HERMON LABORATORIES

ELECTRICAL TESTING
0839.01

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TEST REPORT

ACCORDING TO:

EN 301 489-3: V1.6.1: 2013, other than telecommunication center equipment,
EN 301 489-7: V1.3.1: 2005, other than telecommunication center equipment,
EN 301 489-24: V1.5.1: 2010, other than telecommunication center equipment,
EN 301 489-1: V1.9.2: 2011, other than telecommunication center equipment

FOR:

Pointer Telocation Inc.

Vehicle Tracking Equipment with 2G modem

CR300B 2G

Part numbers:

CT7801201-000, CT7801211-000

CR300 2G

Part number:

CT7801205-000

Vehicle Tracking Equipment with 3G modem

CR300B 3G EU

Part numbers:

CT7801202-000, CT7801212-000

CR300 3G EU

Part number:

CT7801206-000

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1 Applicant information

Client name:	Pointer Telocation Inc.
Address:	7715 NW 48th Street, Suite 395, Doral FL 33166, USA
Telephone:	001 (305) 903-6634
Contact name:	Mr. Jay Pico

2 Equipment under test attributes

Product name:	Vehicle Tracking Equipment with 2G modem
Brand:	CR300B 2G
Part number:	CT7801201-000
Hardware version:	B
Software release:	43
Product name:	Vehicle Tracking Equipment with 3G modem
Brand:	CR300B 3G EU
Part number:	CT7801202-000
Hardware version:	B
Software release:	43
Receipt date:	07-Oct-15

Note: according to manufacturer's declaration of identity provided in Appendix G of the test report, the EUT part numbers CT7801201-000 & CT7801211-000, as well as CT7801202-000 & CT7801212-000 are electronically / electrically / mechanically identical and the reason of the change is marketing purposes; the EUT part number CT7801206-000 is the same as CT7801212-000 but without internal battery; the EUT part number CT7801205-000 is the same as CT7801211-000 but without internal battery. That is why the EUT part numbers CT7801201-000 and CT7801202-000 only were tested.

3 Manufacturer information

Manufacturer name:	Pointer Telocation Ltd.
E-mail:	itamarg@pointer.com
Contact name:	Mr. Itamar Gohary

4 Test details

Project ID:	27317
Location:	Hermon Laboratories Ltd. Harakevet Industrial Zone, Binyamina 30500, Israel
Test started:	07-Oct-15
Test completed:	20-Oct-15
Test specifications:	EN 301 489-3: V1.6.1: 2013, other than telecommunication center equipment, EN 301 489-7: V1.3.1: 2005, other than telecommunication center equipment, EN 301 489-24: V1.5.1: 2010, other than telecommunication center equipment, EN 301 489-1: V1.9.2: 2011, other than telecommunication center equipment

5 Tests summary

Test	Status
EN 301 489-3/7/24/1, other than telecommunication center equipment	
Conducted emission measurements at AC mains input/output port	Not required
Conducted emission measurements at DC power input port, Class B	Pass
Conducted emission measurements at telecommunication port/s	Not required
Radiated emission measurements, Class B	Pass
Harmonic current emissions at AC mains input port	Not required
Voltage fluctuations and flicker at AC mains input port	Not required
Immunity to electrostatic discharge (ESD)	Pass
Radiated immunity to radio frequency electromagnetic field	Pass
Conducted immunity to electrical fast transients/ bursts (EFT/ B)	Not required
Conducted immunity to voltage surges	Not required
Conducted immunity to disturbances induced by radio frequency field	Not required
Immunity to transients and surges in the vehicular environment	Pass
Conducted immunity to voltage dips and short interruptions	Not required

* The emissions from 2G or 3G modems were regarded as radio spurious emissions subject to Article 3.2 of the R&TTE Directive.

Testing was completed against all relevant requirements of the test standard. The results obtained indicate that the product under test complies in full with the requirements tested.
The test results relate only to the items tested. Pass/ fail decision was based on nominal values.

	Name and Title	Date	Signature
Tested by:	Mrs. E. Pitt, test engineer	October 20, 2015	
	Mr. A. Troupiansky, test engineer		
Reviewed by:	Ms. N. Averin, certification engineer	March 3, 2016	
Approved by:	Mr. M. Nikishin, EMC and radio group leader	March 16, 2016	

6 EUT description

6.1 General information

The EUTs are the following products:

1) Vehicle Tracking Equipment with 2G modem, brand CR300B 2G, part number CT7801201-000;

2) Vehicle Tracking Equipment with 3G modem, brand CR300B 3G EU, part number CT7801202-000.

The CR300B 2G incorporates 2G modem (Telit GE910) including GPS receiver operating at 1500 MHz and GPRS transceiver operating at 1850 MHz.

The CR300B 3G EU incorporates 3G modem (Telit UE910-EUD) including GPS receiver operating at 1500 MHz and GPRS transceiver operating at 1950 MHz.

Each EUT is powered from 12 VDC.

6.2 Ports and lines

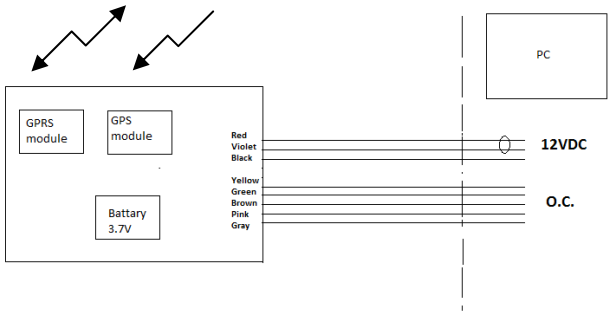
Port type	Port description	Connected from	Connected to	Qty.	Cable type	Cable length	Indoor / outdoor
Power	DC power	EUT	Power supply	1	Unshielded	2.8 m Note 1	Outdoor
Signal	Data	EUT	Open circuit	5	Unshielded	2.8 m Note 1	Outdoor

Note 1: always less that 3 m.

6.3 Auxiliary equipment

Description	Manufacturer	Model number	Serial number
PC	Lenovo	2518-4PG	25184PG

6.4 Test configuration



Wire Name	FROM	TO	Function
W7 Cable	P1(7)	P2(2)	--
	P1(8)	P2(3)	--
W1 (RED)	P1(1)	Free	Main Power
W2 (BLACK)	P1(6)	W7(P2(1)+Shield)+Free +W9(Black)	GND
W3 (VIOLET)	P1(4)	Free	Ignition
W4 (YELLOW)	P1(9)	Free	UNLOCK2\SHOCK
W5 (GREEN)	P1(2)	Free	LED
W6 (BROWN)	P1(3)	Free	GLOBAL OUTPUT
W8 (PINK)	P1(5)	Free	DOOR
W9 (GRAY)	P1(10)	Free	DALLAS

6.5 Performance criteria

6.5.1 Performance criteria according to EN 301-489-1

6.5.1.1 Performance criteria for continuous phenomena applied to transmitters and receivers, Section 6.1

The EUT shall continue to operate as intended during and after the test. No degradation of performance or loss of function is allowed below a permissible performance level specified by the manufacturer, when the apparatus is used as intended. In some cases this permissible performance level may be replaced by a permissible loss of performance.

During the test the EUT shall not unintentionally transmit or change its actual operating state and stored data.

If the minimum performance level or the permissible performance loss is not specified by the manufacturer, either of these may be derived from the product description and documentation, and what the user may reasonably expect from the apparatus if used as intended.

6.5.1.2 Performance criteria for transient phenomena applied to transmitters and receivers, Section 6.2

The EUT shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. In some cases this permissible performance level may be replaced by a permissible loss of performance.

During the EMC exposure to an electromagnetic phenomenon, degradation of performance is however allowed. No change of the actual mode of operation (e.g. unintended transmission) or stored data is allowed.

If the minimum performance level or the permissible performance loss is not specified by the manufacturer, either of these may be derived from the product description and documentation, and what the user may reasonably expect from the apparatus if used as intended.

6.5.1.3 Performance criteria for equipment which does not provide a continuous communication link, Section 6.3

For radio equipment, which does not provide a continuous communication link, the performance criteria described in the clauses above are not appropriate, then the manufacturer shall declare, for inclusion in the test report, his own specification for an acceptable level of performance or degradation during and/or after the immunity tests. The performance specification shall be included in the product description and documentation.

6.5.1.4 Performance criteria for ancillary equipment tested on a stand alone basis, Section 6.4

If ancillary equipment is intended to be tested on a stand alone basis, the performance criteria described in the clauses above are not appropriate, then the manufacturer shall declare, for inclusion in the test report, his own specification for an acceptable level of performance or degradation during and/or after the immunity tests. The performance specification shall be included in the product description and documentation.

6.5.1.5 Performance criteria for voltage dips and interruptions, Section 9.7.3

For a voltage dip corresponding to a reduction of the supply voltage of 30% for 10 ms:

- for transmitters the performance criteria for transient phenomena for transmitter shall apply;
- for receivers the performance criteria for transient phenomena for receiver shall apply;
- for ancillary equipment the pass/failure criteria supplied by the manufacturer shall apply, unless the ancillary equipment is tested in connection with a receiver or transmitter, in which case the corresponding performance criteria above shall apply.

For a voltage dip corresponding to a reduction of the supply voltage of 60% for 100 ms and/or a voltage interruption corresponding to a reduction of the supply voltage >95% for 5000 ms:

- in the case where the equipment is fitted with or connected to a battery back-up, the performance criteria for transient phenomena for transmitters or for receivers shall apply;
- in the case where the equipment is powered solely from the AC mains supply (without the use of a parallel battery back-up) volatile user data may have been lost and if applicable the communication link need to be maintained and lost functions should be recoverable by user or operator;
- no unintentional responses shall occur at the end of the test;
- in the event of loss of function(s) or in the event of loss the stored data, this fact shall be recorded in the test report; for ancillary equipment the pass/failure criteria supplied by the manufacturer shall apply, unless the ancillary equipment is tested in connection with a receiver or transmitter, in which case the corresponding performance criteria above shall apply.

6.5.2 Performance criteria according to EN 301-489-3

6.5.2.1 Performance criteria for continuous phenomena applied to transmitters (CT), Section 6.4

For equipment type I or II including ancillary equipment tested on a stand alone basis, the performance criteria A of the applicable class shall apply.

For equipment of type II or III that requires a communication link that is maintained during the test, it shall be verified by appropriate means supplied by the manufacturer that the communication link is maintained during each individual exposure in the test sequence.

Where the EUT is a transmitter, tests shall be repeated with the EUT in standby mode to ensure that any unintentional transmission does not occur.

6.5.2.2 Performance criteria for transient phenomena applied to transmitters (TT), Section 6.5

For equipment type I or II including ancillary equipment tested on a stand alone basis, the performance criteria B of the applicable class shall apply, except for the power interruptions exceeding a certain time the performance criteria deviations are specified in Section 7.2.2 of EN 301 489-3.

For equipment of type II or III that requires a communication link that is maintained during the test, it shall be verified by appropriate means supplied by the manufacturer that the communication link is maintained during each individual exposure in the test sequence.

Where the EUT is a transmitter, tests shall be repeated with the EUT in standby mode to ensure that any unintentional transmission does not occur.

6.5.2.3 Performance criteria for continuous phenomena applied to receivers (CR), Section 6.6

For equipment type I or II including ancillary equipment tested on a stand alone basis, the performance criteria A of the applicable class shall apply.

For equipment of type II or III that requires a communication link that is maintained during the test, it shall be verified by appropriate means supplied by the manufacturer that the communication link is maintained during each individual exposure in the test sequence.

Where the EUT is a transceiver, tests shall be repeated with the EUT in standby mode to ensure that any unintentional transmission does not occur.

6.5.2.4 Performance criteria for transient phenomena applied to receivers (TR), Section 6.7

For equipment type I or II including ancillary equipment tested on a stand alone basis, the performance criteria B of the applicable class shall apply, except for the power interruptions exceeding a certain time the performance criteria deviations are specified in Section 7.2.2 of EN 301 489-3.

For equipment of type II or III that requires a communication link that is maintained during the test, it shall be verified by appropriate means supplied by the manufacturer that the communication link is maintained during each individual exposure in the test sequence.

Where the EUT is a transceiver, tests shall be repeated with the EUT in standby mode to ensure that any unintentional transmission does not occur.

6.5.2.5 Performance criteria for equipment tested on a stand alone basis, Section 6.8

If ancillary equipment is intended to be tested on a stand alone basis, the performance criteria described in the clauses above are not appropriate, then the manufacturer shall declare, for inclusion in the test report, his own specification for an acceptable level of performance or degradation during and/or after the immunity tests. The performance specification shall be included in the product description and documentation.

6.5.2.6 Performance criteria for voltage dips and interruptions, Section 7.2.2

For a voltage dip corresponding to a reduction of the supply voltage of 30% for 10 ms the performance criteria CT or CR shall apply as appropriate.

For a voltage dip corresponding to a reduction of the supply voltage of 60% for 100 ms the following class-dependent performance criteria shall apply:

- for transmitters, belonging to class 1 equipment, the performance criteria CT;
- for transmitters, belonging to class 2 or 3 equipment, the performance criteria TT;
- for receivers, belonging to class 1 equipment, the performance criteria CR;
- for receivers, belonging to class 2 or 3 equipment, the performance criteria TR.

For a voltage interruption corresponding to a reduction of the supply voltage >95% for 5000 ms the performance criteria TT or TR shall apply as appropriate.

6.5.3 Performance criteria according to EN 301-489-7

6.5.3.1 Performance criteria for continuous phenomena applied to transmitters (CT), Section 6.1

A communication link shall be established at the start of the test and maintained during the test.

During the test, the uplink speech output level shall be at least 35 dB less than the previously recorded reference levels, when measured through an audio band pass filter of width 200 Hz, centered on 1 kHz (audio breakthrough check).

NOTE: When there is a high level background noise present the filter bandwidth can be reduced down to a minimum of 40 Hz.

At the conclusion of the test, the EUT shall operate as intended with no loss of user control functions or stored data, and the communication link shall have been maintained. In addition to confirming the above performance during a call, the test shall also be performed in idle mode, and the transmitter shall not unintentionally operate.

6.5.3.2 Performance criteria for transient phenomena applied to transmitters (TT), Section 6.2

A communication link shall be established at the start of the test and maintained during the test.

At the conclusion of each exposure, the EUT shall operate with no user noticeable loss of the communication link.

At the conclusion of the total test comprising the series of individual exposures, the EUT shall operate as intended with no loss of user control functions or stored data, as declared by the manufacturer, and the communication link shall have been maintained.

In addition to confirming the above performance during a call, the test shall also be performed in idle mode, and the transmitter shall not unintentionally operate.

6.5.3.3 Performance criteria for continuous phenomena applied to receivers (CR), Section 6.3

A communication link shall be established at the start of the test.

During the test, the RXQUAL of the downlink shall not exceed the value of three, measured during each individual exposure in the test sequence.

During the test, the downlink speech output level shall be at least 35 dB less than the previously recorded reference levels, when measured through an audio band pass filter of width 200 Hz, centered on 1 kHz (audio breakthrough check).

NOTE: When there is a high level background noise present the filter bandwidth can be reduced down to a minimum of 40 Hz.

At the conclusion of the test, the EUT shall operate as intended with no loss of user control functions or stored data, and the communication link shall have been maintained.

6.5.3.4 Performance criteria for transient phenomena applied to receivers (TR), Section 6.4
A communication link shall be established at the start of the test.
At the conclusion of each exposure, the EUT shall operate with no user noticeable loss of the communication link.
At the conclusion of the total test comprising the series of individual exposures, the EUT shall operate as intended with no loss of user control functions or stored data, as declared by the manufacturer, and the communication link shall have been maintained.

6.5.3.5 Performance criteria for ancillary equipment tested on a stand alone basis, Section 6.5
The provision of EN 301 489-1, Section 6.4 shall apply.

6.5.3.6 Performance criteria for transient and surges in the vehicular environment, Section 7.2.2
During tests with pulses 3a and 3b, the performance criteria TT shall apply.

6.5.3.7 Performance criteria for voltage dips, Section 7.2.2
For a voltage dip corresponding to a reduction of the supply voltage of 30% for 10 ms the performance criteria TT or CR shall apply as appropriate.

6.5.4 Performance criteria according to EN 301-489-24

6.5.4.1 Performance criteria for continuous phenomena, Section 6.1
A communication link shall be established at the start of the test, and maintained during the test, clauses 4.1 and 4.2.
In the speech mode, the performance criteria shall be that the Up Link and Down Link speech output levels shall be at least 35 dB less than the recorded reference levels, when measured through an audio band pass filter of width 200 Hz, centred on 1 kHz (annex B).
NOTE: When there is a high level of background audio noise present, the filter bandwidth can be reduced down to a minimum of 40 Hz.
At the conclusion of the test, the EUT shall operate as intended with no loss of user control functions or stored data, and the communication link shall have been maintained.
In addition to confirming the above performance in traffic mode, the test shall be performed in idle mode, and the transmitter shall not unintentionally operate.

6.5.4.2 UTRA, Section 6.1.1
In the data transfer mode, the performance criteria can be one of the following:

- if the BER (as referred in TS 134 109 [8]) is used, it shall not exceed 0,001 during the test sequence;
- if the BLER (as referred in TS 134 109 [8]) is used, it shall not exceed 0,01 during the test sequence.

The BLER calculation shall be based on evaluating the CRC on each transport block.

6.5.4.3 E-UTRA, Section 6.1.2
In the data transfer mode, the performance criteria shall be that the throughput shall be ≥ 95 % of the maximum throughput of the reference measurement channel as specified in annex C in TS 136 101 [13] with parameters specified in tables 7.3.1-1 and 7.3.1-2 in TS 136 101 [13] during the test sequence.

6.5.4.4 Performance criteria for transient phenomena, Section 6.2
A communications link shall be established at the start of the test, clauses 4.1 and 4.2.
At the conclusion of each exposure the EUT shall operate with no user noticeable loss of the communication link.
At the conclusion of the total test comprising the series of individual exposures, the EUT shall operate as intended with no loss of user control functions or stored data, as declared by the manufacturer, and the communication link shall have been maintained.
In addition to confirming the above performance in traffic mode, the test shall also be performed in idle mode, and the transmitter shall not unintentionally operate.

6.6 Acceptance criteria

The EUT performance shall be checked by monitoring on auxiliary PC of GPRS connection link and of GPS coordination:

- Analog inputs shown in Section 6.4 of the test report shall remain without changes.
- Outputs shown in Section 6.4 of the test report shall remain without changes.

Test specification:	Conducted emission measurements at DC power input port, Class B		
Test procedure:	EN 301 489-1, Section 8.3, EN 55022 Class B, Section 5.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	07-Oct-15		
Temperature: 24 ºC	Air Pressure: 1008 hPa	Relative Humidity: 55 %	Power Supply: 12 VDC
Remarks: CR300B 2G, part number CT7801201-000			

7 Emissions tests according to EN 301 489-3/7/24/1 requirements

7.1 Conducted emission measurements at DC power input port, CR300B 2G, part number CT7801201-000

7.1.1 General

This test was performed to measure common mode conducted emissions at the EUT power port. The specification test limits are given in Table 7.1.1.

Table 7.1.1 Limits for conducted emissions at DC power input port

Frequency, MHz	Class B limit, dB(μV)		Class A limit, dB(μV)	
	QP	AVRG	QP	AVRG
0.15 - 0.5	66 - 56*	56 - 46*	79	66
0.5 - 5.0	56	46	73	60
5.0 - 30	60	50	73	60

* The limit decreases linearly with the logarithm of frequency.

7.1.2 Test procedure

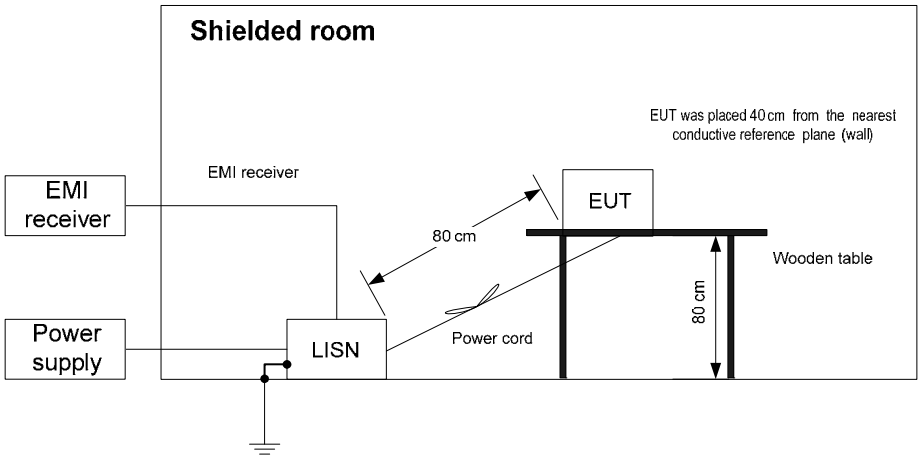
7.1.2.1 The EUT was set up as shown in Figure 7.1.1, energized and the EUT performance was checked.

7.1.2.2 The measurements were performed at the EUT power terminals with the LISN, connected to the EMI receiver in the frequency range referred to in Table 7.1.2. The unused coaxial connector of the LISN was terminated with 50 Ohm.

7.1.2.3 The position of the EUT cables was varied to find the highest emission.

7.1.2.4 The worst test results with respect to the limits were recorded in Table 7.1.2 and shown in the associated plots.

Figure 7.1.1 Setup for conducted emission measurements at DC power input port, table-top EUT



Test specification:	Conducted emission measurements at DC power input port, Class B		
Test procedure:	EN 301 489-1, Section 8.3, EN 55022 Class B, Section 5.1		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	07-Oct-15		
Temperature: 24 ºC	**Air Pressure:** 1008 hPa	**Relative Humidity:** 55 %	**Power Supply:** 12 VDC
Remarks: CR300B 2G, part number CT7801201-000			

Table 7.1.2 Conducted emissions at DC power input port test results, CR300B 2G, part number CT7801201-000

LINE: DC power input
EUT SET UP: TABLE-TOP
TEST SITE: SHIELDED ROOM
DETECTORS USED: PEAK / QUASI-PEAK / AVERAGE
FREQUENCY RANGE: 150 kHz - 30 MHz
RESOLUTION BANDWIDTH: 9 kHz

Frequency, MHz	Peak emission, dB(μV)	Quasi-peak			Average			Line ID	Verdict
		Measured emission, dB(μV)	Limit, dB(μV)	Margin, dB*	Measured emission, dB(μV)	Limit, dB(μV)	Margin, dB*		
0.24	32.69	29.57	62.12	-32.55	23.85	52.12	-28.27	L1	Pass
1.06	28.76	25.33	56.00	-30.67	18.12	46.00	-27.88		
1.89	29.05	27.56	56.00	-28.44	26.89	46.00	-19.11		
14.16	31.99	29.92	60.00	-30.08	24.05	50.00	-25.95		
0.22	32.96	29.11	62.85	-33.74	21.31	52.85	-31.54	L2	Pass
1.20	31.12	27.60	56.00	-28.40	18.31	46.00	-27.69		
1.89	29.07	27.69	56.00	-28.31	26.90	46.00	-19.10		
26.43	33.79	29.60	60.00	-30.40	24.05	50.00	-25.95		

*- Margin = Measured emission - specification limit.

Reference numbers of test equipment used

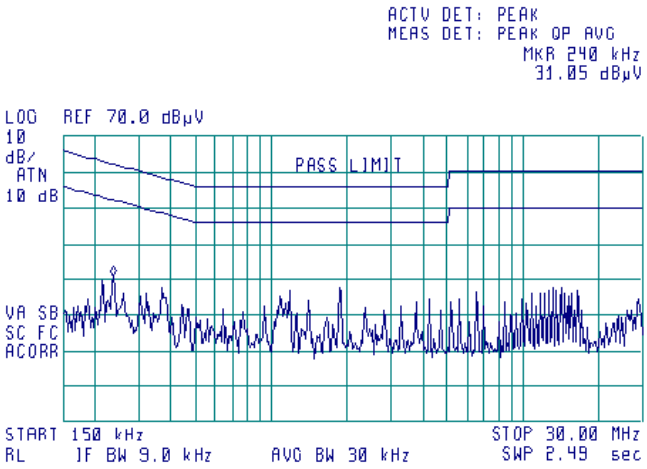
HL 0787	HL 1425	HL 1553	HL 2221	HL 3612			

Full description is given in Appendix A.

Test specification:	Conducted emission measurements at DC power input port, Class B		
Test procedure:	EN 301 489-1, Section 8.3, EN 55022 Class B, Section 5.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	07-Oct-15		
Temperature: 24 ºC	Air Pressure: 1008 hPa	Relative Humidity: 55 %	Power Supply: 12 VDC
Remarks: CR300B 2G, part number CT7801201-000			

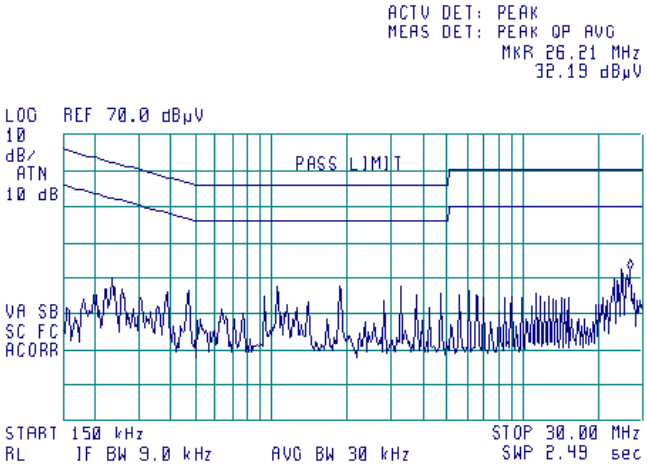
Plot 7.1.1 Conducted emissions at DC power port, CR300B 2G, part number CT7801201-000

LINE: L1
LIMIT: QUASI-PEAK, AVERAGE
DETECTOR: PEAK



Plot 7.1.2 Conducted emissions at DC power port, CR300B 2G, part number CT7801201-000

LINE: L2
LIMIT: QUASI-PEAK, AVERAGE
DETECTOR: PEAK



Test specification:	Conducted emission measurements at DC power input port, Class B		
Test procedure:	EN 301 489-1, Section 8.3, EN 55022 Class B, Section 5.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	07-Oct-15		
Temperature: 24 ºC	Air Pressure: 1008 hPa	Relative Humidity: 55 %	Power Supply: 12 VDC
Remarks: CR300B 3G EU, part number CT7801202-000			

7.2 Conducted emission measurements at DC power input port, CR300B 3G EU, part number CT7801202-000

7.2.1 General

This test was performed to measure common mode conducted emissions at the EUT power port. The specification test limits are given in Table 7.2.1.

Table 7.2.1 Limits for conducted emissions at DC power input port

Frequency, MHz	Class B limit, dB(μV)		Class A limit, dB(μV)	
	QP	AVRG	QP	AVRG
0.15 - 0.5	66 - 56*	56 - 46*	79	66
0.5 - 5.0	56	46	73	60
5.0 - 30	60	50	73	60

* The limit decreases linearly with the logarithm of frequency.

7.2.2 Test procedure

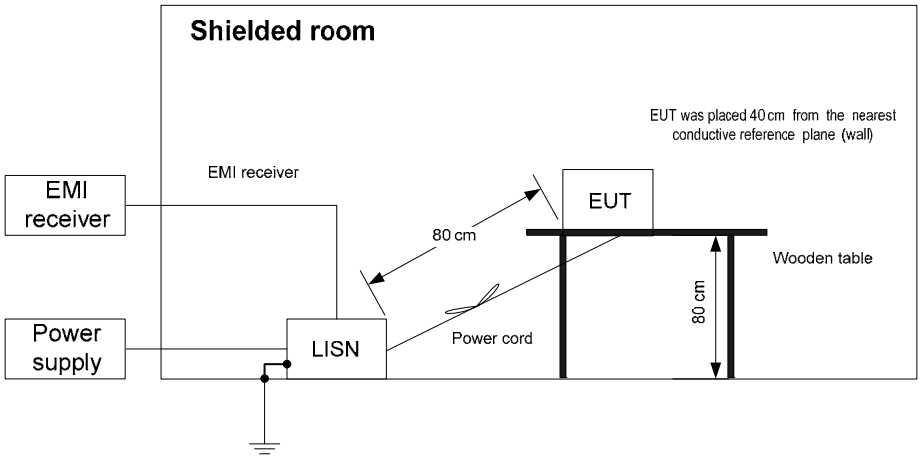
7.2.2.1 The EUT was set up as shown in Figure 7.2.1, energized and the EUT performance was checked.

7.2.2.2 The measurements were performed at the EUT power terminals with the LISN, connected to the EMI receiver in the frequency range referred to in Table 7.2.2. The unused coaxial connector of the LISN was terminated with 50 Ohm.

7.2.2.3 The position of the EUT cables was varied to find the highest emission.

7.2.2.4 The worst test results with respect to the limits were recorded in Table 7.2.2 and shown in the associated plots.

Figure 7.2.1 Setup for conducted emission measurements at DC power input port, table-top EUT



Test specification:	Conducted emission measurements at DC power input port, Class B		
Test procedure:	EN 301 489-1, Section 8.3, EN 55022 Class B, Section 5.1		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	07-Oct-15		
Temperature: 24 ºC	**Air Pressure:** 1008 hPa	**Relative Humidity:** 55 %	**Power Supply:** 12 VDC
Remarks: CR300B 3G EU, part number CT7801202-000			

Table 7.2.2 Conducted emissions at DC power input port test results, CR300B 3G EU, part number CT7801202-000

LINE: DC power input
EUT SET UP: TABLE-TOP
TEST SITE: SHIELDED ROOM
DETECTORS USED: PEAK / QUASI-PEAK / AVERAGE
FREQUENCY RANGE: 150 kHz - 30 MHz
RESOLUTION BANDWIDTH: 9 kHz

Frequency, MHz	Peak emission, dB(μV)	Quasi-peak			Average			Line ID	Verdict
		Measured emission, dB(μV)	Limit, dB(μV)	Margin, dB*	Measured emission, dB(μV)	Limit, dB(μV)	Margin, dB*		
0.24	30.89	27.71	62.07	-34.36	21.97	52.07	-30.10	L1	Pass
0.48	25.22	23.40	56.45	-33.05	22.67	46.45	-23.78		
2.86	26.41	24.88	56.00	-31.12	24.36	46.00	-21.64		
15.24	29.31	25.52	60.00	-34.48	22.54	50.00	-27.46		
0.22	29.32	26.03	62.84	-36.81	17.14	52.84	-35.70	L2	Pass
2.86	26.39	24.89	56.00	-31.11	24.36	46.00	-21.64		
3.81	26.39	24.79	56.00	-31.21	24.07	46.00	-21.93		
25.24	32.50	30.22	60.00	-29.78	26.07	50.00	-23.93		

*- Margin = Measured emission - specification limit.

Reference numbers of test equipment used

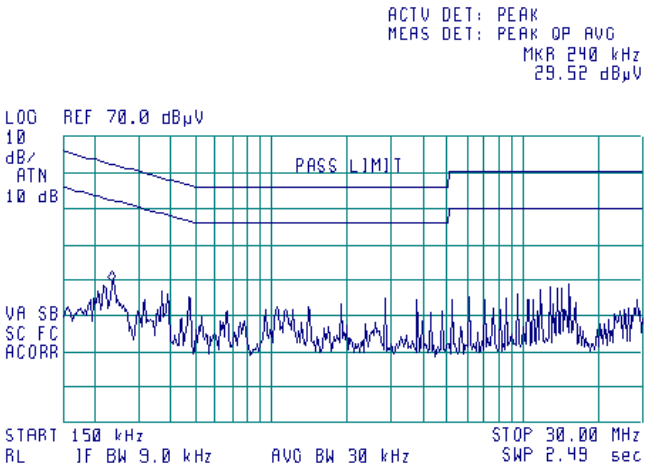
HL 0787	HL 1425	HL 1553	HL 2221	HL 3612			

Full description is given in Appendix A.

Test specification:	Conducted emission measurements at DC power input port, Class B		
Test procedure:	EN 301 489-1, Section 8.3, EN 55022 Class B, Section 5.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	07-Oct-15		
Temperature: 24 ºC	Air Pressure: 1008 hPa	Relative Humidity: 55 %	Power Supply: 12 VDC
Remarks: CR300B 3G EU, part number CT7801202-000			

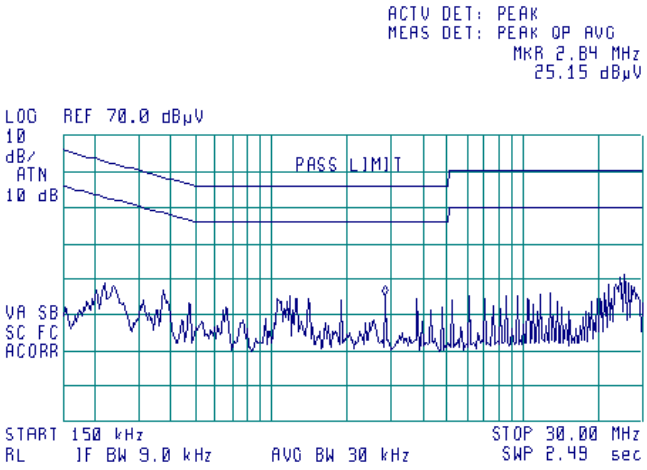
Plot 7.2.1 Conducted emissions at DC power port, CR300B 3G EU, part number CT7801202-000

LINE: L1
LIMIT: QUASI-PEAK, AVERAGE
DETECTOR: PEAK



Plot 7.2.2 Conducted emissions at DC power port, CR300B 3G EU, part number CT7801202-000

LINE: L2
LIMIT: QUASI-PEAK, AVERAGE
DETECTOR: PEAK



Test specification:	Radiated emission measurements, Class B		
Test procedure:	EN 301 489-1, Section 8.2, EN 55022 Class B, Section 6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	11-Oct-15 - 20-Oct-15		
Temperature: 23 ºC	Air Pressure: 1013 hPa	Relative Humidity: 48 %	Power Supply: 12 VDC
Remarks: CR300B 2G, part number CT7801201-000 & CR300B 3G EU, part number CT7801202-000 toghether			

7.3 Radiated emission measurements, CR300B 2G, part number CT7801201-000 & CR300B 3G EU, part number CT7801202-000 toghether

7.3.1 General

This test was performed to measure radiated emissions from the EUT enclosure. The specification test limits are given in Table 7.3.1.

Table 7.3.1 Radiated emission limits

Frequency, MHz	Class B limit, dB(μV/m)				Class A limit, dB(μV/m)			
	Peak	Quasi-peak		Average	Peak	Quasi-peak		Average
	@3 m	@10 m	@3 m	@3 m	@3 m	@10 m	@3 m	@3 m
30 - 230	——	30.0	40.5*	——	——	40.0	50.5*	——
230 - 1000	——	37.0	47.5*	——	——	47.0	57.5*	——
1000 – 3000	70	——	——	50	76	——	——	56
3000 - 6000	74	——	——	54	80	——	——	60

* The limit for test distance other than specified was calculated using the inverse linear distance extrapolation factor as follows: $Lim_{S2} = Lim_{S1} + 20 \log (S_1/S_2)$,
where S_1 and S_2 – standard defined and test distance respectively in meters.

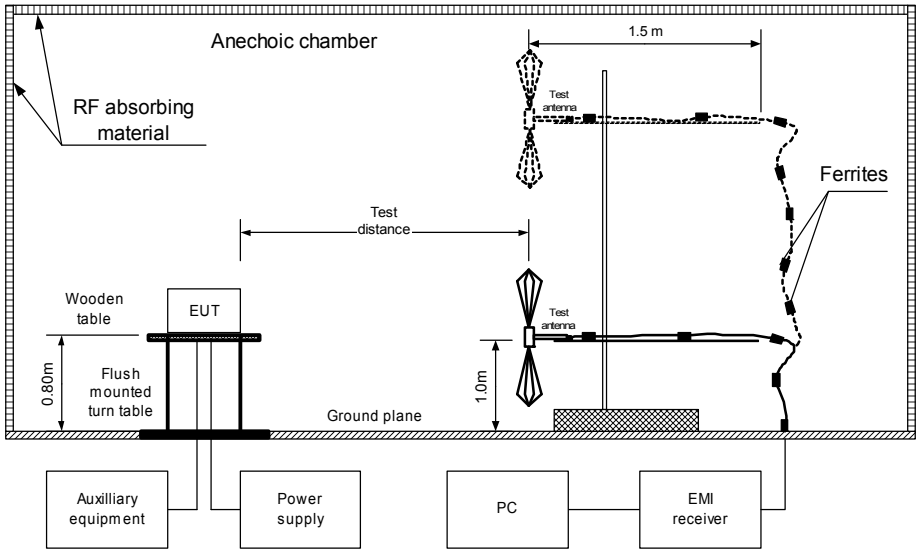
7.3.2 Test procedure

7.3.2.1 The EUT was set up as shown in Figure 7.3.1 and the associated photographs, energized and the EUT performance was checked.

7.3.2.2 The measurements were performed in the anechoic chamber at 3 m test distance. The specified frequency range was investigated with the antenna connected to the EMI receiver. To find the highest emission the turntable was rotated 360^0 and the measuring antenna height was swept from 1 to 1.8 m in both, vertical and horizontal polarizations. The EUT cables position was varied to maximize emission.

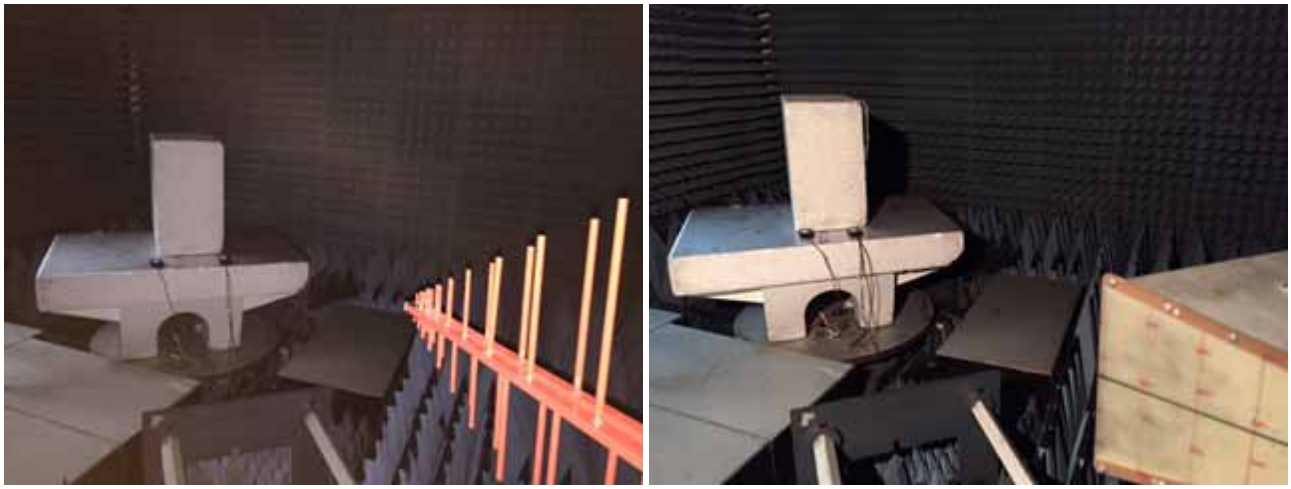
7.3.2.3 The worst test results with respect to the limits were recorded in Table 7.3.2 and shown in the associated plots.

Figure 7.3.1 Setup for radiated emission measurements in anechoic chamber, table-top EUT



Test specification:	Radiated emission measurements, Class B		
Test procedure:	EN 301 489-1, Section 8.2, EN 55022 Class B, Section 6		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	11-Oct-15 - 20-Oct-15		
Temperature: 23 ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 48 %	**Power Supply:** 12 VDC
Remarks: CR300B 2G, part number CT7801201-000 & CR300B 3G EU, part number CT7801202-000 toghether			

**Photograph 7.3.1 Setup for radiated emission measurements, general view,
CR300B 2G, part number CT7801201-000 & CR300B 3G EU, part number CT7801202-000 toghether**



**Photograph 7.3.2 Setup for radiated emission measurements, EUT cabling,
CR300B 2G, part number CT7801201-000 & CR300B 3G EU, part number CT7801202-000 toghether**

Test specification:	Radiated emission measurements, Class B		
Test procedure:	EN 301 489-1, Section 8.2, EN 55022 Class B, Section 6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	11-Oct-15 - 20-Oct-15		
Temperature: 23 ºC	Air Pressure: 1013 hPa	Relative Humidity: 48 %	Power Supply: 12 VDC
Remarks: CR300B 2G, part number CT7801201-000 & CR300B 3G EU, part number CT7801202-000 toghether			

Table 7.3.2 Radiated emission test results, CR300B 2G, part number CT7801201-000 & CR300B 3G EU, part number CT7801202-000 toghether

EUT SET UP: TABLE-TOP
TEST SITE: Anechoic chamber
TEST DISTANCE: 3 m
FREQUENCY RANGE: 30 MHz – 1000 MHz
DETECTORS USED: PEAK / QUASI-PEAK
RESOLUTION BANDWIDTH: 120 kHz

Frequency, MHz	Peak emission, dB(μV/m)	Quasi-peak			Antenna polarization	Antenna height, m	Turn-table position**, degrees	Verdict
		Measured emission, dB(μV/m)	Limit, dB(μV/m)	Margin, dB*				
No unintentional emissions were found.								Pass

FREQUENCY RANGE: 1000 MHz - 6000 MHz
DETECTORS USED: PEAK / AVERAGE
RESOLUTION BANDWIDTH: 1 MHz

Frequency, MHz	Peak			Average			Antenna polarization	Antenna height, m	Turn-table position**, degrees	Verdict
	Measured emission, dB(μV/m)	Limit, dB(μV/m)	Margin, dB*	Measured emission, dB(μV/m)	Limit, dB(μV/m)	Margin, dB*				
No unintentional emissions were found.										Pass

*- Margin = Measured emission - specification limit.
**- EUT front panel refers to 0 degrees position of turntable.

Reference numbers of test equipment used

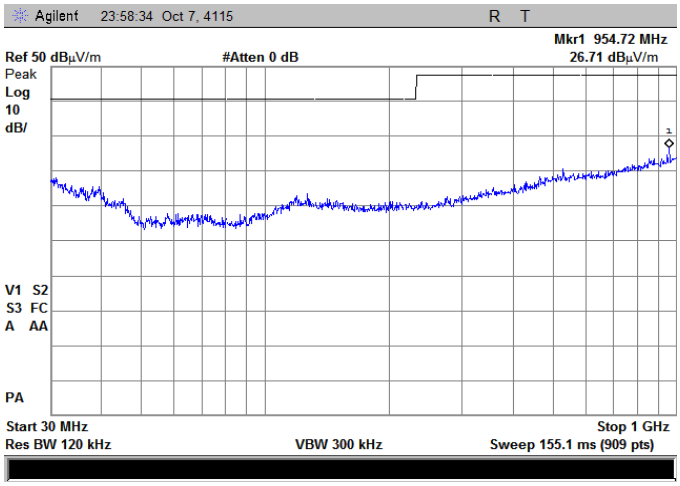
HL 2432	HL 2697	HL 2780	HL 4347	HL 4721	HL 4932		

Full description is given in Appendix A.

Test specification:	Radiated emission measurements, Class B		
Test procedure:	EN 301 489-1, Section 8.2, EN 55022 Class B, Section 6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	11-Oct-15 - 20-Oct-15		
Temperature: 23 ºC	Air Pressure: 1013 hPa	Relative Humidity: 48 %	Power Supply: 12 VDC
Remarks: CR300B 2G, part number CT7801201-000 & CR300B 3G EU, part number CT7801202-000 toghether			

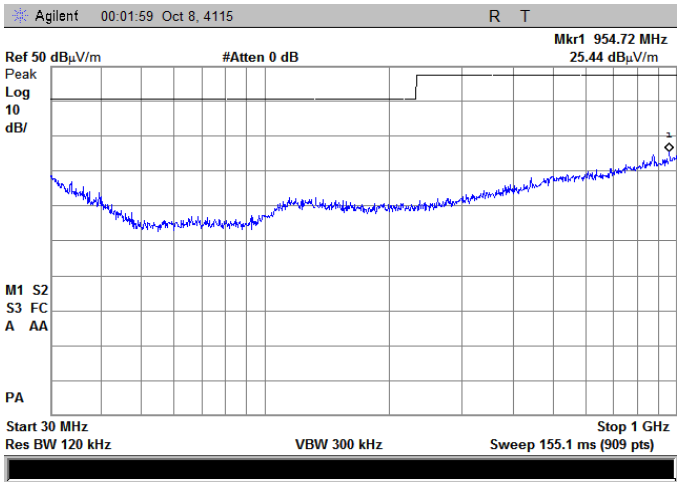
Plot 7.3.1 Radiated emission measurements in 30 - 1000 MHz range, vertical antenna polarization, CR300B 2G, part number CT7801201-000 & CR300B 3G EU, part number CT7801202-000 toghether

TEST SITE: Anechoic chamber
TEST DISTANCE: 3 m



Plot 7.3.2 Radiated emission measurements in 30 - 1000 MHz range, horizontal antenna polarization, CR300B 2G, part number CT7801201-000 & CR300B 3G EU, part number CT7801202-000 toghether

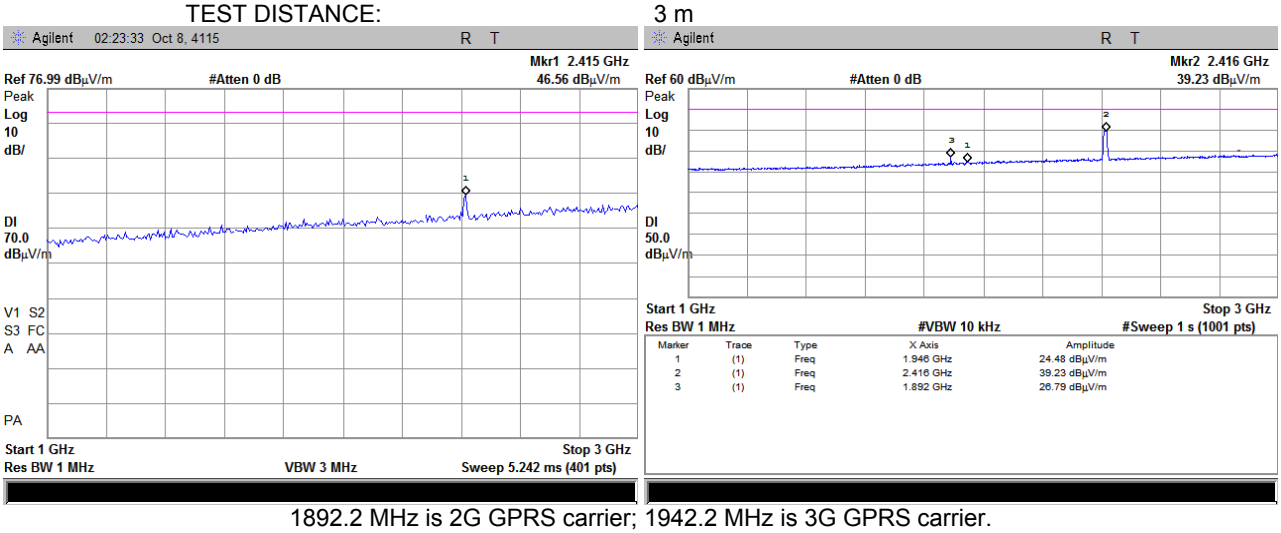
TEST SITE: Anechoic chamber
TEST DISTANCE: 3 m



Test specification:	Radiated emission measurements, Class B		
Test procedure:	EN 301 489-1, Section 8.2, EN 55022 Class B, Section 6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	11-Oct-15 - 20-Oct-15		
Temperature: 23 ºC	Air Pressure: 1013 hPa	Relative Humidity: 48 %	Power Supply: 12 VDC
Remarks: CR300B 2G, part number CT7801201-000 & CR300B 3G EU, part number CT7801202-000 toghether			

Plot 7.3.3 Radiated emission measurements in 1000 – 3000 MHz range, vertical & horizontal antenna polarization, CR300B 2G, part number CT7801201-000 & CR300B 3G EU, part number CT7801202-000 toghether

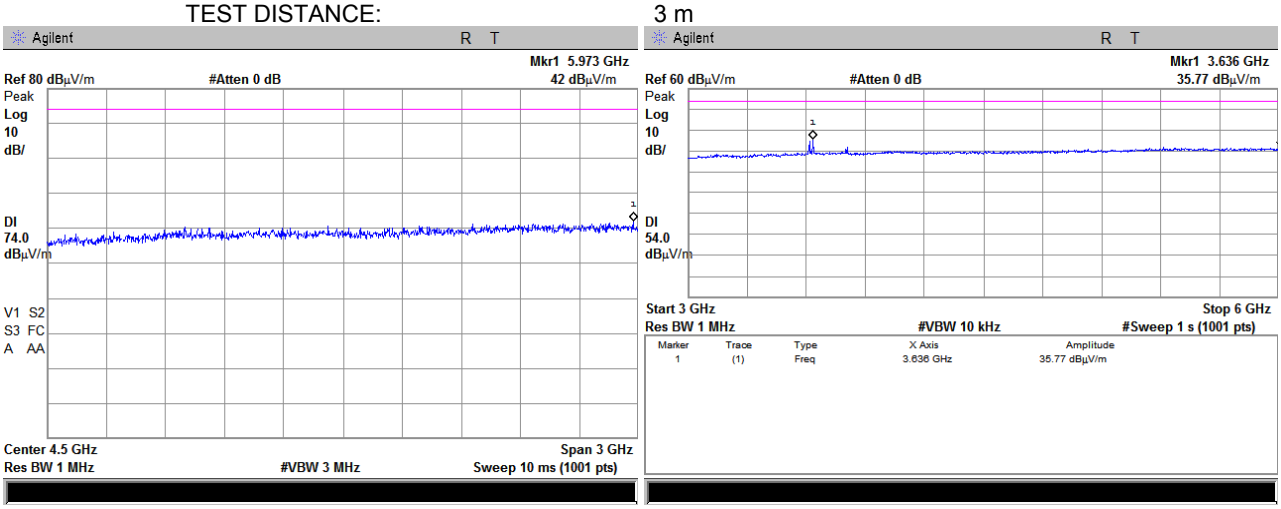
TEST SITE: Anechoic chamber
TEST DISTANCE: 3 m



1892.2 MHz is 2G GPRS carrier; 1942.2 MHz is 3G GPRS carrier.
2416 MHz is ambient noise.

Plot 7.3.4 Radiated emission measurements in 3000 – 6000 MHz range, vertical & horizontal antenna polarization, CR300B 2G, part number CT7801201-000 & CR300B 3G EU, part number CT7801202-000 toghether

TEST SITE: Anechoic chamber
TEST DISTANCE: 3 m



Test specification:	Immunity to electrostatic discharge (ESD)		
Test procedure:	EN 61000-4-2; EN 301 489-1, Section 9.3		
Test mode:	Compliance	Verdict:	PASS
Date(s):	07-Oct-15		
Temperature: 23 ºC	Air Pressure: 1005 hPa	Relative Humidity: 48 %	Power Supply: 12 VDC
Remarks: CR300B 2G, part number CT7801201-000 & CR300B 3G EU, part number CT7801202-000			

8 Immunity tests according to EN 301 489-3/7/24/1 requirements

8.1 Immunity to electrostatic discharge (ESD)

8.1.1 General

This test was performed to verify the EUT immunity to electrostatic discharges from operators directly and from adjacent objects. The ESDs were applied to all parts of the EUT, which are accessible during normal operation and maintenance.
The ESD levels, performance criterion and test results are referred to in Table 8.1.1.

8.1.2 Test procedure

8.1.2.1 The EUT was set up as shown in Figure 8.1.1 and the associated photographs, energized and the EUT performance was checked.

8.1.2.2 Single contact discharges of both polarities with 1 s time interval between pulses were applied to the horizontal coupling plane (HCP) at 10 centimeter distance from the EUT. Each side of the EUT was subjected to ESDs.

8.1.2.3 Single contact discharges of both polarities with 1 s time interval between pulses were applied to the vertical coupling plane (VCP) placed 10 centimeters from the EUT. The VCP was moved, in turn, to all sides of the EUT and it was subjected to the ESDs.

8.1.2.4 Single contact discharges of both polarities with 1 s time interval between pulses were applied to conductive parts of the EUT cabinet.

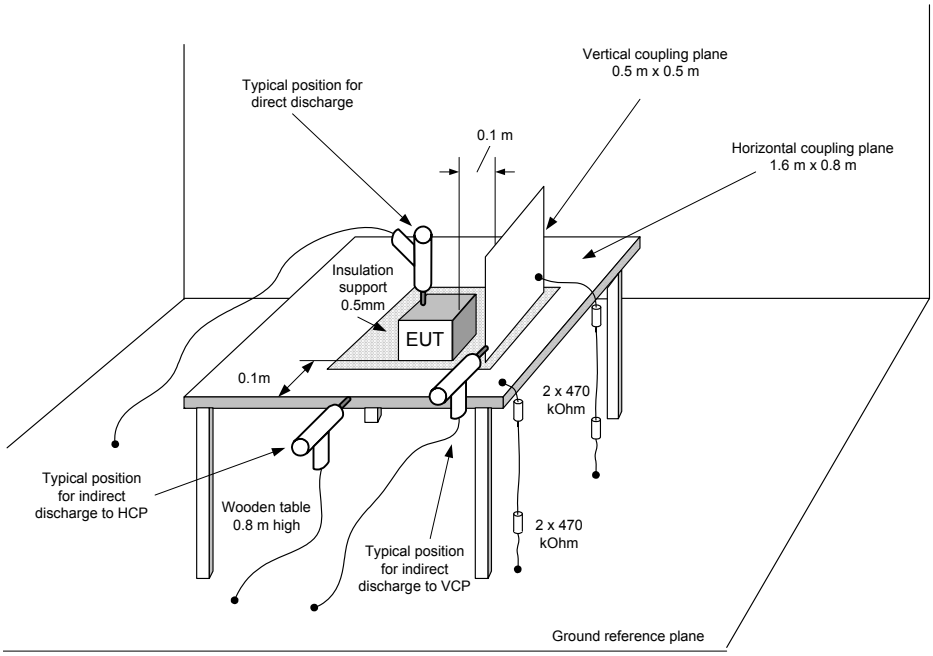
8.1.2.5 Single air discharges of both polarities with 1 s time interval between pulses were applied to non-conductive parts of the EUT.

8.1.2.6 The EUT operation was monitored throughout the test for any malfunction or degradation and its performance was recorded.

8.1.2.7 Upon this the test was completed.

Test specification:	Immunity to electrostatic discharge (ESD)		
Test procedure:	EN 61000-4-2; EN 301 489-1, Section 9.3		
Test mode:	Compliance	Verdict:	PASS
Date(s):	07-Oct-15		
Temperature: 23 ºC	Air Pressure: 1005 hPa	Relative Humidity: 48 %	Power Supply: 12 VDC
Remarks: CR300B 2G, part number CT7801201-000 & CR300B 3G EU, part number CT7801202-000			

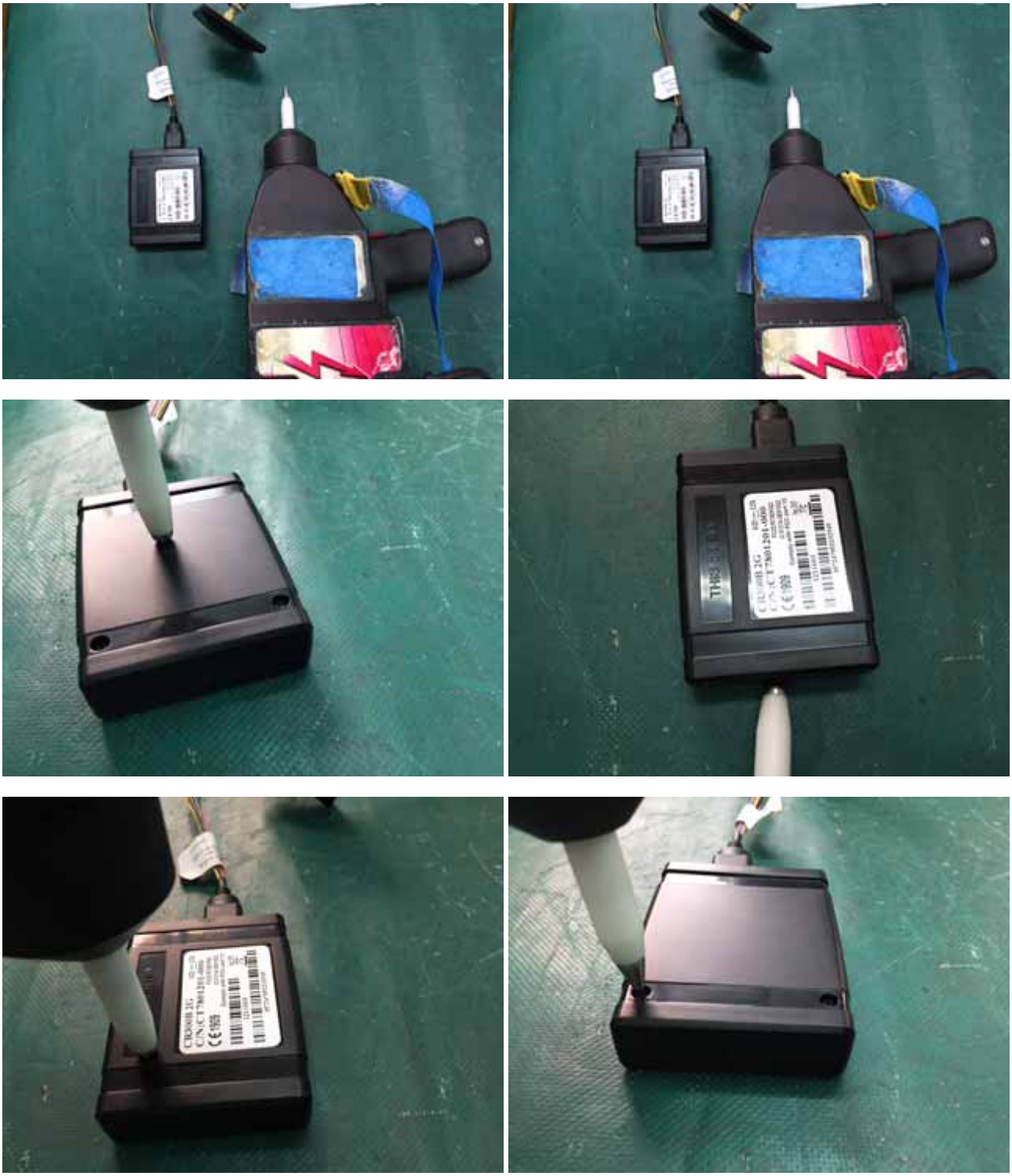
Figure 8.1.1 Setup for immunity to ESD, table-top EUT



Photograph 8.1.1 Setup for immunity to ESD, general view

Test specification:	Immunity to electrostatic discharge (ESD)		
Test procedure:	EN 61000-4-2; EN 301 489-1, Section 9.3		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	07-Oct-15		
Temperature: 23 ºC	**Air Pressure:** 1005 hPa	**Relative Humidity:** 48 %	**Power Supply:** 12 VDC
Remarks: CR300B 2G, part number CT7801201-000 & CR300B 3G EU, part number CT7801202-000			

Photograph 8.1.2 Setup for immunity to ESD, EUT test points



Test specification:	Immunity to electrostatic discharge (ESD)		
Test procedure:	EN 61000-4-2; EN 301 489-1, Section 9.3		
Test mode:	Compliance	Verdict:	PASS
Date(s):	07-Oct-15		
Temperature: 23 ºC	Air Pressure: 1005 hPa	Relative Humidity: 48 %	Power Supply: 12 VDC
Remarks: CR300B 2G, part number CT7801201-000 & CR300B 3G EU, part number CT7801202-000			

Table 8.1.1 Immunity to ESD test results

EUT SET UP: TABLE-TOP
PERFORMANCE CRITERIA: TT/TR
NUMBER OF DISCHARGES AT EACH POINT & EACH LEVEL: 10 POSITIVE / 10 NEGATIVE

ESD applied to	Test voltage, kV	Number of test points	EUT performance description during the test	Verdict
Transceive mode				
CR300B 2G, part number CT7801201-000				
Air discharge				
EUT	2	10*	NP	Pass
	4		NP	
	8		NP	
Contact discharge				
EUT	2	2	NP	Pass
	4		NP	
HCP	2	4	NP	Pass
	4		NP	
VCP	2	4	NP	Pass
	4		NP	
CR300B 3G EU, part number CT7801202-000				
Air discharge				
EUT	2	10*	NP	Pass
	4		NP	
	8		NP	
Contact discharge				
EUT	2	2	NP	Pass
	4		NP	
HCP	2	4	NP	Pass
	4		NP	
VCP	2	4	NP	Pass
	4		NP	

* 10 positive / 10 negative air discharges were applied only to the test points, where discharges occurred. At all other points dielectric was examined for sufficient insulation to prevent disruption.

Reference numbers of test equipment used

HL 2823	HL 3377	HL 4979					

Full description is given in Appendix A.

Test specification:	Radiated immunity to radio frequency electromagnetic field		
Test procedure:	EN 61000-4-3; EN 301 489-1, Section 9.2		
Test mode:	Compliance	Verdict:	PASS
Date(s):	12-Oct-15		
Temperature: 23 ºC	Air Pressure: 1011 hPa	Relative Humidity: 48 %	Power Supply: 12 VDC
Remarks: CR300B 2G, part number CT7801201-000 & CR300B 3G EU, part number CT7801202-000 together			

8.2 Radiated immunity to radio frequency electromagnetic field

8.2.1 General

This test was performed to verify the EUT immunity to radiated radio frequency electromagnetic field.
The radiated RF electromagnetic field levels, performance criterion and test results are referred to in Table 8.2.1.

8.2.2 Test procedure

8.2.2.1 The EUT was set up as shown in Figure 8.2.1 and the associated photographs, energized and the EUT performance was checked.

8.2.2.2 The electric field generating antenna was installed facing the EUT front panel at the specified distance.

8.2.2.3 The test setup was adjusted to produce the required field strength level. The field strength was monitored by the isotropic field probe, which was placed near the EUT.

8.2.2.4 The signal frequency was scanned throughout the frequency range.

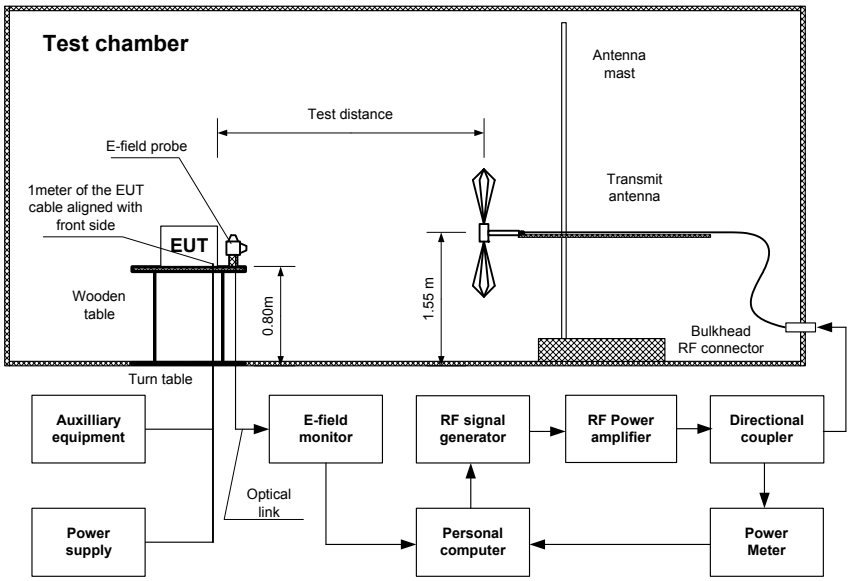
8.2.2.5 The test was performed with the antennas in both vertical and horizontal polarization.

8.2.2.6 The test was repeated for the rest of the EUT orientations.

8.2.2.7 The EUT operation was monitored throughout the test for any malfunction or degradation and its performance was recorded.

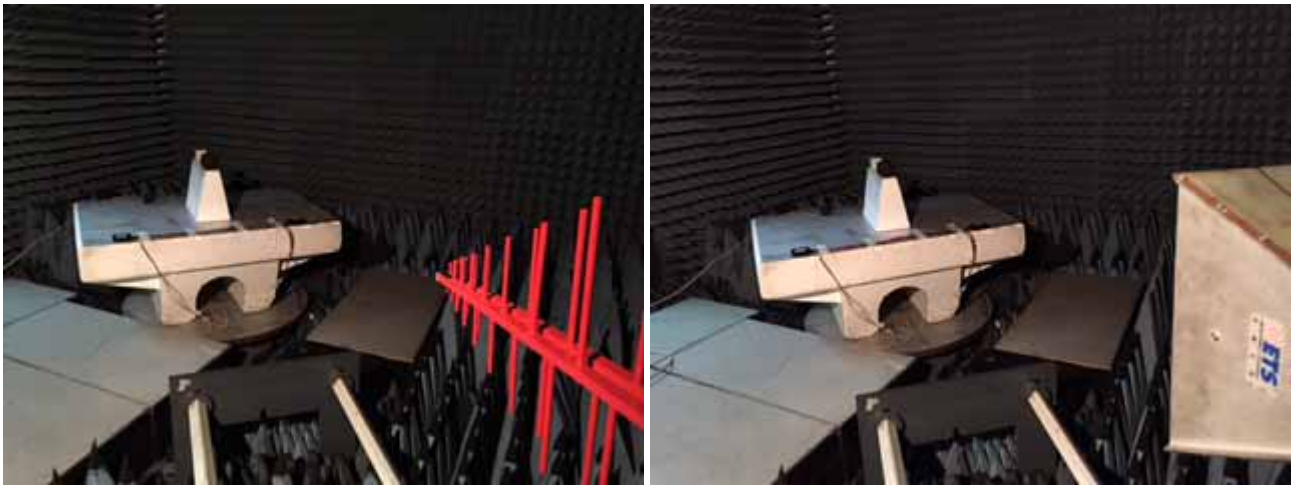
8.2.2.8 Upon this the test was completed.

Figure 8.2.1 Setup for radiated immunity to RF electromagnetic field test, table-top EUT

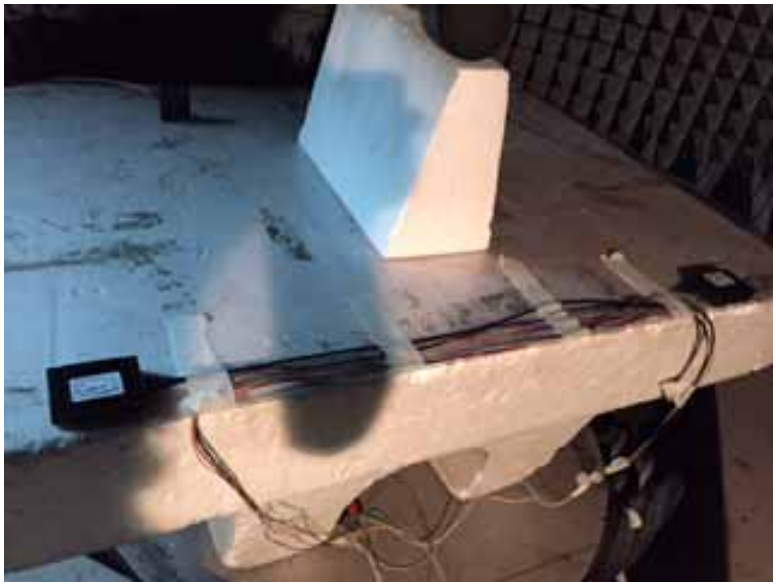


Test specification:	Radiated immunity to radio frequency electromagnetic field		
Test procedure:	EN 61000-4-3; EN 301 489-1, Section 9.2		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	12-Oct-15		
Temperature: 23 ºC	**Air Pressure:** 1011 hPa	**Relative Humidity:** 48 %	**Power Supply:** 12 VDC
Remarks: CR300B 2G, part number CT7801201-000 & CR300B 3G EU, part number CT7801202-000 together			

Photograph 8.2.1 Setup for radiated immunity to RF electromagnetic field test, general view, CR300B 2G, part number CT7801201-000 & CR300B 3G EU, part number CT7801202-000 together



Photograph 8.2.2 Setup for radiated immunity to RF electromagnetic field test, EUT cabling, CR300B 2G, part number CT7801201-000 & CR300B 3G EU, part number CT7801202-000 together



Test specification:	Radiated immunity to radio frequency electromagnetic field		
Test procedure:	EN 61000-4-3; EN 301 489-1, Section 9.2		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	12-Oct-15		
Temperature: 23 ºC	**Air Pressure:** 1011 hPa	**Relative Humidity:** 48 %	**Power Supply:** 12 VDC
Remarks: CR300B 2G, part number CT7801201-000 & CR300B 3G EU, part number CT7801202-000 together			

Table 8.2.1 Radiated immunity to RF electromagnetic field test results,
CR300B 2G, part number CT7801201-000 & CR300B 3G EU, part number CT7801202-000 together

EUT SET UP: TABLE-TOP
PERFORMANCE CRITERIA: CT/CR
TEST SITE: ANECHOIC CHAMBER
ANTENNA TO EUT DISTANCE: 2.4 m
MODULATION: 80% AM with 1 kHz
DWELL TIME: 2.8 s
FREQUENCY STEP: 1 % of current frequency

FREQUENCY RANGES: 80 – 1000 MHz; 1400 – 2700 MHz

EUT orientation*	Antenna polarization	Field strength**, V_{rms}/m	EUT performance description during the test	Verdict
Transceive mode				
0°	Vertical	3	NP	Pass
	Horizontal		NP	
90°	Vertical		NP	Pass
	Horizontal		NP	
180°	Vertical		NP	Pass
	Horizontal		NP	
270°	Vertical		NP	Pass
	Horizontal		NP	

* - 0° = antenna installed facing the EUT front panel.
**- Field strength measured prior to modulation.

Reference numbers of test equipment used

HL 2376	HL 2432	HL 2667	HL 2697	HL 3158	HL 3389	HL 3623	HL 4021
HL 4236	HL 4297	HL 4347					

Full description is given in Appendix A.

Test specification:	Immunity to transients and surges in the vehicular environment		
Test procedure:	ISO 7637-1, ISO 7637-2, EN 301 489-1, Section 9.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	08-Oct-15 - 15-Oct-15		
Temperature: 23 ºC	Air Pressure: 1013 hPa	Relative Humidity: 44 %	Power Supply: 12 VDC
Remarks: CR300B 2G, part number CT7801201-000 & CR300B 3G EU, part number CT7801202-000			

8.3 Conducted immunity to transient and surges in the vehicular environment (12 VDC powered EUT)

8.3.1 General

This test was performed to verify the EUT immunity to electrical transients on power line. The specification test levels are given in Table 8.3.1.

Table 8.3.1 Conducted transient test levels

Test pulse	Number of pulses or test time	Pulse parameters
1	10 pulses	Figure 8.3.1
2a	10 pulses	Figure 8.3.2
2b	10 pulses	Figure 8.3.3
3a	20 min	Figure 8.3.4
3b	20 min	Figure 8.3.5
4	10 pulses of test level III(a)	Figure 8.3.6
	10 pulses of test level III(b)	
	10 pulses of test level III(c)	
	10 pulses of test level III(d)	
	10 pulses of test level III(e)	

8.3.2 Calibration procedure

8.3.2.1 The test equipment was set up as shown in Figure 8.3.7 and the associated photograph; the power supply was adjusted to 13.5 VDC.

8.3.2.2 The pulse generator was energized and adjusted to match test Pulse 1 characteristics as provided in Table 8.3.1 and shown in the associated plots.

8.3.2.3 The calibration procedure was repeated for Pulses 2a, 2b, 3a, 3b as referred to in Table 8.3.1 and shown in the associated plots.

8.3.2.4 The power supply was adjusted to 12 VDC.

8.3.2.5 The pulse generator was energized and adjusted to match test Pulse 4 characteristics as provided in Table 8.3.1 and shown in the associated plots.

8.3.2.6 Upon this the calibration was completed.

8.3.3 Test procedure

8.3.3.1 The EUT was set up as shown in Figure 8.3.7 and the associated photograph, energized from 13.5 VDC power source and the EUT performance was checked.

8.3.3.2 The calibrated Pulse 1 was applied to the EUT power line, the EUT response is shown in the associated plots.

8.3.3.3 The EUT operation was monitored throughout the test and its performance was recorded in Table 8.3.2.

8.3.3.4 The above described procedure was repeated for Pulses 2a, 2b, 3a, 3b as referred to in Table 8.3.2.

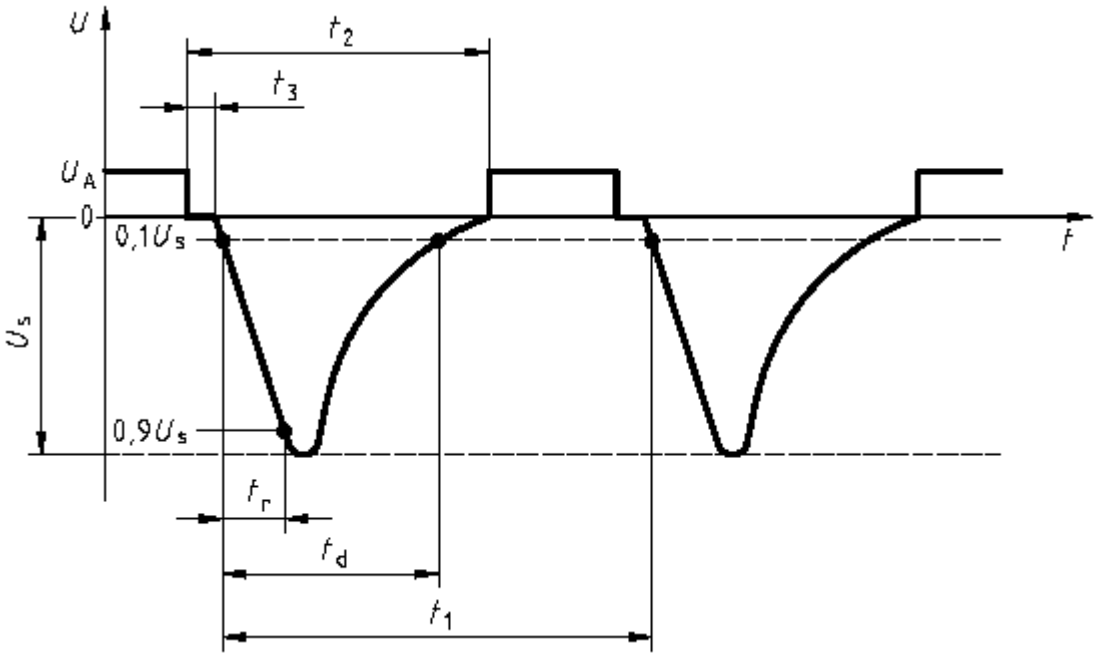
8.3.3.5 The EUT was set up as shown in Figure 8.3.7 and the associated photographs, energized from 12 VDC power source and the EUT performance was checked.

8.3.3.6 The above described procedure was repeated for Pulse 4 as referred to in Table 8.3.2.

8.3.3.7 Upon this the test was completed.

Test specification:	Immunity to transients and surges in the vehicular environment		
Test procedure:	ISO 7637-1, ISO 7637-2, EN 301 489-1, Section 9.6		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	08-Oct-15 - 15-Oct-15		
Temperature: 23 ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 44 %	**Power Supply:** 12 VDC
Remarks: CR300B 2G, part number CT7801201-000 & CR300B 3G EU, part number CT7801202-000			

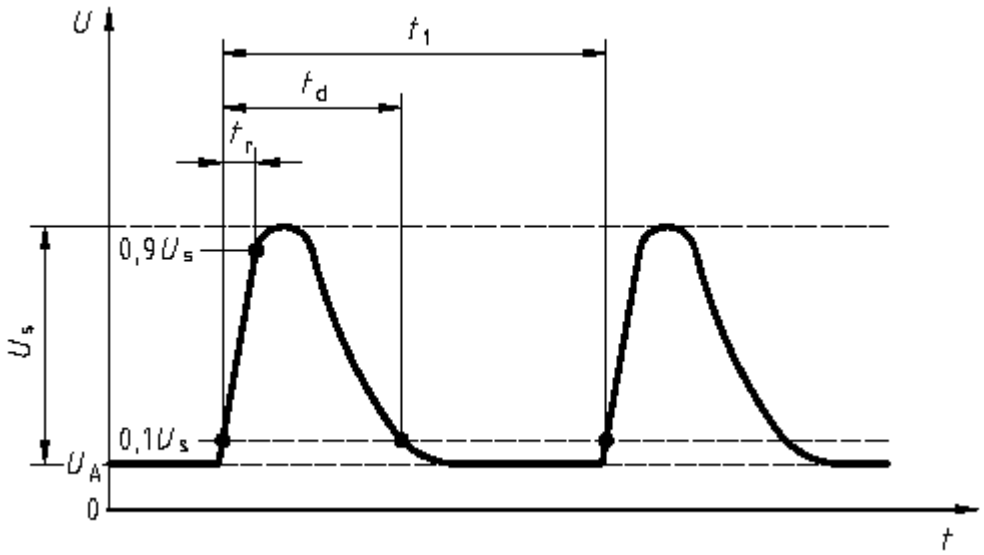
Figure 8.3.1 Test pulse 1 characteristics



Parameter	Test level III
U_s	-75 V
R_i	10 Ω
t_d	2 ms
t_r	(1 + 0 / - 0.5) µs
t_1	0.5 to 5 s
t_2	200 ms
t_3	<100 µs

Test specification:	Immunity to transients and surges in the vehicular environment		
Test procedure:	ISO 7637-1, ISO 7637-2, EN 301 489-1, Section 9.6		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	08-Oct-15 - 15-Oct-15		
Temperature: 23 ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 44 %	**Power Supply:** 12 VDC
Remarks: CR300B 2G, part number CT7801201-000 & CR300B 3G EU, part number CT7801202-000			

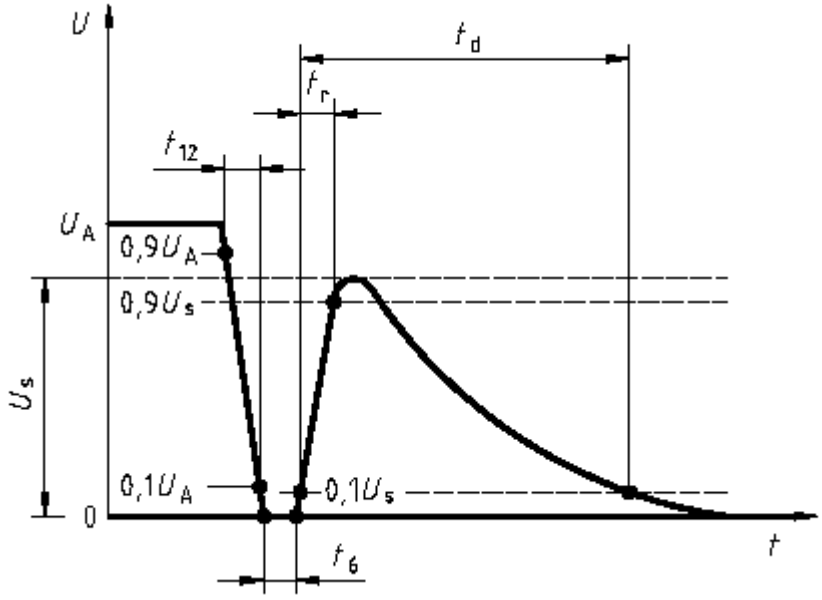
Figure 8.3.2 Test pulse 2a characteristics



Parameter	Test level III
U_s	+37 V
R_i	2 Ω
t_d	0.05 ms
t_r	(1 + 0 / - 0.5) µs
t_1	0.2 to 5 s

Test specification:	Immunity to transients and surges in the vehicular environment		
Test procedure:	ISO 7637-1, ISO 7637-2, EN 301 489-1, Section 9.6		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	08-Oct-15 - 15-Oct-15		
Temperature: 23 ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 44 %	**Power Supply:** 12 VDC
Remarks: CR300B 2G, part number CT7801201-000 & CR300B 3G EU, part number CT7801202-000			

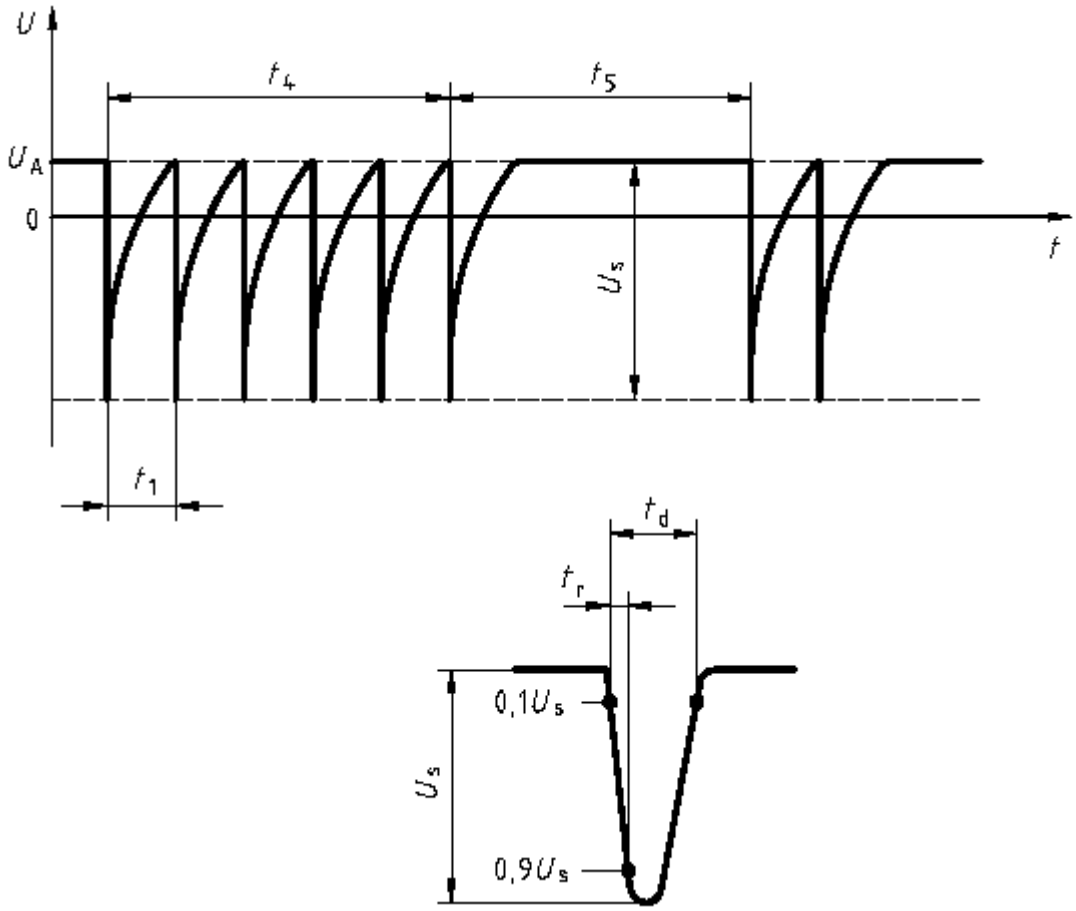
Figure 8.3.3 Test pulse 2b characteristics



Parameter	Test level III
U_A	13.5±0.5 V
U_s	+10 V
R_i	0 to 0.05 Ω
t_d	0.2 s to 2 s
t_r	(1 ± 0.5) ms
t_{12}	(1 ± 0.5) ms
t_6	(1 ± 0.5) ms

Test specification:	Immunity to transients and surges in the vehicular environment		
Test procedure:	ISO 7637-1, ISO 7637-2, EN 301 489-1, Section 9.6		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	08-Oct-15 - 15-Oct-15		
Temperature: 23 ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 44 %	**Power Supply:** 12 VDC
Remarks: CR300B 2G, part number CT7801201-000 & CR300B 3G EU, part number CT7801202-000			

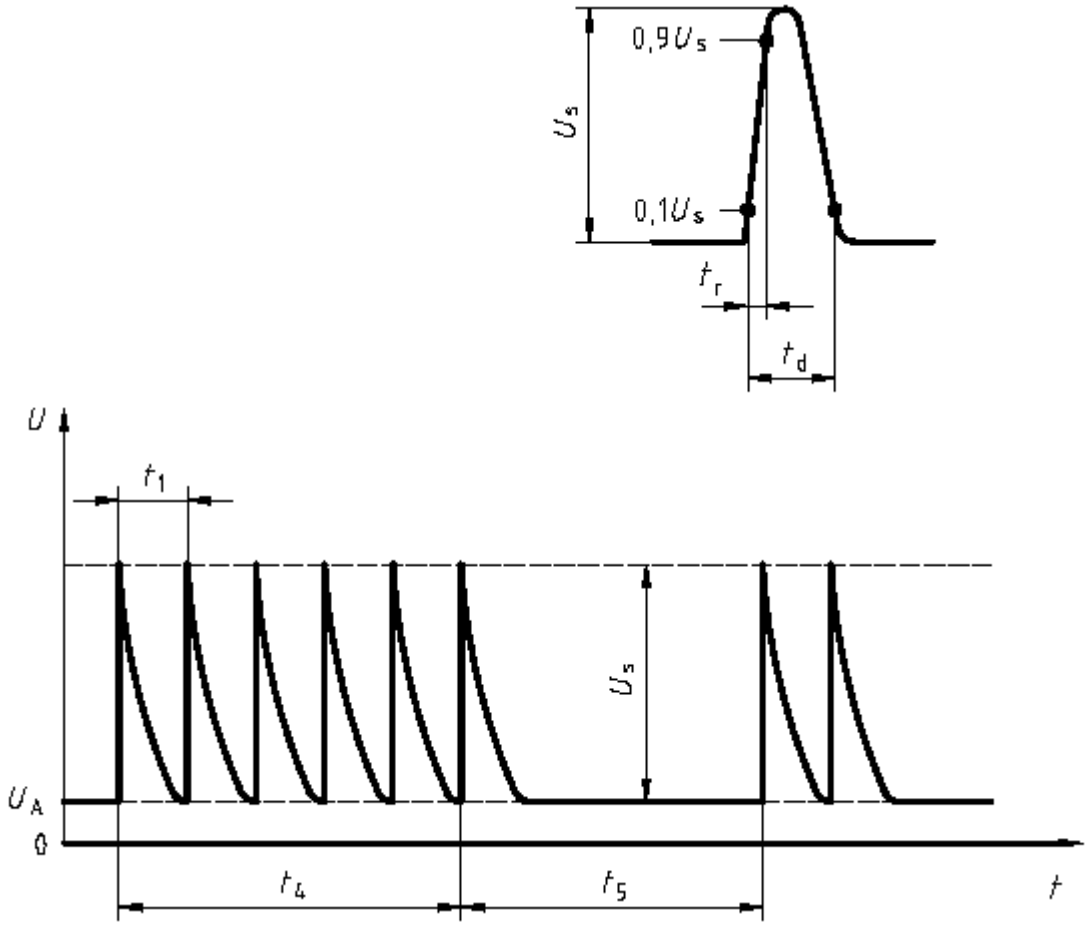
Figure 8.3.4 Test pulse 3a characteristics



Parameter	Test level III
U_A	13.5±0.5 V
U_s	-112 V
R_i	50 Ω
t_d	(0.1 + 0.1) µs
t_r	(5 ± 1.5) ns
t_1	100 µs
t_4	10 ms
t_5	90 ms

Test specification:	Immunity to transients and surges in the vehicular environment		
Test procedure:	ISO 7637-1, ISO 7637-2, EN 301 489-1, Section 9.6		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	08-Oct-15 - 15-Oct-15		
Temperature: 23 ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 44 %	**Power Supply:** 12 VDC
Remarks: CR300B 2G, part number CT7801201-000 & CR300B 3G EU, part number CT7801202-000			

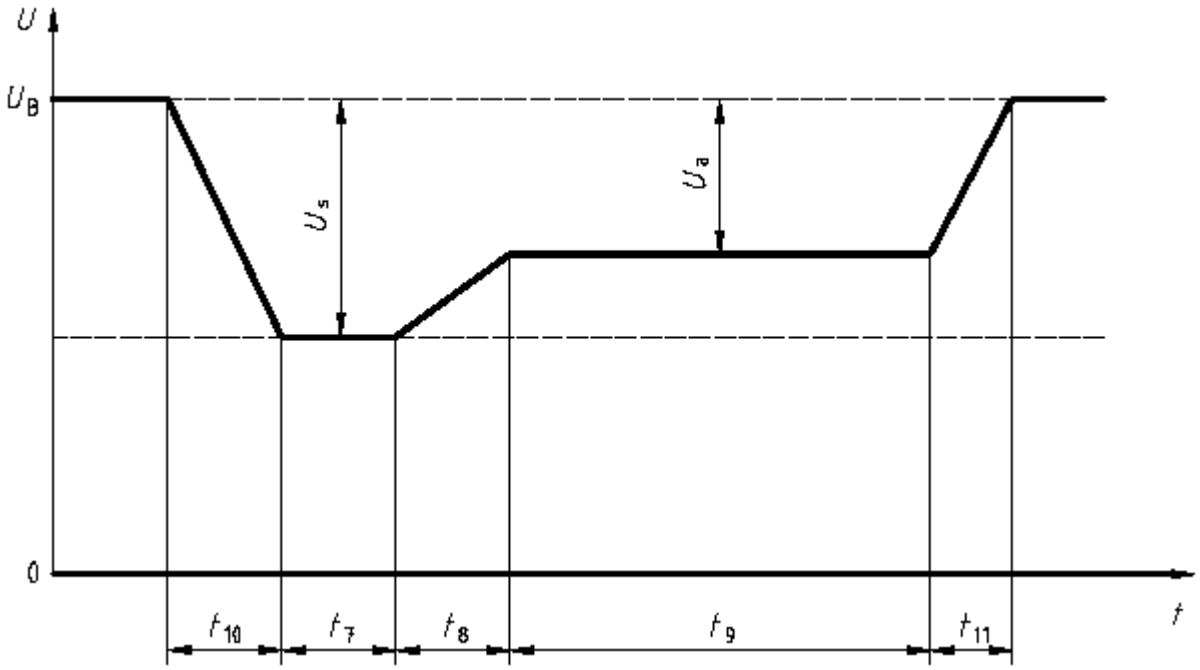
Figure 8.3.5 Test pulse 3b characteristics



Parameter	Test level III
U_A	13.5±0.5 V
U_s	+75 V
R_i	50 Ω
t_d	(0.1 + 0.1) µs
t_r	(5 ± 1.5) ns
t_1	100 µs
t_4	10 ms
t_5	90 ms

Test specification:	Immunity to transients and surges in the vehicular environment		
Test procedure:	ISO 7637-1, ISO 7637-2, EN 301 489-1, Section 9.6		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	08-Oct-15 - 15-Oct-15		
Temperature: 23 ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 44 %	**Power Supply:** 12 VDC
Remarks: CR300B 2G, part number CT7801201-000 & CR300B 3G EU, part number CT7801202-000			

Figure 8.3.6 Test pulse 4 characteristics

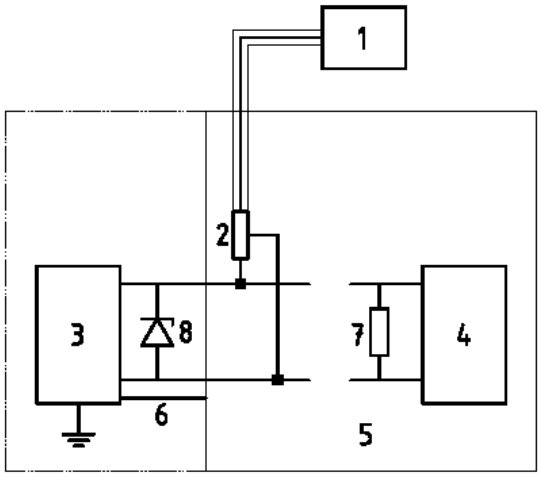


Parameter	Test level III
U_B	12±0.2 V
U_s	-6 V
U_a	-2.5 V to -6 V with $\lvert U_a \rvert \leq \lvert U_s \rvert$
R_i	0 to 0.02 Ω
t_7	15 to 40 ms[Note 1]
t_8	≤ 50 ms
t_9	0.5 to 20 s[Note 1]
t_{10}	5 ms
t_{11}	5 to 100 ms[Note 2]

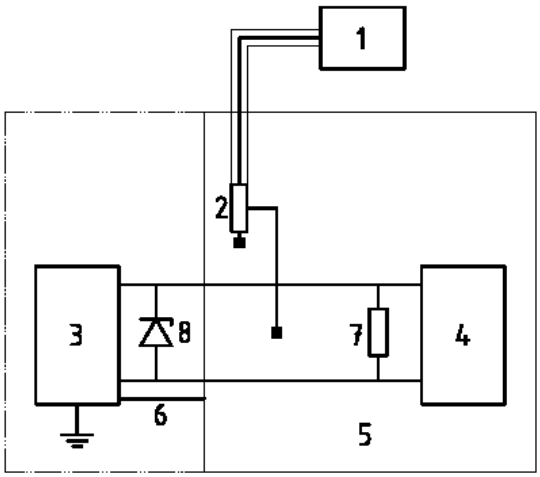
Note 1: The value used was agreed between the vehicle manufacturer and the equipment supplier to suit the proposed application.
Note 2: t_{11} = 5 ms is typical of the case when engine starts at the end of the cranking period, while t_{11} = 100 ms is typical of the case when the engine does not start.

Test specification:	Immunity to transients and surges in the vehicular environment		
Test procedure:	ISO 7637-1, ISO 7637-2, EN 301 489-1, Section 9.6		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	08-Oct-15 - 15-Oct-15		
Temperature: 23 ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 44 %	**Power Supply:** 12 VDC
Remarks: CR300B 2G, part number CT7801201-000 & CR300B 3G EU, part number CT7801202-000			

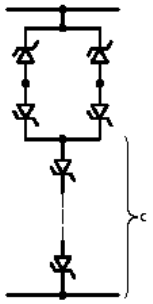
Figure 8.3.7 Immunity to conducted transient on power line test setup



a) Pulse adjustment



b) Pulse injection



c) Example of suppression diode bridge for test pulse 5b only

Key

1 oscilloscope or equivalent
2 voltage probe
3 test pulse generator with internal power supply resistance R_i
4 DUT
5 ground plane
6 Ground connection (maximum length for test pulse 3: 100 mm)
7 optional resistor (R_v) [a]
8 optional diode bridge [b]

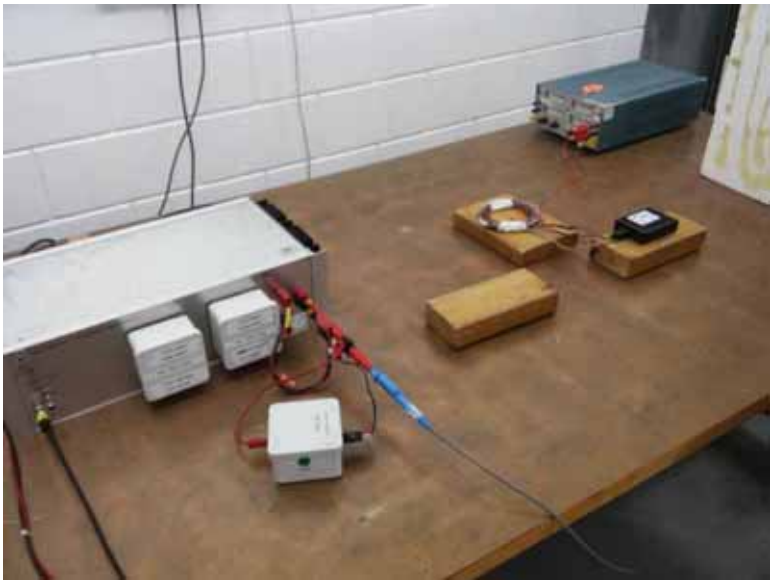
[a] For simulation of vehicle system loading for load dump test pulses 5a and 5b only. If used, the value of R_v shall be specified in the test plan (typical value 0,7 Ω to 40 Ω).

[b] For simulation of load dump waveform for alternator with centralized load dump suppression for pulse 5b only [see Figure 2 c)].

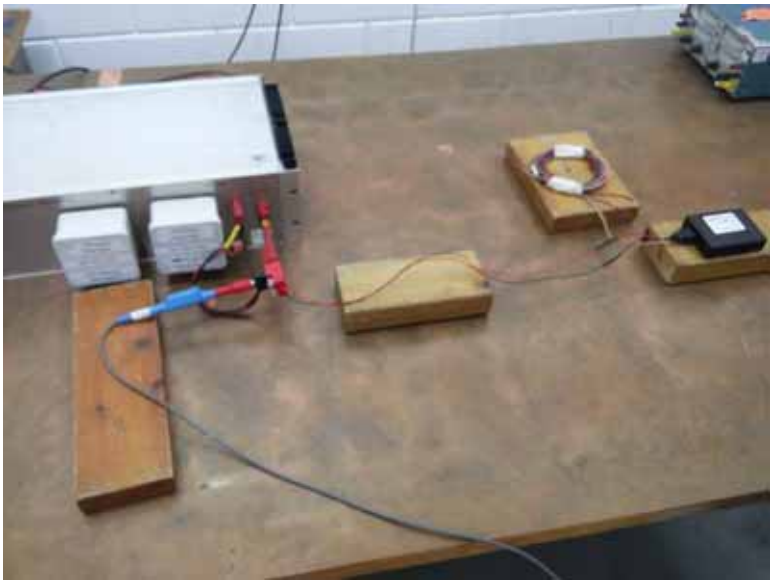
[c] Add forward biased diodes as required to achieve max. open-circuit (suppressed) voltage.

Test specification:	Immunity to transients and surges in the vehicular environment		
Test procedure:	ISO 7637-1, ISO 7637-2, EN 301 489-1, Section 9.6		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	08-Oct-15 - 15-Oct-15		
Temperature: 23 ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 44 %	**Power Supply:** 12 VDC
Remarks: CR300B 2G, part number CT7801201-000 & CR300B 3G EU, part number CT7801202-000			

Photograph 8.3.1 Conducted transients on power line calibration setup, Pulse 1

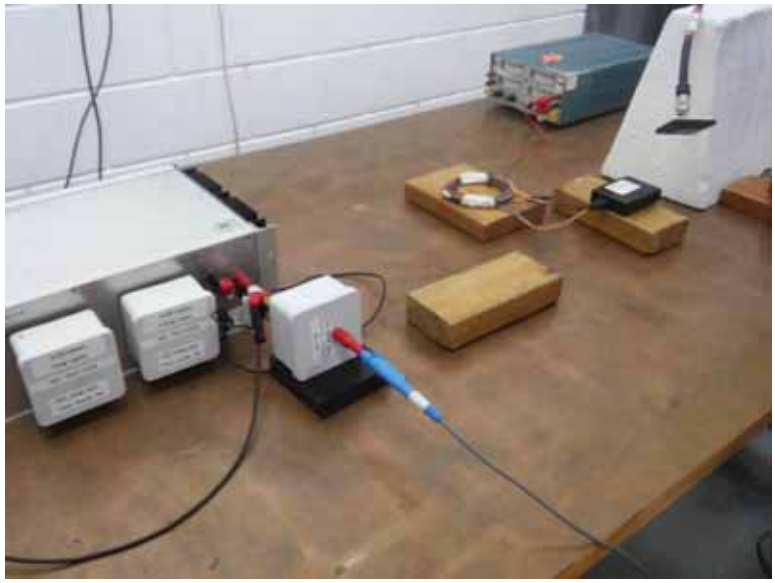


Photograph 8.3.2 Conducted transients on power line test setup, Pulse 1

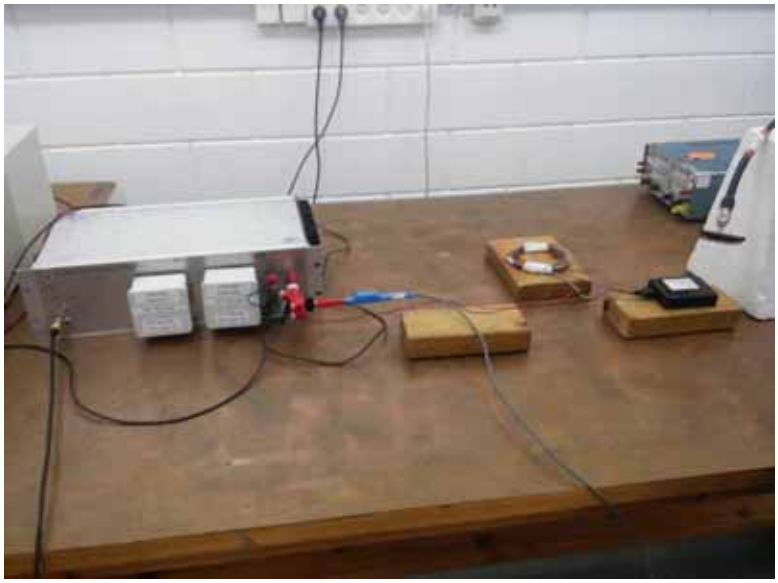


Test specification:	Immunity to transients and surges in the vehicular environment		
Test procedure:	ISO 7637-1, ISO 7637-2, EN 301 489-1, Section 9.6		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	08-Oct-15 - 15-Oct-15		
Temperature: 23 ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 44 %	**Power Supply:** 12 VDC
Remarks: CR300B 2G, part number CT7801201-000 & CR300B 3G EU, part number CT7801202-000			

Photograph 8.3.3 Conducted transients on power line calibration setup, Pulse 2a



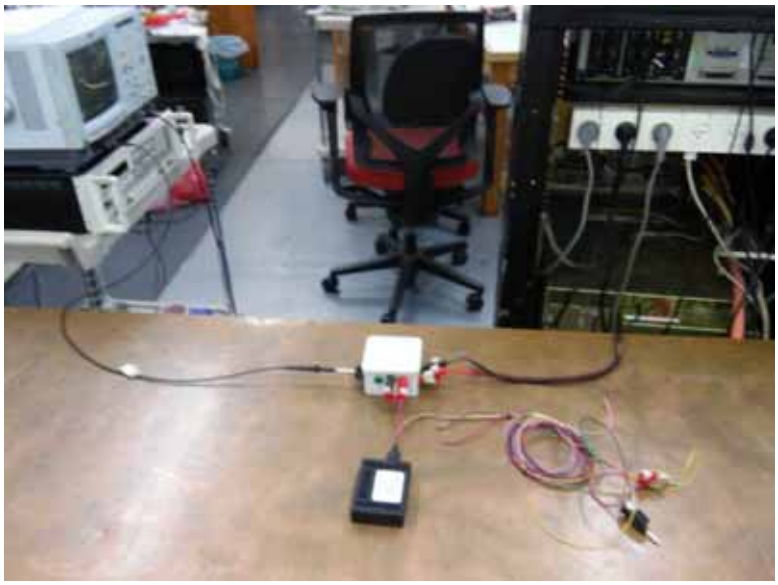
Photograph 8.3.4 Conducted transients on power line test setup, Pulse 2a



Test specification:	Immunity to transients and surges in the vehicular environment		
Test procedure:	ISO 7637-1, ISO 7637-2, EN 301 489-1, Section 9.6		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	08-Oct-15 - 15-Oct-15		
Temperature: 23 ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 44 %	**Power Supply:** 12 VDC
Remarks: CR300B 2G, part number CT7801201-000 & CR300B 3G EU, part number CT7801202-000			

Photograph 8.3.5 Conducted transients on power line calibration setup, Pulse 2b

Photograph 8.3.6 Conducted transients on power line test setup, Pulses 2b



Test specification:	Immunity to transients and surges in the vehicular environment		
Test procedure:	ISO 7637-1, ISO 7637-2, EN 301 489-1, Section 9.6		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	08-Oct-15 - 15-Oct-15		
Temperature: 23 ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 44 %	**Power Supply:** 12 VDC
Remarks: CR300B 2G, part number CT7801201-000 & CR300B 3G EU, part number CT7801202-000			

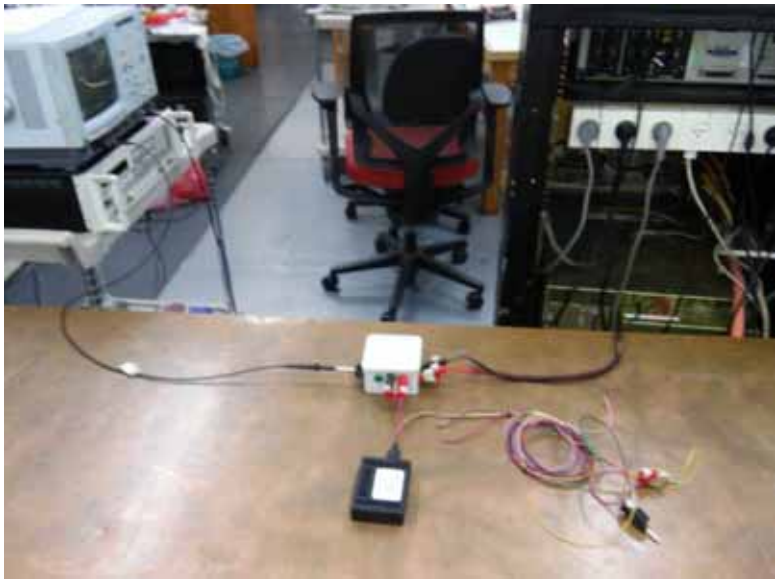
Photograph 8.3.7 Conducted transients on power line calibration setup, Pulse 3a and Pulse 3b

Photograph 8.3.8 Conducted transients on power line test setup, Pulse 3a and Pulse 3b

Test specification:	Immunity to transients and surges in the vehicular environment		
Test procedure:	ISO 7637-1, ISO 7637-2, EN 301 489-1, Section 9.6		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	08-Oct-15 - 15-Oct-15		
Temperature: 23 ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 44 %	**Power Supply:** 12 VDC
Remarks: CR300B 2G, part number CT7801201-000 & CR300B 3G EU, part number CT7801202-000			

Photograph 8.3.9 Conducted transients on power line calibration setup, Pulse 4

Photograph 8.3.10 Conducted transients on power line test setup, Pulse 4



Test specification:	Immunity to transients and surges in the vehicular environment		
Test procedure:	ISO 7637-1, ISO 7637-2, EN 301 489-1, Section 9.6		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	08-Oct-15 - 15-Oct-15		
Temperature: 23 ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 44 %	**Power Supply:** 12 VDC
Remarks: CR300B 2G, part number CT7801201-000 & CR300B 3G EU, part number CT7801202-000			

Table 8.3.2 Immunity to conducted transients on power line test results

DISTURBED LINE: 12 VDC power

Test pulse	Number of pulses or test time	Pulse level, V	Test level	Performance criterion	EUT performance description during the test	Verdict
Transceive mode, CR300B 2G, part number CT7801201-000						
1	10 pulses	-75	III	TT/TR	NP	Pass
2a	10 pulses	+37	III	TT/TR	NP	Pass
2b	10 pulses	+10	III	TT/TR	NP	Pass
3a	20 min	-112	III	CT/CR	NP	Pass
3b	20 min	+75	III	CT/CR	NP	Pass
4	10 pulses of test level III(a)	-6/-6	III	TT/TR	NP	Pass
Transceive mode, CR300B 3G EU, part number CT7801202-000						
1	10 pulses	-75	III	TT/TR	NP	Pass
2a	10 pulses	+37	III	TT/TR	NP	Pass
2b	10 pulses	+10	III	TT/TR	NP	Pass
3a	20 min	-112	III	CT/CR	NP	Pass
3b	20 min	+75	III	CT/CR	NP	Pass
4	10 pulses of test level III(a)	-6/-6	III	TT/TR	NP	Pass

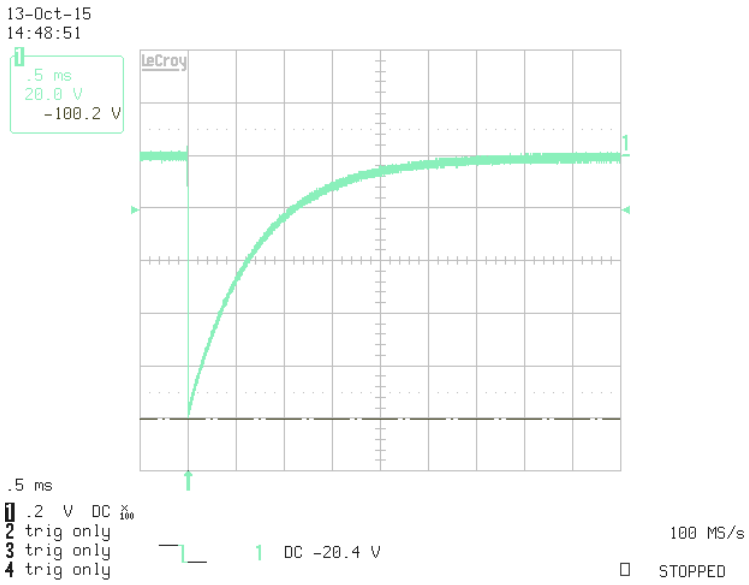
Reference numbers of test equipment used

HL 0205	HL 0393	HL 0860	HL 1829	HL 1876	HL 1903	HL 2226	HL 2364
HL 2438	HL 2453	HL 2464	HL 2485	HL 3134	HL 3333	HL 3521	HL 4819

Full description is given in Appendix A.

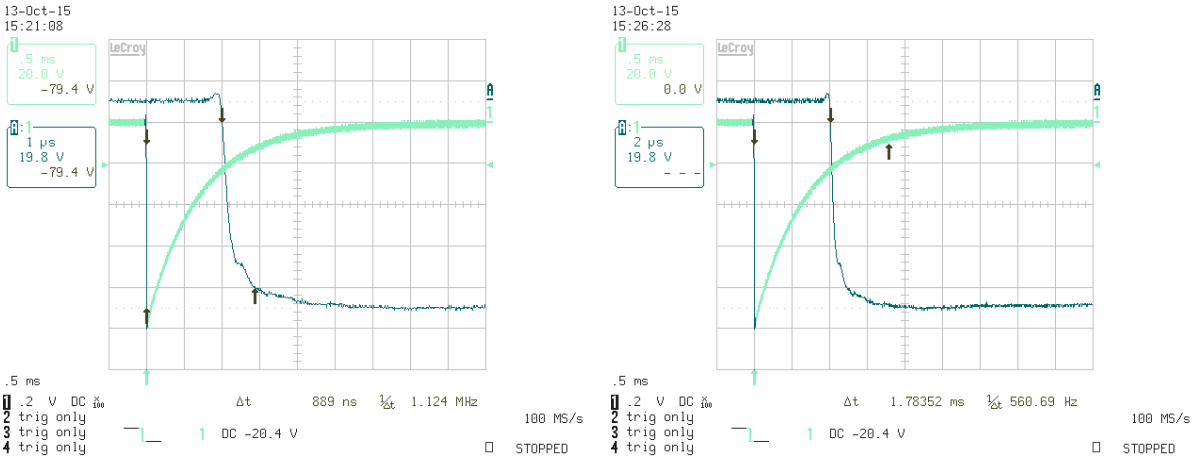
Test specification:	Immunity to transients and surges in the vehicular environment		
Test procedure:	ISO 7637-1, ISO 7637-2, EN 301 489-1, Section 9.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	08-Oct-15 - 15-Oct-15		
Temperature: 23 ºC	Air Pressure: 1013 hPa	Relative Humidity: 44 %	Power Supply: 12 VDC
Remarks: CR300B 2G, part number CT7801201-000 & CR300B 3G EU, part number CT7801202-000			

Plot 8.3.1 Verification of Pulse 1, R_i = 10 Ω, open circuit



U_s= - 100 V

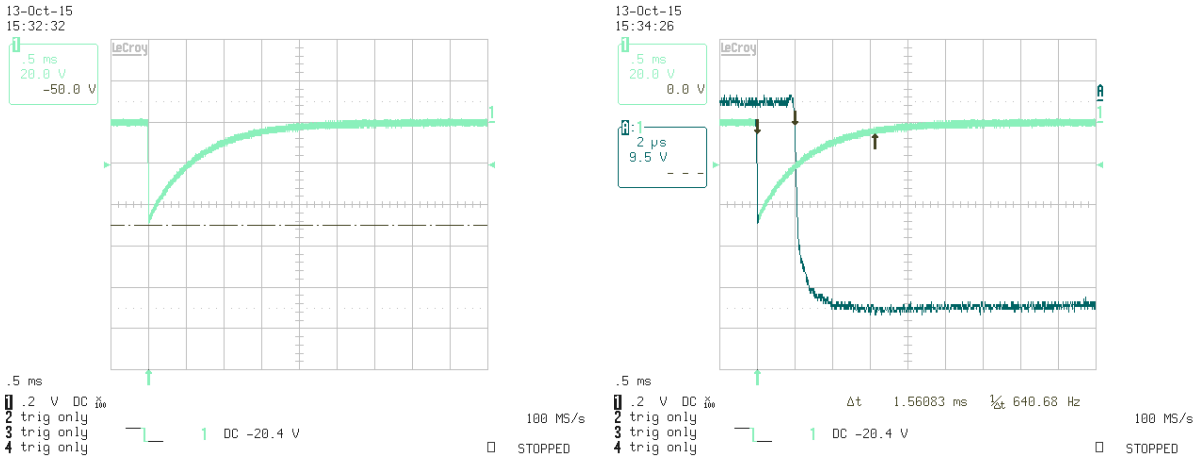
Plot 8.3.2 Verification of Pulse 1, R_i = 10 Ω, open circuit



t_r = 0.889 µs, t_d =1784 µs

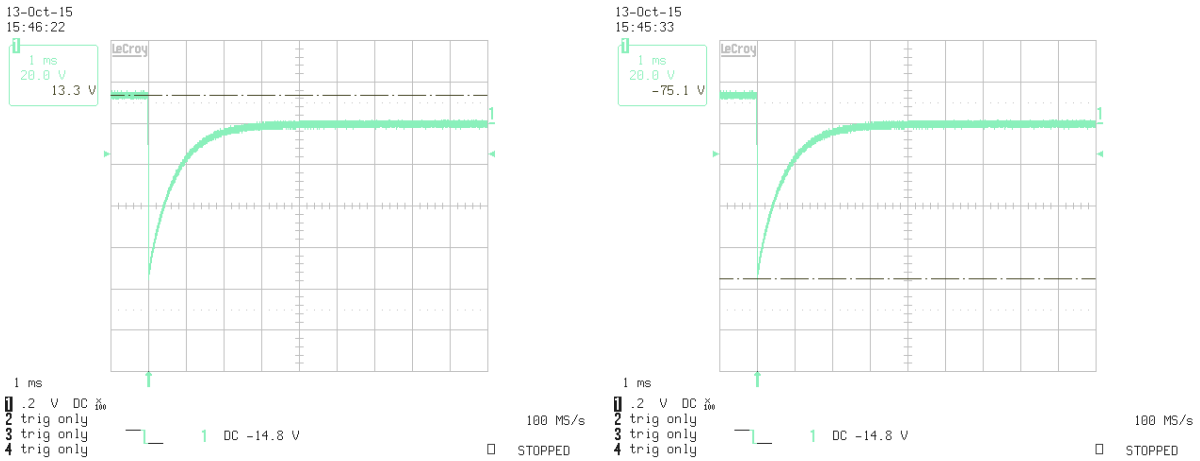
Test specification:	Immunity to transients and surges in the vehicular environment		
Test procedure:	ISO 7637-1, ISO 7637-2, EN 301 489-1, Section 9.6		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	08-Oct-15 - 15-Oct-15		
Temperature: 23 ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 44 %	**Power Supply:** 12 VDC
Remarks: CR300B 2G, part number CT7801201-000 & CR300B 3G EU, part number CT7801202-000			

Plot 8.3.3 Verification of Pulse 1, R_i = 10 Ω, load 10 Ω



U_s= - 50 V, t_d = 1560 µs

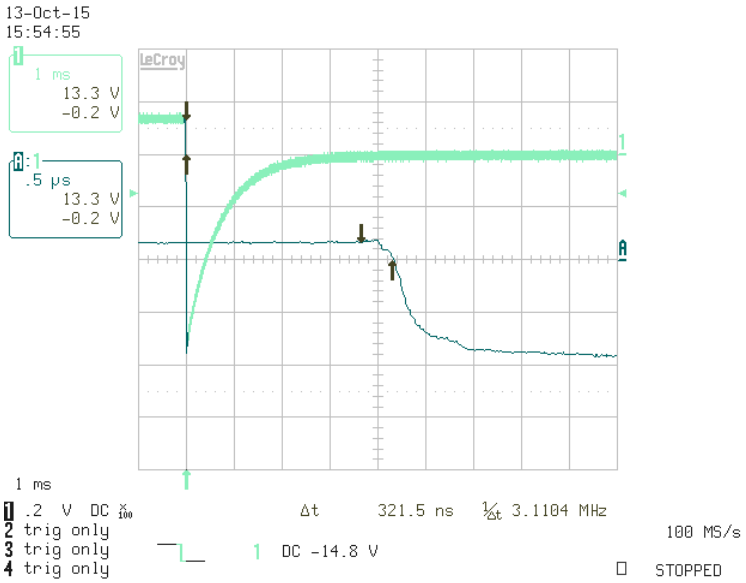
Plot 8.3.4 Calibration of Pulse 1, Level III, R_i = 10 Ω, open circuit



U_A= 13.3 V, U_s= - 75 V

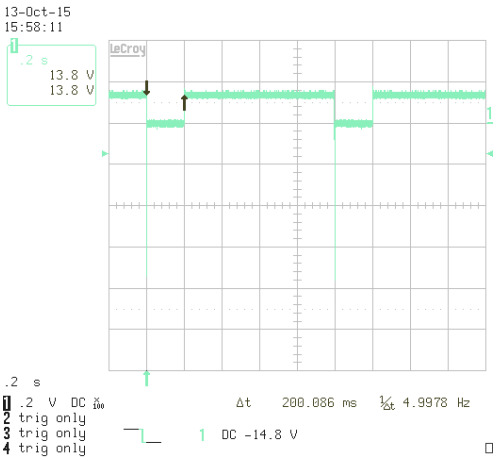
Test specification:	Immunity to transients and surges in the vehicular environment		
Test procedure:	ISO 7637-1, ISO 7637-2, EN 301 489-1, Section 9.6		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	08-Oct-15 - 15-Oct-15		
Temperature: 23 ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 44 %	**Power Supply:** 12 VDC
Remarks: CR300B 2G, part number CT7801201-000 & CR300B 3G EU, part number CT7801202-000			

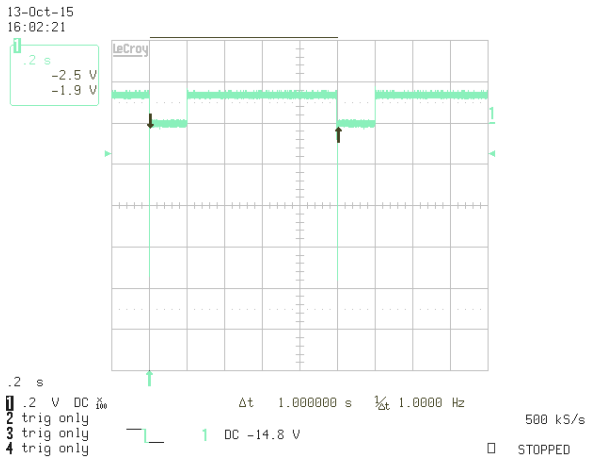
Plot 8.3.5 Calibration of Pulse 1, Level III, R_i = 10 Ω, open circuit



t_3 = 0.322 µs

Plot 8.3.6 Calibration of Pulse 1, Level III, R_i = 10 Ω, open circuit

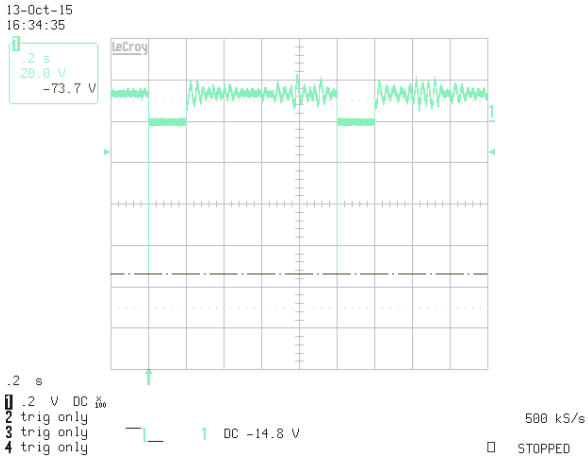




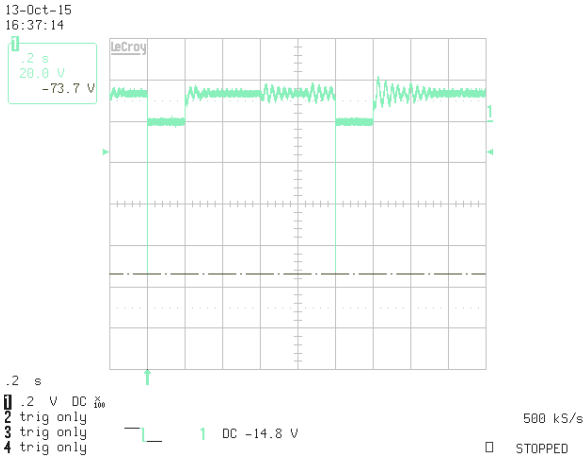
t_2 = 200 ms, t_1 =1 s,

Test specification:	Immunity to transients and surges in the vehicular environment		
Test procedure:	ISO 7637-1, ISO 7637-2, EN 301 489-1, Section 9.6		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	08-Oct-15 - 15-Oct-15		
Temperature: 23 ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 44 %	**Power Supply:** 12 VDC
Remarks: CR300B 2G, part number CT7801201-000 & CR300B 3G EU, part number CT7801202-000			

Plot 8.3.7 EUT response to Pulse 1, Level III
EUT in transceive mode



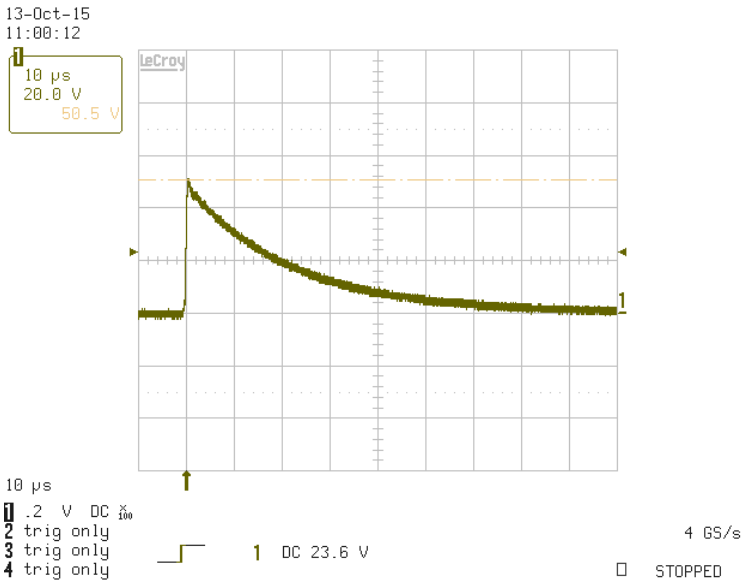
CR300B 2G, part number CT7801201-000



CR300B 3G EU, part number CT7801202-000

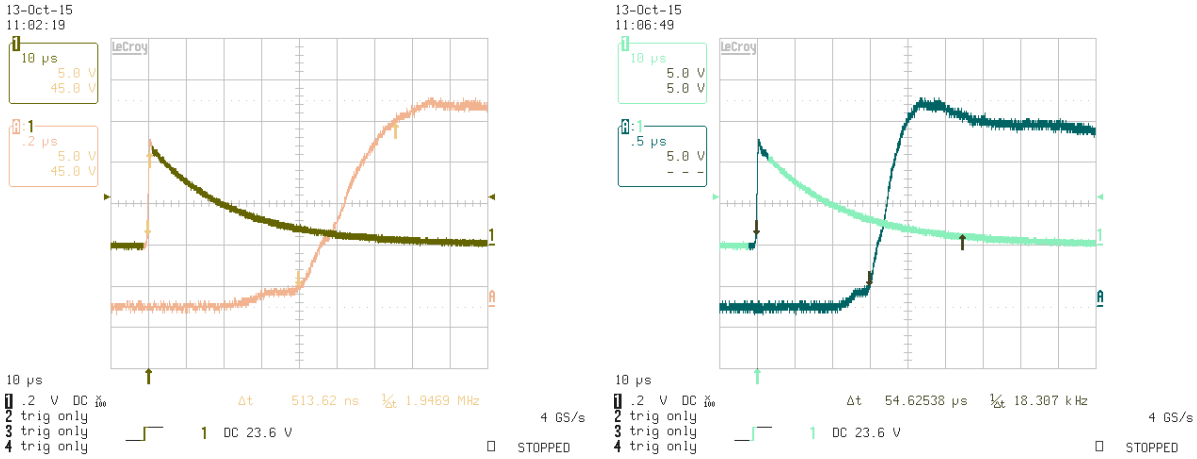
Test specification:	Immunity to transients and surges in the vehicular environment		
Test procedure:	ISO 7637-1, ISO 7637-2, EN 301 489-1, Section 9.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	08-Oct-15 - 15-Oct-15		
Temperature: 23 ºC	Air Pressure: 1013 hPa	Relative Humidity: 44 %	Power Supply: 12 VDC
Remarks: CR300B 2G, part number CT7801201-000 & CR300B 3G EU, part number CT7801202-000			

Plot 8.3.8 Verification of Pulse 2a, R_i = 2 Ω, open circuit



U_s= 50.5 V

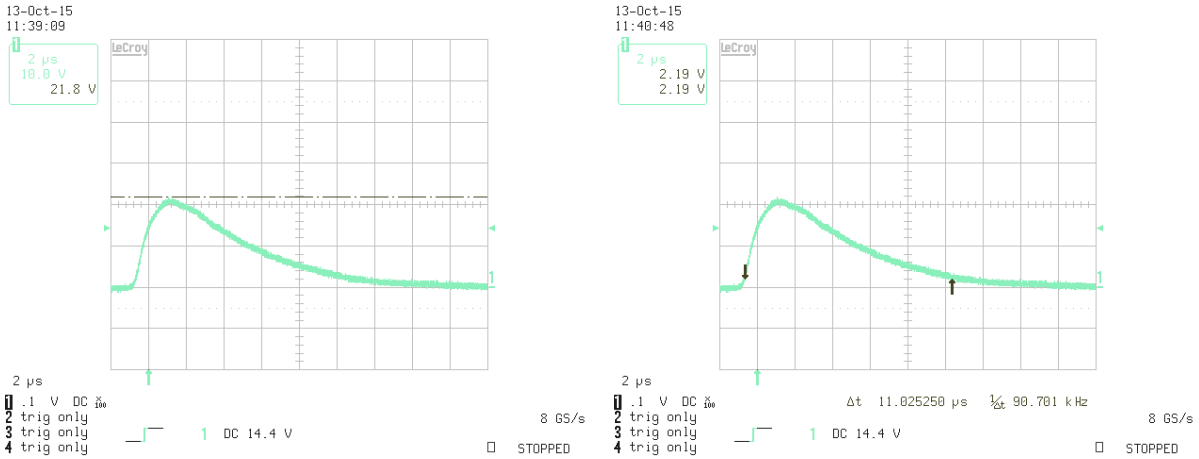
Plot 8.3.9 Verification of Pulse 2a, R_i = 2 Ω, open circuit



t_r = 0.514 µs, t_d =54.6 µs

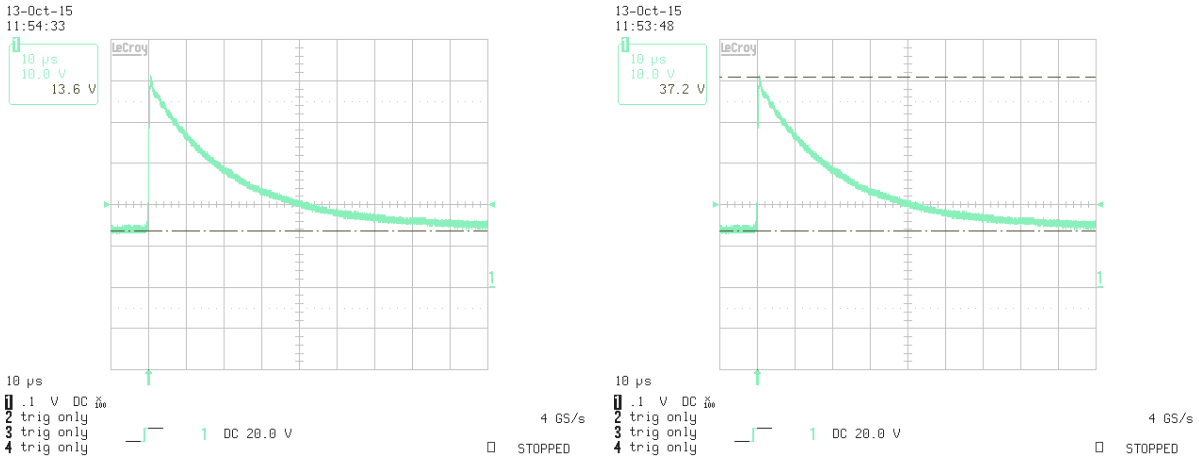
Test specification:	Immunity to transients and surges in the vehicular environment		
Test procedure:	ISO 7637-1, ISO 7637-2, EN 301 489-1, Section 9.6		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	08-Oct-15 - 15-Oct-15		
Temperature: 23 ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 44 %	**Power Supply:** 12 VDC
Remarks: CR300B 2G, part number CT7801201-000 & CR300B 3G EU, part number CT7801202-000			

Plot 8.3.10 Verification of Pulse 2a, R_i = 2 Ω, load 2 Ω



U_s= 21.8 V, t_d = 11.0 µs

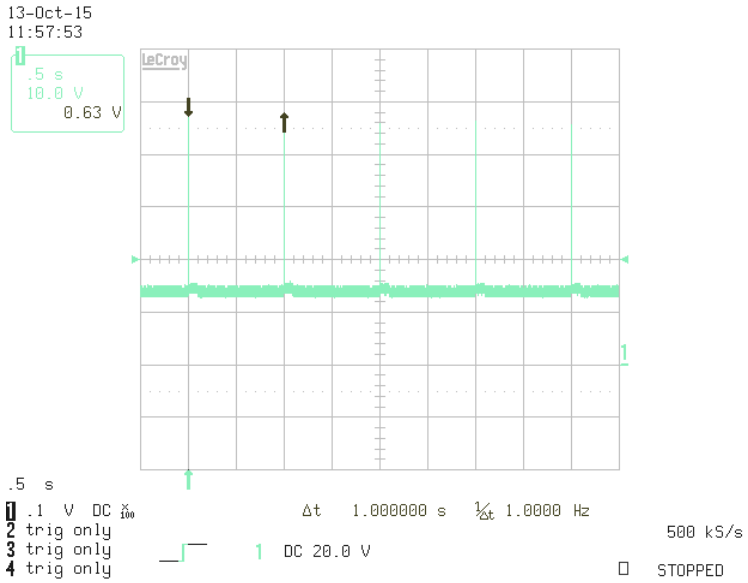
Plot 8.3.11 Calibration of Pulse 2a, Level III, R_i = 2 Ω, open circuit



U_A= 13.6 V, U_s= 37.2 V

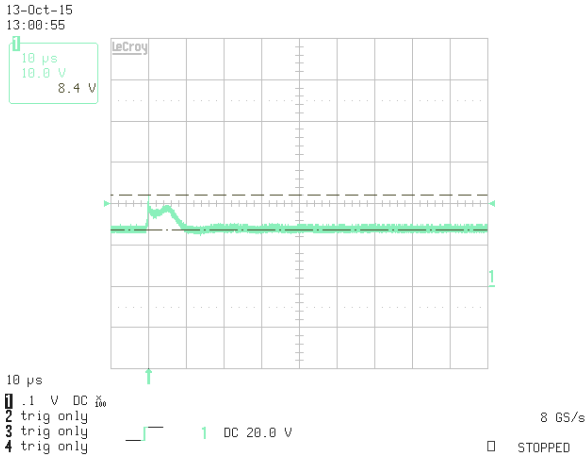
Test specification:	Immunity to transients and surges in the vehicular environment		
Test procedure:	ISO 7637-1, ISO 7637-2, EN 301 489-1, Section 9.6		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	08-Oct-15 - 15-Oct-15		
Temperature: 23 ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 44 %	**Power Supply:** 12 VDC
Remarks: CR300B 2G, part number CT7801201-000 & CR300B 3G EU, part number CT7801202-000			

Plot 8.3.12 Calibration of Pulse 2a, Level III, R_i = 2 Ω, open circuit

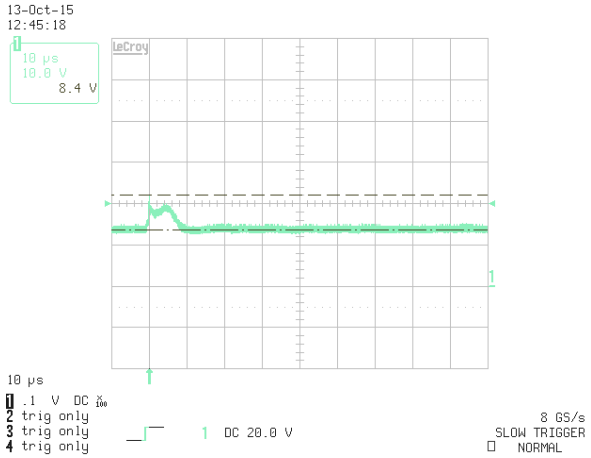


t_1 = 1 s

Plot 8.3.13 EUT response to Pulse 2a, Level III, EUT in transceive mode



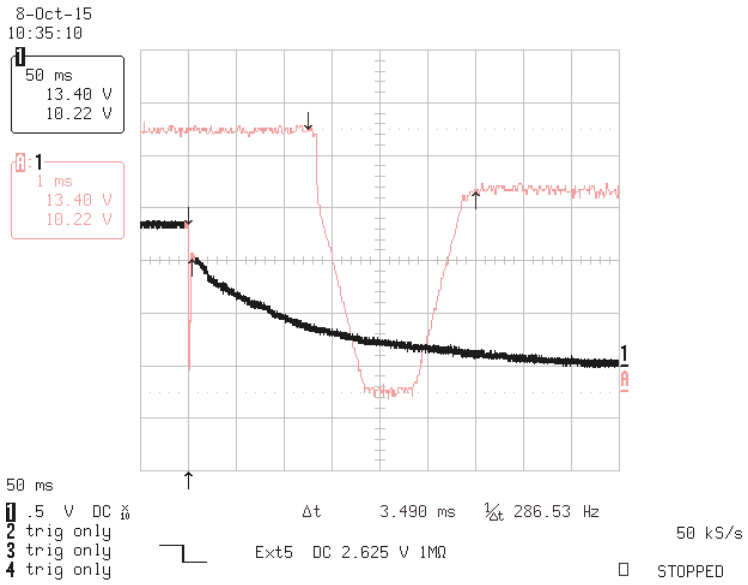
CR300B 2G, part number CT7801201-000



CR300B 3G EU, part number CT7801202-000

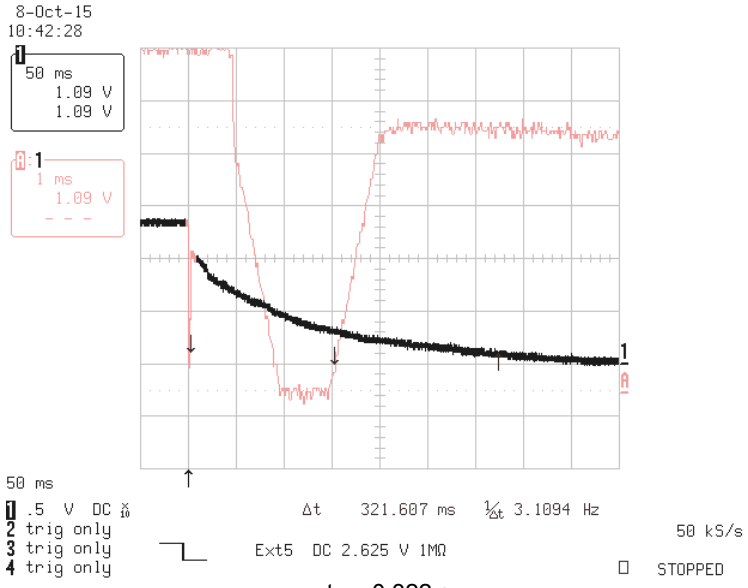
Test specification:	Immunity to transients and surges in the vehicular environment		
Test procedure:	ISO 7637-1, ISO 7637-2, EN 301 489-1, Section 9.6		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	08-Oct-15 - 15-Oct-15		
Temperature: 23 ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 44 %	**Power Supply:** 12 VDC
Remarks: CR300B 2G, part number CT7801201-000 & CR300B 3G EU, part number CT7801202-000			

Plot 8.3.14 Calibration of Pulse 2b, Level III, R_i = 0.03 Ω, open circuit



U_A= 13.4 V, U_s= 10.2 V

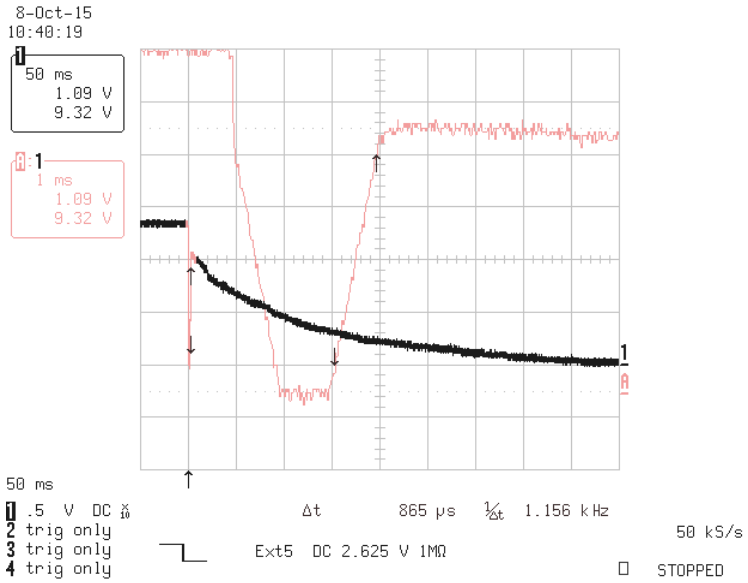
Plot 8.3.15 Calibration of Pulse 2b, Level III, R_i = 0.03 Ω, open circuit



t_d = 0.322 s

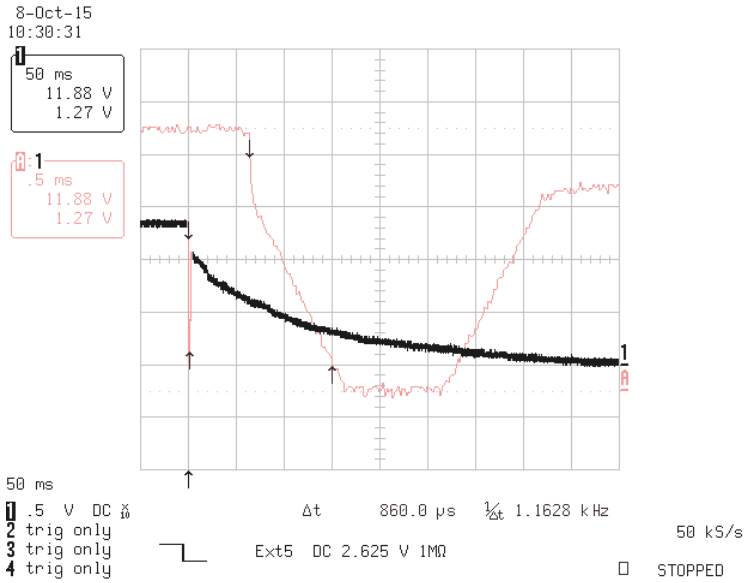
Test specification:	Immunity to transients and surges in the vehicular environment		
Test procedure:	ISO 7637-1, ISO 7637-2, EN 301 489-1, Section 9.6		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	08-Oct-15 - 15-Oct-15		
Temperature: 23 ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 44 %	**Power Supply:** 12 VDC
Remarks: CR300B 2G, part number CT7801201-000 & CR300B 3G EU, part number CT7801202-000			

Plot 8.3.16 Calibration of Pulse 2b, Level III, R_i = 0.03 Ω, open circuit



t_r = 0.865 ms

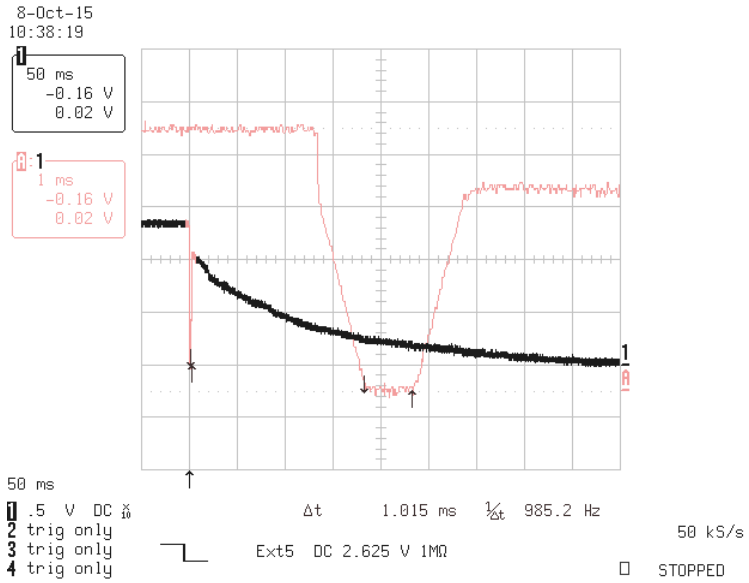
Plot 8.3.17 Calibration of Pulse 2b, Level III, R_i = 0.03 Ω, open circuit



t_{12} = 0.86 ms

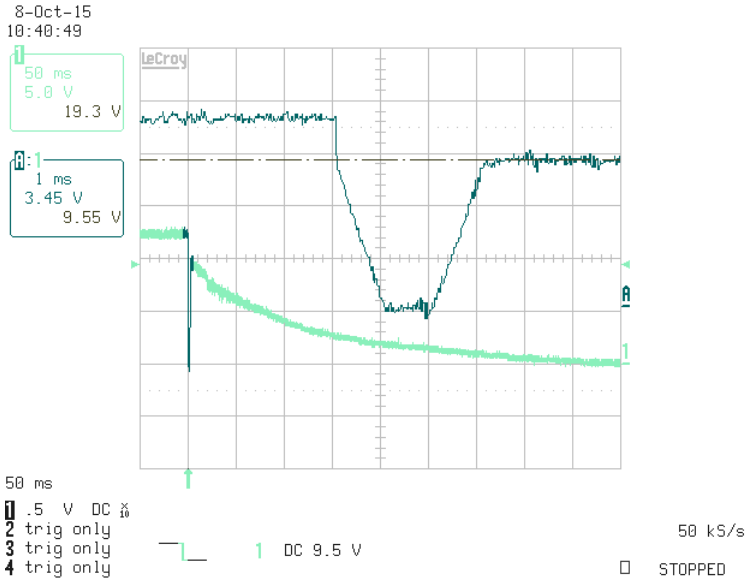
Test specification:	Immunity to transients and surges in the vehicular environment		
Test procedure:	ISO 7637-1, ISO 7637-2, EN 301 489-1, Section 9.6		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	08-Oct-15 - 15-Oct-15		
Temperature: 23 ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 44 %	**Power Supply:** 12 VDC
Remarks: CR300B 2G, part number CT7801201-000 & CR300B 3G EU, part number CT7801202-000			

Plot 8.3.18 Calibration of Pulse 2b, Level III, R_i = 0.03 Ω, open circuit



t_6 = 1.015 ms

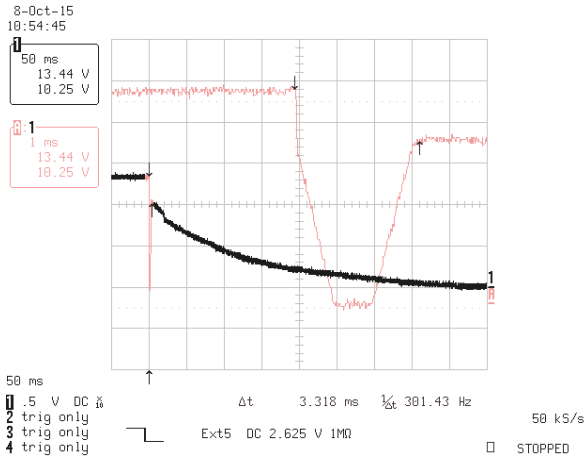
Plot 8.3.19 Calibration of Pulse 2b, Level III, R_i = 0.03 Ω, load 0.5 Ω



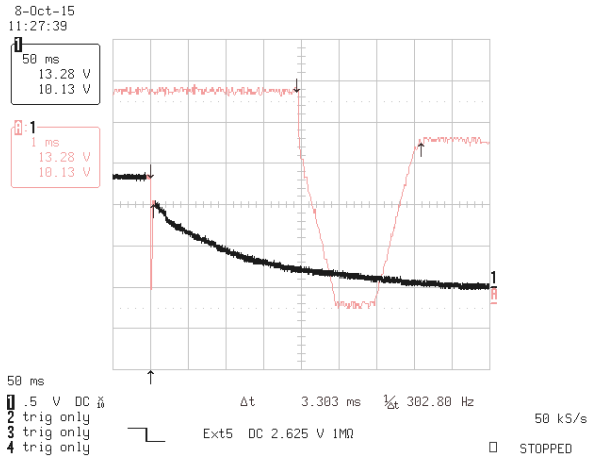
U_s= 9.6 V

Test specification:	Immunity to transients and surges in the vehicular environment		
Test procedure:	ISO 7637-1, ISO 7637-2, EN 301 489-1, Section 9.6		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	08-Oct-15 - 15-Oct-15		
Temperature: 23 ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 44 %	**Power Supply:** 12 VDC
Remarks: CR300B 2G, part number CT7801201-000 & CR300B 3G EU, part number CT7801202-000			

Plot 8.3.20 EUT response to Pulse 2b, Level III,
EUT in transceive mode



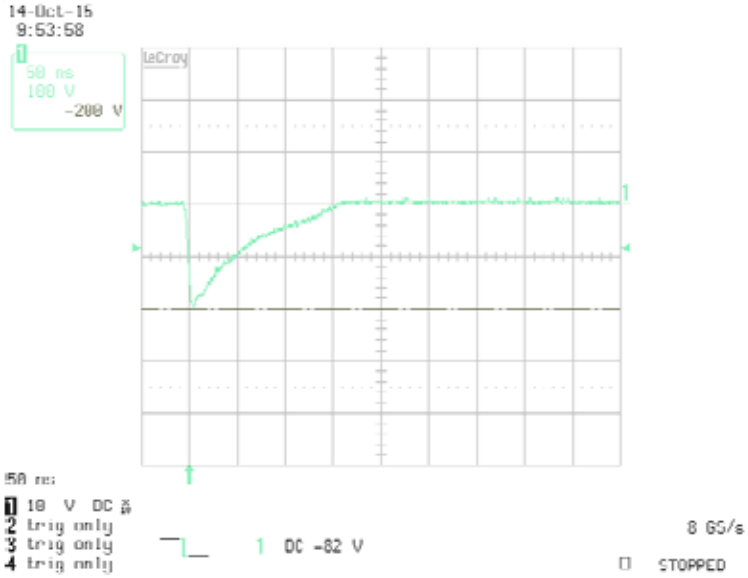
CR300B 2G, part number CT7801201-000



CR300B 3G EU, part number CT7801202-000

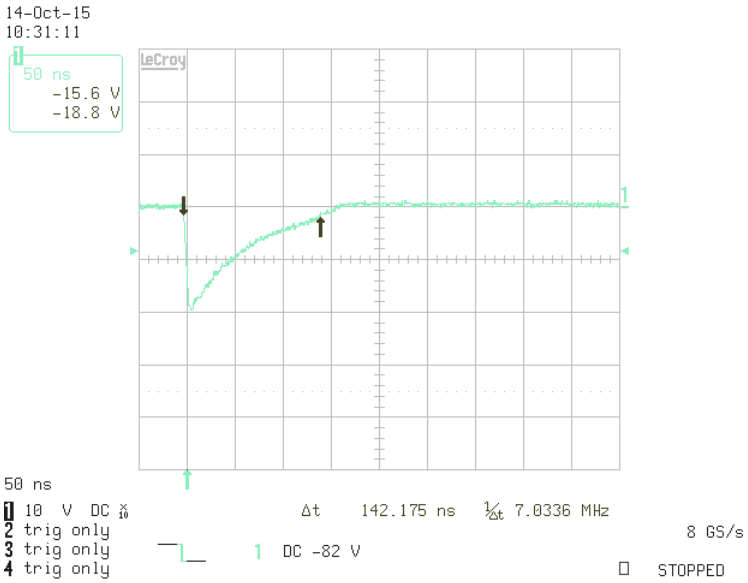
Test specification:	Immunity to transients and surges in the vehicular environment		
Test procedure:	ISO 7637-1, ISO 7637-2, EN 301 489-1, Section 9.6		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	08-Oct-15 - 15-Oct-15		
Temperature: 23 ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 44 %	**Power Supply:** 12 VDC
Remarks: CR300B 2G, part number CT7801201-000 & CR300B 3G EU, part number CT7801202-000			

Plot 8.3.21 Verification of Pulse 3a, R_i = 50 Ω, open circuit



U_s= -200 V

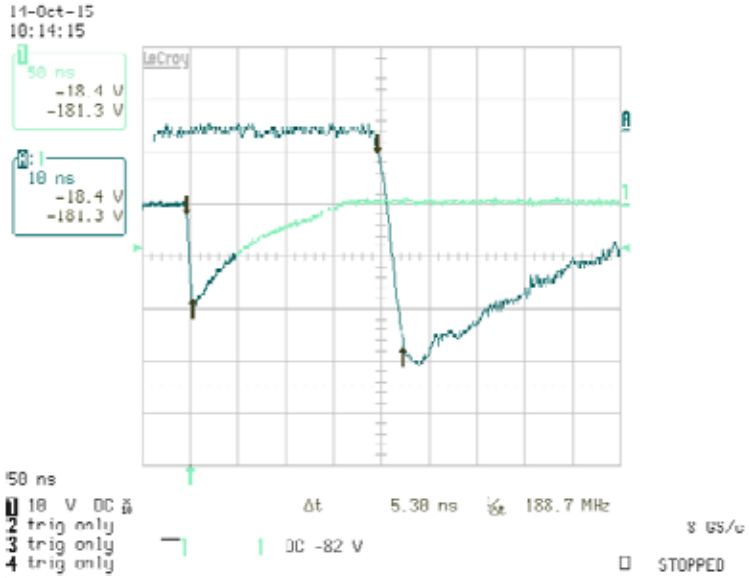
Plot 8.3.22 Verification of Pulse 3a, R_i = 50 Ω, open circuit



t_d =142 ns

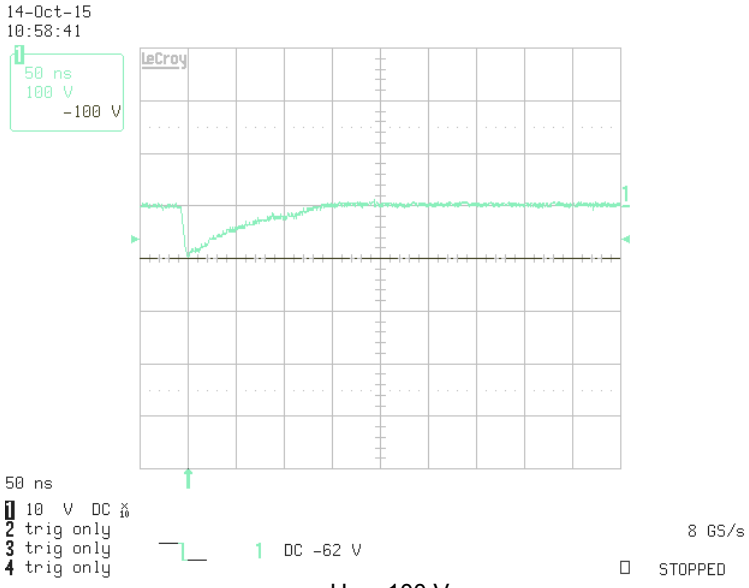
Test specification:	Immunity to transients and surges in the vehicular environment		
Test procedure:	ISO 7637-1, ISO 7637-2, EN 301 489-1, Section 9.6		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	08-Oct-15 - 15-Oct-15		
Temperature: 23 ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 44 %	**Power Supply:** 12 VDC
Remarks: CR300B 2G, part number CT7801201-000 & CR300B 3G EU, part number CT7801202-000			

Plot 8.3.23 Verification of Pulse 3a, R_i = 50 Ω, open circuit



t_r = 5.3 ns

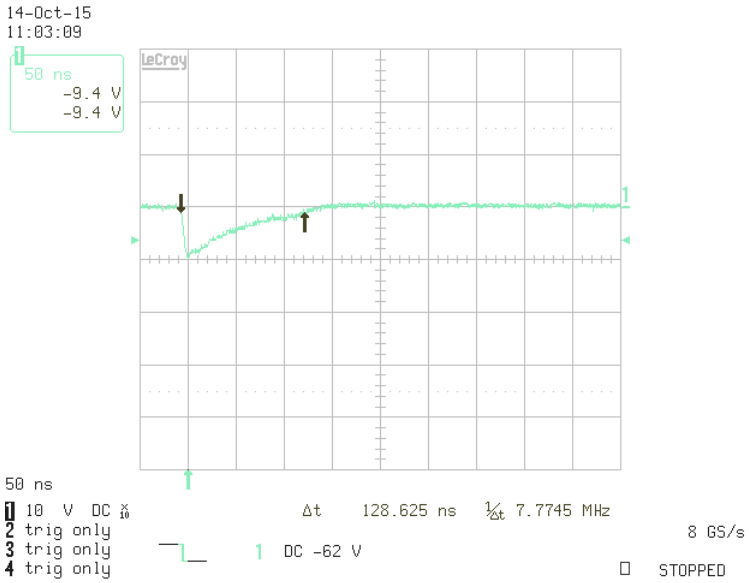
Plot 8.3.24 Verification of Pulse 3a, R_i = 50 Ω, load 50 Ω



U_s= -100 V

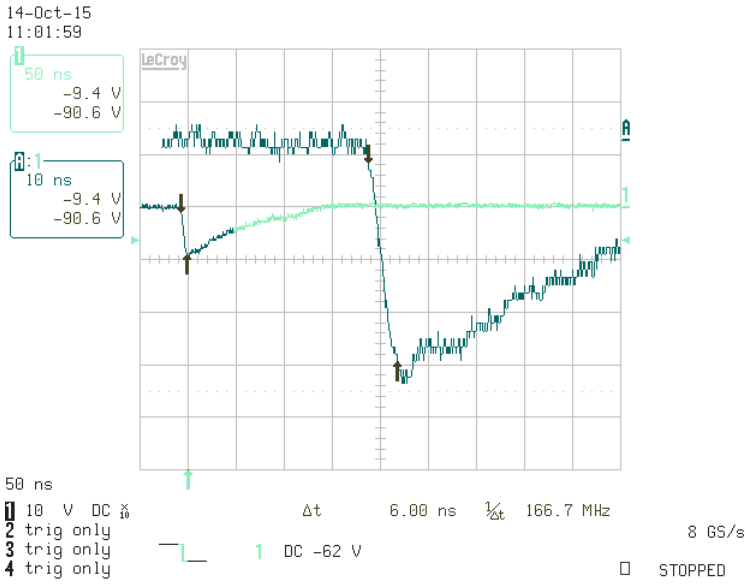
Test specification:	Immunity to transients and surges in the vehicular environment		
Test procedure:	ISO 7637-1, ISO 7637-2, EN 301 489-1, Section 9.6		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	08-Oct-15 - 15-Oct-15		
Temperature: 23 ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 44 %	**Power Supply:** 12 VDC
Remarks: CR300B 2G, part number CT7801201-000 & CR300B 3G EU, part number CT7801202-000			

Plot 8.3.25 Verification of Pulse 3a, Level III, R_i = 50 Ω, load 50 Ω



t_d = 128.62ns

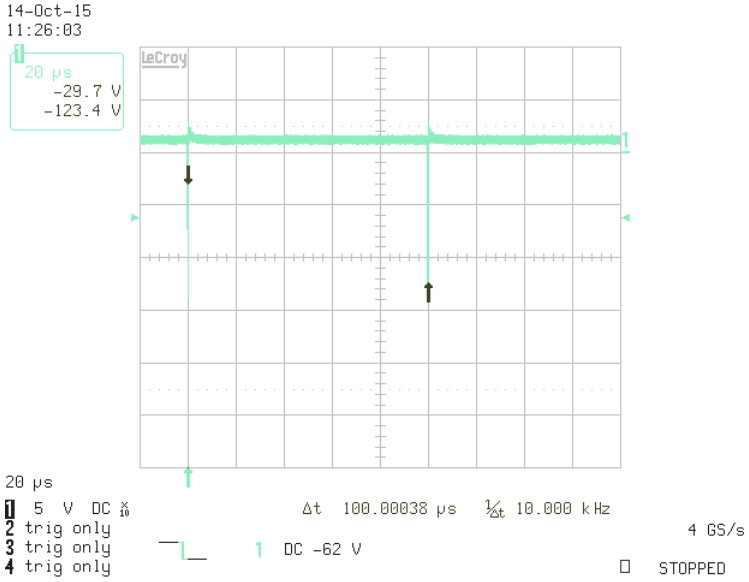
Plot 8.3.26 Verification of Pulse 3a, R_i = 50 Ω, load 50 Ω



t_r = 6ns

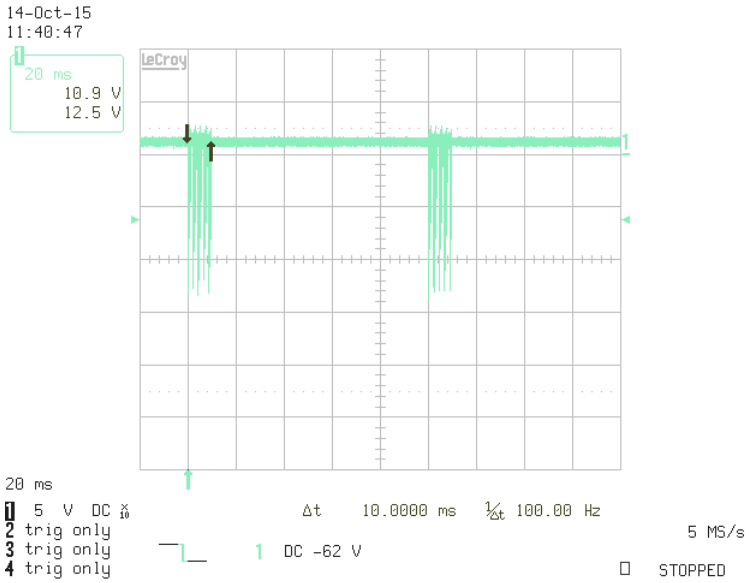
Test specification:	Immunity to transients and surges in the vehicular environment		
Test procedure:	ISO 7637-1, ISO 7637-2, EN 301 489-1, Section 9.6		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	08-Oct-15 - 15-Oct-15		
Temperature: 23 ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 44 %	**Power Supply:** 12 VDC
Remarks: CR300B 2G, part number CT7801201-000 & CR300B 3G EU, part number CT7801202-000			

Plot 8.3.27 Calibration of Pulse 3a, Level III, R_i = 50 Ω, open circuit



t_1 = 100 µs

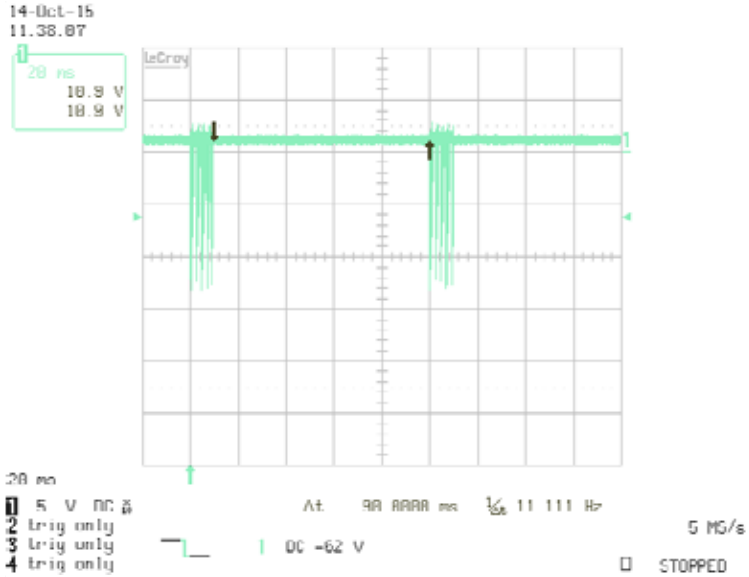
Plot 8.3.28 Calibration of Pulse 3a, Level III, R_i = 50 Ω, open circuit



t_4 = 10 ms

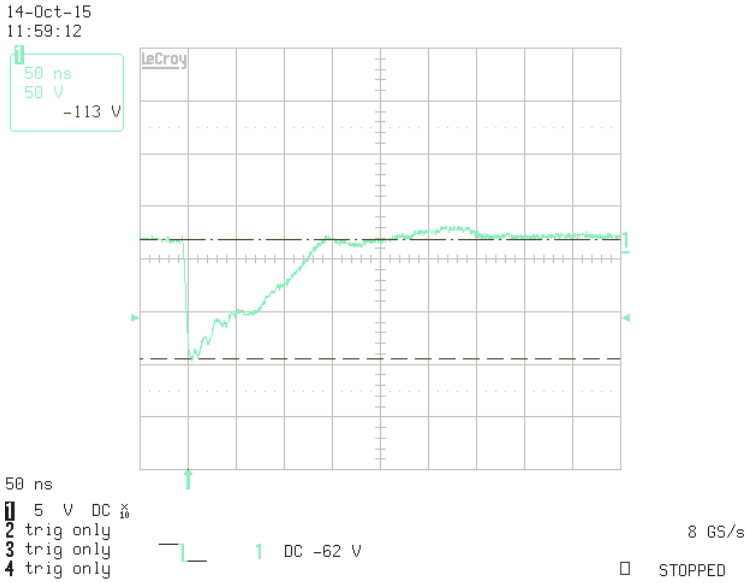
Test specification:	Immunity to transients and surges in the vehicular environment		
Test procedure:	ISO 7637-1, ISO 7637-2, EN 301 489-1, Section 9.6		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	08-Oct-15 - 15-Oct-15		
Temperature: 23 ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 44 %	**Power Supply:** 12 VDC
Remarks: CR300B 2G, part number CT7801201-000 & CR300B 3G EU, part number CT7801202-000			

Plot 8.3.29 Calibration of Pulse 3a, Level III, R_i = 50 Ω, open circuit



t_5 = 90ms

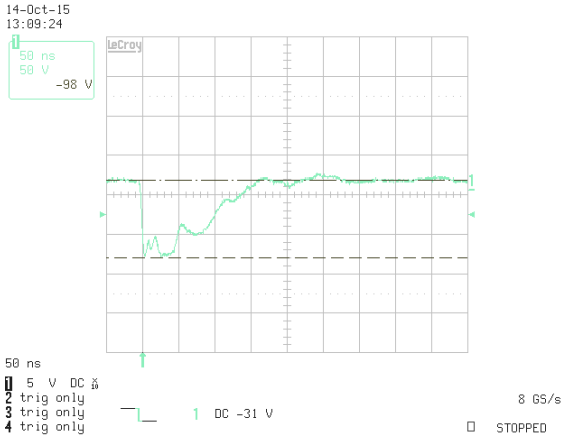
Plot 8.3.30 Calibration of Pulse 3a, Level III, R_i = 50 Ω, open circuit



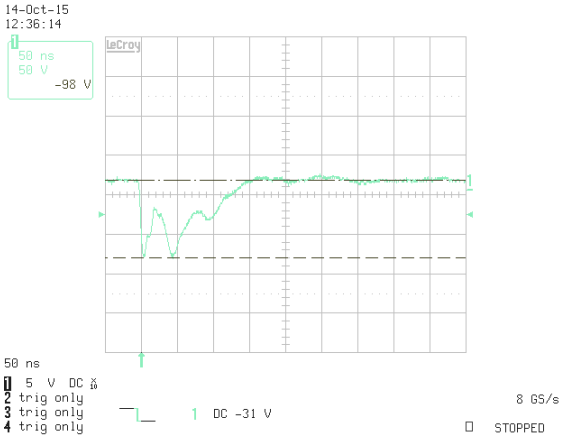
U_s= -113V

Test specification:	Immunity to transients and surges in the vehicular environment		
Test procedure:	ISO 7637-1, ISO 7637-2, EN 301 489-1, Section 9.6		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	08-Oct-15 - 15-Oct-15		
Temperature: 23 ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 44 %	**Power Supply:** 12 VDC
Remarks: CR300B 2G, part number CT7801201-000 & CR300B 3G EU, part number CT7801202-000			

Plot 8.3.31 EUT response to Pulse 3a, Level III,
EUT in transceive mode



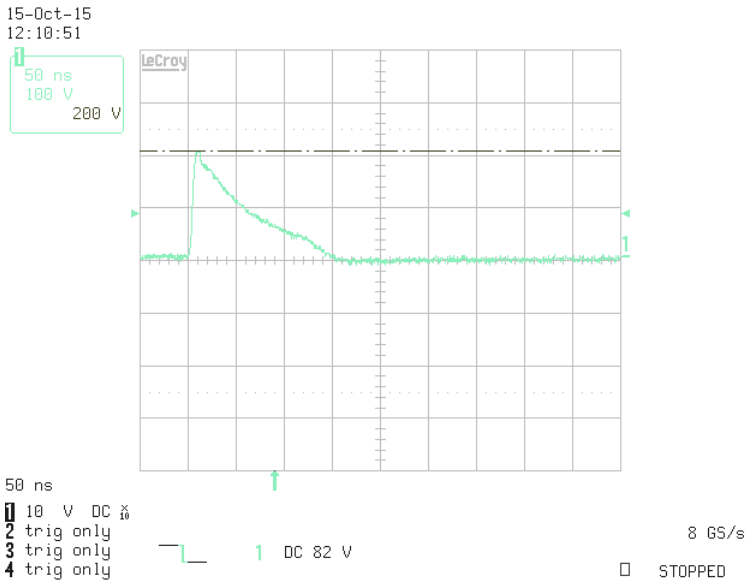
CR300B 2G, part number CT7801201-000



CR300B 3G EU, part number CT7801202-000

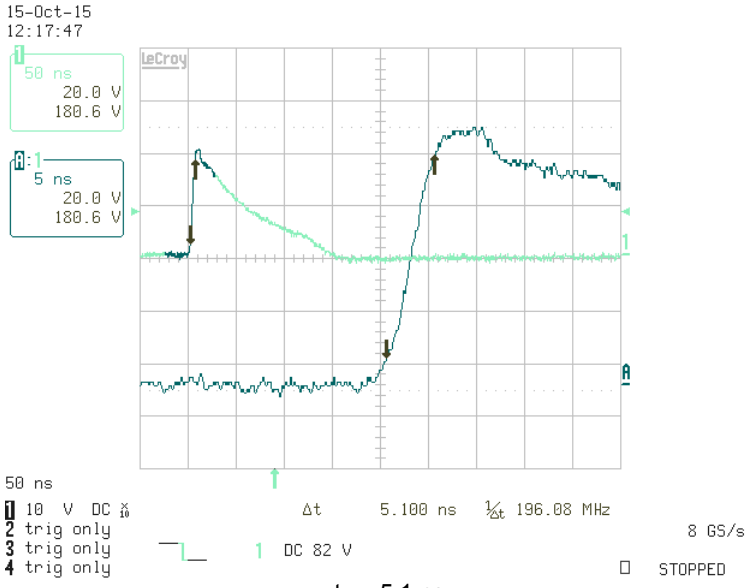
Test specification:	Immunity to transients and surges in the vehicular environment		
Test procedure:	ISO 7637-1, ISO 7637-2, EN 301 489-1, Section 9.6		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	08-Oct-15 - 15-Oct-15		
Temperature: 23 ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 44 %	**Power Supply:** 12 VDC
Remarks: CR300B 2G, part number CT7801201-000 & CR300B 3G EU, part number CT7801202-000			

Plot 8.3.32 Verification of Pulse 3b, R_i = 50 Ω, open circuit



U_s= 200 V

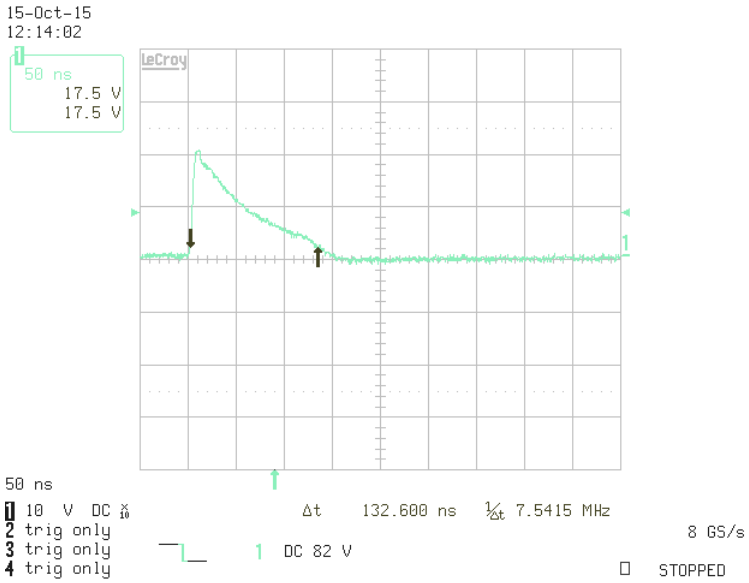
Plot 8.3.33 Verification of Pulse 3b, R_i = 50 Ω, open circuit



t_d = 5.1 ns

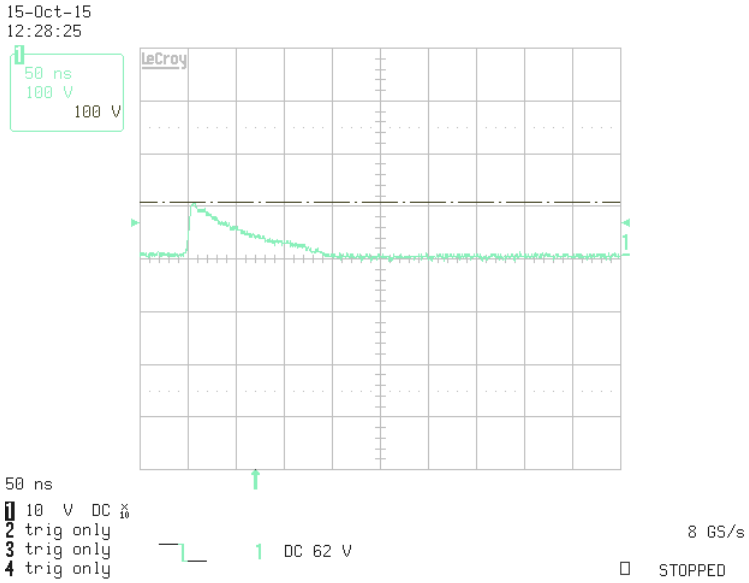
Test specification:	Immunity to transients and surges in the vehicular environment		
Test procedure:	ISO 7637-1, ISO 7637-2, EN 301 489-1, Section 9.6		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	08-Oct-15 - 15-Oct-15		
Temperature: 23 ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 44 %	**Power Supply:** 12 VDC
Remarks: CR300B 2G, part number CT7801201-000 & CR300B 3G EU, part number CT7801202-000			

Plot 8.3.34 Verification of Pulse 3b, R_i = 50 Ω, open circuit



t_r = 132.6 ns

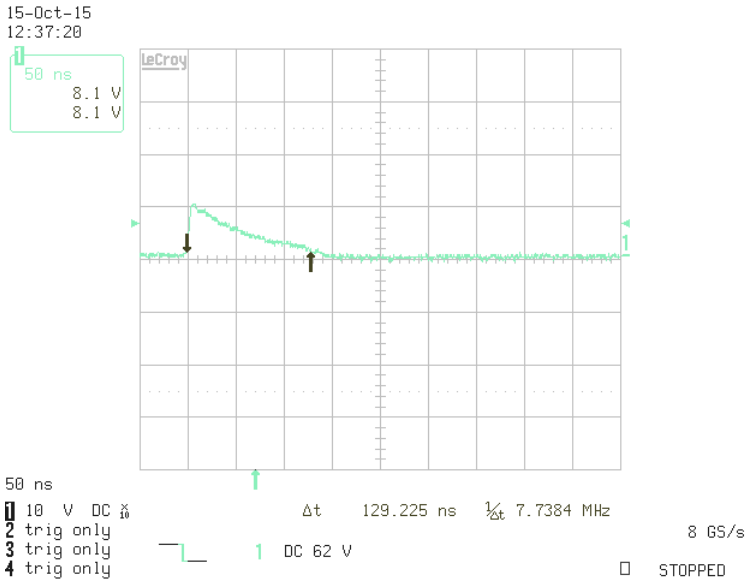
Plot 8.3.35 Verification of Pulse 3b, R_i = 50 Ω, load 50 Ω



U_s=100 V

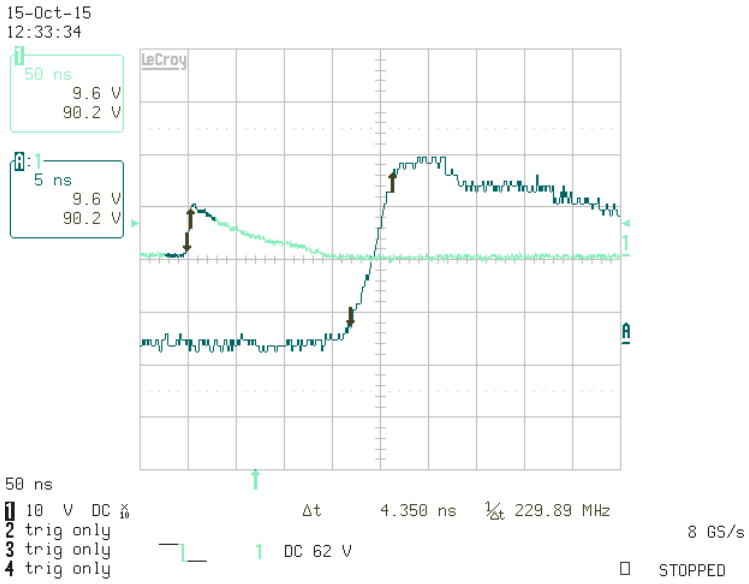
Test specification:	Immunity to transients and surges in the vehicular environment		
Test procedure:	ISO 7637-1, ISO 7637-2, EN 301 489-1, Section 9.6		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	08-Oct-15 - 15-Oct-15		
Temperature: 23 ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 44 %	**Power Supply:** 12 VDC
Remarks: CR300B 2G, part number CT7801201-000 & CR300B 3G EU, part number CT7801202-000			

Plot 8.3.36 Verification of Pulse 3b, Level III, R_i = 50 Ω, load 50 Ω



t_d =129.225 ns

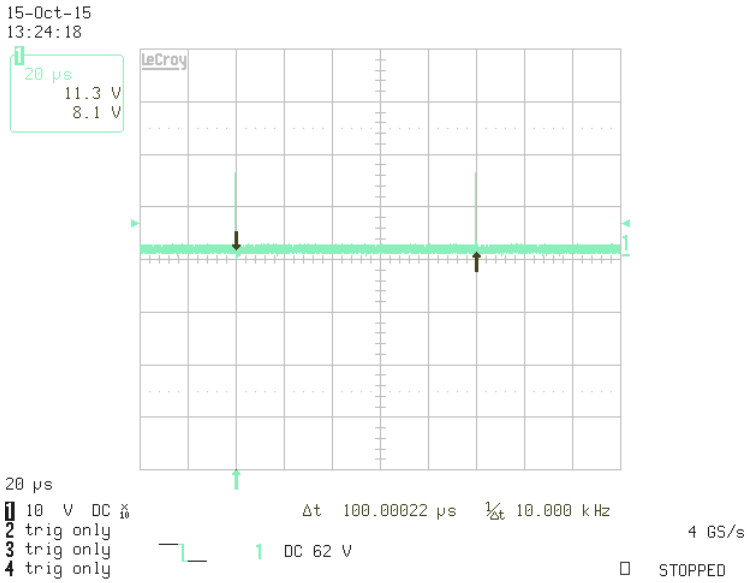
Plot 8.3.37 Verification of Pulse 3b, R_i = 50 Ω, load 50 Ω



t_r = 4.35ns

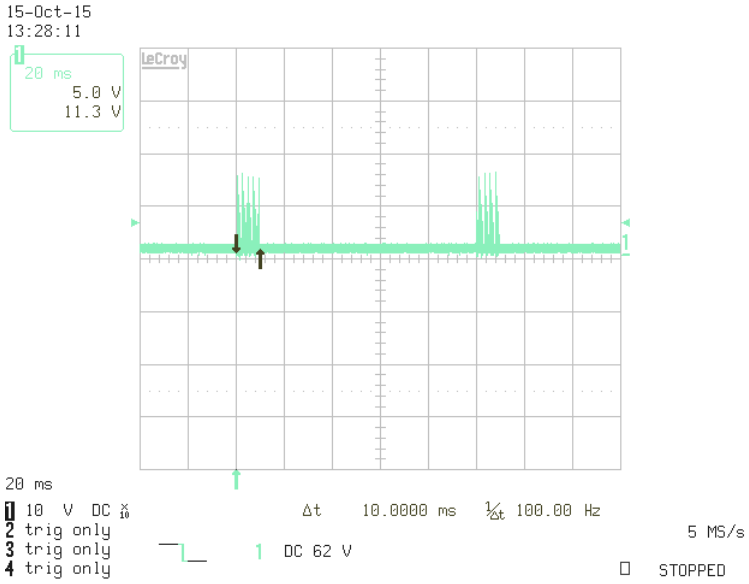
Test specification:	Immunity to transients and surges in the vehicular environment		
Test procedure:	ISO 7637-1, ISO 7637-2, EN 301 489-1, Section 9.6		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	08-Oct-15 - 15-Oct-15		
Temperature: 23 ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 44 %	**Power Supply:** 12 VDC
Remarks: CR300B 2G, part number CT7801201-000 & CR300B 3G EU, part number CT7801202-000			

Plot 8.3.38 Calibration of Pulse 3b, Level III, R_i = 50 Ω, open circuit



t_1 = 100 µs

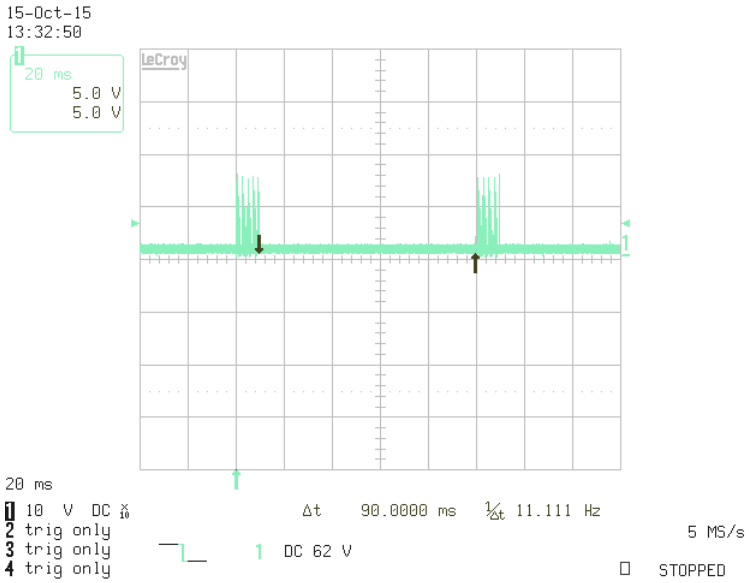
Plot 8.3.39 Calibration of Pulse 3b, Level III, R_i = 50 Ω, open circuit



t_4 = 10 ms

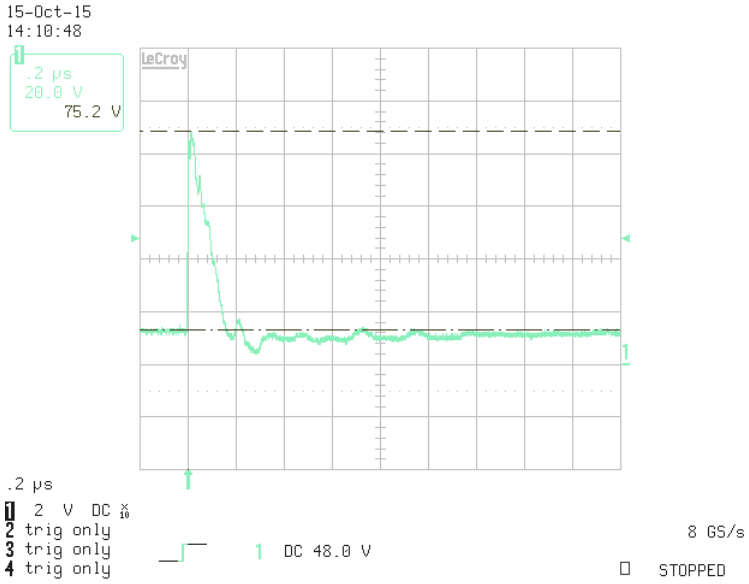
Test specification:	Immunity to transients and surges in the vehicular environment		
Test procedure:	ISO 7637-1, ISO 7637-2, EN 301 489-1, Section 9.6		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	08-Oct-15 - 15-Oct-15		
Temperature: 23 ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 44 %	**Power Supply:** 12 VDC
Remarks: CR300B 2G, part number CT7801201-000 & CR300B 3G EU, part number CT7801202-000			

Plot 8.3.40 Calibration of Pulse 3b, Level III, R_i = 50 Ω, open circuit



t_5 = 90 ms

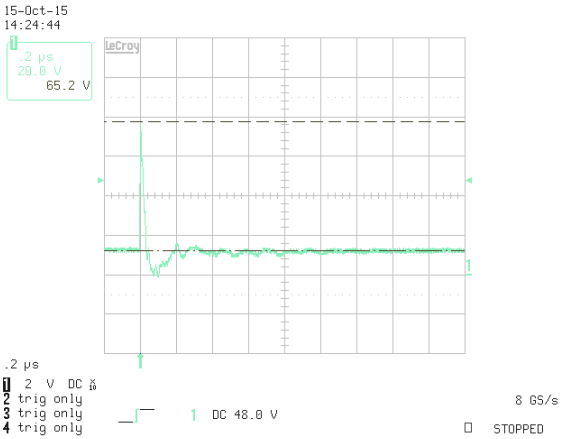
Plot 8.3.41 Calibration of Pulse 3b, Level III, R_i = 50 Ω, open circuit



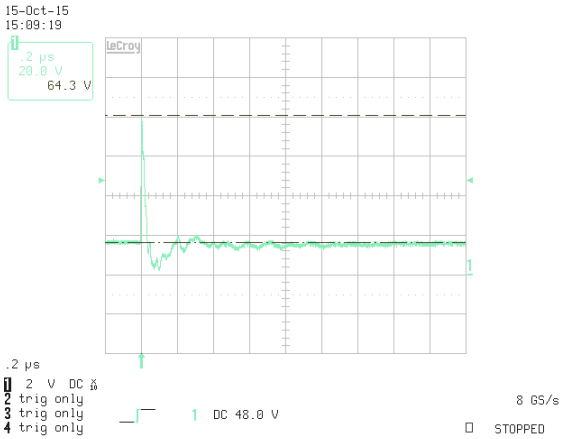
U_s=75.2 V

Test specification:	Immunity to transients and surges in the vehicular environment		
Test procedure:	ISO 7637-1, ISO 7637-2, EN 301 489-1, Section 9.6		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	08-Oct-15 - 15-Oct-15		
Temperature: 23 ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 44 %	**Power Supply:** 12 VDC
Remarks: CR300B 2G, part number CT7801201-000 & CR300B 3G EU, part number CT7801202-000			

Plot 8.3.42 EUT response to Pulse 3b, Level III,
EUT in transceive mode



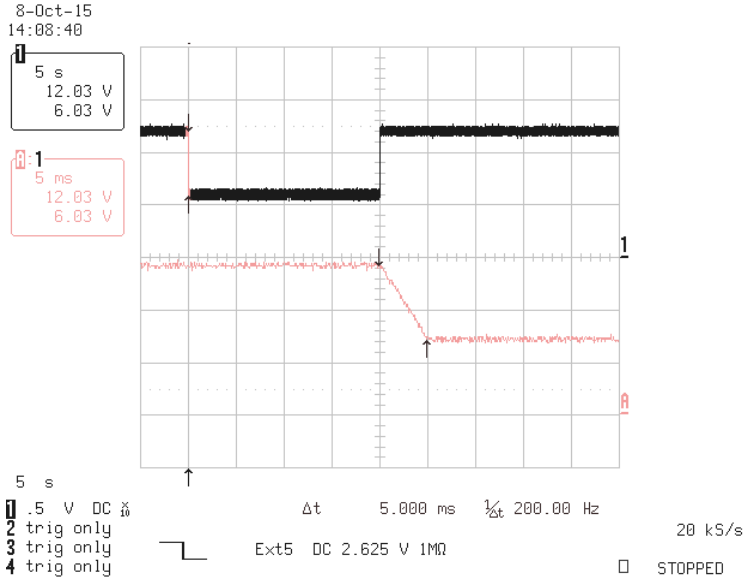
CR300B 2G, part number CT7801201-000



CR300B 3G EU, part number CT7801202-000

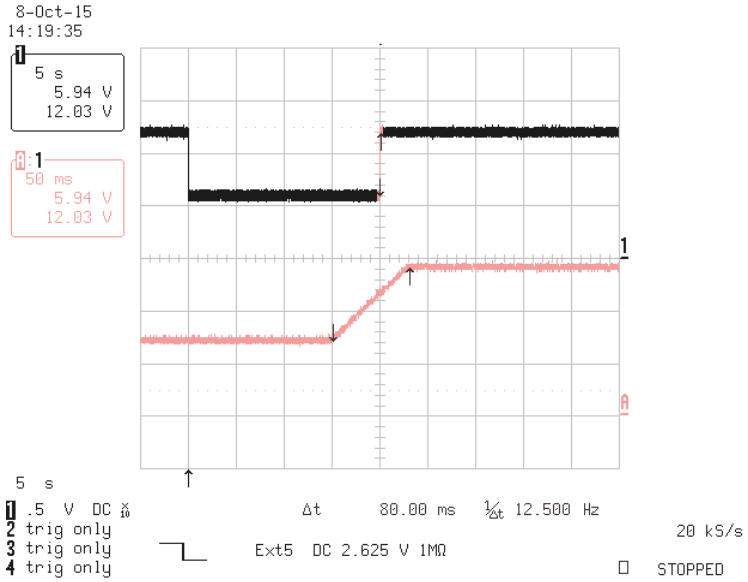
Test specification:	Immunity to transients and surges in the vehicular environment		
Test procedure:	ISO 7637-1, ISO 7637-2, EN 301 489-1, Section 9.6		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	08-Oct-15 - 15-Oct-15		
Temperature: 23 ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 44 %	**Power Supply:** 12 VDC
Remarks: CR300B 2G, part number CT7801201-000 & CR300B 3G EU, part number CT7801202-000			

Plot 8.3.43 Calibration of Pulse 4, Level III(a), R_i = 0.01 Ω



U_B= 12 V, U_s= -6 V, t_{10} = 5 ms

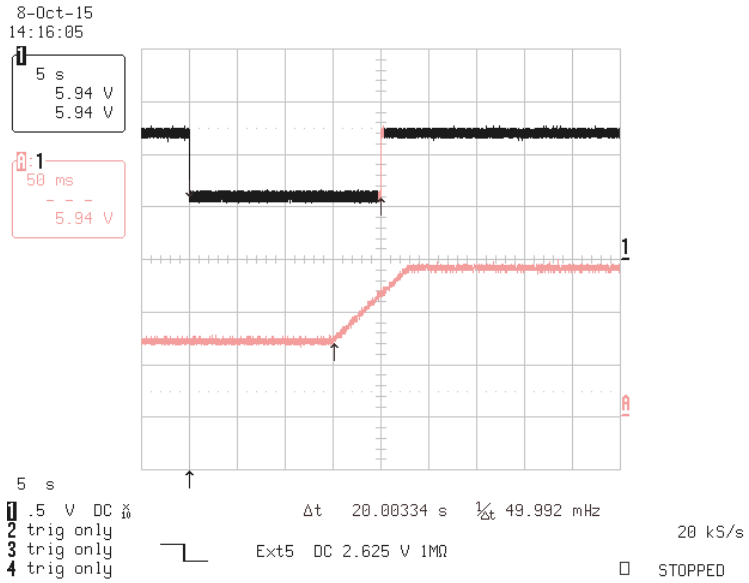
Plot 8.3.44 Calibration of Pulse 4, Level III(a), R_i = 0.01 Ω



U_a= -6 V, t_{11} = 80 ms

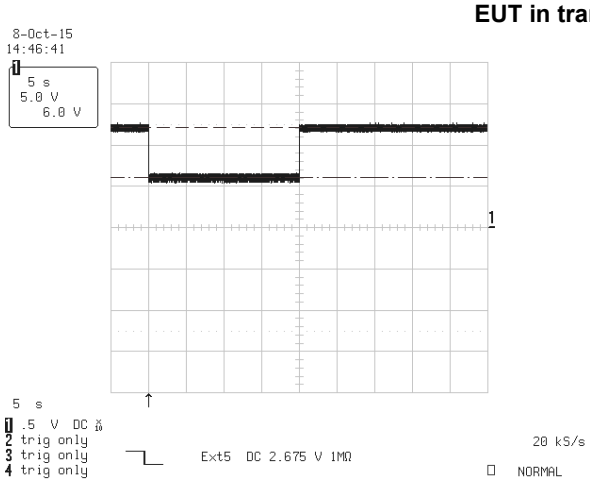
Test specification:	Immunity to transients and surges in the vehicular environment		
Test procedure:	ISO 7637-1, ISO 7637-2, EN 301 489-1, Section 9.6		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	08-Oct-15 - 15-Oct-15		
Temperature: 23 ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 44 %	**Power Supply:** 12 VDC
Remarks: CR300B 2G, part number CT7801201-000 & CR300B 3G EU, part number CT7801202-000			

Plot 8.3.45 Calibration of Pulse 4, Level III(a), R_i = 0.01 Ω

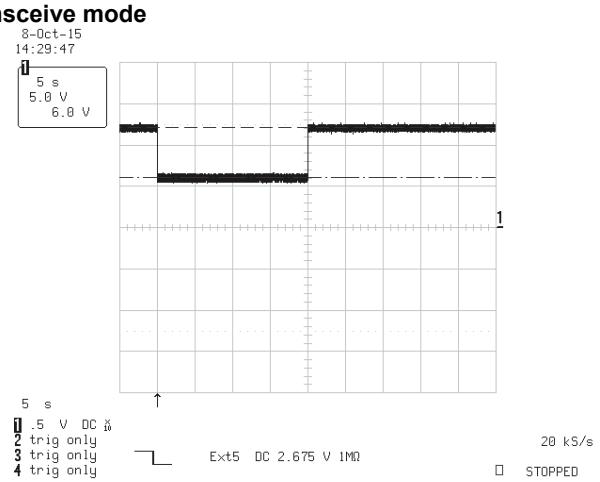


$t_7 + t_8 + t_9 = 20$ s

Plot 8.3.46 EUT response to Pulse 4, Level III(a), U_s = -12V / U_a = -6V
EUT in transceive mode



CR300B 2G, part number CT7801201-000



CR300B 3G EU, part number CT7801202-000

9 APPENDIX A Test equipment and ancillaries used for tests

HL No	Description	Manufacturer	Model	Ser. No.	Last Cal./Check	Due Cal./Check
0205	Power Supply, DC, 40 V, 30 A	Hewlett Packard	6268B	0981	06-May-15	06-May-16
0393	Generator Waveform Programmable Synthesizer, 50 MHz	Wavetek	178	S7030251	17-Aug-15	17-Aug-16
0787	Transient Limiter 9 kHz-200 MHz	Hewlett Packard	11947A	3107A01877	12-Oct-15	12-Oct-16
0860	Generator Burst, IEC 61000-4-4, EFT	EMV-System Schloder	SFT 400	811270	16-Dec-14	16-Dec-15
1425	EMI Receiver, 9 kHz - 2.9 GHz	Agilent Technologies	8542E	3710A00222, 3705A00204	24-Dec-14	24-Dec-15
1553	Cable RF, 3.5 m, N/N-type	Alpha Wire	RG-214	1553	01-Jan-15	01-Jan-16
1829	Termination Coaxial, 50 Ohm, 80 W, 0 - 1 GHz	Bird Electronic Corp.	81B	5883	04-Feb-15	04-Feb-16
1876	Attenuator, 50 Ohm, 100 W, 20 dB	Bird Electronic Corp.	8343-200	2200	01-Feb-15	01-Feb-16
1903	Power Supply, DC, Regulated, 60V, 25A	Horizon Electronics	SR 60-25	72-7137	30-Nov-15	30-Nov-16
2221	LISN 50 Ohm / 5 uH + 1 Ohm, 100 A	Hermon Laboratories	50/5+1	2221	04-Jun-15	04-Jun-16
2226	Automotive Transient Generator	Hermon Laboratories	ATG-1	2226	12-Oct-15	12-Oct-16
2364	SmartWave Switching Amplifier	Elgar	SW5250AE-4	0317A00596	24-Jul-15	24-Jul-16
2376	Coupler coaxial bi-directional 1-4 GHz,20dB	Narda	3022	50076	25-Jun-15	25-Jun-16
2432	Antenna, Double-Ridged Waveguide Horn 1 to 18 GHz	EMC Test Systems	3115	00027177	17-Apr-15	17-Apr-16
2438	High Voltage Power Source, 2500/650 VDC	Hermon Labs	HVPS-2500-650	2438	10-Mar-15	10-Mar-16
2453	Connection box 3X3	Hermon Labs	CB-1	2453	07-May-15	07-May-16
2464	Capacitor 1 uF, MIL STD 461 CS02	Hermon Labs	C-CS02	2464	15-Nov-15	15-Nov-16
2485	Inductor for spike generators 1.1 mH	Hitran	AP2371-00	46236	18-Mar-15	18-Mar-16
2667	Signal generator, 9 kHz - 3.3 GHz	Rohde &Schwarz	SML03	101909	07-May-15	07-May-16
2697	Antenna, 30 MHz - 3.0 GHz	Sunol Sciences. Corp.	JB3	A022805	15-May-15	15-May-16
2780	EMC analyzer, 100 Hz to 26.5 GHz	Agilent Technologies	E7405A	MY45102462	08-Sep-15	08-Sep-16
2823	ESD generator	Schloder	SESD 30000	509155	23-Mar-15	23-Mar-16
3134	Passive Probe, 500MHz, 10 Mohm, 11 pF, 10:1, 500V	LeCroy Corporation	PP005A	3134	17-Dec-14	17-Dec-15
3158	Amplifier, 80 to 1000 MHz, 500 W	Amplifier Research	500W1000A	032960	02-Apr-15	02-Apr-16
3333	Oscilloscope, 1 GHz, 4 channels	LeCroy Corporation	LC584AL	10239	25-Nov-15	25-Nov-16
3377	Resistor for ESD tests EN 61000-4-2 470 kOhm X 2	Hermon Labs	R470 x 2	3377	01-Apr-15	01-Apr-16
3389	Microwave Cable Assembly, 26.5 GHz, 1.0 m, N type/N type	Suhner Sucoflex	104EA	3389	04-Feb-15	04-Feb-16
3521	Multimeter	Fluke	115	94771103	26-Jul-15	26-Jul-16
3612	Cable RF, 17.5 m, N type-N type	Teldor	RG-214/U	NA	07-Dec-14	07-Dec-15
3623	Cable RF, 6.0 m, N-N type, DC-6.5GHz	Belden	MIL C-17	NA	09-Sep-15	09-Sep-16
4021	Power Amplifier 1 to 2.5 GHz, 25 W and 1.8 to 4 GHz, 10 W	Hermon Labs	A 0.7-4	0001	05-Apr-15	05-Apr-16
4236	High Pass Filter, 50 Ohm, 0.07 to 1000 MHz.	Mini-Circuits	ZFHP-ORO55_S+	NA	23-Nov-15	23-Oct-17
4297	Dual directional coupler, 80 to 1000 MHz, 50 dB, 1500W	WERLATONE	C3908	96810	17-Dec-14	17-Dec-15
4347	Low Loss Armored Test Cable, DC - 18 GHz, 2.0 m, N type-M/N type-M	MegaPhase	NC29-N1N1-79	12025103 001	08-Jan-15	08-Jan-16
4721	Low Loss Armored Test Cable, DC - 18 GHz, 4.5 m, N type-M/N type-M	MegaPhase	NC29-N1N1-177	51300101 001	12-Jul-15	12-Jul-16
4819	Isoprobe III-100:1, Max. 1000V DC	Multi-Contact	68.9548-12023	NA	18-Dec-14	18-Dec-15
4932	Microwave preamplifier, 500 MHz to 18 GHz, 40 dB Gain	COM-POWER CORPORATION	PAM-118A	551029	19-Nov-15	19-Nov-16
4979	Resistor for ESD tests EN 61000-4-2 470 kOhm X 2	Hermon Labs	R470x2	NA	01-Apr-15	01-Apr-16

10 APPENDIX B Test laboratory description

Tests were performed at Hermon Laboratories Ltd., which is a fully independent, private, EMC, safety, environmental and telecommunication testing facility.
Hermon Laboratories is listed by the Federal Communications Commission (USA) for all parts of Code of Federal Regulations 47 (CFR 47), Registration Numbers 90624 for OATS and 90623 for the anechoic chamber; by Industry Canada for electromagnetic emissions (file numbers IC 2186A-1 for OATS, IC 2186A-2 for anechoic chamber, IC 2186A-3 for full-anechoic chamber for RE measurements above 1 GHz), certified by VCCI, Japan (the registration numbers are R-808 for OATS, R-1082 for anechoic chamber, G-27 for full-anechoic chamber for RE measurements above 1 GHz, C-845 for conducted emissions site, T-1606 for conducted emissions at telecommunication ports), has a status of a Telefication - Listed Testing Laboratory, Certificate No. L138/00. The laboratory is accredited by American Association for Laboratory Accreditation (USA) according to ISO/IEC 17025 for electromagnetic compatibility, product safety, telecommunications testing and environmental simulation (for exact scope please refer to Certificate No. 839.01). The FCC Designation Number is US1003.

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Person for contact: Mr. Alex Usoskin, CEO.

11 APPENDIX C Abbreviations and acronyms

A	ampere
AC	alternating current
A/m	ampere per meter
AM	amplitude modulation
AVRG	average (detector)
BB	broad band
cm	centimeter
CDN	coupling/ decoupling network
CR	continuous phenomena applied to receivers
CT	continuous phenomena applied to transmitters
dB	decibel
dBm	decibel referred to one milliwatt
dB(μV)	decibel referred to one microvolt
dB(μV/m)	decibel referred to one microvolt per meter
dB(μA)	decibel referred to one microampere
dBΩ	decibel referred to one Ohm
DC	direct current
EMC	electromagnetic compatibility
EMI	electromagnetic interference
EN	European Norm
EUT	equipment under test
GHz	gigahertz
GND	ground
H	height
HCP	horizontal coupling plane
HL	Hermon laboratories
Hz	hertz
k	kilo
kHz	kilohertz
kV	kilovolt
L	length
LISN	line impedance stabilization network
m	meter
MHz	megahertz
min	minute
mm	millimeter
ms	millisecond
μs	microsecond
NA	not applicable
NB	narrow band
NP	normal performance
NT	not tested
OATS	open area test site
Ω	Ohm
QP	quasi-peak
PM	pulse modulation
PS	power supply
RE	radiated emission
RF	radio frequency
rms	root mean square
s	second
TR	transient phenomena applied to receivers
TT	transient phenomena applied to transmitters
V	volt
VA	volt-ampere
VCP	vertical coupling plane
W	width

12 APPENDIX D Test equipment correction factors

Correction factor
Line impedance stabilization network
Model LISN 50 Ohm / 5 uH + 1 Ohm
Hermon Laboratories
Insertion loss

No.	Parameter	Applied, kHz	Measured (L1), dB	Measured (L2), dB	Uncertainty, dB
1	(insertion loss)	150kHz	0.40	0.39	±0.22
2		170kHz	0.34	0.34	±0.22
3		200kHz	0.28	0.27	±0.22
4		250kHz	0.22	0.22	±0.22
5		300kHz	0.19	0.18	±0.22
6		350kHz	0.16	0.16	±0.22
7		400kHz	0.15	0.15	±0.22
8		500kHz	0.13	0.13	±0.22
9		600kHz	0.12	0.12	±0.22
10		700kHz	0.11	0.12	±0.22
11		800kHz	0.11	0.11	±0.22
12		900kHz	0.10	0.11	±0.22
13		1000kHz	0.10	0.11	±0.22
14		1200kHz	0.10	0.11	±0.22
15		1500kHz	0.10	0.10	±0.22
16		2000kHz	0.09	0.10	±0.22
17		2500kHz	0.09	0.11	±0.22
18		3000kHz	0.09	0.10	±0.22
19		4000kHz	0.09	0.11	±0.22
20		5000kHz	0.09	0.11	±0.22
21		7000kHz	0.10	0.11	±0.22
22		10000kHz	0.11	0.12	±0.22
23		15000kHz	0.13	0.15	±0.22
24		20000kHz	0.15	0.17	±0.22
25		30000kHz	0.20	0.21	±0.22
26		40000kHz	0.25	0.25	±0.22
27		50000kHz	0.26	0.26	±0.22
28		60000kHz	0.26	0.25	±0.22
29		70000kHz	0.24	0.24	±0.22
30		80000kHz	0.28	0.30	±0.22
31		90000kHz	0.42	0.43	±0.22
31		100000kHz	0.56	0.58	±0.22
32		108000kHz	0.65	0.68	-±0.22

The correction factor in dB is to be added to meter readings of an interference analyzer or a spectrum analyzer.

Antenna calibration
Sunol Sciences Inc., model JB3, serial number A022805

Frequency, MHz	Antenna factor, dB(1/m)
30	22.7
35	18.4
40	14.5
45	10.9
50	8.3
60	7.9
70	9.0
80	9.3
90	9.7
100	11.2
120	14.4
140	13.7
160	13.8
180	11.8
200	12.8
250	12.3
300	13.4
400	16.0
500	17.7
600	18.1
700	20.7
800	21.1
900	22.2
1000	23.1
1100	24.2
1200	25.1
1300	25.1
1400	25.8
1500	26.3
1600	27.6
1700	28.1
1800	27.9
1900	28.1
2000	28.3
2500	31.9
3000	34.0

Antenna factor in dB(1/m) is to be added to receiver meter reading in dB(μV) to obtain field strength in dB(μV/m).

Antenna factor
Double-ridged waveguide horn antenna
EMC Test Systems, model 3115, serial number: 00027177

Frequency, MHz	Measured antenna factor, dB/m
1000	23.8
1500	24.7
2000	27.0
2500	28.7
3000	30.2
3500	31.4
4000	32.9
4500	32.4
5000	33.3
5500	34.2
6000	34.5
6500	34.4
7000	35.3
7500	36.6
8000	36.7
8500	37.4
9000	37.8
9500	37.5
10000	38.1
10500	37.9
11000	38.2
11500	38.8
12000	39.4
12500	38.9
13000	39.5
13500	40.4
14000	41.0
14500	42.7
15000	41.4
15500	39.0
16000	37.6
16500	38.5
17000	40.4
17500	44.2
18000	48.7

Antenna factor in dB(1/m) is to be added to receiver meter reading in dB(μV) to convert it into field intensity in dB(μV/m).

13 APPENDIX E Measurement uncertainties

Expanded uncertainty at 95% confidence in Hermon Labs EMC measurements

Test description	Expanded uncertainty
Conducted emissions at mains port with LISN and HP 8542E or HP 8546A receiver	9 kHz to 150 kHz: ± 3.9 dB 150 kHz to 30 MHz: ± 3.8 dB
Conducted emissions at telecommunication port with HP 8542E or HP 8546A receiver	ISN: ± 3.3 dB Current probe: ± 3.5 dB
Radiated emissions at 10 m measuring distance Horizontal polarization Vertical polarization	 Biconilog antenna: ± 5.0 dB Biconical antenna: ± 5.0 dB Log periodic antenna: ± 5.1 dB Double ridged horn antenna: ± 5.3 dB Biconilog antenna: ± 5.5 dB Biconical antenna: ± 5.5 dB Log periodic antenna: ± 5.6 dB Double ridged horn antenna: ± 5.8 dB
Radiated emissions at 3 m measuring distance Horizontal polarization Vertical polarization	 Biconilog antenna: ± 5.3 dB Biconical antenna: ± 5.0 dB Log periodic antenna: ± 5.3 dB Double ridged horn antenna: ± 5.3 dB Biconilog antenna: ± 6.0 dB Biconical antenna: ± 5.7 dB Log periodic antenna: ± 6.0 dB Double ridged horn antenna: ± 6.0 dB
Harmonic current	± 4.0%
Voltage fluctuations and flickers	± 5.3%
ESD	It has been demonstrated that calibration results are within the limits specified in the EN 61000-4-2 standard reduced by uncertainty of calibration that prove compliance with standard requirements with at least a 95% confidence. Parameters that have been calibrated and tolerances are shown below: First peak current of discharge: ±10% (refer to standard Table 2) Current at 30 ns: ±30% (refer to standard Table 2) Current at 60 ns: ±30% (refer to standard Table 2) Rise time: 0.7 – 1 (ns)
Radiated immunity AR FP2000 E-field probe AR FP2080 E-field probe	 10 kHz to 250 MHz: ± 1.9 dB; 250 MHz to 1 GHz: ± 2.1 dB 80 MHz to 26 GHz: ± 2.7 dB; 26 GHz to 40 GHz: ± 4.0 dB
Conducted RF immunity - CDN injection - Current probe injection - Direct injection	 ± 1.3 dB ± 3.1 dB ± 3.1 dB

Test description	Expanded uncertainty
EFT - CDN injection - Capacitive clamp injection	It has been demonstrated that calibration results are within the limits specified in the EN 61000-4-4 standard reduced by uncertainty of calibration, that prove compliance with standard requirements with at least a 95% confidence. Parameters that have been calibrated and tolerances are shown below: Peak voltage: (0.125 to 2 kV) ±10% at 50 Ω Peak voltage: (0.24 to 3.8 kV) ±10% at 1000 Ω Rise time: 5 ns ±30% at 50 Ω / 5 ns ±30% at 1000 Ω Crest time: 50 ns ±30% at 50 Ω / 50 ns -15 ns / +100 ns at 1000 Ω Burst duration: 15 ms ± 20% at 5 kHz / 0.75 ms ± 20% at 100 kHz Burst period: 300 ms ± 20% Repetition frequency: 5 or 100 kHz ±20% Peak voltage at CDN output: (0.125 to 2 kV) ±10% at 50 Ω under 4 kV Rise time at CDN output: 5 ns ±30% at 50 Ω under 4 kV Crest time at CDN output: 50 ns ±30% at 50 Ω under 4 kV
High voltage surges	It has been demonstrated that calibration results are within the limits specified in the EN 61000-4-5 standard reduced by uncertainty of calibration, that prove compliance with standard requirements with at least a 95% confidence. Parameters that have been calibrated and tolerances are shown below: **1.2/50 µs combination wave generator:** Open-circuit output voltage: (0.5 to 6 kV) ±10% Short-circuit output current: (0.25 to 3 kA) ±10% Effective output impedance: 2 Ω ±10% Phase shifting: 0 to 360º ±10º Undershoot: < 30% of the output voltage Coupling: Direct / 18 µF / 9 µF+10 Ω Open-circuit front time: 1.2 µs ±30% / 1.2 µs ±30% / 1.2 µs ±30% Open-circuit time to half-value: 50 µs ±20% / 50 µs ±10 µs / 50 µs +10/-25 µs Short-circuit front time: 8 µs ±20% / 8 µs ±20% / 2.5 µs ±30% Short-circuit time to half-value: 20 µs ±20% / 20 µs ±20% / 25 µs ±30% **10/700 µs combination wave generator:** Open-circuit output voltage: (0.5 to 6 kV) ±10% Short-circuit output current: (12.5 A to 150 A) ±10% Effective output impedance: 40 Ω ±10% Open-circuit front time: 10 µs ± 30% Open-circuit time to half-value: 700 µs ± 20% Short-circuit front time: 5 µs ± 20% Short-circuit time to half-value: 320 µs ± 20%
Voltage dips, short interruptions and variations	It has been demonstrated that calibration results are within the limits specified in the EN 61000-4-11 standard reduced by uncertainty of calibration, that prove compliance with standard requirements with at least a 95% confidence. Parameters that have been calibrated and tolerances are shown below: Open-circuit voltage: ±5% Voltage change under full load: Nominal voltage: ±5% 70% of nominal voltage: ±7% 40% of nominal voltage: ±10%
Immunity to electrical transient	± 6.96%

Hermon Laboratories is accredited by A2LA for calibration according to present requirements of ISO/IEC 17025 and NCSL Z540-1. The accreditation is granted to perform calibration of parameters that are listed in the Scope of Hermon Laboratories Accreditation.

Hermon Laboratories calibrates its reference and transfer standards by calibration laboratories accredited to ISO/IEC 17025 by a mutually recognized Accreditation Body or by a recognized national metrology institute. All reference and transfer standards used in the calibration system are traceable to national or international standards.

In-house calibration of all test and measurement equipment is performed on a regular basis according to Hermon Laboratories calibration procedures, manufacturer calibration/verification procedures or procedures defined in the relevant standards. The Hermon Laboratories test and measurement equipment is calibrated within the tolerances specified by the manufacturers and/or by the relevant standards.

14 APPENDIX F Specification references

EN 301 489-1 V1.9.2: 2011	Electromagnetic compatibility and Radio spectrum Matters (ERM). ElectroMagnetic Compatibility (EMC) standard for radio equipment and services. Part 1: Common technical requirements
EN 301 489-3 V1.6.1: 2013	Electromagnetic compatibility and Radio spectrum Matters (ERM). ElectroMagnetic Compatibility (EMC) standard for radio equipment and services. Part 3: Specific conditions for Short-Range Devices (SRD) operating on frequencies between 9 kHz and 40 GHz
EN 301 489-7 V1.3.1: 2005	Electromagnetic compatibility and Radio spectrum Matters (ERM). ElectroMagnetic Compatibility (EMC) standard for radio equipment and services. Part 7: Specific conditions for mobile and portable radio and ancillary equipment of digital cellular radio telecommunication systems (GSM and DCS)
EN 301 489-24 V1.5.1: 2010	Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 24: Specific conditions for IMT-2000 CDMA Direct Spread (UTRA and E-UTRA) for Mobile and portable (UE) radio and ancillary equipment
EN 55022: 2010 + AC(11)	Limits and methods of measurement of interference characteristics of information technology equipment
CISPR 16-1-1: 2010	Specification for radio disturbance and immunity measuring apparatus and methods. Part 1-1: Radio disturbance and immunity measuring apparatus – Measuring apparatus
EN 61000-3-2: 2014	Electromagnetic compatibility (EMC) - Part 3: Limits. Section 2. Limits for harmonic current emissions for equipment with input current <16 A
EN 61000-3-3: 2013	Electromagnetic compatibility (EMC) - Part 3: Limits. Section 3: Limitation of voltage fluctuations and flicker in low-voltage supply systems for equipment with rated current <16 A
EN 61000-4-2: 2009	Electromagnetic compatibility (EMC). Part 4: testing and measurement techniques. Section 2: Electrostatic discharge immunity test
EN 61000-4-3: 2006+A1(08)+A2(10)	Electromagnetic compatibility (EMC). Part 4: testing and measurement techniques. Section 3: Radiated, radio frequency, electromagnetic field immunity test
EN 61000-4-4: 2004+A1(10)	Electromagnetic compatibility (EMC). Part 4: testing and measurement techniques. Section 4: Electrical fast transient/burst immunity test
EN 61000-4-5: 2006	Electromagnetic compatibility (EMC). Part 4: testing and measurement techniques. Section 5: Surge immunity test
EN 61000-4-6: 2009	Electromagnetic compatibility (EMC) Part 4: testing and measurement techniques. Section 6: Immunity to conducted disturbances, inducted by radio-frequency fields
EN 61000-4-11: 2004	Electromagnetic compatibility (EMC). Part 4: testing and measurement techniques Section 11: Voltage dips, short interruptions and voltage variations immunity test
ISO 7637-2: 2004	Road vehicles – Electrical disturbance from conduction and coupling. Part 2: Electrical transient conduction along supply lines only

END OF TEST REPORT

15 APPENDIX G Manufacturer's declaration of identity

POINTER

Declaration of Identity

We, the undersigned,

Company: Pointer Telocation Inc
Address: 7715 NW 48th Street, Suite 395
Country: Doral, FL 33166
Telephone number: (305) 903-6634

declare under our sole responsibility that the following equipment:

Brand/Item	Type/Model	Short Product description
CR300B 3G EU	CT7801202-000	Vehicle Tracking equipment with 3G modem
CR300B 2G	CT7801201-000	Vehicle Tracking equipment with 2G modem

is electronically/electrically/mechanically identical to the following equipment (including Software/Hardware version(s)):

Brand/Item	Type/Model	Short Product description
CR300B 3G EU	CT7801212-000	Same as above with Different enclosure shape
CR300B 2G	CT7801211-000	Same as above with Different enclosure shape
CR300 3G EU	CT7801206-000	Same as above without internal battery
CR300 2G	CT7801205-000	Same as above without internal battery

The reason for name change is: Marketing purposes

..... (date)

IGOR ROGOV
09-03-2016
VP R&D

..... (signature)

..... (printed name)

..... (position)

..... (company stamp)

END OF DOCUMENT