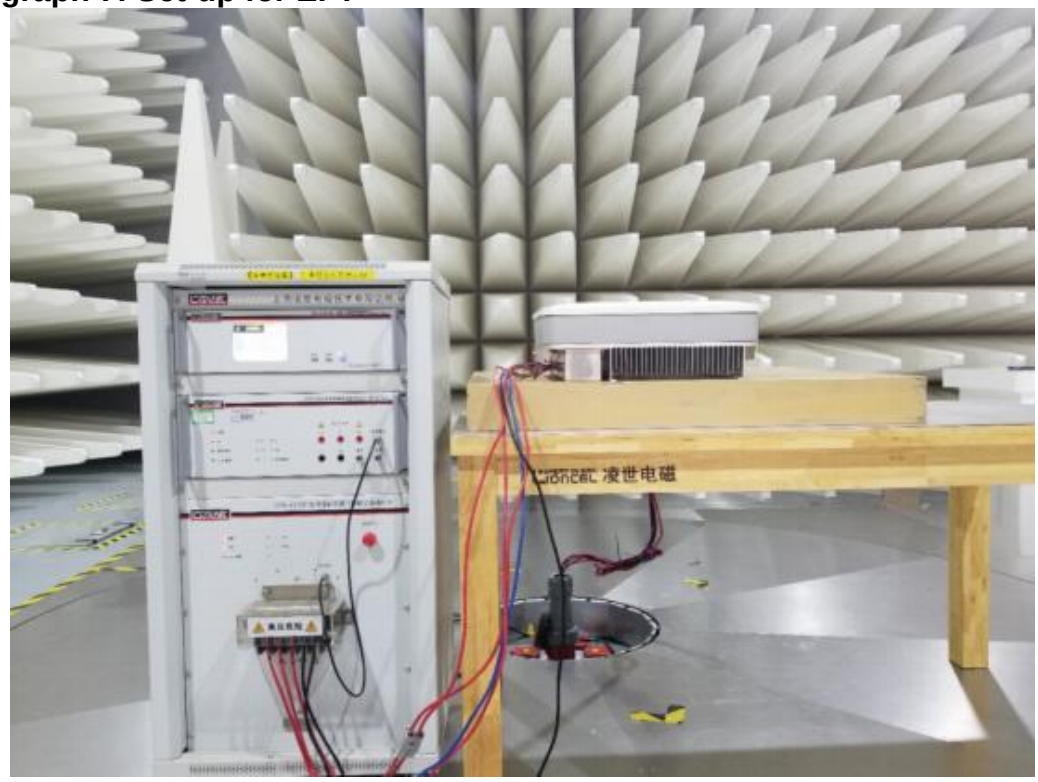
Photograph 5: Set-up for Conducted Susceptibility (CS)

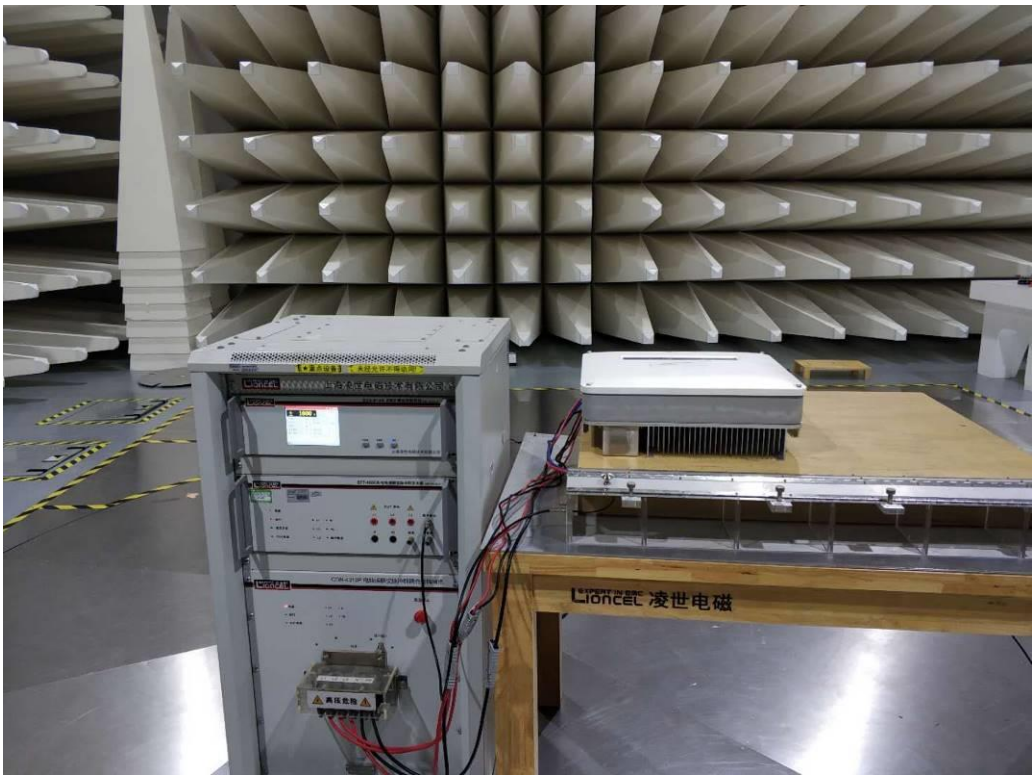


Photograph 6: Set-up for Power-frequency Magnetic Fields

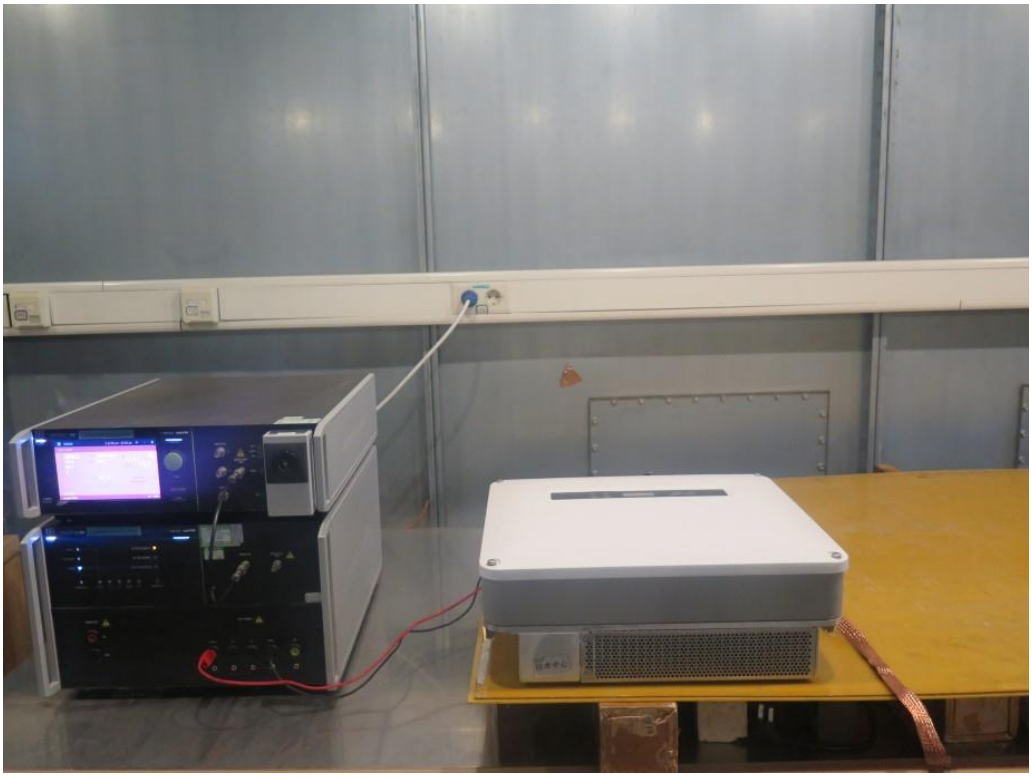


Photograph 7: Set-up for EFT

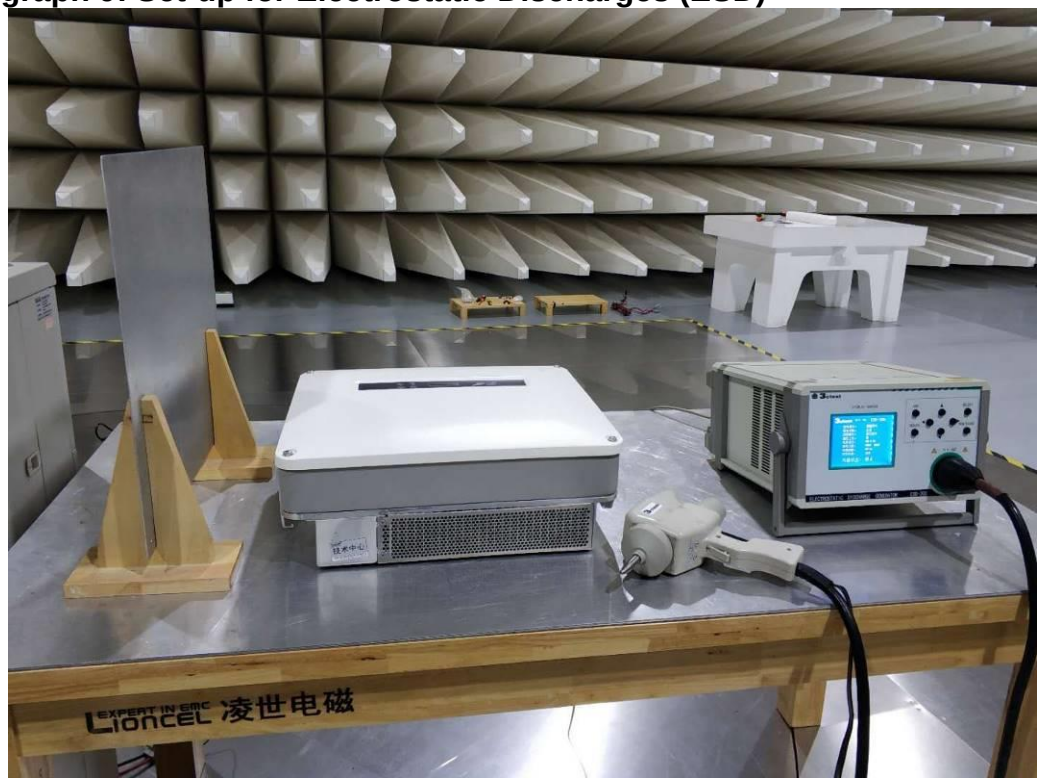




Photograph 8: Set-up for Surge



Photograph 9: Set-up for Electrostatic Discharges (ESD)



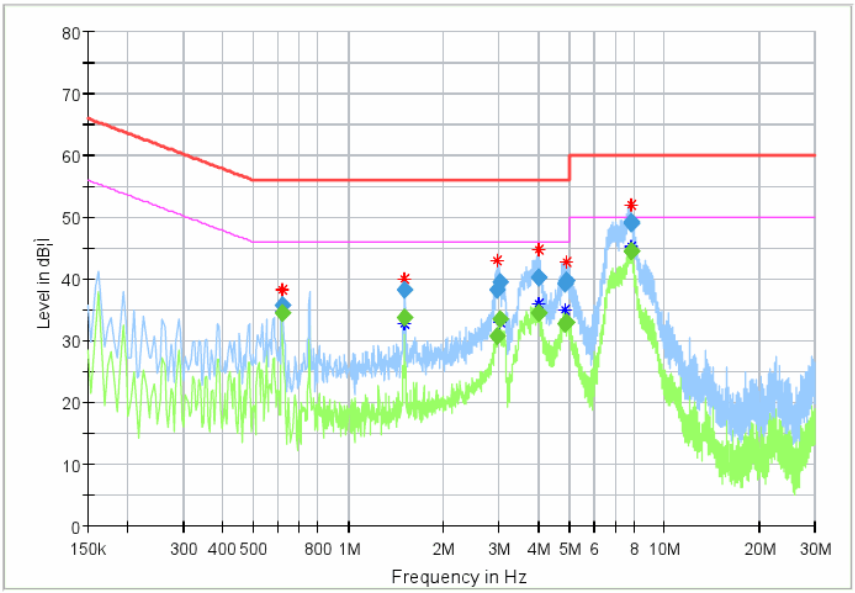
8. List of Tables

9. List of Photographs

Conducted Emission Measurement

Phase: L1 **Temperature:** 24.9℃ **Humidity:**54%
Limit:(CE) : EN 61000-6-3
M/N:SPI12K-B
Mode:ON(100% full load)
Note: DATE: 2019/3/14

Full Spectrum

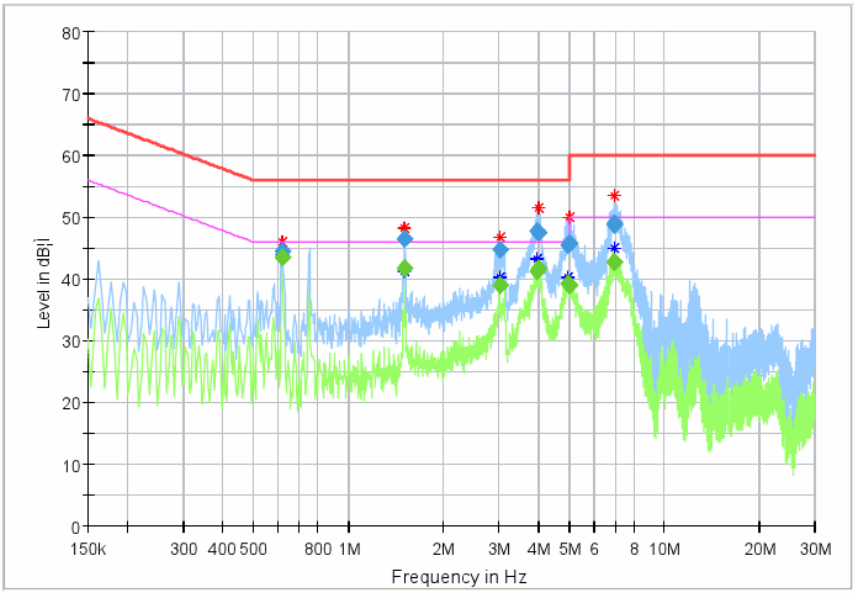


Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	PE	Corr. (dB)
0.620000	---	34.49	46.00	11.51	1500.0	9.000	L1	GND	10.5
0.620000	35.84	---	56.00	20.16	1500.0	9.000	L1	GND	10.5
1.508000	---	33.84	46.00	12.16	1500.0	9.000	L1	GND	10.6
1.508000	38.22	---	56.00	17.78	1500.0	9.000	L1	GND	10.6
2.956000	---	30.63	46.00	15.37	1500.0	9.000	L1	GND	10.6
2.956000	38.36	---	56.00	17.64	1500.0	9.000	L1	GND	10.6
3.012000	---	33.62	46.00	12.38	1500.0	9.000	L1	GND	10.6
3.012000	39.55	---	56.00	16.45	1500.0	9.000	L1	GND	10.6
3.992000	40.31	---	56.00	15.69	1500.0	9.000	L1	GND	10.7
3.992000	---	34.51	46.00	11.49	1500.0	9.000	L1	GND	10.7
3.996000	40.28	---	56.00	15.72	1500.0	9.000	L1	GND	10.7
3.996000	---	34.60	46.00	11.40	1500.0	9.000	L1	GND	10.7
4.868000	---	32.82	46.00	13.18	1500.0	9.000	L1	GND	10.7
4.868000	39.31	---	56.00	16.69	1500.0	9.000	L1	GND	10.7
4.900000	---	33.05	46.00	12.95	1500.0	9.000	L1	GND	10.7
4.900000	39.64	---	56.00	16.36	1500.0	9.000	L1	GND	10.7
7.824000	---	44.42	50.00	5.58	1500.0	9.000	L1	GND	10.8
7.824000	48.99	---	60.00	11.01	1500.0	9.000	L1	GND	10.8
7.832000	---	44.62	50.00	5.38	1500.0	9.000	L1	GND	10.8
7.832000	49.14	---	60.00	10.86	1500.0	9.000	L1	GND	10.8

Conducted Emission Measurement

Phase: L2 **Temperature:** 24.9℃ **Humidity:**54%
Limit:(CE) : EN 61000-6-3
M/N: SPI12K-B
Mode:ON(100% full load)
Note: DATE: 2019/3/14

Full Spectrum



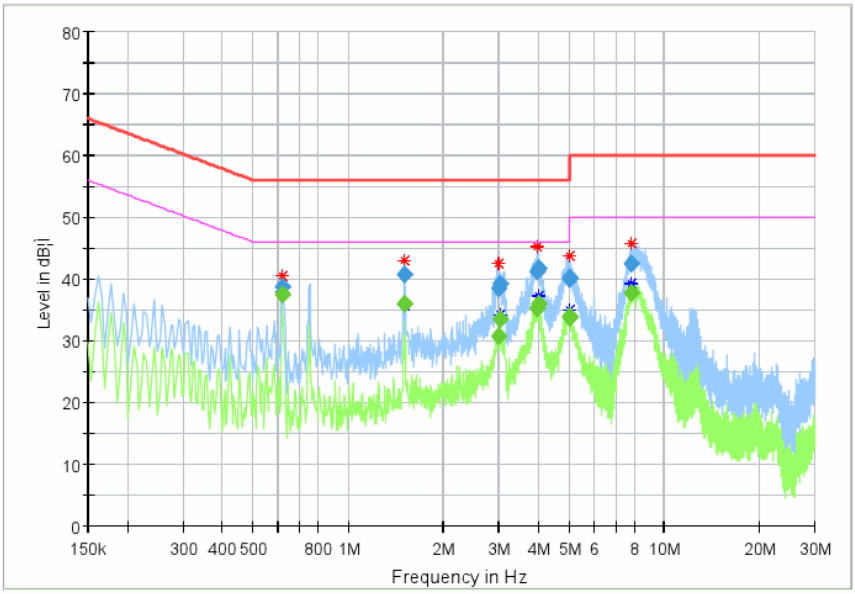
Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	PE	Corr. (dB)
0.620000	44.51	---	56.00	11.49	1500.0	9.000	L2	GND	10.5
0.620000	---	43.46	46.00	2.54	1500.0	9.000	L2	GND	10.5
1.508000	46.47	---	56.00	9.53	1500.0	9.000	L2	GND	10.6
1.508000	---	41.80	46.00	4.20	1500.0	9.000	L2	GND	10.6
3.012000	44.78	---	56.00	11.22	1500.0	9.000	L2	GND	10.6
3.012000	---	39.01	46.00	6.99	1500.0	9.000	L2	GND	10.6
3.976000	---	41.27	46.00	4.73	1500.0	9.000	L2	GND	10.7
3.976000	47.70	---	56.00	8.30	1500.0	9.000	L2	GND	10.7
3.988000	---	41.81	46.00	4.19	1500.0	9.000	L2	GND	10.7
3.988000	47.50	---	56.00	8.50	1500.0	9.000	L2	GND	10.7
4.956000	---	39.16	46.00	6.84	1500.0	9.000	L2	GND	10.7
4.956000	45.45	---	56.00	10.55	1500.0	9.000	L2	GND	10.7
5.024000	---	39.09	50.00	10.91	1500.0	9.000	L2	GND	10.7
5.024000	45.75	---	60.00	14.25	1500.0	9.000	L2	GND	10.7
6.928000	---	42.78	50.00	7.22	1500.0	9.000	L2	GND	10.8
6.928000	48.77	---	60.00	11.23	1500.0	9.000	L2	GND	10.8
6.968000	---	42.86	50.00	7.14	1500.0	9.000	L2	GND	10.8
6.968000	48.90	---	60.00	11.10	1500.0	9.000	L2	GND	10.8

Conducted Emission Measurement

Phase: L3 **Temperature:** 24.9℃ **Humidity:**54%
Limit:(CE) : EN 61000-6-3
M/N: SPI12K-B
Mode:ON(100% full load)
Note:

DATE: 2019/3/14

Full Spectrum

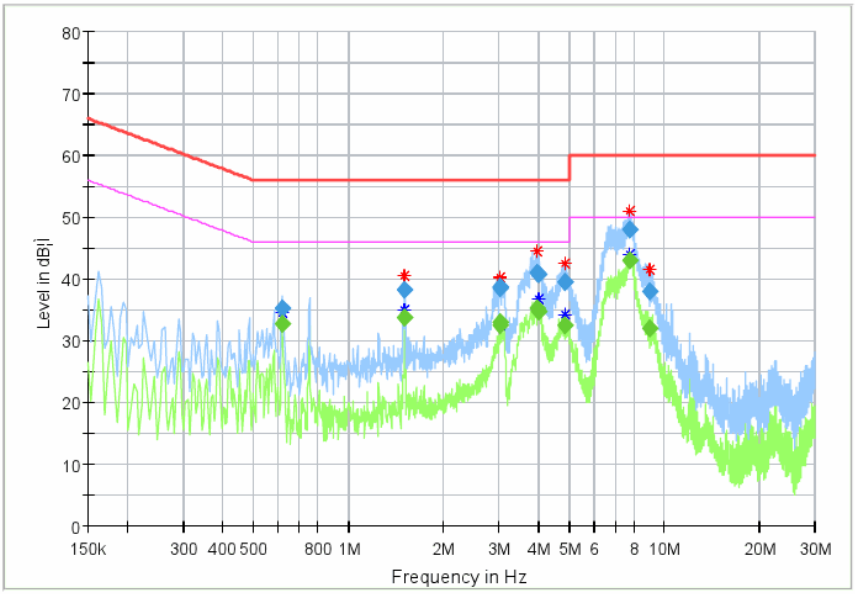


Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	PE	Corr. (dB)
0.620000	38.76	---	56.00	17.24	1500.0	9.000	L3	GND	10.5
0.620000	---	37.45	46.00	8.55	1500.0	9.000	L3	GND	10.5
1.508000	40.81	---	56.00	15.19	1500.0	9.000	L3	GND	10.6
1.508000	---	36.03	46.00	9.97	1500.0	9.000	L3	GND	10.6
2.980000	38.47	---	56.00	17.53	1500.0	9.000	L3	GND	10.6
2.980000	---	30.68	46.00	15.32	1500.0	9.000	L3	GND	10.6
3.016000	39.33	---	56.00	16.67	1500.0	9.000	L3	GND	10.6
3.016000	---	33.43	46.00	12.57	1500.0	9.000	L3	GND	10.6
3.952000	41.21	---	56.00	14.79	1500.0	9.000	L3	GND	10.7
3.952000	---	35.35	46.00	10.65	1500.0	9.000	L3	GND	10.7
3.988000	41.64	---	56.00	14.36	1500.0	9.000	L3	GND	10.7
3.988000	---	36.05	46.00	9.95	1500.0	9.000	L3	GND	10.7
4.992000	40.04	---	56.00	15.96	1500.0	9.000	L3	GND	10.7
4.992000	---	33.70	46.00	12.30	1500.0	9.000	L3	GND	10.7
5.008000	40.17	---	60.00	19.83	1500.0	9.000	L3	GND	10.7
5.008000	---	34.08	50.00	15.92	1500.0	9.000	L3	GND	10.7
7.900000	42.53	---	60.00	17.47	1500.0	9.000	L3	GND	10.8
7.900000	---	37.86	50.00	12.14	1500.0	9.000	L3	GND	10.8

Conducted Emission Measurement

Phase: N **Temperature:** 24.9℃ **Humidity:**54%
Limit:(CE) : EN 61000-6-3
M/N: SPI12K-B
Mode:ON(100% full load)
Note: DATE: 2019/3/14

Full Spectrum

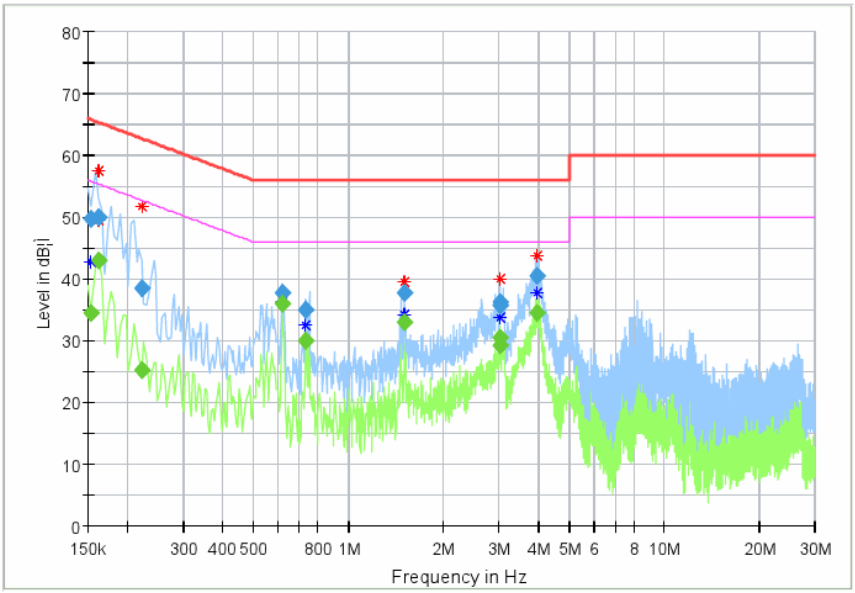


Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	PE	Corr. (dB)
0.616000	35.24	---	56.00	20.76	1500.0	9.000	N	GND	10.5
0.616000	---	32.71	46.00	13.29	1500.0	9.000	N	GND	10.5
1.508000	38.22	---	56.00	17.78	1500.0	9.000	N	GND	10.6
1.508000	---	33.79	46.00	12.21	1500.0	9.000	N	GND	10.6
3.012000	---	32.97	46.00	13.03	1500.0	9.000	N	GND	10.6
3.012000	38.87	---	56.00	17.13	1500.0	9.000	N	GND	10.6
3.016000	---	32.55	46.00	13.45	1500.0	9.000	N	GND	10.6
3.016000	38.43	---	56.00	17.57	1500.0	9.000	N	GND	10.6
3.976000	---	35.34	46.00	10.66	1500.0	9.000	N	GND	10.7
3.976000	41.05	---	56.00	14.95	1500.0	9.000	N	GND	10.7
3.984000	---	34.76	46.00	11.24	1500.0	9.000	N	GND	10.7
3.984000	40.81	---	56.00	15.19	1500.0	9.000	N	GND	10.7
4.828000	39.40	---	56.00	16.60	1500.0	9.000	N	GND	10.7
4.828000	---	32.58	46.00	13.42	1500.0	9.000	N	GND	10.7
7.752000	47.88	---	60.00	12.12	1500.0	9.000	N	GND	10.8
7.752000	---	43.09	50.00	6.91	1500.0	9.000	N	GND	10.8
9.044000	37.88	---	60.00	22.12	1500.0	9.000	N	GND	10.9
9.044000	---	32.02	50.00	17.98	1500.0	9.000	N	GND	10.9

Conducted Emission Measurement

Phase: L1 **Temperature:** 24.9℃ **Humidity:**54%
Limit:(CE) : EN 61000-6-3
M/N:SPI20K-B
Mode:ON(100% full load)
Note: DATE: 2019/3/14

Full Spectrum

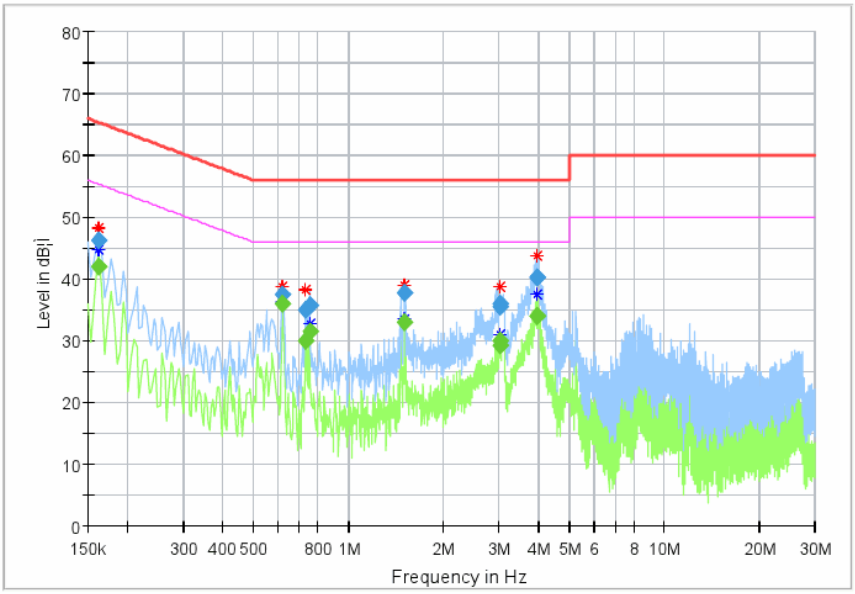


Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	PE	Corr. (dB)
0.154000	49.72	---	65.78	16.06	1500.0	9.000	L1	GND	10.4
0.154000	---	34.45	55.78	21.33	1500.0	9.000	L1	GND	10.4
0.162000	50.08	---	65.36	15.28	1500.0	9.000	L1	GND	10.4
0.162000	---	43.00	55.36	12.36	1500.0	9.000	L1	GND	10.4
0.222000	---	25.24	52.74	27.51	1500.0	9.000	L1	GND	10.4
0.222000	38.51	---	62.74	24.23	1500.0	9.000	L1	GND	10.4
0.620000	---	36.11	46.00	9.89	1500.0	9.000	L1	GND	10.5
0.620000	37.64	---	56.00	18.36	1500.0	9.000	L1	GND	10.5
0.736000	---	30.02	46.00	15.98	1500.0	9.000	L1	GND	10.5
0.736000	35.04	---	56.00	20.96	1500.0	9.000	L1	GND	10.5
1.508000	---	32.95	46.00	13.05	1500.0	9.000	L1	GND	10.6
1.508000	37.66	---	56.00	18.34	1500.0	9.000	L1	GND	10.6
3.008000	---	30.43	46.00	15.57	1500.0	9.000	L1	GND	10.6
3.008000	36.28	---	56.00	19.72	1500.0	9.000	L1	GND	10.6
3.020000	---	29.34	46.00	16.66	1500.0	9.000	L1	GND	10.6
3.020000	35.87	---	56.00	20.13	1500.0	9.000	L1	GND	10.6
3.968000	---	34.58	46.00	11.42	1500.0	9.000	L1	GND	10.7
3.968000	40.45	---	56.00	15.55	1500.0	9.000	L1	GND	10.7

Conducted Emission Measurement

Phase: L2 **Temperature:** 24.9℃ **Humidity:**54%
Limit:(CE) : EN 61000-6-3
M/N: SPI20K-B
Mode:ON(100% full load)
Note: DATE: 2019/3/14

Full Spectrum

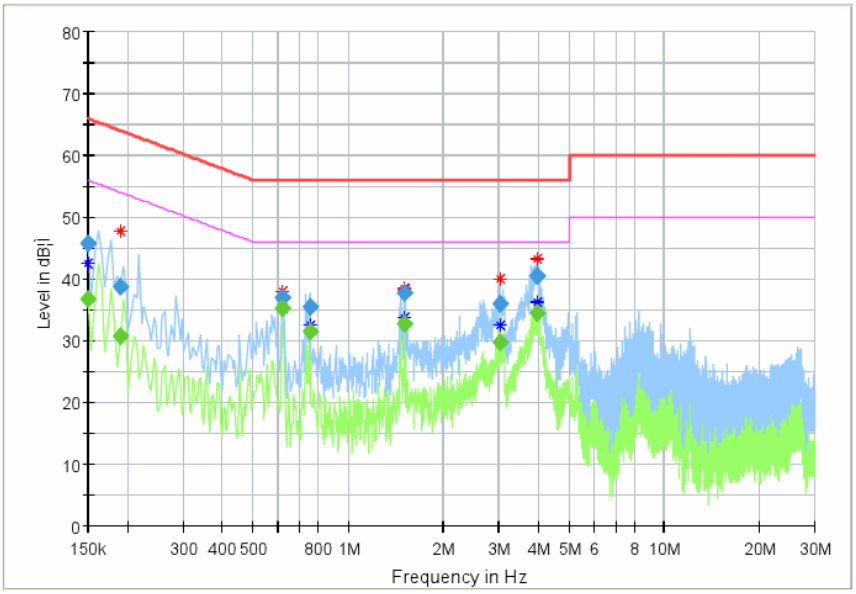


Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	PE	Corr. (dB)
0.162000	---	41.95	55.36	13.41	1500.0	9.000	L2	GND	10.4
0.162000	46.21	---	65.36	19.15	1500.0	9.000	L2	GND	10.4
0.620000	---	35.93	46.00	10.07	1500.0	9.000	L2	GND	10.5
0.620000	37.50	---	56.00	18.50	1500.0	9.000	L2	GND	10.5
0.736000	35.05	---	56.00	20.95	1500.0	9.000	L2	GND	10.5
0.736000	---	29.97	46.00	16.03	1500.0	9.000	L2	GND	10.5
0.756000	35.63	---	56.00	20.37	1500.0	9.000	L2	GND	10.5
0.756000	---	31.54	46.00	14.46	1500.0	9.000	L2	GND	10.5
1.508000	---	32.94	46.00	13.06	1500.0	9.000	L2	GND	10.6
1.508000	37.73	---	56.00	18.27	1500.0	9.000	L2	GND	10.6
3.016000	36.06	---	56.00	19.94	1500.0	9.000	L2	GND	10.6
3.016000	---	29.90	46.00	16.10	1500.0	9.000	L2	GND	10.6
3.020000	35.61	---	56.00	20.39	1500.0	9.000	L2	GND	10.6
3.020000	---	29.18	46.00	16.82	1500.0	9.000	L2	GND	10.6
3.944000	40.23	---	56.00	15.77	1500.0	9.000	L2	GND	10.7
3.944000	---	33.93	46.00	12.07	1500.0	9.000	L2	GND	10.7
3.980000	40.32	---	56.00	15.68	1500.0	9.000	L2	GND	10.7
3.980000	---	34.09	46.00	11.91	1500.0	9.000	L2	GND	10.7

Conducted Emission Measurement

Phase: L3 **Temperature:** 24.9℃ **Humidity:**54%
Limit:(CE) : EN 61000-6-3
M/N: SPI20K-B
Mode:ON(100% full load)
Note: DATE: 2019/3/14

Full Spectrum

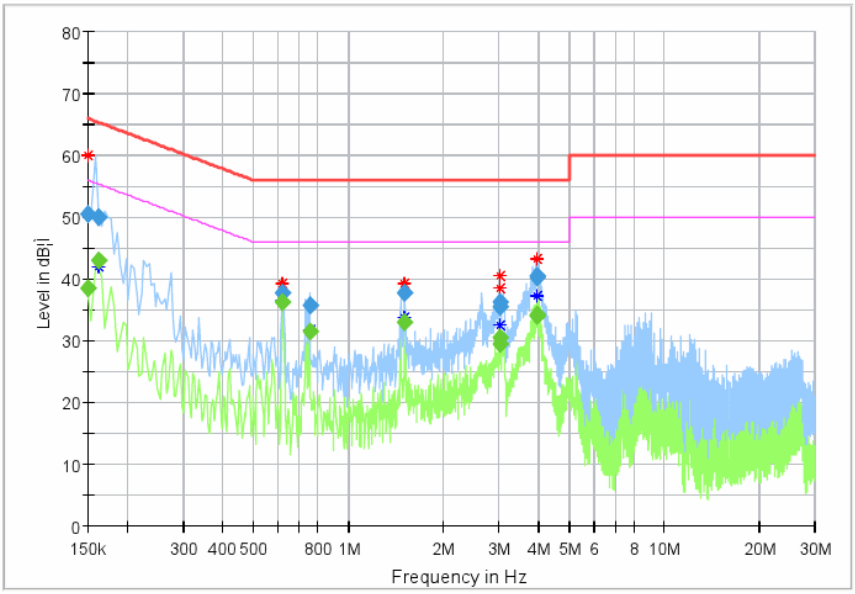


Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	PE	Corr. (dB)
0.150000	---	36.85	56.00	19.15	1500.0	9.000	L3	GND	10.4
0.150000	45.67	---	66.00	20.33	1500.0	9.000	L3	GND	10.4
0.190000	---	30.71	54.04	23.33	1500.0	9.000	L3	GND	10.4
0.190000	38.79	---	64.04	25.24	1500.0	9.000	L3	GND	10.4
0.620000	---	35.34	46.00	10.66	1500.0	9.000	L3	GND	10.5
0.620000	36.96	---	56.00	19.04	1500.0	9.000	L3	GND	10.5
0.756000	---	31.49	46.00	14.51	1500.0	9.000	L3	GND	10.5
0.756000	35.58	---	56.00	20.42	1500.0	9.000	L3	GND	10.5
1.508000	---	32.82	46.00	13.18	1500.0	9.000	L3	GND	10.6
1.508000	37.75	---	56.00	18.25	1500.0	9.000	L3	GND	10.6
3.016000	---	29.86	46.00	16.14	1500.0	9.000	L3	GND	10.6
3.016000	36.02	---	56.00	19.98	1500.0	9.000	L3	GND	10.6
3.952000	---	34.42	46.00	11.58	1500.0	9.000	L3	GND	10.7
3.952000	40.55	---	56.00	15.45	1500.0	9.000	L3	GND	10.7

Conducted Emission Measurement

Phase: N **Temperature:** 24.9℃ **Humidity:**54%
Limit:(CE) : EN 61000-6-3
M/N: SPI20K-B
Mode:ON(100% full load)
Note: DATE: 2019/3/14

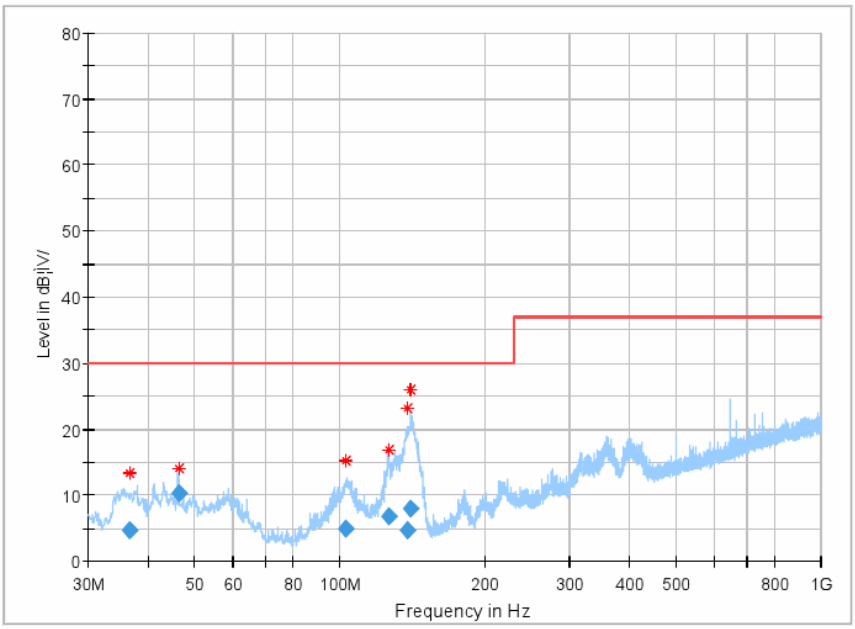
Full Spectrum



Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	PE	Corr. (dB)
0.150000	50.38	---	66.00	15.62	1500.0	9.000	N	GND	10.4
0.150000	---	38.45	56.00	17.55	1500.0	9.000	N	GND	10.4
0.162000	49.99	---	65.36	15.37	1500.0	9.000	N	GND	10.4
0.162000	---	43.02	55.36	12.34	1500.0	9.000	N	GND	10.4
0.620000	---	36.20	46.00	9.80	1500.0	9.000	N	GND	10.5
0.620000	37.74	---	56.00	18.26	1500.0	9.000	N	GND	10.5
0.756000	---	31.60	46.00	14.40	1500.0	9.000	N	GND	10.5
0.756000	35.76	---	56.00	20.24	1500.0	9.000	N	GND	10.5
1.508000	---	32.99	46.00	13.01	1500.0	9.000	N	GND	10.6
1.508000	37.70	---	56.00	18.30	1500.0	9.000	N	GND	10.6
3.008000	---	30.53	46.00	15.47	1500.0	9.000	N	GND	10.6
3.008000	36.30	---	56.00	19.71	1500.0	9.000	N	GND	10.6
3.020000	---	29.41	46.00	16.59	1500.0	9.000	N	GND	10.6
3.020000	35.61	---	56.00	20.39	1500.0	9.000	N	GND	10.6
3.952000	40.61	---	56.00	15.39	1500.0	9.000	N	GND	10.7
3.952000	---	34.27	46.00	11.73	1500.0	9.000	N	GND	10.7
3.980000	40.31	---	56.00	15.69	1500.0	9.000	N	GND	10.7
3.980000	---	33.95	46.00	12.05	1500.0	9.000	N	GND	10.7

Radiated Emission Measurement

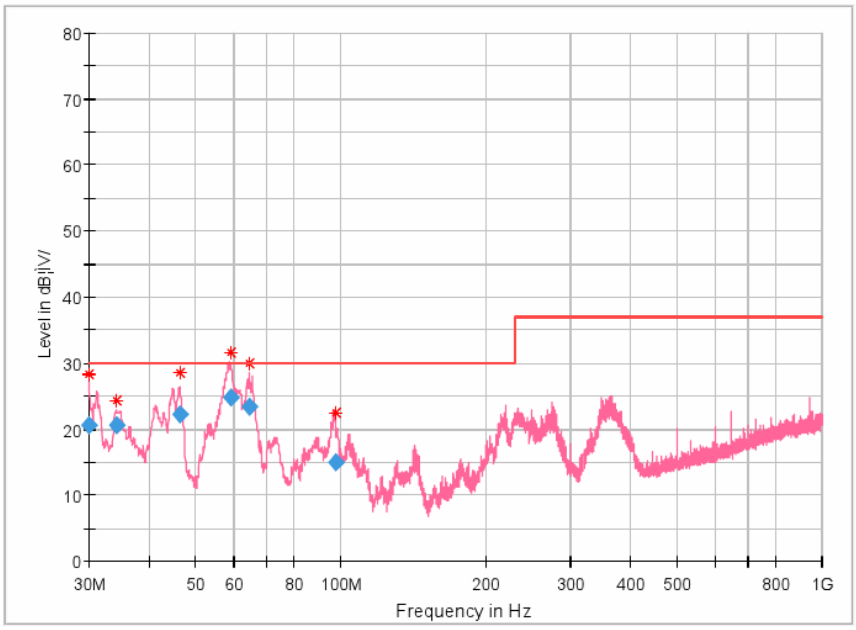
Polarization: Horizontal **Temperature:** 24.9℃ **Humidity:**54%
Limit(RE 10M) : EN 61000-6-3-
M/N: SPI12K-B
Mode:ON(100% full load)
Note:
DATE: 2019/3/14



Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
36.743000	4.65	30.00	25.35	1000.0	120.000	300.0	H	-90.0	-14.9
46.279000	10.21	30.00	19.79	1000.0	120.000	294.0	H	-73.0	-13.9
102.977000	4.87	30.00	25.13	1000.0	120.000	255.0	H	-175.0	-15.5
126.755000	6.77	30.00	23.23	1000.0	120.000	250.0	H	128.0	-17.1
138.167000	4.68	30.00	25.32	1000.0	120.000	272.0	H	-22.0	-17.6
140.557000	7.99	30.00	22.01	1000.0	120.000	236.0	H	-50.0	-17.7

Radiated Emission Measurement

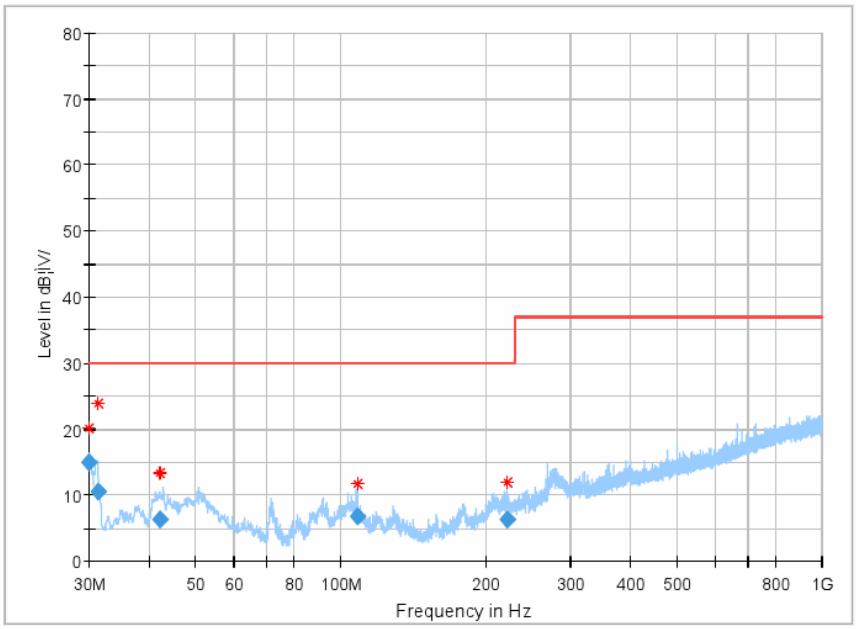
Polarization: Vertical **Temperature:** 24.9℃ **Humidity:**54%
Limit(RE 10M) : EN 61000-6-3
M/N: SPI12K-B
Mode:ON(100% full load)
Note:
DATE: 2019/3/14



Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.000000	20.61	30.00	9.39	1000.0	120.000	131.0	V	-45.0	-16.7
34.211000	20.60	30.00	9.40	1000.0	120.000	100.0	V	46.0	-15.5
46.336000	22.15	30.00	7.85	1000.0	120.000	101.0	V	171.0	-13.9
58.958000	24.74	30.00	5.26	1000.0	120.000	176.0	V	-153.0	-15.0
64.686000	23.46	30.00	6.54	1000.0	120.000	238.0	V	-103.0	-16.5
97.764000	14.94	30.00	15.06	1000.0	120.000	100.0	V	27.0	-16.0

Radiated Emission Measurement

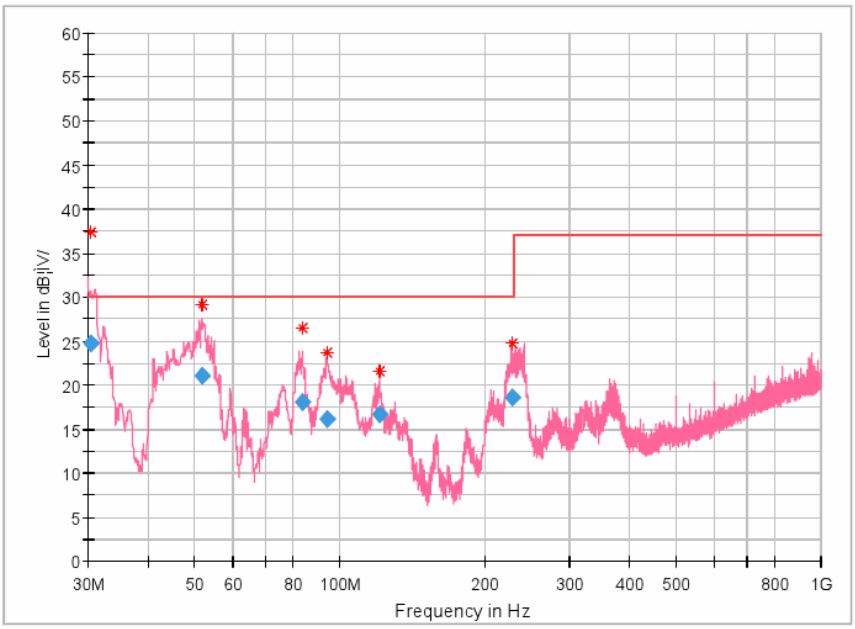
Polarization: Horizontal **Temperature:** 24.9℃ **Humidity:**54%
Limit(RE 10M) : EN 61000-6-3
M/N: SPI20K-B
Mode:ON(100% full load)
Note: DATE: 2019/3/14



Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.040000	15.08	30.00	14.92	1000.0	120.000	101.0	H	169.0	-16.7
31.347000	10.55	30.00	19.45	1000.0	120.000	130.0	H	97.0	-16.3
42.181000	6.20	30.00	23.80	1000.0	120.000	175.0	H	-175.0	-14.1
107.988000	6.75	30.00	23.25	1000.0	120.000	176.0	H	-50.0	-15.3
221.529000	6.34	30.00	23.66	1000.0	120.000	200.0	H	50.0	-13.5

Radiated Emission Measurement

Polarization: Vertical **Temperature:** 24.9℃ **Humidity:**54%
Limit(RE 10M) : EN 61000-6-3
M/N: SPI20K-B
Mode:ON(100% full load)
Note:
DATE: 2019/3/14



Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.400000	24.79	30.00	5.21	1000.0	120.000	100.0	V	49.0	-16.6
51.991000	21.14	30.00	8.86	1000.0	120.000	174.0	V	47.0	-14.0
83.755000	18.07	30.00	11.93	1000.0	120.000	114.0	V	25.0	-18.3
93.986000	16.16	30.00	13.84	1000.0	120.000	114.0	V	-12.0	-16.6
120.969000	16.72	30.00	13.28	1000.0	120.000	100.0	V	180.0	-17.0
229.044000	18.68	30.00	11.32	1000.0	120.000	100.0	V	-7.0	-13.2

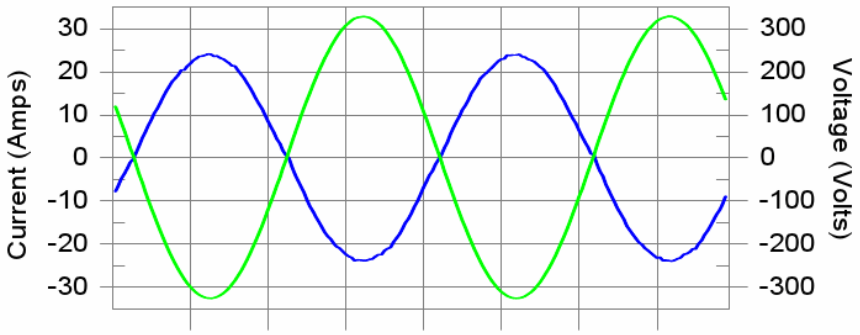
Teseq Profline
4542 Luterbach, Switzerland

Harmonics – Per EN/IEC61000-3-12(Phase A-Run time)

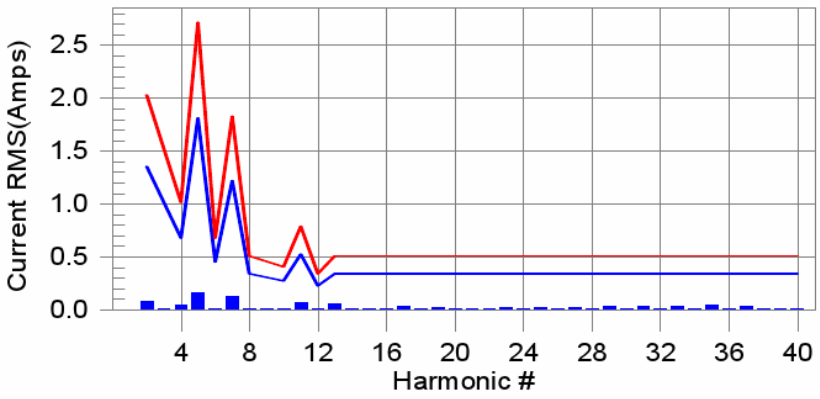
EUT: SPI12K-B Tested by: Tested by
Test category: Table:3, Rsce=33, Inter-Harm,) Test Margin: 100
Test date: 2019/4/9 Start time: 17:59:38 End time: 18:02:30
Test duration (min): 2.5 Data file name: WIN2106_H-000033.cts_data
Comment: FULL LOAD
Customer: KEHUA

Test Result: Pass Source qualification: Normal

Current & voltage waveforms



Harmonics and Class 3 limit line **European Limits**



Test result: Pass **Worst harmonic was #13 with 16.75 % of the limit.**

Teseq Profline
4542 Luterbach, Switzerland

Current Test Result Summary (Phase A-Run time)

EUT: SPI12K-B Tested by: Tested by
Test category: Table:3, Rsce=33, Inter-Harm,) Test Margin: 100
Test date: 2019/4/9 Start time: 17:59:38 End time: 18:02:30
Test duration (min): 2.5 Data file name: WIN2106_H-000033.cts_data
Comment: FULL LOAD
Customer: KEHUA

Test Result: Pass Measured I-ref: 16.911 Amp rms Source: Normal
I-THC(%): 1.6 Limit(%): 13.0 PWHC(%): 3.5 PWHC Limit(%): 22.0

Highest parameter values during test:

V_RMS (Volts):	231.60	Frequency(Hz):	50.00
I_Peak (Amps):	24.425	I_RMS (Amps):	16.924
I_Fund (Amps):	16.911	Crest Factor:	1.444
Power (Watts):	-3915	Power Factor:	-1.000

Harm#	Harms(avg)	100%Limit	%of Limit	Harms(max)	150%Limit	%of Limit	Status
2	0.085	1.353	6.3	0.090	2.030	4.4	Pass
3	0.014	N/A	N/A	0.021	N/A	N/A	N/A
4	0.045	0.677	6.6	0.047	1.015	4.6	Pass
5	0.167	1.810	9.2	0.173	2.715	6.4	Pass
6	0.008	0.451	1.8	0.009	0.677	1.3	Pass
7	0.131	1.218	10.8	0.136	1.827	7.4	Pass
8	0.009	0.338	2.6	0.010	0.507	1.9	Pass
9	0.009	N/A	N/A	0.010	N/A	N/A	N/A
10	0.015	0.271	5.5	0.016	0.406	4.0	Pass
11	0.074	0.524	14.1	0.075	0.786	9.5	Pass
12	0.008	0.226	3.4	0.009	0.338	2.5	Pass
13	0.057	0.338	16.7	0.058	0.507	11.4	Pass
14	0.008	N/A	N/A	0.009	N/A	N/A	N/A
15	0.008	N/A	N/A	0.010	N/A	N/A	N/A
16	0.014	N/A	N/A	0.015	N/A	N/A	N/A
17	0.034	N/A	N/A	0.035	N/A	N/A	N/A
18	0.008	N/A	N/A	0.009	N/A	N/A	N/A
19	0.024	N/A	N/A	0.026	N/A	N/A	N/A
20	0.012	N/A	N/A	0.013	N/A	N/A	N/A
21	0.009	N/A	N/A	0.011	N/A	N/A	N/A
22	0.009	N/A	N/A	0.011	N/A	N/A	N/A
23	0.025	N/A	N/A	0.026	N/A	N/A	N/A
24	0.010	N/A	N/A	0.011	N/A	N/A	N/A
25	0.026	N/A	N/A	0.028	N/A	N/A	N/A
26	0.012	N/A	N/A	0.014	N/A	N/A	N/A
27	0.020	N/A	N/A	0.021	N/A	N/A	N/A
28	0.012	N/A	N/A	0.014	N/A	N/A	N/A
29	0.030	N/A	N/A	0.031	N/A	N/A	N/A
30	0.010	N/A	N/A	0.011	N/A	N/A	N/A
31	0.033	N/A	N/A	0.035	N/A	N/A	N/A
32	0.015	N/A	N/A	0.016	N/A	N/A	N/A
33	0.040	N/A	N/A	0.042	N/A	N/A	N/A
34	0.016	N/A	N/A	0.017	N/A	N/A	N/A
35	0.042	N/A	N/A	0.044	N/A	N/A	N/A
36	0.010	N/A	N/A	0.011	N/A	N/A	N/A
37	0.032	N/A	N/A	0.035	N/A	N/A	N/A
38	0.014	N/A	N/A	0.016	N/A	N/A	N/A
39	0.012	N/A	N/A	0.014	N/A	N/A	N/A
40	0.014	N/A	N/A	0.016	N/A	N/A	N/A

Note: Measured I-ref was applied for this test.

Teseq Profline
4542 Luterbach, Switzerland

Voltage Source Verification Data (Phase A-Run time)

EUT: SPI12K-B Tested by: Tested by
Test category: Table:3, Rsce=33, Inter-Harm,) Test Margin: 100
Test date: 2019/4/9 Start time: 17:59:38 End time: 18:02:30
Test duration (min): 2.5 Data file name: WIN2106_H-000033.cts_data
Comment: FULL LOAD
Customer: KEHUA

Test Result: Pass Source qualification: Normal
Measured source distortion is within the requirements of the standards
Measurements are compliant with IEC/EN61000-3-12 Ed.2 (2011) & IEC/EN61000-4-7

Highest parameter values during test:

Voltage (Vrms):	231.60	Frequency(Hz):	50.00
I_Peak (Amps):	24.425	I_RMS (Amps):	16.924
I_Fund (Amps):	16.911	Crest Factor:	1.444
Power (Watts):	-3915	Power Factor:	-1.000

Harm#	Harmonics V-rms	Limit V-rms	% of Limit	Status
2	0.321	0.925	34.66	OK
3	0.162	2.893	5.60	OK
4	0.044	0.926	4.72	OK
5	0.137	3.472	3.94	OK
6	0.024	0.925	2.61	OK
7	0.172	2.891	5.95	OK
8	0.025	0.925	2.69	OK
9	0.149	1.388	10.76	OK
10	0.022	0.926	2.36	OK
11	0.167	1.619	10.33	OK
12	0.029	0.694	4.12	OK
13	0.150	1.388	10.84	OK
14	0.033	0.694	4.71	OK
15	0.128	0.694	18.45	OK
16	0.036	0.695	5.25	OK
17	0.118	0.694	16.96	OK
18	0.029	0.694	4.17	OK
19	0.111	0.694	15.94	OK
20	0.040	0.694	5.78	OK
21	0.101	0.694	14.59	OK
22	0.031	0.694	4.43	OK
23	0.111	0.694	16.00	OK
24	0.026	0.694	3.75	OK
25	0.104	0.694	14.92	OK
26	0.025	0.694	3.60	OK
27	0.082	0.694	11.83	OK
28	0.023	0.694	3.24	OK
29	0.093	0.694	13.38	OK
30	0.024	0.694	3.46	OK
31	0.093	0.694	13.43	OK
32	0.021	0.694	3.08	OK
33	0.071	0.694	10.21	OK
34	0.025	0.694	3.61	OK
35	0.088	0.694	12.74	OK
36	0.020	0.694	2.94	OK
37	0.088	0.694	12.73	OK
38	0.028	0.694	4.10	OK
39	0.060	0.694	8.60	OK
40	0.036	0.694	5.19	OK

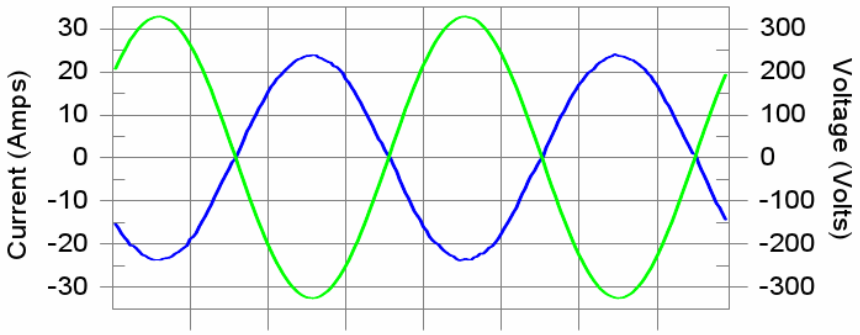
Teseq Profline
4542 Luterbach, Switzerland

Harmonics – Per EN/IEC61000-3-12(Phase B-Run time)

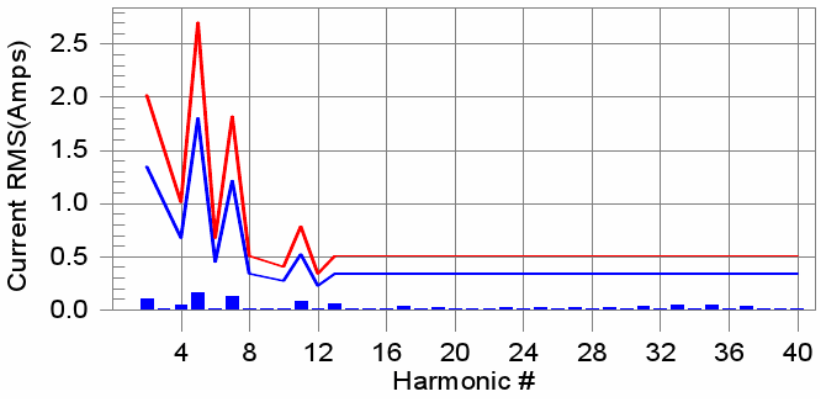
EUT: SPI12K-B Tested by: Tested by
Test category: Table:3, Rsce=33, Inter-Harm,) Test Margin: 100
Test date: 2019/4/9 Start time: 17:59:38 End time: 18:02:30
Test duration (min): 2.5 Data file name: WIN2106_H-000033.cts_data
Comment: FULL LOAD
Customer: KEHUA

Test Result: Pass Source qualification: Normal

Current & voltage waveforms



Harmonics and Class 3 limit line European Limits



Test result: Pass Worst harmonic was #13 with 17.34 % of the limit.

Teseq Profline
4542 Luterbach, Switzerland

Current Test Result Summary (Phase B-Run time)

EUT: SPI12K-B Tested by: Tested by
Test category: Table:3, Rsce=33, Inter-Harm,) Test Margin: 100
Test date: 2019/4/9 Start time: 17:59:38 End time: 18:02:30
Test duration (min): 2.5 Data file name: WIN2106_H-000033.cts_data
Comment: FULL LOAD
Customer: KEHUA

Test Result: Pass Measured I-ref: 16.827 Amp rms Source: Normal
I-THC(%): 1.7 Limit(%): 13.0 PWHC(%): 3.5 PWHC Limit(%): 22.0

Highest parameter values during test:

V_RMS (Volts):	231.06	Frequency(Hz):	50.00
I_Peak (Amps):	24.390	I_RMS (Amps):	16.838
I_Fund (Amps):	16.827	Crest Factor:	1.449
Power (Watts):	-3888	Power Factor:	-1.000

Harm#	Harms(avg)	100%Limit	%of Limit	Harms(max)	150%Limit	%of Limit	Status
2	0.103	1.346	7.7	0.110	2.020	5.5	Pass
3	0.014	N/A	N/A	0.023	N/A	N/A	N/A
4	0.043	0.673	6.4	0.045	1.010	4.5	Pass
5	0.164	1.801	9.1	0.168	2.701	6.2	Pass
6	0.007	0.449	1.6	0.008	0.673	1.2	Pass
7	0.132	1.212	10.9	0.135	1.818	7.4	Pass
8	0.010	0.337	2.9	0.011	0.505	2.1	Pass
9	0.009	N/A	N/A	0.010	N/A	N/A	N/A
10	0.016	0.269	5.8	0.017	0.404	4.2	Pass
11	0.076	0.522	14.6	0.078	0.783	10.0	Pass
12	0.007	0.224	3.3	0.009	0.337	2.6	Pass
13	0.058	0.337	17.3	0.060	0.505	11.8	Pass
14	0.008	N/A	N/A	0.009	N/A	N/A	N/A
15	0.010	N/A	N/A	0.011	N/A	N/A	N/A
16	0.014	N/A	N/A	0.015	N/A	N/A	N/A
17	0.029	N/A	N/A	0.031	N/A	N/A	N/A
18	0.008	N/A	N/A	0.009	N/A	N/A	N/A
19	0.028	N/A	N/A	0.030	N/A	N/A	N/A
20	0.011	N/A	N/A	0.013	N/A	N/A	N/A
21	0.011	N/A	N/A	0.012	N/A	N/A	N/A
22	0.012	N/A	N/A	0.013	N/A	N/A	N/A
23	0.025	N/A	N/A	0.027	N/A	N/A	N/A
24	0.011	N/A	N/A	0.013	N/A	N/A	N/A
25	0.027	N/A	N/A	0.029	N/A	N/A	N/A
26	0.011	N/A	N/A	0.013	N/A	N/A	N/A
27	0.018	N/A	N/A	0.020	N/A	N/A	N/A
28	0.010	N/A	N/A	0.012	N/A	N/A	N/A
29	0.028	N/A	N/A	0.030	N/A	N/A	N/A
30	0.010	N/A	N/A	0.011	N/A	N/A	N/A
31	0.032	N/A	N/A	0.034	N/A	N/A	N/A
32	0.015	N/A	N/A	0.016	N/A	N/A	N/A
33	0.040	N/A	N/A	0.041	N/A	N/A	N/A
34	0.016	N/A	N/A	0.018	N/A	N/A	N/A
35	0.049	N/A	N/A	0.051	N/A	N/A	N/A
36	0.010	N/A	N/A	0.011	N/A	N/A	N/A
37	0.031	N/A	N/A	0.033	N/A	N/A	N/A
38	0.013	N/A	N/A	0.015	N/A	N/A	N/A
39	0.013	N/A	N/A	0.014	N/A	N/A	N/A
40	0.014	N/A	N/A	0.016	N/A	N/A	N/A

Note: Measured I-ref was applied for this test.

Teseq Profline
4542 Luterbach, Switzerland

Voltage Source Verification Data (Phase B-Run time)

EUT: SPI12K-B Tested by: Tested by
Test category: Table:3, Rsce=33, Inter-Harm,) Test Margin: 100
Test date: 2019/4/9 Start time: 17:59:38 End time: 18:02:30
Test duration (min): 2.5 Data file name: WIN2106_H-000033.cts_data
Comment: FULL LOAD
Customer: KEHUA

Test Result: Pass Source qualification: Normal
Measured source distortion is within the requirements of the standards
Measurements are compliant with IEC/EN61000-3-12 Ed.2 (2011) & IEC/EN61000-4-7

Highest parameter values during test:

Voltage (Vrms):	231.06	Frequency(Hz):	50.00
I_Peak (Amps):	24.390	I_RMS (Amps):	16.838
I_Fund (Amps):	16.827	Crest Factor:	1.449
Power (Watts):	-3888	Power Factor:	-1.000

Harm#	Harmonics V-rms	Limit V-rms	% of Limit	Status
2	0.315	0.924	34.08	OK
3	0.166	2.887	5.76	OK
4	0.036	0.924	3.85	OK
5	0.144	3.465	4.15	OK
6	0.020	0.924	2.15	OK
7	0.181	2.887	6.29	OK
8	0.024	0.924	2.54	OK
9	0.156	1.386	11.24	OK
10	0.021	0.924	2.31	OK
11	0.182	1.617	11.27	OK
12	0.024	0.693	3.48	OK
13	0.159	1.386	11.44	OK
14	0.021	0.693	3.01	OK
15	0.132	0.693	18.98	OK
16	0.027	0.693	3.94	OK
17	0.125	0.693	18.03	OK
18	0.026	0.693	3.79	OK
19	0.120	0.693	17.36	OK
20	0.027	0.693	3.88	OK
21	0.110	0.693	15.82	OK
22	0.028	0.693	3.98	OK
23	0.106	0.693	15.37	OK
24	0.027	0.693	3.90	OK
25	0.108	0.693	15.62	OK
26	0.023	0.693	3.26	OK
27	0.082	0.693	11.91	OK
28	0.022	0.693	3.14	OK
29	0.096	0.693	13.90	OK
30	0.019	0.693	2.80	OK
31	0.096	0.693	13.83	OK
32	0.025	0.693	3.54	OK
33	0.070	0.693	10.03	OK
34	0.027	0.693	3.95	OK
35	0.090	0.693	12.93	OK
36	0.022	0.693	3.20	OK
37	0.085	0.693	12.21	OK
38	0.033	0.693	4.73	OK
39	0.064	0.693	9.17	OK
40	0.036	0.693	5.19	OK

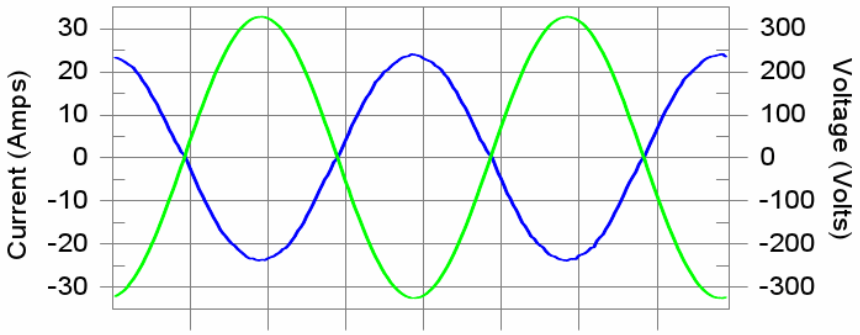
Teseq Profline
4542 Luterbach, Switzerland

Harmonics – Per EN/IEC61000-3-12(Phase C-Run time)

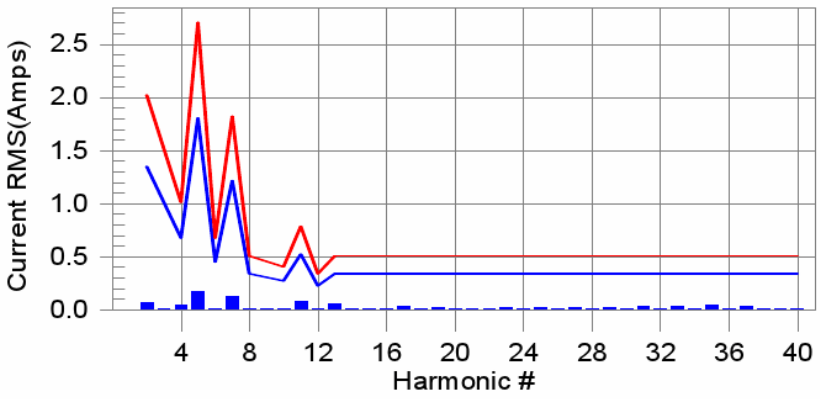
EUT: SPI12K-B Tested by: Tested by
Test category: Table:3, Rsce=33, Inter-Harm,) Test Margin: 100
Test date: 2019/4/9 Start time: 17:59:38 End time: 18:02:30
Test duration (min): 2.5 Data file name: WIN2106_H-000033.cts_data
Comment: FULL LOAD
Customer: KEHUA

Test Result: Pass Source qualification: Normal

Current & voltage waveforms



Harmonics and Class 3 limit line **European Limits**



Test result: Pass **Worst harmonic was #13 with 16.93 % of the limit.**

Teseq Profline
4542 Luterbach, Switzerland

Current Test Result Summary (Phase C-Run time)

EUT: SPI12K-B Tested by: Tested by
Test category: Table:3, Rsce=33, Inter-Harm,) Test Margin: 100
Test date: 2019/4/9 Start time: 17:59:38 End time: 18:02:30
Test duration (min): 2.5 Data file name: WIN2106_H-000033.cts_data
Comment: FULL LOAD
Customer: KEHUA

Test Result: Pass Measured I-ref: 16.849 Amp rms Source: Normal
I-THC(%): 1.6 Limit(%): 13.0 PWHC(%): 3.5 PWHC Limit(%): 22.0

Highest parameter values during test:

V_RMS (Volts):	231.14	Frequency(Hz):	50.00
I_Peak (Amps):	24.427	I_RMS (Amps):	16.861
I_Fund (Amps):	16.849	Crest Factor:	1.450
Power (Watts):	-3895	Power Factor:	-1.000

Harm#	Harms(avg)	100%Limit	%of Limit	Harms(max)	150%Limit	%of Limit	Status
2	0.074	1.348	5.5	0.079	2.022	3.9	Pass
3	0.014	N/A	N/A	0.020	N/A	N/A	N/A
4	0.042	0.674	6.3	0.045	1.011	4.4	Pass
5	0.174	1.803	9.6	0.178	2.705	6.6	Pass
6	0.007	0.449	1.5	0.008	0.674	1.1	Pass
7	0.131	1.213	10.8	0.134	1.820	7.4	Pass
8	0.010	0.337	2.9	0.011	0.506	2.2	Pass
9	0.009	N/A	N/A	0.011	N/A	N/A	N/A
10	0.015	0.270	5.6	0.016	0.404	4.0	Pass
11	0.075	0.522	14.4	0.077	0.784	9.8	Pass
12	0.007	0.225	3.2	0.008	0.337	2.4	Pass
13	0.056	0.337	16.5	0.057	0.506	11.3	Pass
14	0.008	N/A	N/A	0.009	N/A	N/A	N/A
15	0.009	N/A	N/A	0.011	N/A	N/A	N/A
16	0.014	N/A	N/A	0.016	N/A	N/A	N/A
17	0.033	N/A	N/A	0.034	N/A	N/A	N/A
18	0.008	N/A	N/A	0.009	N/A	N/A	N/A
19	0.025	N/A	N/A	0.027	N/A	N/A	N/A
20	0.012	N/A	N/A	0.013	N/A	N/A	N/A
21	0.010	N/A	N/A	0.012	N/A	N/A	N/A
22	0.011	N/A	N/A	0.012	N/A	N/A	N/A
23	0.026	N/A	N/A	0.027	N/A	N/A	N/A
24	0.010	N/A	N/A	0.012	N/A	N/A	N/A
25	0.025	N/A	N/A	0.026	N/A	N/A	N/A
26	0.010	N/A	N/A	0.011	N/A	N/A	N/A
27	0.018	N/A	N/A	0.019	N/A	N/A	N/A
28	0.010	N/A	N/A	0.012	N/A	N/A	N/A
29	0.028	N/A	N/A	0.030	N/A	N/A	N/A
30	0.010	N/A	N/A	0.011	N/A	N/A	N/A
31	0.031	N/A	N/A	0.032	N/A	N/A	N/A
32	0.016	N/A	N/A	0.017	N/A	N/A	N/A
33	0.038	N/A	N/A	0.039	N/A	N/A	N/A
34	0.016	N/A	N/A	0.022	N/A	N/A	N/A
35	0.051	N/A	N/A	0.053	N/A	N/A	N/A
36	0.011	N/A	N/A	0.012	N/A	N/A	N/A
37	0.029	N/A	N/A	0.031	N/A	N/A	N/A
38	0.014	N/A	N/A	0.016	N/A	N/A	N/A
39	0.012	N/A	N/A	0.013	N/A	N/A	N/A
40	0.014	N/A	N/A	0.016	N/A	N/A	N/A

Note: Measured I-ref was applied for this test.

Teseq Profline
4542 Luterbach, Switzerland

Voltage Source Verification Data (Phase C-Run time)

EUT: SPI12K-B Tested by: Tested by
Test category: Table:3, Rsce=33, Inter-Harm,) Test Margin: 100
Test date: 2019/4/9 Start time: 17:59:38 End time: 18:02:30
Test duration (min): 2.5 Data file name: WIN2106_H-000033.cts_data
Comment: FULL LOAD
Customer: KEHUA

Test Result: Pass Source qualification: Normal
Measured source distortion is within the requirements of the standards
Measurements are compliant with IEC/EN61000-3-12 Ed.2 (2011) & IEC/EN61000-4-7

Highest parameter values during test:

Voltage (Vrms):	231.14	Frequency(Hz):	50.00
I_Peak (Amps):	24.427	I_RMS (Amps):	16.861
I_Fund (Amps):	16.849	Crest Factor:	1.450
Power (Watts):	-3895	Power Factor:	-1.000

Harm#	Harmonics V-rms	Limit V-rms	% of Limit	Status
2	0.285	0.924	30.79	OK
3	0.156	2.889	5.40	OK
4	0.049	0.924	5.30	OK
5	0.149	3.467	4.31	OK
6	0.025	0.924	2.67	OK
7	0.186	2.888	6.42	OK
8	0.030	0.924	3.23	OK
9	0.153	1.386	11.07	OK
10	0.024	0.924	2.56	OK
11	0.179	1.617	11.07	OK
12	0.025	0.693	3.61	OK
13	0.154	1.386	11.09	OK
14	0.031	0.693	4.44	OK
15	0.127	0.693	18.34	OK
16	0.037	0.693	5.28	OK
17	0.136	0.693	19.68	OK
18	0.029	0.693	4.22	OK
19	0.127	0.693	18.35	OK
20	0.036	0.693	5.20	OK
21	0.115	0.693	16.65	OK
22	0.035	0.693	5.07	OK
23	0.116	0.693	16.76	OK
24	0.025	0.693	3.63	OK
25	0.108	0.693	15.53	OK
26	0.023	0.693	3.31	OK
27	0.085	0.693	12.29	OK
28	0.026	0.693	3.79	OK
29	0.098	0.693	14.19	OK
30	0.021	0.693	3.00	OK
31	0.092	0.693	13.29	OK
32	0.023	0.693	3.38	OK
33	0.065	0.693	9.32	OK
34	0.026	0.693	3.76	OK
35	0.090	0.693	12.99	OK
36	0.023	0.693	3.26	OK
37	0.091	0.693	13.18	OK
38	0.035	0.693	4.99	OK
39	0.058	0.693	8.30	OK
40	0.042	0.693	6.00	OK

Teseq Profline
4542 Luterbach, Switzerland

5th Harmonic Phase Angle and Magnitude for Phase A :
H-5_min_phase : 29.1 Degree (Leading)
H-5_max_phase : 35.5 Degree (Leading)
H-5_ave_phase : 32.2 Degree (Leading)

H-5_ave_vector_magnitude : 0.173 Amp
H-5_standard_ave_magnitude : 0.167 Amp
H-5_standard_max_magnitude : 0.178 Amp
Ratio of H-5_ave_vector / H-5_standard_ave : 0.994

Phase A = 16.746% of tested Rsce = 33.000, Rsce = 5.526
Phase B = 17.339% of tested Rsce = 33.000, Rsce = 5.722
Phase C = 16.544% of tested Rsce = 33.000, Rsce = 5.460
Minimum Rsce required: Rsce = 5.722

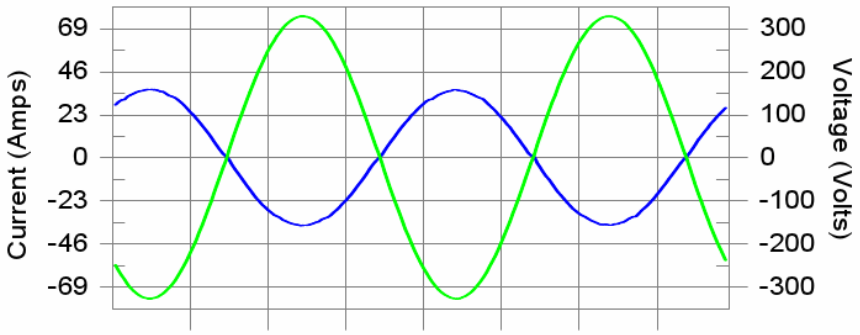
Teseq Profline
4542 Luterbach, Switzerland

Harmonics – Per EN/IEC61000-3-12(Phase A-Run time)

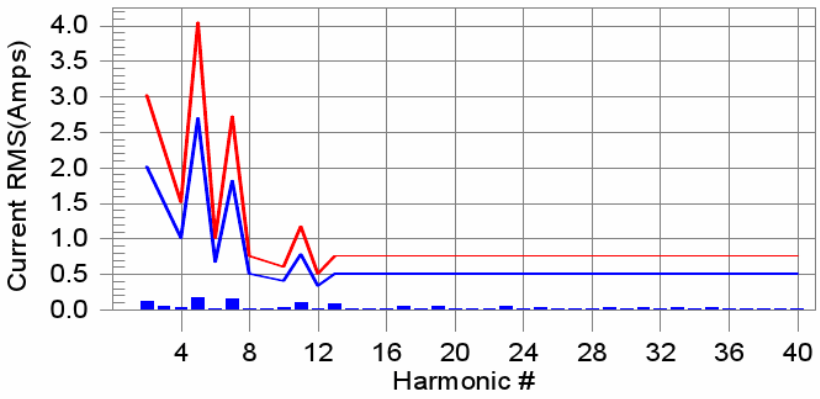
EUT: SPI20K-B Tested by: CTR
Test category: Table:3, Rsce=33, Inter-Harm,) Test Margin: 100
Test date: 2019/4/9 Start time: 17:54:20 End time: 17:57:13
Test duration (min): 2.5 Data file name: WIN2106_H-000032.cts_data
Comment: FULL LOAD
Customer:

Test Result: Pass Source qualification: Normal

Current & voltage waveforms



Harmonics and Class 3 limit line **European Limits**



Test result: Pass **Worst harmonic was #13 with 22.96 % of the limit.**

Teseq Profline
4542 Luterbach, Switzerland

Current Test Result Summary (Phase A-Run time)

EUT: SPI20K-B Tested by: CTR
Test category: Table:3, Rsce=33, Inter-Harm,) Test Margin: 100
Test date: 2019/4/9 Start time: 17:54:20 End time: 17:57:13
Test duration (min): 2.5 Data file name: WIN2106_H-000032.cts_data
Comment: FULL LOAD
Customer:

Test Result: Pass Measured I-ref: 25.186 Amp rms Source: Normal
I-THC(%): 1.3 Limit(%): 13.0 PWHC(%): 2.6 PWHC Limit(%): 22.0

Highest parameter values during test:

V_RMS (Volts):	232.07	Frequency(Hz):	50.00
I_Peak (Amps):	39.282	I_RMS (Amps):	27.222
I_Fund (Amps):	25.186	Crest Factor:	2.081
Power (Watts):	-6312	Power Factor:	-1.000

Harm#	Harms(avg)	100%Limit	%of Limit	Harms(max)	150%Limit	%of Limit	Status
2	0.123	2.015	6.1	0.179	3.023	5.9	Pass
3	0.051	N/A	N/A	0.111	N/A	N/A	N/A
4	0.042	1.008	4.2	0.099	1.511	6.5	Pass
5	0.178	2.695	6.6	0.200	4.043	5.0	Pass
6	0.015	0.672	2.3	0.054	1.008	5.4	Pass
7	0.150	1.814	8.3	0.170	2.720	6.2	Pass
8	0.017	0.504	3.3	0.039	0.756	5.2	Pass
9	0.010	N/A	N/A	0.033	N/A	N/A	N/A
10	0.025	0.403	6.2	0.040	0.605	6.6	Pass
11	0.102	0.781	13.1	0.109	1.171	9.3	Pass
12	0.010	0.336	2.9	0.026	0.504	5.1	Pass
13	0.079	0.504	15.7	0.085	0.756	11.2	Pass
14	0.013	N/A	N/A	0.025	N/A	N/A	N/A
15	0.009	N/A	N/A	0.023	N/A	N/A	N/A
16	0.013	N/A	N/A	0.023	N/A	N/A	N/A
17	0.058	N/A	N/A	0.063	N/A	N/A	N/A
18	0.009	N/A	N/A	0.019	N/A	N/A	N/A
19	0.054	N/A	N/A	0.059	N/A	N/A	N/A
20	0.015	N/A	N/A	0.023	N/A	N/A	N/A
21	0.010	N/A	N/A	0.019	N/A	N/A	N/A
22	0.014	N/A	N/A	0.020	N/A	N/A	N/A
23	0.045	N/A	N/A	0.050	N/A	N/A	N/A
24	0.011	N/A	N/A	0.017	N/A	N/A	N/A
25	0.040	N/A	N/A	0.045	N/A	N/A	N/A
26	0.016	N/A	N/A	0.019	N/A	N/A	N/A
27	0.020	N/A	N/A	0.024	N/A	N/A	N/A
28	0.016	N/A	N/A	0.020	N/A	N/A	N/A
29	0.029	N/A	N/A	0.033	N/A	N/A	N/A
30	0.011	N/A	N/A	0.016	N/A	N/A	N/A
31	0.030	N/A	N/A	0.035	N/A	N/A	N/A
32	0.019	N/A	N/A	0.023	N/A	N/A	N/A
33	0.042	N/A	N/A	0.047	N/A	N/A	N/A
34	0.016	N/A	N/A	0.019	N/A	N/A	N/A
35	0.039	N/A	N/A	0.043	N/A	N/A	N/A
36	0.011	N/A	N/A	0.015	N/A	N/A	N/A
37	0.023	N/A	N/A	0.026	N/A	N/A	N/A
38	0.014	N/A	N/A	0.018	N/A	N/A	N/A
39	0.013	N/A	N/A	0.017	N/A	N/A	N/A
40	0.012	N/A	N/A	0.015	N/A	N/A	N/A

Note: Measured I-ref was applied for this test.

Teseq Profline
4542 Luterbach, Switzerland

Voltage Source Verification Data (Phase A-Run time)

EUT: SPI20K-B Tested by: CTR
Test category: Table:3, Rsce=33, Inter-Harm,) Test Margin: 100
Test date: 2019/4/9 Start time: 17:54:20 End time: 17:57:13
Test duration (min): 2.5 Data file name: WIN2106_H-000032.cts_data
Comment: FULL LOAD
Customer:

Test Result: Pass Source qualification: Normal
Measured source distortion is within the requirements of the standards
Measurements are compliant with IEC/EN61000-3-12 Ed.2 (2011) & IEC/EN61000-4-7

Highest parameter values during test:

Voltage (Vrms):	232.07	Frequency(Hz):	50.00
I_Peak (Amps):	39.282	I_RMS (Amps):	27.222
I_Fund (Amps):	25.186	Crest Factor:	2.081
Power (Watts):	-6312	Power Factor:	-1.000

Harm#	Harmonics V-rms	Limit V-rms	% of Limit	Status
2	0.324	0.927	34.90	OK
3	0.328	2.899	11.31	OK
4	0.056	0.928	5.99	OK
5	0.196	3.479	5.63	OK
6	0.025	0.928	2.68	OK
7	0.199	2.898	6.88	OK
8	0.022	0.928	2.33	OK
9	0.156	1.389	11.20	OK
10	0.020	0.928	2.14	OK
11	0.193	1.624	11.86	OK
12	0.029	0.695	4.13	OK
13	0.167	1.391	12.03	OK
14	0.028	0.695	3.98	OK
15	0.136	0.694	19.61	OK
16	0.032	0.695	4.58	OK
17	0.150	0.694	21.54	OK
18	0.027	0.696	3.92	OK
19	0.129	0.695	18.64	OK
20	0.040	0.696	5.70	OK
21	0.101	0.695	14.55	OK
22	0.035	0.696	4.96	OK
23	0.126	0.695	18.19	OK
24	0.028	0.695	4.08	OK
25	0.119	0.695	17.15	OK
26	0.038	0.696	5.44	OK
27	0.088	0.695	12.64	OK
28	0.036	0.696	5.18	OK
29	0.094	0.695	13.60	OK
30	0.029	0.696	4.14	OK
31	0.091	0.695	13.08	OK
32	0.041	0.696	5.82	OK
33	0.080	0.695	11.50	OK
34	0.042	0.696	6.05	OK
35	0.084	0.695	12.05	OK
36	0.028	0.696	4.03	OK
37	0.081	0.695	11.64	OK
38	0.036	0.696	5.17	OK
39	0.060	0.695	8.57	OK
40	0.038	0.696	5.49	OK

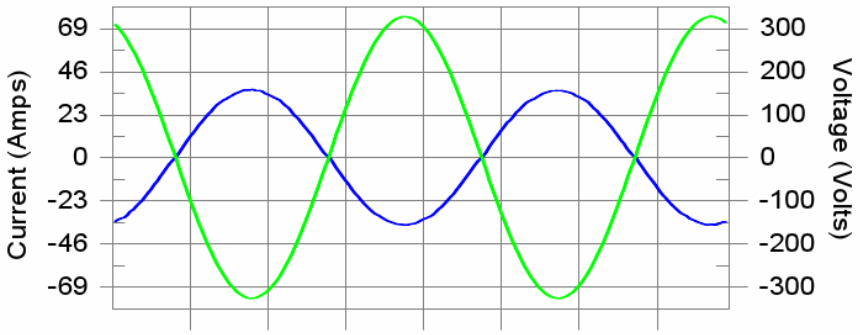
Teseq Profline
4542 Luterbach, Switzerland

Harmonics – Per EN/IEC61000-3-12(Phase B-Run time)

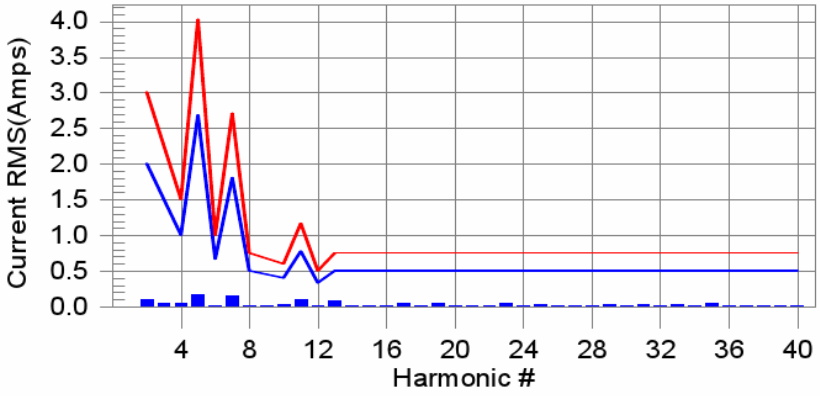
EUT: SPI20K-B Tested by: CTR
Test category: Table:3, Rsce=33, Inter-Harm,) Test Margin: 100
Test date: 2019/4/9 Start time: 17:54:20 End time: 17:57:13
Test duration (min): 2.5 Data file name: WIN2106_H-000032.cts_data
Comment: FULL LOAD
Customer:

Test Result: Pass Source qualification: Normal

Current & voltage waveforms



Harmonics and Class 3 limit line European Limits



Test result: Pass Worst harmonic was #13 with 23.40 % of the limit.

Teseq Profline
4542 Luterbach, Switzerland

Current Test Result Summary (Phase B-Run time)

EUT: SPI20K-B Tested by: CTR
Test category: Table:3, Rsce=33, Inter-Harm,) Test Margin: 100
Test date: 2019/4/9 Start time: 17:54:20 End time: 17:57:13
Test duration (min): 2.5 Data file name: WIN2106_H-000032.cts_data
Comment: FULL LOAD
Customer: 科华

Test Result: Pass Measured I-ref: 25.091 Amp rms Source: Normal
I-THC(%): 1.3 Limit(%): 13.0 PWHC(%): 2.7 PWHC Limit(%): 22.0

Highest parameter values during test:

V_RMS (Volts):	231.32	Frequency(Hz):	50.00
I_Peak (Amps):	39.550	I_RMS (Amps):	27.090
I_Fund (Amps):	25.091	Crest Factor:	2.088
Power (Watts):	-6265	Power Factor:	-1.000

Harm#	Harms(avg)	100%Limit	%of Limit	Harms(max)	150%Limit	%of Limit	Status
2	0.098	2.007	4.9	0.160	3.011	5.3	Pass
3	0.051	N/A	N/A	0.130	N/A	N/A	N/A
4	0.045	1.004	4.4	0.104	1.506	6.9	Pass
5	0.178	2.685	6.6	0.197	4.027	4.9	Pass
6	0.013	0.669	1.9	0.053	1.004	5.3	Pass
7	0.150	1.807	8.3	0.168	2.710	6.2	Pass
8	0.017	0.502	3.3	0.043	0.753	5.8	Pass
9	0.010	N/A	N/A	0.034	N/A	N/A	N/A
10	0.025	0.401	6.3	0.044	0.602	7.3	Pass
11	0.105	0.778	13.5	0.112	1.167	9.6	Pass
12	0.010	0.335	2.9	0.029	0.502	5.8	Pass
13	0.080	0.502	15.9	0.086	0.753	11.4	Pass
14	0.011	N/A	N/A	0.025	N/A	N/A	N/A
15	0.012	N/A	N/A	0.026	N/A	N/A	N/A
16	0.015	N/A	N/A	0.024	N/A	N/A	N/A
17	0.056	N/A	N/A	0.060	N/A	N/A	N/A
18	0.010	N/A	N/A	0.020	N/A	N/A	N/A
19	0.057	N/A	N/A	0.062	N/A	N/A	N/A
20	0.012	N/A	N/A	0.022	N/A	N/A	N/A
21	0.013	N/A	N/A	0.019	N/A	N/A	N/A
22	0.015	N/A	N/A	0.022	N/A	N/A	N/A
23	0.045	N/A	N/A	0.051	N/A	N/A	N/A
24	0.012	N/A	N/A	0.018	N/A	N/A	N/A
25	0.039	N/A	N/A	0.045	N/A	N/A	N/A
26	0.013	N/A	N/A	0.018	N/A	N/A	N/A
27	0.020	N/A	N/A	0.026	N/A	N/A	N/A
28	0.015	N/A	N/A	0.018	N/A	N/A	N/A
29	0.030	N/A	N/A	0.034	N/A	N/A	N/A
30	0.011	N/A	N/A	0.017	N/A	N/A	N/A
31	0.029	N/A	N/A	0.033	N/A	N/A	N/A
32	0.017	N/A	N/A	0.023	N/A	N/A	N/A
33	0.042	N/A	N/A	0.047	N/A	N/A	N/A
34	0.017	N/A	N/A	0.020	N/A	N/A	N/A
35	0.048	N/A	N/A	0.053	N/A	N/A	N/A
36	0.012	N/A	N/A	0.016	N/A	N/A	N/A
37	0.022	N/A	N/A	0.025	N/A	N/A	N/A
38	0.013	N/A	N/A	0.016	N/A	N/A	N/A
39	0.013	N/A	N/A	0.017	N/A	N/A	N/A
40	0.011	N/A	N/A	0.014	N/A	N/A	N/A

Note: Measured I-ref was applied for this test.

Teseq Profline
4542 Luterbach, Switzerland

Voltage Source Verification Data (Phase B-Run time)

EUT: SPI20K-B Tested by: CTR
Test category: Table:3, Rsce=33, Inter-Harm,) Test Margin: 100
Test date: 2019/4/9 Start time: 17:54:20 End time: 17:57:13
Test duration (min): 2.5 Data file name: WIN2106_H-000032.cts_data
Comment: FULL LOAD
Customer: 科华

Test Result: Pass Source qualification: Normal
Measured source distortion is within the requirements of the standards
Measurements are compliant with IEC/EN61000-3-12 Ed.2 (2011) & IEC/EN61000-4-7

Highest parameter values during test:

Voltage (Vrms):	231.32	Frequency(Hz):	50.00
I_Peak (Amps):	39.550	I_RMS (Amps):	27.090
I_Fund (Amps):	25.091	Crest Factor:	2.088
Power (Watts):	-6265	Power Factor:	-1.000

Harm#	Harmonics V-rms	Limit V-rms	% of Limit	Status
2	0.318	0.925	34.35	OK
3	0.181	2.885	6.26	OK
4	0.042	0.925	4.49	OK
5	0.156	3.468	4.50	OK
6	0.024	0.925	2.56	OK
7	0.193	2.889	6.68	OK
8	0.029	0.925	3.11	OK
9	0.167	1.385	12.05	OK
10	0.031	0.925	3.33	OK
11	0.197	1.619	12.17	OK
12	0.020	0.694	2.92	OK
13	0.170	1.388	12.28	OK
14	0.023	0.694	3.30	OK
15	0.140	0.692	20.18	OK
16	0.027	0.694	3.89	OK
17	0.151	0.692	21.82	OK
18	0.022	0.694	3.12	OK
19	0.140	0.692	20.26	OK
20	0.027	0.694	3.95	OK
21	0.106	0.692	15.36	OK
22	0.031	0.694	4.49	OK
23	0.126	0.693	18.15	OK
24	0.019	0.694	2.80	OK
25	0.118	0.693	17.06	OK
26	0.029	0.694	4.12	OK
27	0.084	0.693	12.10	OK
28	0.035	0.694	5.08	OK
29	0.092	0.693	13.25	OK
30	0.021	0.694	2.99	OK
31	0.091	0.693	13.20	OK
32	0.033	0.694	4.69	OK
33	0.069	0.693	9.91	OK
34	0.030	0.694	4.35	OK
35	0.087	0.693	12.54	OK
36	0.024	0.693	3.46	OK
37	0.075	0.693	10.85	OK
38	0.032	0.694	4.58	OK
39	0.058	0.693	8.41	OK
40	0.034	0.694	4.89	OK

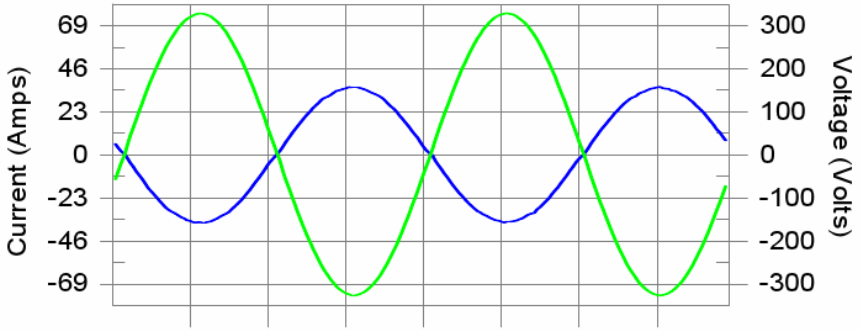
Teseq Profline
4542 Luterbach, Switzerland

Harmonics – Per EN/IEC61000-3-12(Phase C-Run time)

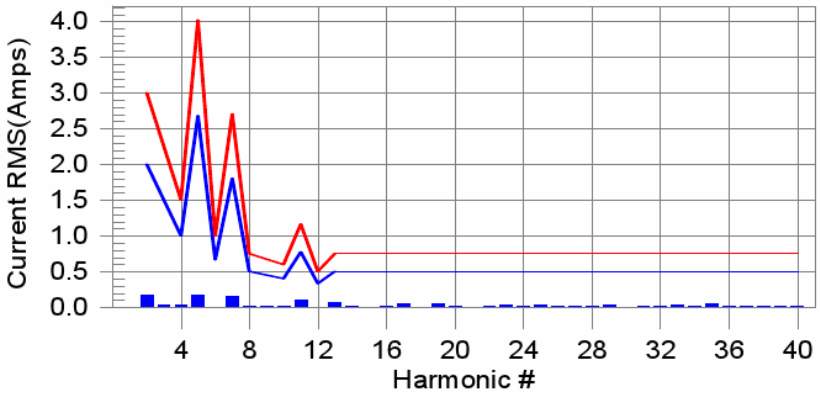
EUT: SPI20K-B Tested by: CTR
Test category: Table:3, Rsce=33, Inter-Harm,) Test Margin: 100
Test date: 2019/4/9 Start time: 17:54:20 End time: 17:57:13
Test duration (min): 2.5 Data file name: WIN2106_H-000032.cts_data
Comment: FULL LOAD
Customer: 科华

Test Result: Pass Source qualification: Normal

Current & voltage waveforms



Harmonics and Class 3 limit line European Limits



Test result: Pass Worst harmonic was #13 with 22.13 % of the limit.

Teseq Profline
4542 Luterbach, Switzerland

Current Test Result Summary (Phase C-Run time)

EUT: SPI20K-B Tested by: CTR
Test category: Table:3, Rsce=33, Inter-Harm,) Test Margin: 100
Test date: 2019/4/9 Start time: 17:54:20 End time: 17:57:13
Test duration (min): 2.5 Data file name: WIN2106_H-000032.cts_data
Comment: FULL LOAD
Customer: 科华

Test Result: Pass Measured I-ref: 25.042 Amp rms Source: Normal
I-THC(%): 1.4 Limit(%): 13.0 PWHC(%): 2.7 PWHC Limit(%): 22.0

Highest parameter values during test:

V_RMS (Volts):	231.36	Frequency(Hz):	50.00
I_Peak (Amps):	38.967	I_RMS (Amps):	27.040
I_Fund (Amps):	25.042	Crest Factor:	2.092
Power (Watts):	-6252	Power Factor:	-1.000

Harm#	Harms(avg)	100%Limit	%of Limit	Harms(max)	150%Limit	%of Limit	Status
2	0.167	2.004	8.3	0.193	3.005	6.4	Pass
3	0.051	N/A	N/A	0.082	N/A	N/A	N/A
4	0.036	1.002	3.6	0.060	1.503	4.0	Pass
5	0.183	2.680	6.8	0.195	4.020	4.9	Pass
6	0.010	0.668	1.4	0.021	1.002	2.1	Pass
7	0.149	1.803	8.3	0.169	2.705	6.3	Pass
8	0.016	0.501	3.3	0.021	0.751	2.9	Pass
9	0.010	N/A	N/A	0.018	N/A	N/A	N/A
10	0.025	0.401	6.2	0.029	0.601	4.8	Pass
11	0.103	0.776	13.2	0.110	1.165	9.4	Pass
12	0.008	0.334	2.4	0.015	0.501	2.9	Pass
13	0.077	0.501	15.4	0.084	0.751	11.1	Pass
14	0.012	N/A	N/A	0.014	N/A	N/A	N/A
15	0.009	N/A	N/A	0.014	N/A	N/A	N/A
16	0.014	N/A	N/A	0.019	N/A	N/A	N/A
17	0.059	N/A	N/A	0.065	N/A	N/A	N/A
18	0.009	N/A	N/A	0.012	N/A	N/A	N/A
19	0.053	N/A	N/A	0.058	N/A	N/A	N/A
20	0.014	N/A	N/A	0.017	N/A	N/A	N/A
21	0.010	N/A	N/A	0.013	N/A	N/A	N/A
22	0.015	N/A	N/A	0.017	N/A	N/A	N/A
23	0.044	N/A	N/A	0.050	N/A	N/A	N/A
24	0.011	N/A	N/A	0.013	N/A	N/A	N/A
25	0.036	N/A	N/A	0.041	N/A	N/A	N/A
26	0.015	N/A	N/A	0.017	N/A	N/A	N/A
27	0.018	N/A	N/A	0.020	N/A	N/A	N/A
28	0.015	N/A	N/A	0.017	N/A	N/A	N/A
29	0.028	N/A	N/A	0.032	N/A	N/A	N/A
30	0.010	N/A	N/A	0.013	N/A	N/A	N/A
31	0.026	N/A	N/A	0.030	N/A	N/A	N/A
32	0.017	N/A	N/A	0.019	N/A	N/A	N/A
33	0.041	N/A	N/A	0.046	N/A	N/A	N/A
34	0.020	N/A	N/A	0.022	N/A	N/A	N/A
35	0.049	N/A	N/A	0.056	N/A	N/A	N/A
36	0.011	N/A	N/A	0.012	N/A	N/A	N/A
37	0.020	N/A	N/A	0.023	N/A	N/A	N/A
38	0.013	N/A	N/A	0.016	N/A	N/A	N/A
39	0.012	N/A	N/A	0.014	N/A	N/A	N/A
40	0.012	N/A	N/A	0.014	N/A	N/A	N/A

Note: Measured I-ref was applied for this test.

Teseq Profline
4542 Luterbach, Switzerland

Voltage Source Verification Data (Phase C-Run time)

EUT: SPI20K-B Tested by: CTR
Test category: Table:3, Rsce=33, Inter-Harm,) Test Margin: 100
Test date: 2019/4/9 Start time: 17:54:20 End time: 17:57:13
Test duration (min): 2.5 Data file name: WIN2106_H-000032.cts_data
Comment: FULL LOAD
Customer: 科华

Test Result: Pass Source qualification: Normal
Measured source distortion is within the requirements of the standards
Measurements are compliant with IEC/EN61000-3-12 Ed.2 (2011) & IEC/EN61000-4-7

Highest parameter values during test:

Voltage (Vrms):	231.36	Frequency(Hz):	50.00
I_Peak (Amps):	38.967	I_RMS (Amps):	27.040
I_Fund (Amps):	25.042	Crest Factor:	2.092
Power (Watts):	-6252	Power Factor:	-1.000

Harm#	Harmonics V-rms	Limit V-rms	% of Limit	Status
2	0.286	0.925	30.87	OK
3	0.202	2.888	6.98	OK
4	0.054	0.925	5.84	OK
5	0.159	3.469	4.59	OK
6	0.027	0.925	2.93	OK
7	0.189	2.891	6.55	OK
8	0.031	0.925	3.40	OK
9	0.157	1.386	11.36	OK
10	0.029	0.925	3.13	OK
11	0.195	1.619	12.03	OK
12	0.028	0.694	3.97	OK
13	0.172	1.385	12.44	OK
14	0.035	0.694	5.10	OK
15	0.142	0.693	20.56	OK
16	0.044	0.694	6.38	OK
17	0.161	0.693	23.29	OK
18	0.032	0.694	4.67	OK
19	0.140	0.693	20.20	OK
20	0.042	0.694	6.10	OK
21	0.113	0.693	16.34	OK
22	0.040	0.694	5.76	OK
23	0.126	0.693	18.17	OK
24	0.038	0.694	5.43	OK
25	0.115	0.693	16.62	OK
26	0.039	0.694	5.65	OK
27	0.089	0.693	12.80	OK
28	0.045	0.694	6.53	OK
29	0.099	0.693	14.35	OK
30	0.033	0.694	4.82	OK
31	0.084	0.693	12.16	OK
32	0.040	0.694	5.74	OK
33	0.066	0.693	9.55	OK
34	0.041	0.694	5.92	OK
35	0.085	0.693	12.32	OK
36	0.032	0.694	4.61	OK
37	0.075	0.693	10.84	OK
38	0.041	0.694	5.87	OK
39	0.060	0.693	8.63	OK
40	0.041	0.694	5.91	OK

Teseq Profline
4542 Luterbach, Switzerland

5th Harmonic Phase Angle and Magnitude for Phase A :
H-5_min_phase : 8.6 Degree (Leading)
H-5_max_phase : 80.5 Degree (Leading)
H-5_ave_phase : 19.2 Degree (Leading)

H-5_ave_vector_magnitude : 0.180 Amp
H-5_standard_ave_magnitude : 0.178 Amp
H-5_standard_max_magnitude : 0.195 Amp
Ratio of H-5_ave_vector / H-5_standard_ave : 0.978

Phase A = 15.734% of tested Rsce = 33.000, Rsce = 5.192
Phase B = 15.917% of tested Rsce = 33.000, Rsce = 5.253
Phase C = 15.401% of tested Rsce = 33.000, Rsce = 5.082
Minimum Rsce required: Rsce = 5.253

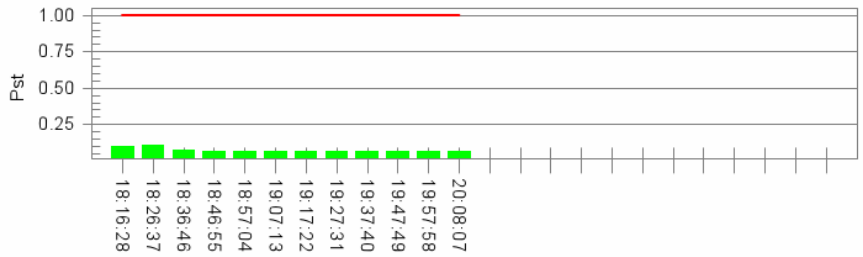
Teseq Profline
4542 Luterbach, Switzerland

Flicker Test Summary (Phase A-Run time) per EN/IEC61000-3-11

EUT: SPI12K-B **Tested by: CTR**
Test category: All parameters **Test Margin: 100**
Test date: 2019/4/9 **Start time: 18:05:55** **End time: 20:08:08**
Test duration (min): 120 **Data file name: WIN2106_F-000034.cts_data**
Comment: FULL LOAD
Customer:
Z-test Phase = (0.150 + j 0.150 Ohm) Neutral = (0.100 + j 0.100 Ohm)

Test Result: Pass
Status: Test Completed

Pst_i and limit line



Plt and limit line

Parameter values recorded during the test:

Vrms at the end of test (Volt): 233.18

T-max (mS):	**0.0**	**Test limit (mS):**	**500.0**	**Pass**
Highest dc (%):	**0.23**	**Test limit (%):**	**3.30**	**Pass**
Highest dmax (%):	**0.27**	**Test limit (%):**	**4.00**	**Pass**

Teseq Profline
4542 Luterbach, Switzerland

Highest Pst (10 min. period):	**0.105**	**Test limit:**	**1.000**	**Pass**
Highest Plt (2 hr. period):	**0.074**	**Test limit:**	**0.650**	**Pass**

Calculated dmax(%): 0.232
Calculated dc(%): 0.305
Calculated Pst : 0.140
Calculated Plt : 0.099

The maximum permissible system impedance Zsys:

Z-phase A = 4.016 Ohm + j 2.510 Ohm
Z-neutral A = 2.678 Ohm + j 1.673 Ohm

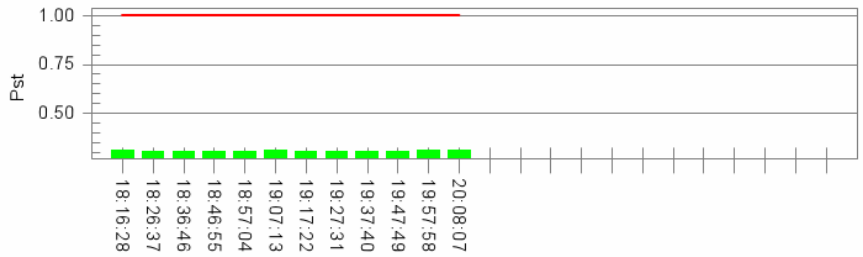
Teseq Profline
4542 Luterbach, Switzerland

Flicker Test Summary (Phase B-Run time) per EN/IEC61000-3-11

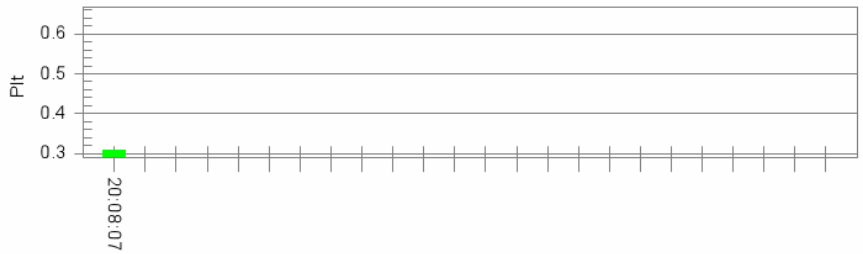
EUT: SPI12K-B **Tested by: CTR**
Test category: All parameters **Test Margin: 100**
Test date: 2019/4/9 **Start time: 18:05:55** **End time: 20:08:08**
Test duration (min): 120 **Data file name: WIN2106_F-000034.cts_data**
Comment: FULL LOAD
Customer:
Z-test Phase = (0.150 + j 0.150 Ohm) Neutral = (0.100 + j 0.100 Ohm)

Test Result: Pass
Status: Test Completed

Pst_i and limit line



Plt and limit line



Parameter values recorded during the test:

Vrms at the end of test (Volt): 233.19

Time(mS) > dt:	**0.0**	**Test limit (mS):**	**500.0**	**Pass**
Highest dc (%):	**0.00**	**Test limit (%):**	**3.30**	**Pass**
Highest dmax (%):	**0.25**	**Test limit (%):**	**4.00**	**Pass**

Teseq Profline
4542 Luterbach, Switzerland

Highest Pst (10 min. period):	**0.311**	**Test limit:**	**1.000**	**Pass**
Highest Plt (2 hr. period):	**0.308**	**Test limit:**	**0.650**	**Pass**

Calculated dmax(%): 0.331
Calculated dc(%): 0.000
Calculated Pst : 0.415
Calculated Plt : 0.411

The maximum permissible system impedance Zsys :

Z-phase B = 0.478 Ohm + j 0.299 Ohm
Z-neutral B = 0.318 Ohm + j 0.199 Ohm

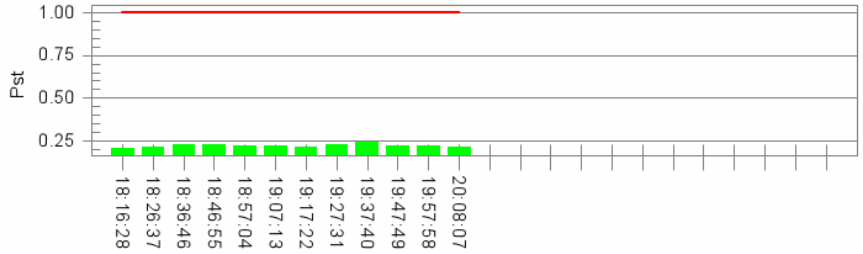
Teseq Profline
4542 Luterbach, Switzerland

Flicker Test Summary (Phase C-Run time) per EN/IEC61000-3-11

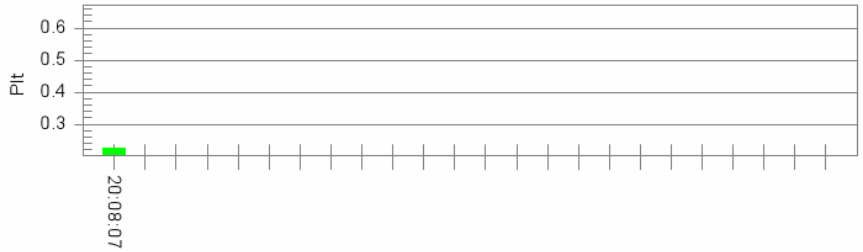
EUT: SPI12K-B **Tested by: CTR**
Test category: All parameters **Test Margin: 100**
Test date: 2019/4/9 **Start time: 18:05:55** **End time: 20:08:08**
Test duration (min): 120 **Data file name: WIN2106_F-000034.cts_data**
Comment: FULL LOAD
Customer:
Z-test Phase = (0.150 + j 0.150 Ohm) Neutral = (0.100 + j 0.100 Ohm)

Test Result: Pass
Status: Test Completed

Pst_i and limit line



Plt and limit line



Parameter values recorded during the test:

Vrms at the end of test (Volt): 233.12

Time(mS) > dt:	**0.0**	**Test limit (mS):**	**500.0**	**Pass**
Highest dc (%):	**0.00**	**Test limit (%):**	**3.30**	**Pass**
Highest dmax (%):	**0.11**	**Test limit (%):**	**4.00**	**Pass**

Teseq Profline
4542 Luterbach, Switzerland

Highest Pst (10 min. period):	**0.245**	**Test limit:**	**1.000**	**Pass**
Highest Plt (2 hr. period):	**0.225**	**Test limit:**	**0.650**	**Pass**

Calculated dmax(%): 0.000
Calculated dc(%): 0.000
Calculated Pst : 0.327
Calculated Plt : 0.300

The maximum permissible system impedance Zsys :

Z-phase C = 0.764 Ohm + j 0.478 Ohm
Z-neutral C = 0.510 Ohm + j 0.318 Ohm

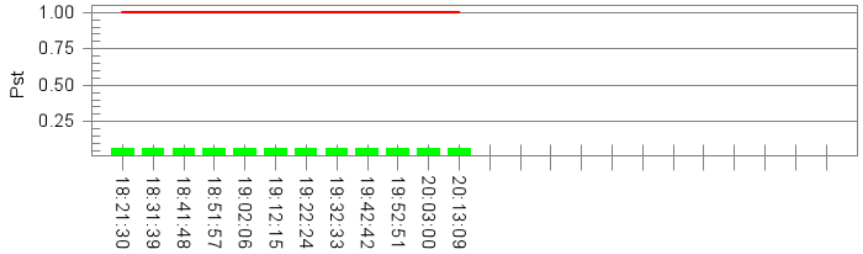
Teseq Profline
4542 Luterbach, Switzerland

Flicker Test Summary (Phase A-Run time) per EN/IEC61000-3-11

EUT: SPI20K-B **Tested by: CTR**
Test category: All parameters **Test Margin: 100**
Test date: 2019/4/10 **Start time: 18:10:57** **End time: 20:13:10**
Test duration (min): 120 **Data file name: WIN2106_F-000038.cts_data**
Comment: FULL LOAD
Customer:
Z-test Phase = (0.150 + j 0.150 Ohm) Neutral = (0.100 + j 0.100 Ohm)

Test Result: Pass
Status: Test Completed

Pst_i and limit line



Plt and limit line

Parameter values recorded during the test:

Vrms at the end of test (Volt): 232.82

T-max (mS):	**0.0**	**Test limit (mS):**	**500.0**	**Pass**
Highest dc (%):	**0.00**	**Test limit (%):**	**3.30**	**Pass**
Highest dmax (%):	**0.08**	**Test limit (%):**	**4.00**	**Pass**

Teseq Profline
4542 Luterbach, Switzerland

Highest Pst (10 min. period):	**0.064**	**Test limit:**	**1.000**	**Pass**
Highest Plt (2 hr. period):	**0.064**	**Test limit:**	**0.650**	**Pass**

Calculated dmax(%): 0.000
Calculated dc(%): 0.000
Calculated Pst : 0.085
Calculated Plt : 0.085

The maximum permissible system impedance Zsys:

Z-phase A = 5.055 Ohm + j 3.160 Ohm
Z-neutral A = 3.370 Ohm + j 2.106 Ohm

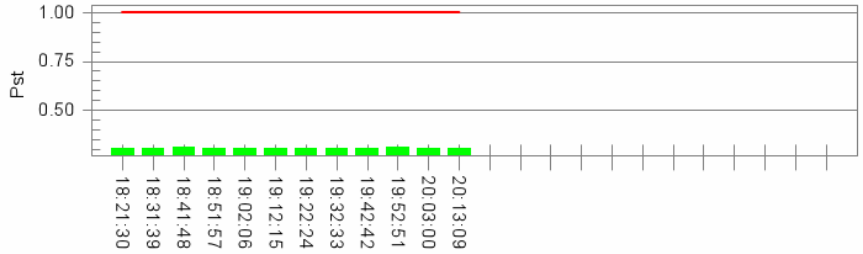
Teseq Profline
4542 Luterbach, Switzerland

Flicker Test Summary (Phase B-Run time) per EN/IEC61000-3-11

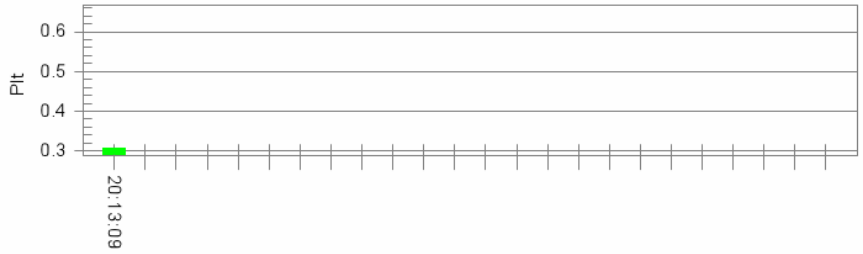
EUT: SPI20K-B **Tested by: CTR**
Test category: All parameters **Test Margin: 100**
Test date: 2019/4/10 **Start time: 18:10:57** **End time: 20:13:10**
Test duration (min): 120 **Data file name: WIN2106_F-000038.cts_data**
Comment: FULL LOAD
Customer:
Z-test Phase = (0.150 + j 0.150 Ohm) Neutral = (0.100 + j 0.100 Ohm)

Test Result: Pass
Status: Test Completed

Pst_i and limit line



Plt and limit line



Parameter values recorded during the test:

Vrms at the end of test (Volt): 233.05

Time(mS) > dt:	**0.0**	**Test limit (mS):**	**500.0**	**Pass**
Highest dc (%):	**0.00**	**Test limit (%):**	**3.30**	**Pass**
Highest dmax (%):	**-0.12**	**Test limit (%):**	**4.00**	**Pass**

Teseq Profline
4542 Luterbach, Switzerland

Highest Pst (10 min. period):	**0.314**	**Test limit:**	**1.000**	**Pass**
Highest Plt (2 hr. period):	**0.307**	**Test limit:**	**0.650**	**Pass**

Calculated dmax(%): 0.000
Calculated dc(%): 0.000
Calculated Pst : 0.419
Calculated Plt : 0.410

The maximum permissible system impedance Zsys :

Z-phase B = 0.480 Ohm + j 0.300 Ohm
Z-neutral B = 0.320 Ohm + j 0.200 Ohm

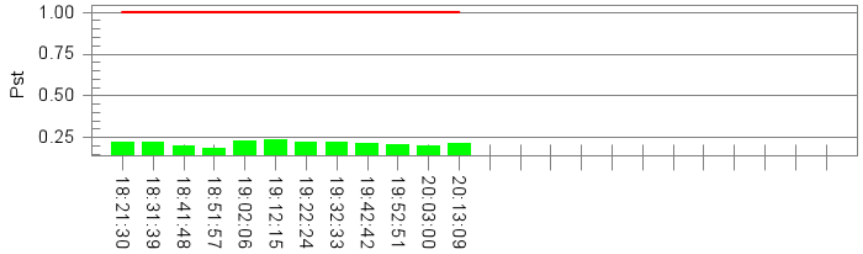
Teseq Profline
4542 Luterbach, Switzerland

Flicker Test Summary (Phase C-Run time) per EN/IEC61000-3-11

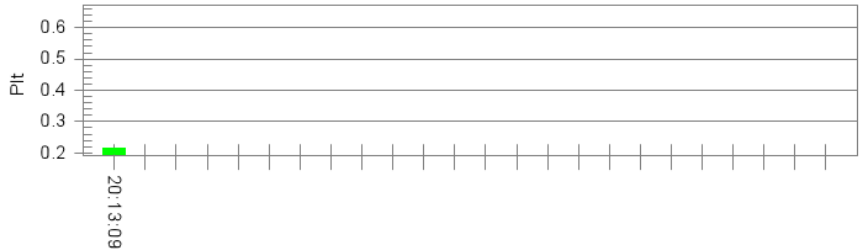
EUT: SPI20K-B **Tested by: CTR**
Test category: All parameters **Test Margin: 100**
Test date: 2019/4/10 **Start time: 18:10:57** **End time: 20:13:10**
Test duration (min): 120 **Data file name: WIN2106_F-000038.cts_data**
Comment: FULL LOAD
Customer:
Z-test Phase = (0.150 + j 0.150 Ohm) Neutral = (0.100 + j 0.100 Ohm)

Test Result: Pass
Status: Test Completed

Pst_i and limit line



Plt and limit line



Parameter values recorded during the test:

Vrms at the end of test (Volt): 233.07

Time(mS) > dt:	**0.0**	**Test limit (mS):**	**500.0**	**Pass**
Highest dc (%):	**0.00**	**Test limit (%):**	**3.30**	**Pass**
Highest dmax (%):	**-0.09**	**Test limit (%):**	**4.00**	**Pass**

Teseq Profline
4542 Luterbach, Switzerland

Highest Pst (10 min. period):	**0.232**	**Test limit:**	**1.000**	**Pass**
Highest Plt (2 hr. period):	**0.215**	**Test limit:**	**0.650**	**Pass**

Calculated dmax(%): 0.000
Calculated dc(%): 0.000
Calculated Pst : 0.310
Calculated Plt : 0.287

The maximum permissible system impedance Zsys :

Z-phase C = 0.820 Ohm + j 0.513 Ohm
Z-neutral C = 0.547 Ohm + j 0.342 Ohm

ESD Immunity Test Data

DESCRIPTION OF SAMPLE(S)

Model: SPI12K-B, SPI20K-B **Date:**2019/3/15 **Temperature:** 23.6℃ **Humidity:**52%

Rating: AC 400V /DC 600V Test Result: ■PASS ☐NG

Test Specification: **Test Method:** ■ IEC61000-4-2

Performance Criterion accepted by Test Specification: ☐A ■B ☐C

Operation Mode: ON(5% load)

Location	*Test Method	Test Voltage	**Result
HCP	■IC ☐DC ☐A	■±2kV■±4kV■±6kV☐±8kV☐±15kV☐ kV	■A☐B☐C☐D
VCP	■IC ☐DC ☐A	■±2kV■±4kV■±6kV☐±8kV☐±15kV☐ kV	■A☐B☐C☐D
Metal	☐IC ■DC ☐A	■±2kV■±4kV☐±6kV☐±8kV☐±15kV☐ kV	■A☐B☐C☐D
Screw	☐IC ■DC ☐A	■±2kV■±4kV☐±6kV☐±8kV☐±15kV☐ kV	■A☐B☐C☐D
Slot	☐IC ☐DC ■A	■±2kV■±4kV☐±6kV■±8kV☐±15kV☐ kV	■A☐B☐C☐D
Screen	☐IC ☐DC ■A	■±2kV■±4kV☐±6kV■±8kV☐±15kV☐ kV	■A☐B☐C☐D

* A:Air Contact Discharge DC:direct Contact Discharge IC:Indirect Contact Discharge

** A: Normal performance within the specification limits

B: Temporary degradation or loss of function or performance which is self-recoverable

C: Temporary degradation or loss of function or performance which requires operator intervention or system reset

D:Degradation or loss of function which is not recoverable due to damage of equipment (components) or software,or Loss of data

Note:Performance Criterion:B (Criterion C could be applied to toys not using score or data entered by the user)

*** For ungrounded EUT,the charge on the EUT shall be removed prior to each applied ESD pulse

Test and inspection center of New United Group

RS Immunity Test Data

NU LAB-D02 Original record number: 2019D087-1

Immunity	R/S	■IEC 61000-4-3 ☐Other:
Product: PV Grid-Connected Inverter		■Pass ☐Fail ☐N/A
Model Number(s) :SPI12K-B, SPI20K-B		

Performance Criterion accepted by Test Specification: A

Level: 3, 3, 1 V/m

Modulation: ☐Unmodulated ■Amplitude modulation ☐Pulse

Ambient Temperature: 26 ℃

Relative humidity: 41 % RH

Atmospheric pressure: 101.1 kPa

Modulated signal: ■1KHz 80% sinewave ☐200Hz 50% Duty cycle

Site: 10m Chamber Inspection layout: _____

Sample working status: ■No damage，working normally☐ Damaged, not working properly

Rate of swept: 1 % Dwell time: 2 s

		Frequency Range					
		80MHz-1GHz		1.4GHz-2.0GHz		2.0GHz-2.7GHz	
Antenna polarity		Vertical	Horizontal	Vertical	Horizontal	Vertical	Horizontal
EUT Orientation	Before	A	A	A	A	A	A
	Rear	A	A	A	A	A	A
	Right	A	A	A	A	A	A
	Left	A	A	A	A	A	A

Remarks:

Tested by: Jing He Reviewed by: Shiwei Sha Date:2019.3.26

Produkte
Products

EFT/B Immunity Test Data

DESCRIPTION OF SAMPLE(S)

Model: SPI12K-B, SPI20K-B **Date:**2019/3/15 **Temperature:** 23.6℃ **Humidity:**52%

Rating: AC 400V /DC 600V Test Result: ■PASS □NG

Test Specification: **Test Method:** ■ IEC61000-4-4

Performance Criterion accepted by Test Specification: □A ■B □C

Operation Mode: ON(5% load)

Conductor Under Test	Test Level	Test Voltage	**Result
■AC □DC □Signal □Control □	□±0.5kV■±1.0kV■±2.0kV □±4.0kV□±4.5kV	■120s □60s	■A □B □C □D
□AC ■DC □Signal □Control □	■±0.5kV■±1.0kV■±2.0kV □±4.0kV□±4.5kV	■120s □60s	■A □B □C □D
□AC □DC □Signal □Control □	□±0.5kV□±1.0kV□±2.0kV □±4.0kV□±4.5kV	□120s □60s	□A □B □C □D
□AC □DC □Signal □Control □	□±0.5kV□±1.0kV□±2.0kV □±4.0kV□±4.5kV	□120s □60s	□A □B □C □D
□AC □DC □Signal □Control □	□±0.5kV□±1.0kV□±2.0kV □±4.0kV□±4.5kV	□120s □60s	□A □B □C □D
□AC □DC □Signal □Control □	□±0.5kV□±1.0kV□±2.0kV □±4.0kV□±4.5kV	□120s □60s	□A □B □C □D
□AC □DC □Signal □Control □	□±0.5kV□±1.0kV□±2.0kV □±4.0kV□±4.5kV	□120s □60s	□A □B □C □D

* A: Normal performance within the specification limits
B: Temporary degradation or loss of function or performance which is self-recoverable
C: Temporary degradation or loss of function or performance which requires operator intervention or system reset
D:Degradation or loss of function which is not recoverable due to damage of equipment (components) or software,or Loss of data

Surge Immunity Test Data

DESCRIPTION OF SAMPLE(S)

Model: SPI12K-B, SPI20K-B **Date:**2019/3/15 **Temperature:** 23.6℃ **Humidity:**52%
Rating: AC 400V /DC 600V Test Result: ■PASS ☐NG
Test Specification: **Test Method:** ■ IEC61000-4-5
Performance Criterion accepted by Test Specification: ☐A ■B ☐C
Operation Mode: ON(5% load)

Conductor Under Test	Test Level	Count	Phase Angel	Surge Interval	*Result
■L1-N ■L2-N ■L3-N	■±0.5kV ■±1.0kV ☐±2.0Kv☐±4.0kV ☐ kV	■5 ☐	■0° ■90° ■180° ■270°	■60s ☐	■A ☐B ☐C ☐D
■L1-L2 ■L1-L3 ■L2-L3	■±0.5kV ■±1.0kV ☐±2.0Kv☐±4.0kV ☐ kV	■5 ☐	■0° ■90° ■180° ■270°	■60s ☐	■A ☐B ☐C ☐D
■L1-PE ■L2-PE ■L3-PE	■±0.5kV ■±1.0kV ■±2.0Kv☐±4.0kV ☐ kV	■5 ☐	■0° ■90° ■180° ■270°	■60s ☐	■A ☐B ☐C ☐D
■N-PE ■L12-PE ■L13-PE	■±0.5kV ■±1.0kV ■±2.0Kv☐±4.0kV ☐ kV	■5 ☐	■0° ■90° ■180° ■270°	■60s ☐	■A ☐B ☐C ☐D
■L23-PE ■L1N-PE ■L2N-PE	■±0.5kV ■±1.0kV ■±2.0Kv☐±4.0kV ☐ kV	■5 ☐	■0° ■90° ■180° ■270°	■60s ☐	■A ☐B ☐C ☐D
■L3N-PE ■L123-PE ■L12N-PE	■±0.5kV ■±1.0kV ■±2.0Kv☐±4.0kV ☐ kV	■5 ☐	■0° ■90° ■180° ■270°	■60s ☐	■A ☐B ☐C ☐D
■L13N-PE ■L23N-PE ■ALL-PE	■±0.5kV ■±1.0kV ■±2.0Kv☐±4.0kV ☐ kV	■5 ☐	■0° ■90° ■180° ■270°	■60s ☐	■A ☐B ☐C ☐D

* A: Normal performance within the specification limits
B: Temporary degradation or loss of function or performance which is self-recoverable
C: Temporary degradation or loss of function or performance which requires operator intervention or system reset
D:Degradation or loss of function which is not recoverable due to damage of equipment (components) or software,or Loss of data

Test and inspection center of New United Group

Surge Immunity Test Data

NU LAB-D05 Original record number：2019D087-2

Immunity	Surge	■IEC 61000-4-5 ☐Other：
Product: PV Grid-Connected Inverter		■Pass ☐Fail ☐N/A
Model Number(s) : SPI12K-B, SPI20K-B		

Test location: Test room 2

Ambient Temperature：26 ℃ Relative humidity：41 %RH Atmospheric pressure：101 kPa

Criterion：B Repeat times：5

Time Interval：60 s Inspection layout：____

Sample working status：■No damage，working normally☐ Damaged, not working properly

Test port: ☐AC power ■DC power ☐Signal line：__

AC power	Phase Angle	0.5kV		1kV		2kV		3kV		4kV	
		+	-	+	-	+	-	+	-	+	-
☐ L1 ☐ N ☐ PE	0°										
	90°										
	180°										
	270°										
	Asynchronous										
☐ L1 ☐ N ☐ PE	0°										
	90°										
	180°										
	270°										
	Asynchronous										
☐ L1 ☐ N ☐ PE	0°										
	90°										
	180°										
	270°										
	Asynchronous										
DC power	Phase	-	-	-	-	-	-	-	-	-	-
☑+ ☑ - ☐ PE	Asynchronous	A	A	A	A						
☑+ ☐ - ☑ PE		A	A	A	A	A	A				
☐+ ☑ - ☑PE		A	A	A	A	A	A				
☑+ ☑ - ☑ PE		A	A	A	A	A	A				
Signal line											

Tested by: Jing He Reviewed by: Shiwei Sha Date:2019.3.26

Test and inspection center of New United Group

C/S Immunity Test Data

NU LAB-D07 Original record number: 2019D087-3

Immunity	C/S	■ IEC 61000-4-6 □ Other: _
Product: PV Grid-Connected Inverter		■Pass □Fail □N/A
Model Number(s) : SPI12K-B, SPI20K-B		
Ambient Temperature: 23 □ Relative humidity :41 %RH Atmospheric pressure: 101.1 kPa Modulation: ■ AM □ Pulse □ None Test port: ■ Power □ Signal Modulation : 1KHz 80%AM Test location:Test room 2 Inspection layout: ____		

Power port test situation: ■No damage, working normally □ Damaged, not working properly

Frequency Range	Injection position	Strength (unmodulated)	Criterion	Result
■ 0.15-80MHz	AC port	3 V(rms)	A	A
■ 0.15-80MHz	DC port	3 V(rms)	A	A

Signal port test situation: □No damage, working normally □ Damaged, not working properly

Frequency Range	Injection position	Strength (unmodulated)	Criterion	Result
□ 0.15-80MHz				
□ 80-230MHz				

Remarks:

Tested by: Jing He Reviewed by: Shiwei Sha Date:2019.3.26

Test and inspection center of New United Group

Power frequency Magnetic Field Immunity Test Data

NU LAB-D08 Original record number: 2019D087-4

Immunity	Power frequency Magnetic Field Immunity	■ IEC 61000-4-8 ☐ Other: ___
Product: PV Grid-Connected Inverter		■Pass ☐Fail ☐N/A
Model Number(s) : SPI12K-B, SPI20K-B		
Ambient Temperature: 26 °C Relative humidity: 41% RH Atmospheric pressure: 101.1 kPa Site: 10m Chamber Inspection layout: _____		
Sample working status: ■No damage, working normally☐ Damaged, not working properly		

Test level	Test duration	EUT Orientation	Criterion	Result
3A/m	10min	X	A	A
3A/m	10min	Y	A	A
3A/m	10min	Z	A	A
Sample working status: ☐No damage, working normally☐ Damaged, not working properly				
Test level	Test duration	EUT Orientation	Criterion	Result

Remarks:

Tested by: Jing He Reviewed by: Shiwei Sha Date:2019.3.26

Measurement Uncertainties

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus.

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor of k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Table 1: Measurement Uncertainty levels

Test	Parameters	Expanded uncertainty (U_{lab})	Expanded uncertainty (U_{cispr})
Conducted Emission	Level accuracy (9kHz to 150kHz) (150kHz to 30MHz)	± 2.80 dB ± 2.80 dB	± 3.8 dB ± 3.4 dB
Radiated Emission	Level accuracy (30MHz to 1000MHz, Horizontal) (30MHz to 1000MHz, Vertical)	± 3.60 dB ± 3.60 dB	± 6.3 dB
Mains Harmonic	Voltage	± 0.07%	N/A
Voltage Fluctuations & Flicker	Voltage	± 1.80%	N/A

As U_{lab} in all applicable tests listed above are less than U_{cispr} according to CISPR 16-4-2:2011,

- compliance is deemed to occur if no measured disturbance exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance exceeds the disturbance limit.