



Skúšobňa
Fakulty elektrotechniky a informatiky STU
Ilkovičova 3, 812 19 Bratislava

Tel: 02/602 91 631, 602 91 152
Fax: 02/6544 0227

TEST REPORT

No.: 01/15/SL EMK
Year: 2015

Applicant: **Vutlan s.r.o.**
Ulica Svornosti 43, 821 06 Bratislava

Tested equipment: **Remote Monitoring System VT8101**

Bratislava 22. 01. 2015

Approved:
Assoc. Prof. K. Kováč, PhD.
Head of Test house of FEI STU

Notes: All test results are valid only for tested equipment. Publication of test report content is not allowed without customer confirmation. Test report may be copied only as a whole, otherwise only with confirmation of Test house of FEI STU in Bratislava. This test report is issued in Slovak and English languages; the Slovak version only of this document can be considered as an original.

SFEI STU v BRATISLAVE	SKÚŠOBŇA Fakulty elektrotechniky a informatiky STU	Ilkovičova 3 812 19 BRATISLAVA
-----------------------------	---	-----------------------------------

Test subject: Remote Monitoring System VT8101

Serial number: 6545

Manufacturer: Vutlan s.r.o., Ulica Svornosti 43, 821 06 Bratislava

Test: Measurement of emissions and immunity tests according to ETSI EN 300 386 v1.6.1:2012 (Immunity test levels were modified according to EN 61000-6-2:2005)

Applicant: Vutlan s.r.o., Ulica Svornosti 43, 821 06 Bratislava

Date of test sample submission: 16. 1. 2015

Number of tested samples: 1

Date of measurement: 16. 1. 2015

Place of measurement: EMC Test Laboratory of SFEI STU Bratislava

Test report contains:

Text pages: 15
Tables: 8
Appendices: 2
Figures: 7

Distribution: Number of pcs

SFEI STU: 1 pc
Applicant: 1 pc

Conditions of measurements and tests:

Identification of test equipment is shown in Fig. 1.

Measured set contained:

- Monitoring System VT8101,
- VT490 digital temperature and humidity sensor connected to VT8101 by cable 4P4C 2m long,
- VT500 temperature sensor connected to VT8101 by cable 4P4C 2m long,
- VT590 leak sensor connected to VT8101 by cable 4P4C 2m long,
- VT16 module of binary input with 2m long two core cable,
- LAN cable for connecting VT8101 and PC 2m long.

Explanation: If the measured set was modified due to any measurement or test conditions, it is noticed on a page corresponding to the measurement or test.

Power supply: 230 V AC

Atmospheric conditions: Temperature: 23 °C
Rel. humidity: 27 %

SFEI STU v BRATISLAVE	SKÚŠOBŇA Fakulty elektrotechniky a informatiky STU	Ilkovičova 3 812 19 BRATISLAVA
-----------------------------	---	-----------------------------------

Test results:

Table 1: Results of conducted and radiated emissions measurement according to ETSI EN 300 386:

No.	Measurement	Method / Configuration of measured set	Limit	Conclusion / Emission class	Page
1	Conducted emissions	EN 55016-2-1 EN 55022	EN 55022	Complies/B	4
2	Radiated emissions	EN 55016-2-3 EN 55022	EN 55022	Complies/B	5

Not performed tests:

Measure of harmonic currents produce according to EN 61000-3-2 and measure of voltage fluctuation and flicker according to EN 61000-3-3 was not realized, because input power of device was lower than 75 W.

Conclusion: Tested device complies with requirements set by ETSI EN 300 386 v1.6.1:2012 of electromagnetic interference within the range shown in the table 1.

Table 2: Results of immunity tests according to ETSI EN 300 386

No.	Test	Method	Function criterion		Page
			Request	Conclusion	
1	Immunity against electrostatic discharges	EN 61000-4-2	B	complies B	6
2	Immunity against HF electromagnetic field	EN 61000-4-3	A	complies A	7
3	Immunity against EFT/Burst pulses	EN 61000-4-4	B	complies A	8
4	Immunity against SURGE pulses	EN 61000-4-5	B	complies A	9
5	Immunity against conducted interference	EN 61000-4-6	A	complies A	10
6	Immunity tests against voltage variations	EN 61000-4-11	B, C	complies A, C	11

Behaviour of the equipment, in terms of criterion of function compatibility, was judged on the basis of specifications of the equipment manufacturer.

Criterion used for function compatibility (abridged version):

Criterion A: The equipment continues to operate as intended. No degradation of performance or loss of function is allowed below that specified by the manufacturer.

Criterion B: The equipment continues to operate as intended after the test. Degradation of performance or loss of function is allowed during the test, however afterwards this must not be outside manufacturer's specifications.

Criterion C: Temporary loss of function is allowed provided the function is self-recoverable or can be restored.

Not performed tests:

Immunity tests against magnetic field according to EN 61000-4-8 was not realized, because manufacturer decelerates the device does not have components that are sensitive on magnetic field (EN 61000-6-2, table 1).

Conclusion: Tested device complies with requirements set by ETSI EN 300 386 v1.6.1:2012 and requirements set by EN 61000-6-2:2005 for electromagnetic immunity within the range shown in the table 2.

Test laboratory declares, that measurement results are valid only for measured subject.

Assoc. Prof. Karol Kováč, PhD.
Head of EMC Laboratory

SFEI STU v BRATISLAVE	SKÚŠOBŇA Fakulty elektrotechniky a informatiky STU	Ilkovičova 3 812 19 BRATISLAVA
-----------------------------	---	-----------------------------------

Test: **Measurement of conducted emissions according to EN 55 022:2010**

Test subject: Remote Monitoring System VT8101

Serial number: 6545

Manufacturer: Vutlan s.r.o., Ulica Svornosti 43, 821 06 Bratislava

Date of measurement: 16. 1. 2015

Test instrumentation:

- a. test receiver R&S ESPI 7 – Ser. No. 101268,
- b. V line impedance stabilization network Schwarzbeck R&S ESH3-Z5 – Ser. No. 846128/015,
- c. transient limiter ESH3-Z2 – Ser. No. 102021,
- d. ISN S8, Schwarzbeck – Ser. No. ISN-S8-0004,
- e. measurement place according to EN 55022.

Metrological properties:

Measuring place was verified according to CISPR 16-1 on 1. 12. 2014, measuring report KP-14/03/EMK, ESPI 7 R&S has Certificate of Calibration No.: 101/240/24/12 from 5. 11. 2012.

Conditions of measurement:

Measurement place was arranged according to EN 55022 (Fig. 2).

Frequency range: 0.15 – 30 MHz

Measurement results:

Measurement results of mains conducted tests for voltage input and LAN of equipment, are shown in appendix MCE 15 01.

Conclusion: Maximal level of disturbing conducted emissions is below limit of ETSI EN 300 386 v1.6.1:2012.

SFEI STU v BRATISLAVE	SKÚŠOBŇA Fakulty elektrotechniky a informatiky STU	Ilkovičova 3 812 19 BRATISLAVA
-----------------------------	---	-----------------------------------

Test: **Measurement of radiated emissions according to EN 55 022:2010**

Test subject: Remote Monitoring System VT8101

Serial number: 6545

Manufacturer: Vutlan s.r.o., Ulica Svornosti 43, 821 06 Bratislava

Date of measurement: 16. 1. 2015

Test instrumentation:

- a. test receiver R&S ESPI 7 – Ser. No. 101268,
- b. rf measuring preamplifier 10 kHz - 5 GHz, Sonoma 352 – Ser. No. 303123,
- c. TRILOG measuring antenna 30 - 3000 MHz, Schwarzbeck – VULB 9163 - Ser. No. 9163-360,
- d. semi-anechoic shielded chamber with measurement place according to EN 55022.

Metrological properties:

Measuring place was verified according to CISPR 16-1 (NSA) on 30. 8. 2011, measuring report KP-11/05EMK, coefficient of transmission on 21. 5. 2014, measuring report KP-14/02/EMK and ESPI 7 R&S has Certificate of Calibration No.: 101/240/24/12 dated 5. 11. 2012.

Conditions of measurement:

Measurement place was arranged according to EN 55 022 (Fig. 3).

Frequency range: 30 –2000 MHz.

Measuring distance: 3 m

Height of antenna: 1 – 4 m

Measurements were performed for both polarizations of receiving antenna.

Measurement results:

Measurement results in frequency range are given in appendix **MRE 15 01**.

Conclusion: *Maximal level of disturbing radiated emissions is below limit of ETSI EN 300 386 v1.6.1:2012.*

SFEI STU v BRATISLAVE	SKÚŠOBŇA Fakulty elektrotechniky a informatiky STU	Ilkovičova 3 812 19 BRATISLAVA
-----------------------------	---	-----------------------------------

Test: Test of immunity against electrostatic discharge according to EN 61000-4-2:2009

Test subject: Remote Monitoring System VT8101

Serial number: 6545

Manufacturer: Vutlan s.r.o., Ulica Svornosti 43, 821 06 Bratislava

Date of measurement: 16. 1. 2015

Test instrumentation:

- a. electrostatic discharge simulator Haefely Trench PESD 1600 – Ser. No. H 606 113,
- b. testing place according to EN 61000-4-2.

Metrological properties:

Testing place was verified according to EN 61000-4-2 on 16. 5. 2012, measuring report KP-12/01/EMK.

Conditions of test:

Test place was arranged according to EN 61000-4-2 (Fig. 4). During the test the status of equipment was checked by employee of applicant by PC connected via LAN interface.

Test results:

Table 3: Result of electrostatic discharge test:

Discharge type	Test level	Request of standard	Test results
Indirect – contact discharge	±6 kV	B	A
Direct - contact discharge	±6 kV	B	B
Direct - air (on the plastic part)	±8 kV	B	A

Note: Explanation of criterions is on page 3.

Conclusion: Immunity level of tested device complies with requirements set by ETSI EN 300 386 v1.6.1:2012 and EN 61000-6-2:2005.

SFEI STU v BRATISLAVE	SKÚŠOBŇA Fakulty elektrotechniky a informatiky STU	Ilkovičova 3 812 19 BRATISLAVA
-----------------------------	---	-----------------------------------

Test: **Test of immunity against HF electromagnetic field according to EN 61000-4-3:2006**

Test subject: Remote Monitoring System VT8101

Serial number: 6545

Manufacturer: Vutlan s.r.o., Ulica Svornosti 43, 821 06 Bratislava

Date of measurement: 16. 1. 2015

Test instrumentation:

- a. signal generator Agilent E8257D – Ser. No. MY45141271,
- b. power amplifier 150W1000, Amplifier Research – Ser. No. 0333238,
- c. power amplifier Milmega AS0840-30/17 – Ser. No. 1030085,
- d. TRILOG measuring antenna 30 - 3000 MHz, Schwarzbeck – VULB 9163 - Ser. No. 9163-360,
- e. test place in anechoic shielded chamber according to EN 61000-4-3.

Metrological properties:

Testing place was verified according to EN 61000-4-3 on 4. 10. 2013, measuring report KP-13/01/EMK.

Conditions of test:

Test place was arranged according to EN 61000-4-3 (Fig. 5). During the test the status of the equipment was checked by employee of applicant. The checking was realized by PC located outside the shielded room and connected via LAN interface.

Frequency range: 80 – 2700 MHz
 Modulation: AM 80 % 1 kHz in whole frequency range
 Polarization: horizontal and vertical.

Test results:

Table 4: Result of immunity test against electromagnetic field

Frequency range	Test level	Request of standard	Test results
80 – 2000 MHz	10 V/m	A	A
2000 – 2700 MHz	3 V/m	A	A

Note: Explanation of criterions is on page 3.

Conclusion: *Immunity level of tested device complies with requirements set by ETSI EN 300 386 v1.6.1:2012 and EN 61000-6-2:2005.*

SFEI STU v BRATISLAVE	SKÚŠOBŇA Fakulty elektrotechniky a informatiky STU	Ilkovičova 3 812 19 BRATISLAVA
-----------------------------	---	-----------------------------------

Test: **Test of immunity against EFT/Burst pulses according to EN 61000-4-4:2004**

Test subject: Remote Monitoring System VT8101

Serial number: 6545

Manufacturer: Vutlan s.r.o., Ulica Svornosti 43, 82106 Bratislava

Date of measurement: 16. 1. 2015

Test instrumentation:

- a. EFT/Burst simulator EFT500N5 – Ser. No. V0947105565,
- b. capacitive clamp according to EN 61000-4-4,
- c. test place for immunity against EFT/Burst testing according to EN 61000-4-4.

Metrological properties:

Testing generator was verified according to EN 61000-4-4 on 15. 12. 2014, measuring report KP-14/06/EMK.

Conditions of test:

Test place was arranged according to EN 61000-4-4 (Fig. 6). The immunity was tested only at those cables which length may be longer than 3 m. During the test the status of the equipment was checked by employee of applicant. The checking was realized by PC connected via LAN interface.

Test results:

Table 5: Result of immunity test against EFT/Burst $f = 5$ kHz, 15/300 ms

Wire	Coupling	Test level	Request of standard	Test results
Supply AC	CDN	± 2 kV	B	A
LAN	Cap. clamp	± 1 kV	B	A

Note: Explanation of criterions is on page 3.

Conclusion: *Immunity level of tested device complies with requirements set by ETSI EN 300 386 v1.6.1:2012 and EN 61000-6-2:2005.*

SFEI STU v BRATISLAVE	SKÚŠOBŇA Fakulty elektrotechniky a informatiky STU	Ilkovičova 3 812 19 BRATISLAVA
-----------------------------	---	-----------------------------------

Test: **Test of immunity against SURGE pulses according to EN 61000-4-5:2006**

Test subject: Remote Monitoring System VT8101

Serial number: 6545

Manufacturer: Vutlan s.r.o., Ulica Svornosti 43, 82106 Bratislava

Date of measurement: 16. 1. 2015

Test instrumentation:

- surge simulator VCS 500-M, EM TEST – Ser. No. V0548100910,
- CDN for data line 250V/10A according to EN 61000-4-5,
- CDN for telecommunication line according to EN 61000-4-5,
- test place according to EN 61000-4-5.

Metrological properties:

Test simulator was verified according to EN 61000-4-5 on 15. 12. 2014, measuring report KP-14/05/EMK.

Conditions of measurement:

Test place was arranged according to EN 61000-4-5. Five pulses of both polarities were applied with repetition time of 1 minute. The pulses were applied to all test ports. During the test the status of the equipment was checked by employee of applicant. The checking was realized by PC connected via LAN interface.

Test results:

Table 6: Result of immunity test against SURGE

Tested port	Coupling impedance	Test level	Request of standard	Test results
L / N	2 Ω	± 1 kV	B	A
L / PE, N / PE	12 Ω	± 2 kV	B	A
LAN	42 Ω	± 1 kV	B	A

Note: Explanation of criterions is on page 3.

Conclusion: *Immunity level of tested device complies with requirements set by ETSI EN 300 386 v1.6.1:2012 and EN 61000-6-2:2005.*

SFEI STU v BRATISLAVE	SKÚŠOBŇA Fakulty elektrotechniky a informatiky STU	Ilkovičova 3 812 19 BRATISLAVA
-----------------------------	---	-----------------------------------

Test: **Test of immunity against conducted interference according to EN 61000-4-6:2009**

Test subject: Remote Monitoring System VT8101

Serial number: 6545

Manufacturer: Vutlan s.r.o., Ulica Svornosti 43, 821 06 Bratislava

Date of measurement: 16. 1. 2015

Test instrumentation:

- a. signal generator Agilent E8257D – Ser. No. MY45141271,
- b. power amplifier Prana 1AP32DT150 – Ser. No. 0511-0697,
- c. set of coupling/decoupling networks (CDN) according to EN 61000-4-6,
- d. injection clamp EM101 – Ser. No. 35639,
- e. injection clamp EM101 – Ser. No. 35976,
- f. attenuator 6 dB/12 W,
- g. test place according to EN 61000-4-6.

Metrological properties:

Test place and CDNs were verified according to EN 61000-4-6 on 13. 1. 2015, measuring report KP-15/02/EMK.

Conditions of measurement:

Test place was arranged according to EN 61000-4-6 (Fig. 7). The immunity was tested only at those cables which length may be longer than 3 m. During the test the status of the equipment was checked by employee of applicant. The checking was realized by PC located outside the shielded room and connected via LAN interface.

Frequency range: 0.15 – 80 MHz

Modulation: AM 80 % 1 kHz in whole frequency range

Test results:

Table 7: Result of immunity test against conducted interference.

Cable	CDN	Test level	Request of standard	Test results
Supply AC	M-3	10 V	A	A
LAN	EM-101	10 V	A	A

Note: Explanation of criterions is on page 3.

Conclusion: *Immunity level of tested device complies with requirements set by ETSI EN 300 386 v1.6.1:2012 and EN 61000-6-2:2005.*

SFEI STU v BRATISLAVE	SKÚŠOBŇA Fakulty elektrotechniky a informatiky STU	Ilkovičova 3 812 19 BRATISLAVA
-----------------------------	---	-----------------------------------

Test: **Test of immunity against voltage dips, short interruptions and voltage fluctuations according to EN 61000-4-11:2004**

Test subject: Remote Monitoring System VT8101

Serial number: 6545

Manufacturer: Vutlan s.r.o., Ulica Svornosti 43, 821 06 Bratislava

Date of measurement: 16. 1. 2015

Test instrumentation:

- programmable AC source Chroma 61503 – Ser. No. 00000253,
- test place according to EN 61000 - 4 - 11.

Metrological properties:

Test place was verified according to EN 61000-4-11 on 10.12.2014, measuring report KP-14/04/EMK.

Conditions of measurement:

Test place was arranged according to EN 61000-4-11. Fluctuations and dips of voltage were generated by programmable AC source. During the test the status of the equipment was checked by employee of applicant. The checking was realized by PC connected via LAN interface.

Test results:

Tab. 8: Result of immunity test against voltage dips and short interruptions

Type	Duration	Status	Standard requirement	Test result
Interruption	250 periods	Voltage dip with automatic recover of function	C	C
Interruption	1 period	Normal status	B	A
Interruption	0.5 period	Normal status	B	A
Drop to 70 %	25 periods	Normal status	C	A
Drop to 40 %	10 periods	Normal status	C	A

Note: Explanation of criterions is on page 3.

Conclusion: *Immunity level of tested device complies with requirements set by ETSI EN 300 386 v1.6.1:2012 and EN 61000-6-2:2005.*

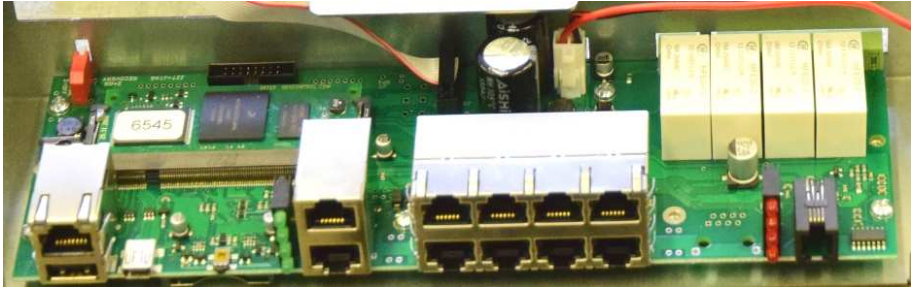


Fig.1: Identification of the equipment.

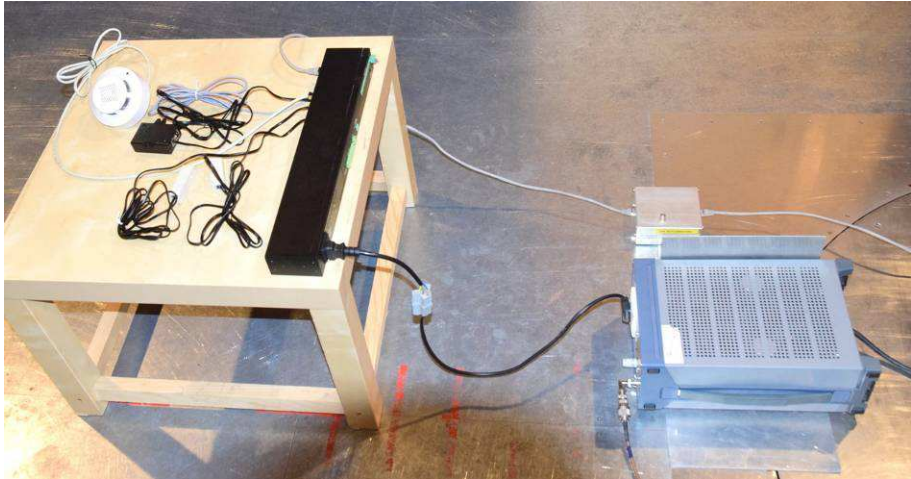


Fig.2: Arrangement of measured sample during conducted emission measurement.

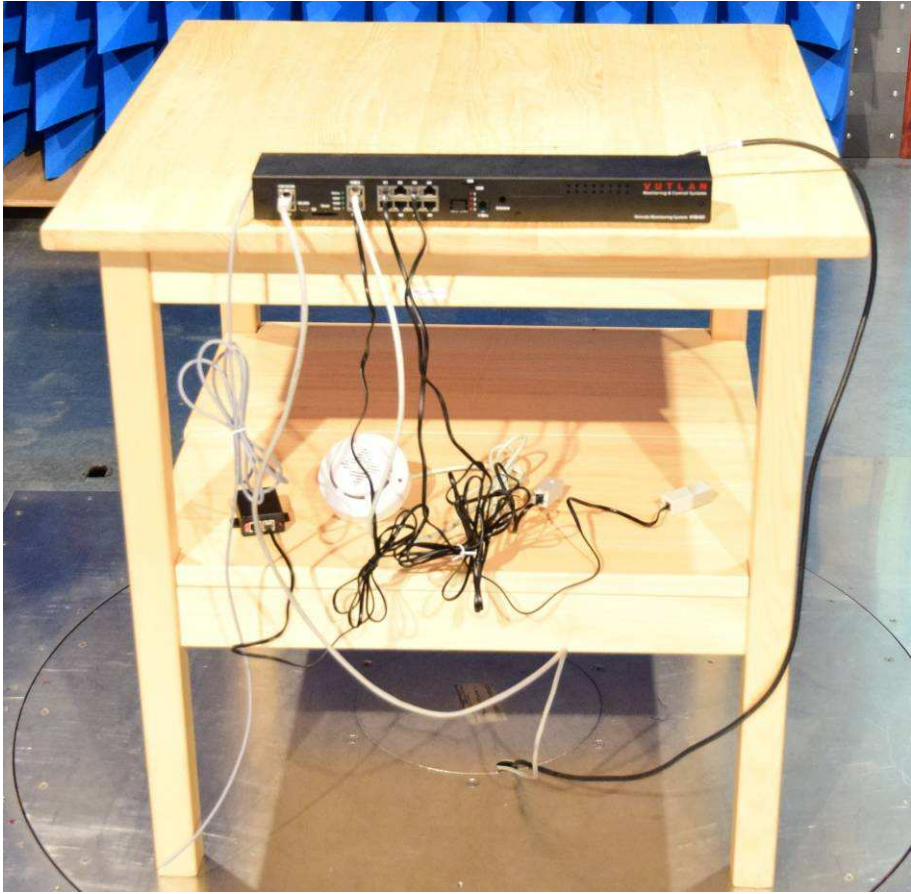


Fig.3: Arrangement of measured sample during radiated emission measurement.

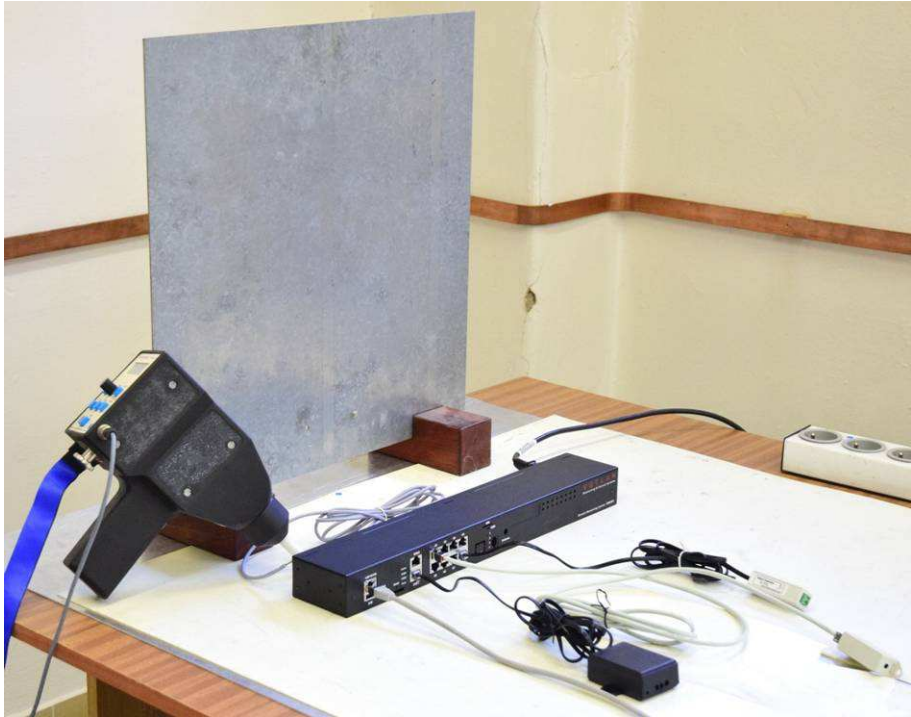


Fig.4: Arrangement of tested sample during the test according to EN 61000-4-2.



Fig.5: Arrangement of tested sample during the test according to EN 61000-4-3.



Fig.6: Arrangement of tested sample during the test according to EN 61000-4-4.

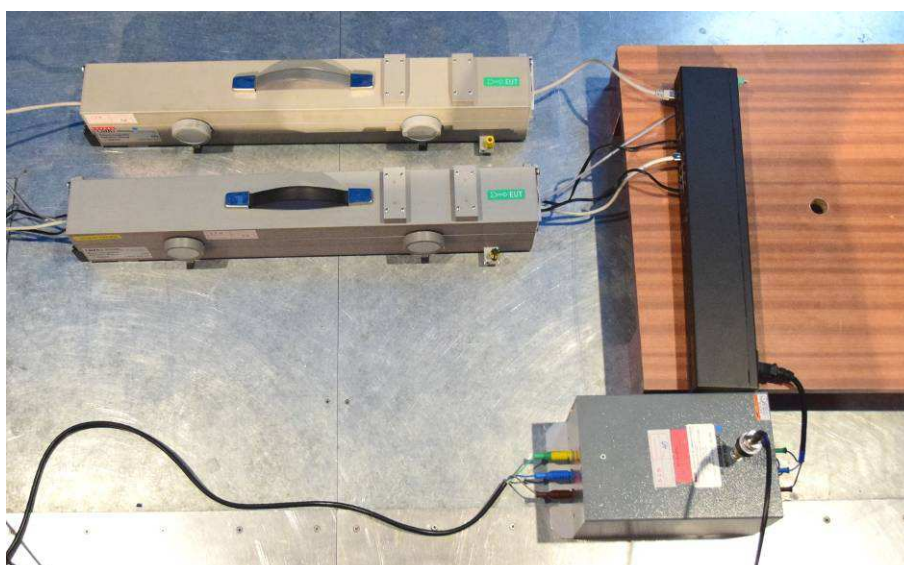


Fig.7: Arrangement of tested sample during the test according to EN 61000-4-6.

<p style="text-align: center;">SFEI STU v BRATISLAVE</p>	<p style="text-align: center;">SKÚŠOBŇA Fakulty elektrotechniky a informatiky STU</p>	<p style="text-align: center;">Ilkovičova 3 812 19 BRATISLAVA</p>
--	--	---

Place and date of test report edition: **Bratislava, 22. 01. 2015**

Test executed by: **A. Krammer, MSc.**

Report created by: **J. Hallon, PhD.**

Test results verified by: **Assoc. Prof. K. Kováč, PhD.**

————— **End of test report** —————

EMI Measurement Test Report Conducted Emission

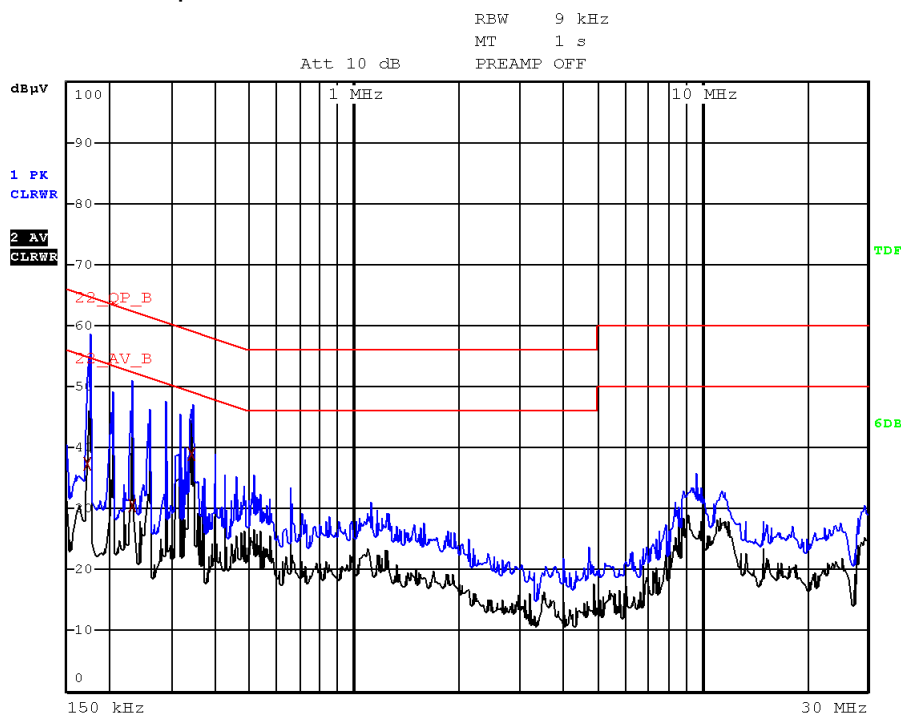
Equipment Under Test: Remote monitoring system VT8101
Operating Conditions: Standard
Operator: A. Krammer
Test Specification: EN 55022
Limit: EN 55022 (B class)
Date: 16. 1. 2015

Measurement 1: Input L

Scan Settings (1 Range)

Frequencies			Receiver Settings		Detectors			
Start	Stop	Step	Res BW	M-Time	Pre-measurement		Final-measurement	
150 kHz	30 MHz	4 kHz	9 kHz	100 ms	PK+	AV	QP	AV

Pre-measurement Graph



Final Measurement Results:

Trace	Frequency [MHz]	Level [dBµV/m]	Limit [dBµV/m]	Delta Limit [dB]
AV	0.174	37.48	54.77	-17.29
AV	0.230	30.50	52.45	-21.95
AV	0.338	38.94	49.25	-10.31

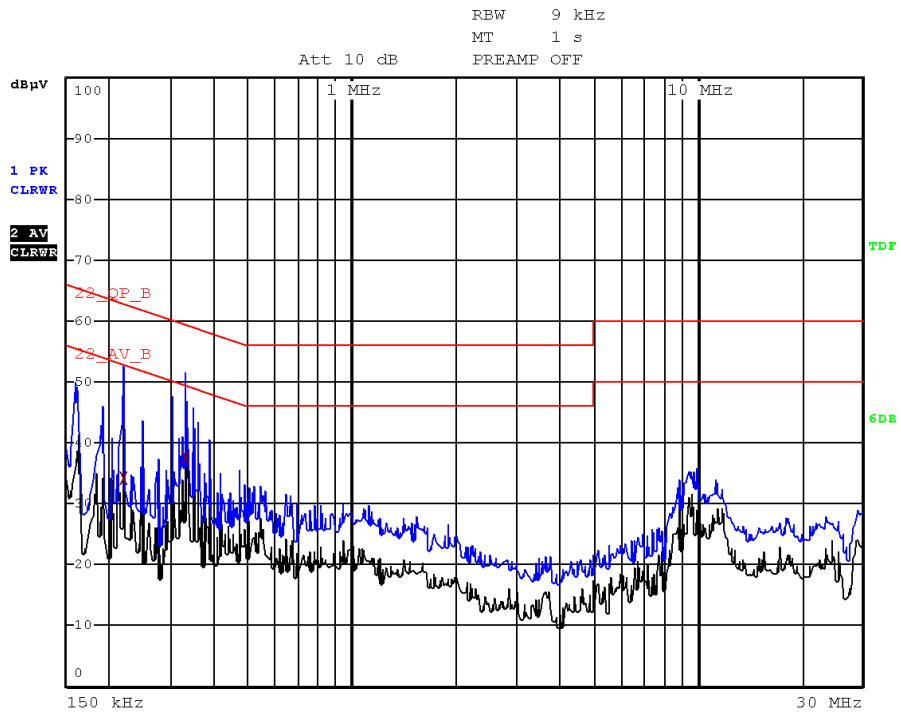
* = limit exceeded

Measurement 2: Input N

Scan Settings (1 Range)

Frequencies			Receiver Settings		Detectors			
Start	Stop	Step	Res BW	M-Time	Pre-measurement		Final-measurement	
150 kHz	30 MHz	4 kHz	9 kHz	100 ms	PK+	AV	QP	AV

Pre-measurement Graph



Final Measurement Results:

Trace	Frequency [MHz]	Level [dBµV/m]	Limit [dBµV/m]	Delta Limit [dB]
AV	0.218	34.21	52.89	-18.68
AV	0.330	37.68	49.45	-11.77

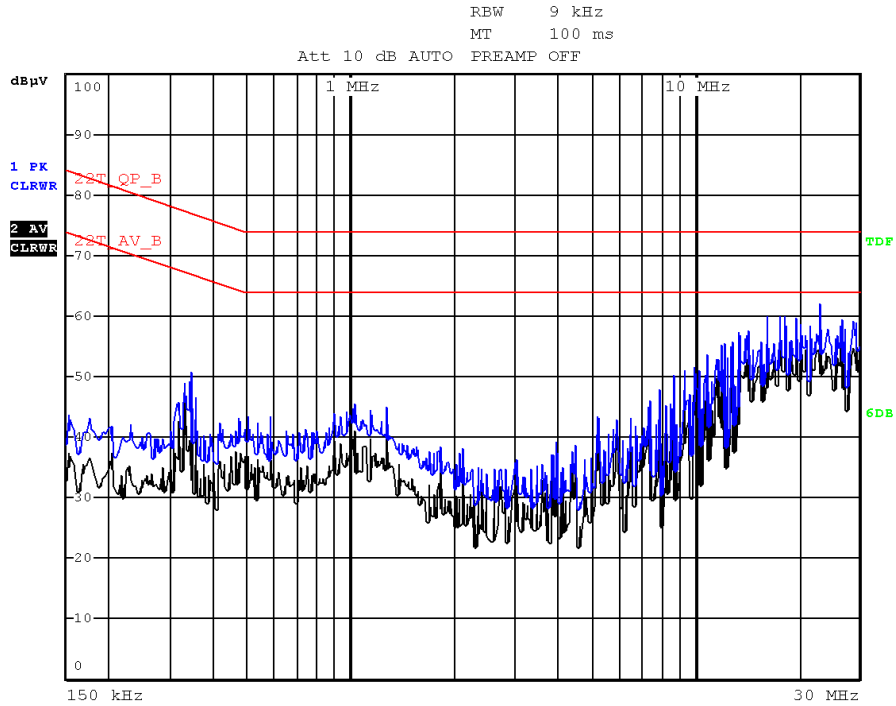
* = limit exceeded

Measurement 3: LAN

Scan Settings (1 Range)

Frequencies			Receiver Settings		Detectors			
Start	Stop	Step	Res BW	M-Time	Pre-measurement		Final-measurement	
150 kHz	30 MHz	4 kHz	9 kHz	100 ms	PK+	AV	QP	AV

Pre-measurement Graph



Final Measurement Results:

Explanation: As the pre-measurement peak and average detector values were more than 6 dB below limits, the final measurement was not realized.

EMI Measurement Test Report Radiated Emission

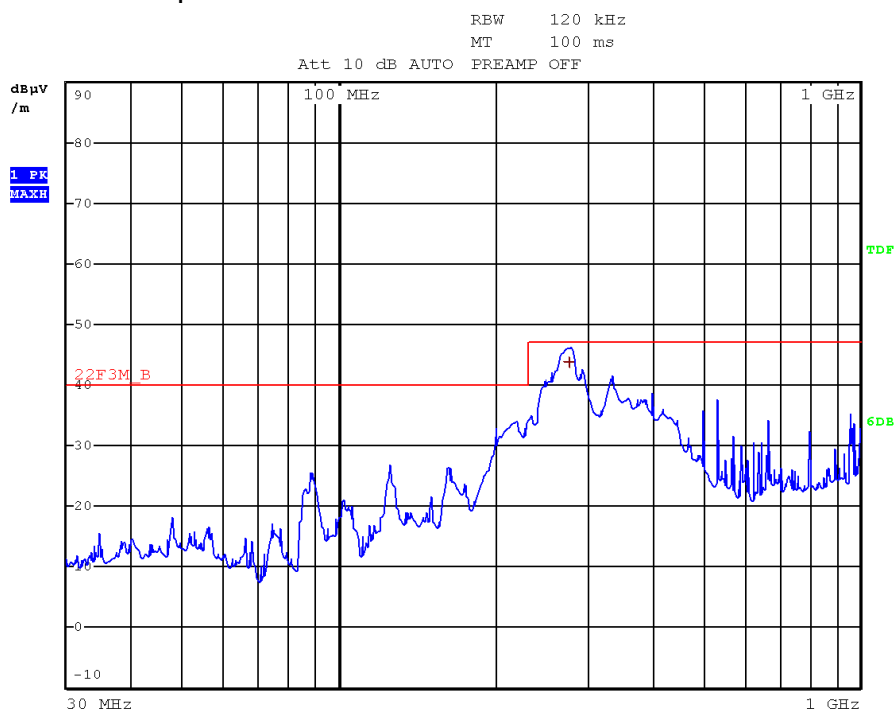
Equipment Under Test: Remote monitoring system VT8101
Operating Conditions: Standard
Operator: A. Krammer
Test Specification: EN 55022
Limit: EN 55022 (B class, for 3 m measurement test place)
Date: 16. 1. 2015

Measurement 1: Horizontal

Scan Settings (2 Ranges)

Frequencies			Receiver Settings		Detectors	
Start	Stop	Step	Res BW	M-Time	Pre-measurement	Final-measurement
30 MHz	1000 MHz	40 kHz	120 kHz	1 ms	PK+	QP
1000 MHz	2000 MHz	40 kHz	1 MHz	1 ms	PK+ / AV	PK+ / AV

Pre-measurement Graph

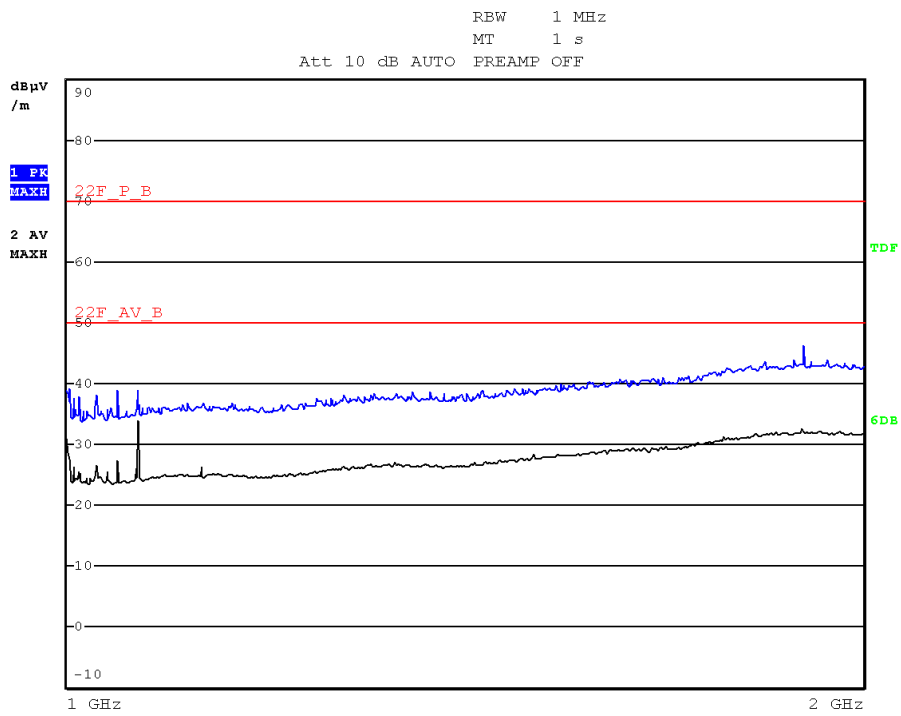


Final Measurement Results:

Trace	Frequency [MHz]	Level [dBµV/m]	Limit [dBµV/m]	Delta Limit [dB]
QP	278.560	43.92	47.00	-3.08

* = limit exceeded

Pre-measurement Graph



Final Measurement Results:

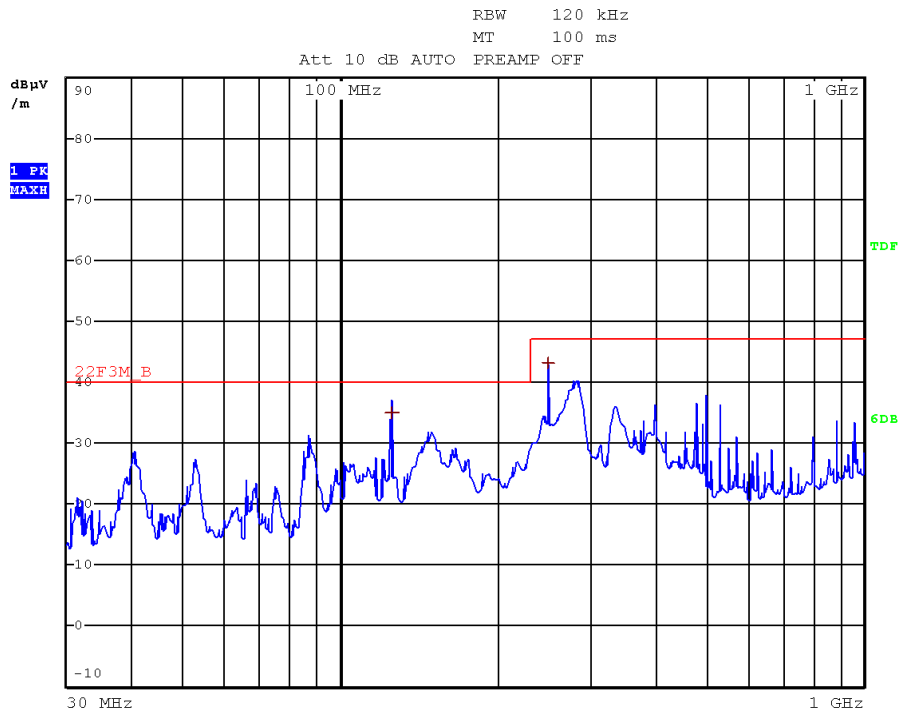
Explanation: As the pre-measurement peak and average detector values were more than 6 dB below limits, the final measurement was not realized.

Measurement 2: Vertical

Scan Settings (2 Ranges)

Frequencies			Receiver Settings		Detectors	
Start	Stop	Step	Res BW	M-Time	Pre-measurement	Final-measurement
30 MHz	1000 MHz	40 kHz	120 kHz	1 ms	PK+	QP
1000 MHz	2000 MHz	40 kHz	1 MHz	1 ms	PK+ / AV	PK+ / AV

Pre-measurement Graph

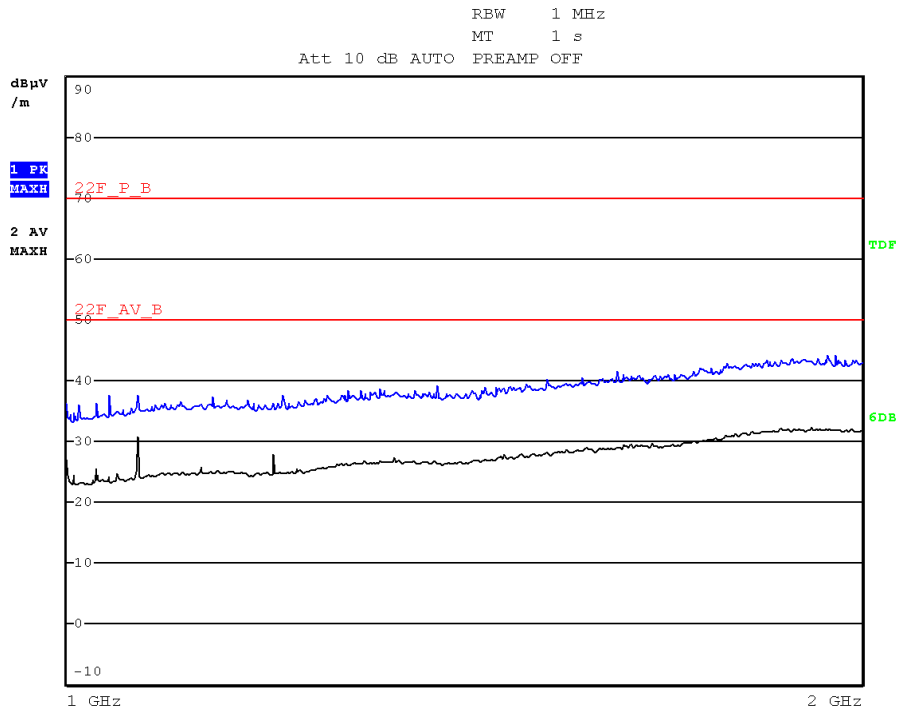


Final Measurement Results

Trace	Frequency [MHz]	Level [dBµV/m]	Limit [dBµV/m]	Delta Limit [dB]
QP	125.000	34.92	40.00	-5.08
QP	250.000	43.38	47.00	-3.62

* = limit exceeded

Pre-measurement Graph



Final Measurement Results:

Explanation: As the pre-measurement peak and average detector values were more than 6 dB below limits, the final measurement was not realized.