



Registration No. DAT-P-207/05

EMI -- TEST REPORT

- FCC Part 15B -

Test Report No. :	T32788-00-01AA	03. November 2008
		Date of issue

Type / Model Name : RRUI4-RS4-U4

Product Description : Kathrein UHF-RFID Reader

Applicant : Kathrein Burgstädt GmbH

Address : Lindenstraße 3, Gewerbegebiet

D-09241 Mühlau

Manufacturer : Kathrein Burgstädt GmbH

Address : Lindenstraße 3, Gewerbegebiet

D-09241 Mühlau

Licence holder : Kathrein Burgstädt GmbH

Address : Lindenstraße 3, Gewerbegebiet

D-09241 Mühlau

Test Result according to the standards listed in clause 1 test standards:	POSITIVE
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DAT-P-207/05-00

The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

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1 TEST STANDARDS

The tests were performed according to following standards:

FCC Rules and Regulations Part 15 Subpart A - General (October 01, 2007)

Part 15, Subpart A, Section 15.31	Measurement standards
Part 15, Subpart A, Section 15.33	Frequency range of radiated measurements
Part 15, Subpart A, Section 15.35	Measurement detector functions and bandwidths

FCC Rules and Regulations Part 15 Subpart B - Unintentional Radiators (October 01, 2007)

Part 15, Subpart B, Section 15.107	AC Line conducted emissions,	Class B
Part 15, Subpart B, Section 15.109	Radiated emissions, general requirements,	Class B

ANSI C63.4: 2003	Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
ANSI C95.1:1992	IEEE Standard for Safety Levels with respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz
CISPR 16-4-2: 2003	Uncertainty in EMC measurement
CISPR 22: 2005 EN 55022: 2006	Information technology equipment

2 SUMMARY

GENERAL REMARKS:

The EuT is capable to exchange data with a PC via USB cable.

This test report describes the radiated and conducted disturbance produced by the data transfer via USB cable and the power supply (ancilliary equipment).

The measurement has been performed in standby mode.

The EuT is declared as Class B digital device.

FINAL ASSESSMENT:

The equipment under test **fulfills** the EMI requirements cited in clause 1 test standards.

Date of receipt of test sample : acc. to storage records

Testing commenced on : 31 July 2008

Testing concluded on : 07 August 2008

Checked by:

Tested by:

Klaus Gegenfurtner
Dipl.-Ing.(FH)
Manager: Radio Group

Anton Altmann
Dipl.-Ing.(FH)

3 EQUIPMENT UNDER TEST

3.1 Photo documentation of the EUT – Detailed photos see Attachment A

3.2 Power supply system utilised

Power supply voltage : 115 V / 60 Hz / 1 ϕ

3.3 Short description of the equipment under test (EUT)

The EUT RRUI4 is a RFID reader. It can read active and passive Tags in the frequency range from 902 to 928 MHz. It can read and write Tags using EPC Gen2 standard. 4 antenna connectors are available. Data are transferred via USB cable to a PC.

Number of tested samples: 1
Serial number: 52010025

The equipment under test was operated during the measurement under the following conditions:

- Data download via USB

-

-

EUT configuration:

(The CDF filled by the applicant can be viewed at the test laboratory.)

The following peripheral devices and interface cables were connected during the measurements:

- AC-DC Adapter	Model : ETC45-24
- USB data cable	Model : Standard cable
- 2 directional antennas	Model : 30°-80° CP, 90° CP
-	Model :
-	Model :
-	Model :

4 TEST ENVIRONMENT

4.1 Address of the test laboratory

mikes-testingpartners gmbh
Ohmstrasse 2-4
94342 Strasskirchen
Germany

4.2 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature: 15-35 ° C

Humidity: 30-60 %

Atmospheric pressure: 86-106 kPa

4.3 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader may notice that tolerances within the calibration of the equipment and facilities may cause additional uncertainty. The measurement uncertainty is calculated for all measurements listed in this test report acc. to CISPR 16-4-2 „Uncertainties, statistics and limit modelling – Uncertainty in EMC measurement“ and documented in the mikes-testingpartners gmbh quality system acc. to DIN EN ISO/IEC 17025. For all measurements shown in this report, the measurement uncertainty of the test laboratory, mikes-testingpartners gmbh, is below the measurement uncertainty as defined by CISPR. Therefore, no special measures must be taken into consideration with regard to the limits according to CISPR. Furthermore, component diversity and modifications in production processes may result in additional deviation. If necessary, refer to the test lab for the actual measurement uncertainty for specific tests. The manufacturer has the sole responsibility of continued compliance of the EUT.

4.4 Measurement Protocol for FCC, VCCI and AUSTEL

4.4.1 GENERAL INFORMATION

4.4.1.1 Test Methodology

Conducted and radiated disturbance testing is performed according to the procedures set out by the International Special Committee on Radio Interference (CISPR) Publication 22, European Standard EN 55022 as shown under section 1 of this report.

The test methods used comply with CISPR Publication 22, EN 55022 - "Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement" and with ANSI C63.4 - "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz."

In compliance with 47 CFR Part 15 Subpart A, Section 15.38 testing for FCC compliance may be achieved by following the procedures set out in ANSI C63.4 and applying the CISPR 22 limits.

4.4.1.2 Justification

The Equipment under Test (EUT) is configured in a typical user arrangement in accordance with the manufacturer's instructions. A cable is connected to each available port and either terminated with a peripheral using the appropriate impedance characteristic or left unterminated. Where appropriate, cables are manually manipulated with respect to each in order to obtain maximum disturbances from the unit.

4.4.2 DETAILS OF TEST PROCEDURES

4.4.2.1 General Standard Information

The test methods used comply with CISPR Publication 22, EN 55022 - "Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement" and with ANSI C63.4 - "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz."

5 TEST CONDITIONS AND RESULTS

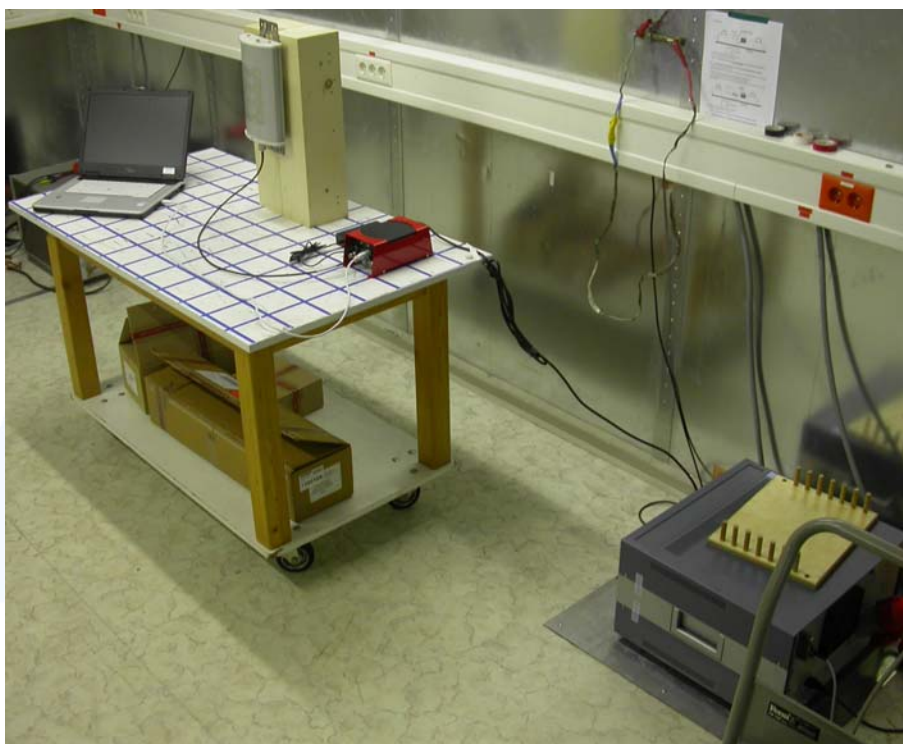
5.1 Conducted emissions

For test instruments and accessories used see section 6 Part A 4.

5.1.1 Description of the test location

Test location: Shielded Room S2

5.1.2 Photo documentation of the test set-up



5.1.3 Applicable standard

According to FCC Part 15B, Section 15.107(a):

Except as shown in paragraphs (b) and (c) of this Section, for an unintentional radiator that is designed to be connected to the public utility AC power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table.

Frequency of emission (MHz)	Conducted limit (dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency

5.1.4 Description of Measurement

The correction factors for cable loss and antenna gain are stored in the memory of the EMI receiver therefore the final level (dBμV) appears directly in the reading of the EMI receiver. This level is compared to the FCC limit.

To convert between dBμV and μV, the following conversions apply:

$$\text{dB}\mu\text{V} = 20(\log \mu\text{V})$$

$$\mu\text{V} = 10^{(\text{dB}\mu\text{V}/20)}$$

The measurements are performed using a receiver, which has CISPR characteristic bandwidth and quasi-peak detection and a line impedance stabilization network (LISN) with 50Ω/50 μH (CISPR 16) characteristics. Table top equipment is placed on a non-conducting table 80 centimetres above the floor and is positioned 40 centimetres from the vertical ground plane (wall) of the screen room. If the minimum limit margin appears to be less than 20 dB with a peak mode measurement, the emissions are remeasured using a tuned receiver with quasi-peak and average detection and recorded on the data sheets.

5.1.5 Test result

Frequency range: 0.15 MHz - 30 MHz

Min. limit margin 8.7 dB

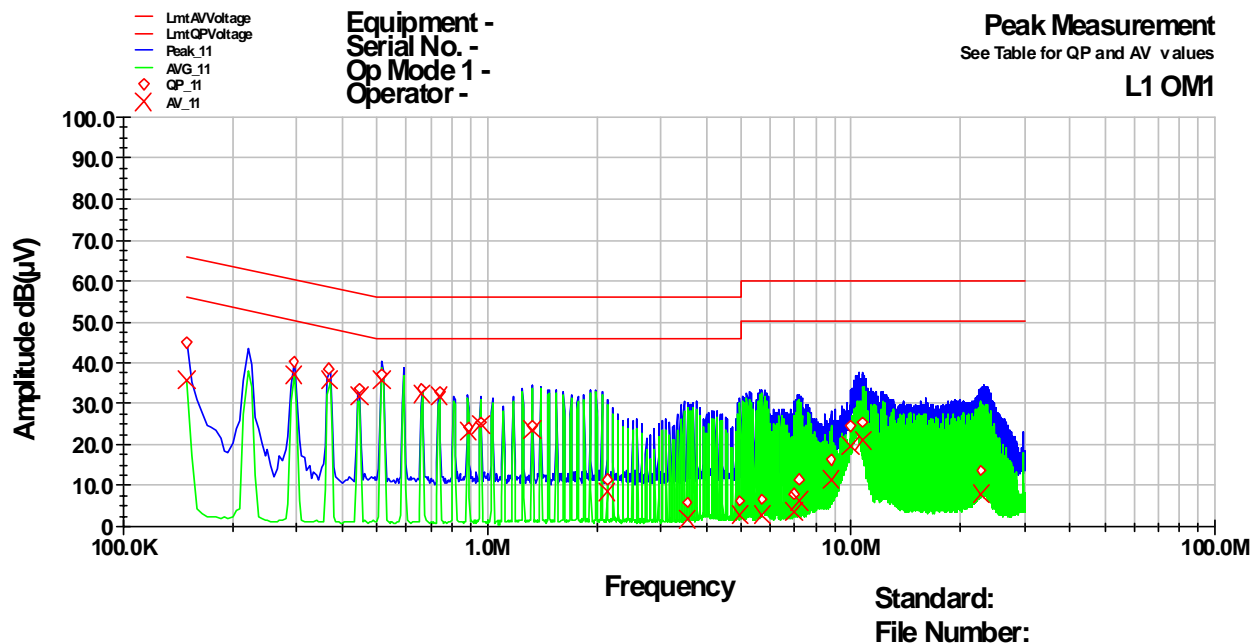
The requirements are **FULFILLED**.

Remarks:

5.1.6 Test protocol

Test point L1
Operation mode: Data download via USB
Remarks:

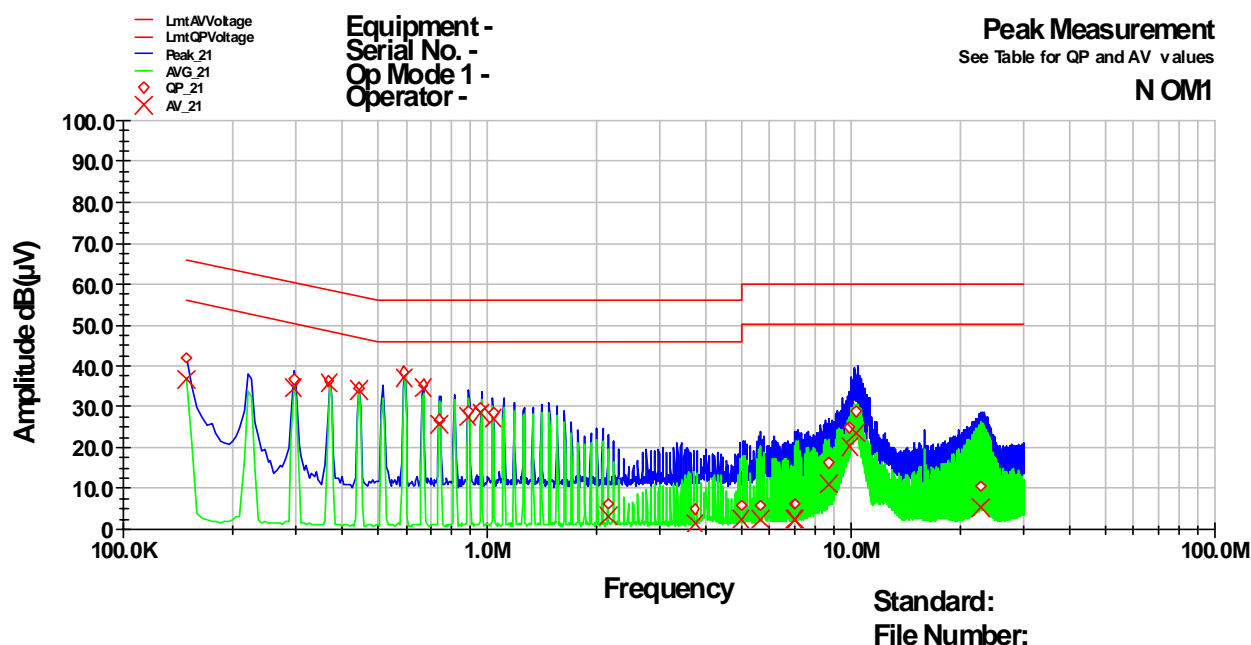
Result: passed



Frequency MHz	QP Level dB(μV)	QP Margin dB	QP Limit dB	AV Level dB(μV)	AV Margin dB	AV Limit dB
0.15	45.0	-21.0	66.0	35.8	-20.2	56.0
0.295	40.0	-20.3	60.4	37.2	-13.1	50.4
0.37	38.3	-20.2	58.5	35.7	-12.8	48.5
0.445	33.7	-23.3	57.0	32.1	-14.8	47.0
0.515	37.1	-18.9	56.0	35.8	-10.2	46.0
0.665	33.6	-22.4	56.0	32.4	-13.6	46.0
0.74	32.8	-23.2	56.0	32.0	-14.0	46.0
0.885	23.9	-32.1	56.0	23.0	-23.0	46.0
0.96	25.5	-30.5	56.0	24.8	-21.2	46.0
1.33	24.5	-31.5	56.0	23.5	-22.5	46.0
2.145	11.3	-44.7	56.0	8.6	-37.4	46.0
3.55	5.7	-50.3	56.0	2.0	-44.0	46.0
4.955	6.4	-49.6	56.0	2.6	-43.4	46.0
5.695	6.7	-53.3	60.0	2.7	-47.3	50.0
6.955	7.8	-52.2	60.0	3.6	-46.4	50.0
7.175	11.4	-48.6	60.0	6.2	-43.8	50.0
8.805	16.2	-43.8	60.0	11.6	-38.5	50.0
9.99	24.5	-35.5	60.0	19.9	-30.1	50.0
10.805	25.5	-34.5	60.0	21.0	-29.0	50.0
22.685	13.7	-46.3	60.0	7.9	-42.1	50.0

Test point: N
Operation mode: Data download via USB
Remarks:

Result: passed



Frequency MHz	QP Level dB(μV)	QP Margin dB	QP Limit dB	AV Level dB(μV)	AV Margin dB	AV Limit dB
0.15	41.7	-24.3	66.0	36.7	-19.3	56.0
0.295	36.6	-23.8	60.4	34.7	-15.7	50.4
0.37	36.1	-22.4	58.5	35.7	-12.8	48.5
0.445	34.7	-22.3	57.0	34.2	-12.8	47.0
0.595	38.4	-17.6	56.0	37.3	-8.7	46.0
0.67	35.3	-20.7	56.0	34.4	-11.6	46.0
0.74	26.6	-29.4	56.0	25.6	-20.4	46.0
0.89	29.0	-27.0	56.0	27.8	-18.2	46.0
0.965	29.6	-26.4	56.0	28.3	-17.8	46.0
1.04	28.5	-27.5	56.0	27.2	-18.8	46.0
2.155	6.3	-49.7	56.0	3.1	-42.9	46.0
3.715	4.9	-51.1	56.0	1.3	-44.7	46.0
4.98	5.7	-50.3	56.0	2.2	-43.8	46.0
5.65	5.7	-54.3	60.0	2.2	-47.8	50.0
6.99	6.3	-53.8	60.0	2.2	-47.8	50.0
7.065	6.4	-53.5	60.0	2.4	-47.6	50.0
8.705	16.2	-43.8	60.0	11.0	-39.0	50.0
9.97	25.1	-34.9	60.0	20.0	-30.0	50.0
10.34	29.0	-31.0	60.0	23.7	-26.3	50.0
22.87	10.8	-49.2	60.0	5.3	-44.7	50.0

5.2 Radiated emissions

For test instruments and accessories used see section 6 Part **SER 2**.

5.2.1 Description of the test location

Test location: OATS1

Test distance: 3 metres

5.2.2 Photo documentation of the test set-up



USB connection between EuT and PC



5.2.3 Applicable standard

According to FCC Part 15B, Section 15.109 (a):

Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 m shall not exceed the given limit.

5.2.4 Description of Measurement

Radiated emissions from the EUT are measured in the frequency range of 30 MHz to 1000 MHz using a tuned receiver and appropriate broadband linearly polarized antennas. Measurements between 30 MHz and 1000 MHz are made with 120 kHz/6 dB bandwidth and quasi-peak detection. Table top equipment is placed on a 1.0 X 1.5 dB(μ V/m) non-conducting table 80 centimetres above the ground plane. Floor standing equipment is placed directly on the turntable/ground plane. The set up of the equipment under test will be in accordance to ANSI C63.4. The interface cables that are closer than 40 cm to the ground plane are bundled in the center in a serpentine fashion so they are at least 40 cm from the ground plane. Cables to simulators/testers (if used in this test) are routed through the center of the table and to a screen room located outside the test area. The antenna was positioned 3 m horizontally from the EUT. To locate maximum emissions from the test sample the antenna is varied in height from 1 to 4 metres, measurement scans are made with horizontal and vertical antenna polarization and the EUT is rotated 360 degrees. The radiated emissions from the EUT are measured in the frequency range of 1 GHz to maximum frequency as specified in section 15.33, using a spectrum analyser and appropriate linearly polarized antennas. Table top equipment is placed on a 1.0 X 1.5 metre non-conducting table 80 centimetres above the ground plane. The set up of the equipment under test will be in accordance to ANSI C63.4. The Interface cables that are closer than 40 cm to the ground plane are bundled in the center in a serpentine fashion so they are at least 40 cm from the ground plane. Cables to simulators/testers (if used in this test) are routed through the center of the table and to a screen room located outside the test area. The antenna was positioned 3 m horizontally from the EUT.

Measurements are made in horizontal and vertical polarization in a fully anechoic chamber. All tests are performed at a test distance of 3 m. Hand-held or body-worn devices are rotated through three orthogonal axes to determine the attitude of the highest emission shall be used for final testing. During the tests the EUT is rotated 360° and the cables and equipment are placed and moved in position in such a way to find the maximum emission level. For testing above 1 GHz, the emission level of the EUT in peak mode complies to the average limit is 20 dB lower, then testing will be stopped and peak values of the EUT will be reported, otherwise, the emission will be measured in average mode again and reported.

The resolution bandwidth during the measurement is as following:

30 MHz – 1000 MHz: RBW: 120 kHz

5.2.5 Test result

Frequency (MHz)	L: QP (dBµV)	L: AV (dBµV)	Bandwidth (kHz)	Correct. (dB)	L: QP dB(µV/m)	L: AV dB(µV/m)	Limit dB(µV/m)	Delta (dB)
30 – 88	---	---	120				40	>20
88 – 216	---	---	120				43.5	>20
216 - 960	---	---	120				46	>20
Above 960	---	---	120				54	>20

Note: No unwanted emissions could be measured!

Limit according to FCC part 15B, Section 15.109(a):

Frequency (MHz)	Limit (µV/m)	Limit dB(µV/m)
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
Above 960	500	54

The requirements are **FULFILLED**.

Remarks: The measurement was performed according to FCC Part 15A, Section 15.33(b), up to 1 GHz.

6 USED TEST EQUIPMENT AND ACCESSORIES

All test instruments used are calibrated and verified regularly. The calibration history is available on request.

Test ID	Model Type	Kind of Equipment	Manufacturer	Equipment No.
A 4	ESHS 30	EMI Test Receiver	Rohde & Schwarz München	02-02/03-05-002
	NNLK 8129	LISN	Schwarzbeck Mess-Elektron	02-02/20-05-001
	ESH 2 - Z 5	LISN	Rohde & Schwarz München	02-02/20-05-004
	N-4000-BNC	RF Cable	mikes-testingpartners gmbh	02-02/50-05-138
	N-1500-N	RF Cable	mikes-testingpartners gmbh	02-02/50-05-140
	ESH 3 - Z 2	Pulse Limiter	Rohde & Schwarz München	02-02/50-05-155
	SP 103 /3.5-60	Convertor 220V / 110V	mikes-testingpartners gmbh	02-02/50-05-182
SER 2	ESVS 30	EMI Test Receiver	Rohde & Schwarz München	02-02/03-05-006
	VULB 9168	Trilog-Broadband Anten	Schwarzbeck Mess-Elektron	02-02/24-05-005
	S10162-B	RF Cable 33m	Huber + Suhner	02-02/50-05-031
	KK-EF393-21N-16	RF Cable 20m	Huber + Suhner	02-02/50-05-033
	NW-2000-NB	RF Cable	Huber + Suhner	02-02/50-05-113

mikes

Equipment No.	Next Calib.	Last Calib.	Next Verif.	Last Verif.
A 4				
02-02/03-05-002	04/30/2009	04/30/2008		
02-02/20-05-001	12/09/2008	06/09/2008		
02-02/20-05-004	03/13/2011	03/13/2008	09/13/2008	03/13/2008
02-02/50-05-138				
02-02/50-05-140				
02-02/50-05-155	09/25/2008	03/25/2008		
02-02/50-05-182				
CPR 3				
02-02/11-05-001	04/08/2009	04/08/2008		
02-02/50-07-066				
02-02/50-07-067				
DC				
02-02/11-05-001	04/08/2009	04/08/2008		
02-02/50-07-066				
02-02/50-07-067				
MB				
02-02/11-05-001	04/08/2009	04/08/2008		
02-02/50-07-066				
02-02/50-07-067				
SEC 1-3				
02-02/11-05-001	04/08/2009	04/08/2008		
02-02/50-05-070				
02-02/50-07-066				
02-02/50-07-067				
SER 2				
02-02/03-05-006	07/30/2009	07/30/2008		
02-02/24-05-005	05/06/2011	05/06/2008	08/21/2008	02/21/2008
02-02/50-05-031				
02-02/50-05-033				
02-02/50-05-113				
SER 3				
02-02/11-05-001	04/08/2009	04/08/2008		
02-02/17-05-003				
02-02/17-05-004				
02-02/17-06-002				
02-02/24-05-009	01/16/2009	01/16/2008		
02-02/50-05-073				
02-02/50-05-075				