PIM SERVICES & SOLUTIONS

PASSIVE INTER MODULATION

DRIVETEL SA

Product and Technical Support at Drivetel SA

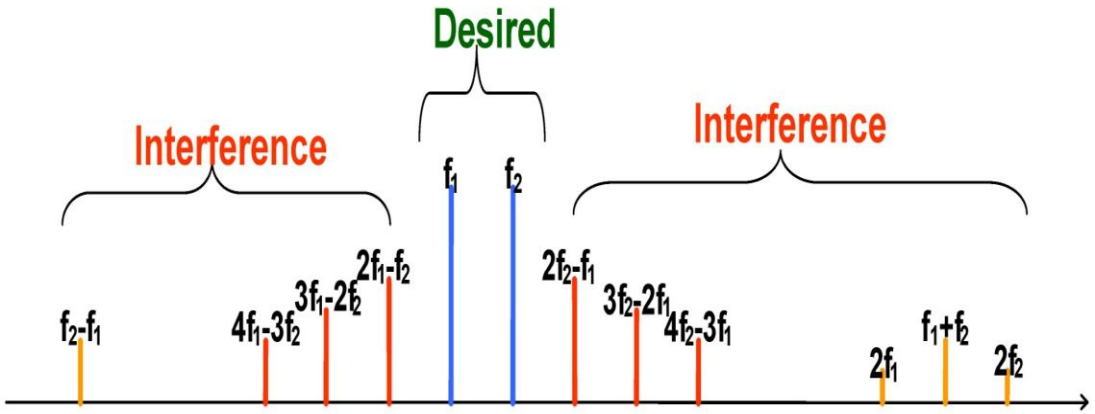
Topics

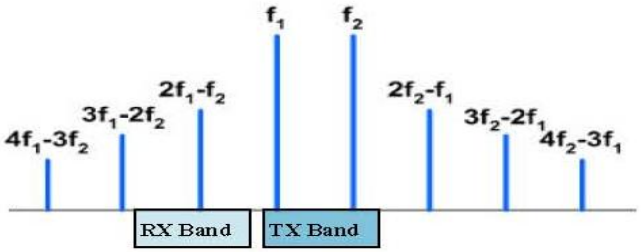
- Introduction
- Fundamentals
- Motives
- Equipment PIM - iQA
- Case Study
- Examples

Passive Inter modulation Fundamentals

What is PIM?

PIM = Noise generated by the interaction between the multiple Tx signals and passive non-linear junctions in the RF path.





Example: f_1 = 869 MHz, f_2 = 894 MHz

IM3 = 2x 869 MHz - 1x 894 MHz = 844 MHz
IM3 = 2x 894 MHz - 1x 869 MHz = 919 MHz
IM5 = 3x 869 MHz - 2x 894 MHz = 819 MHz
IM5 = 3x 894 MHz - 2x 869 MHz = 944 MHz

PIM generated products will affect received band (UL) by Increasing the received Noise floor thus reducing base station sites coverage and capacity.

Motives

PIM Sources

Non-linear metal-to-metal contacts:

→ Loose RF connectors

→ Poorly prepared RF cable terminations

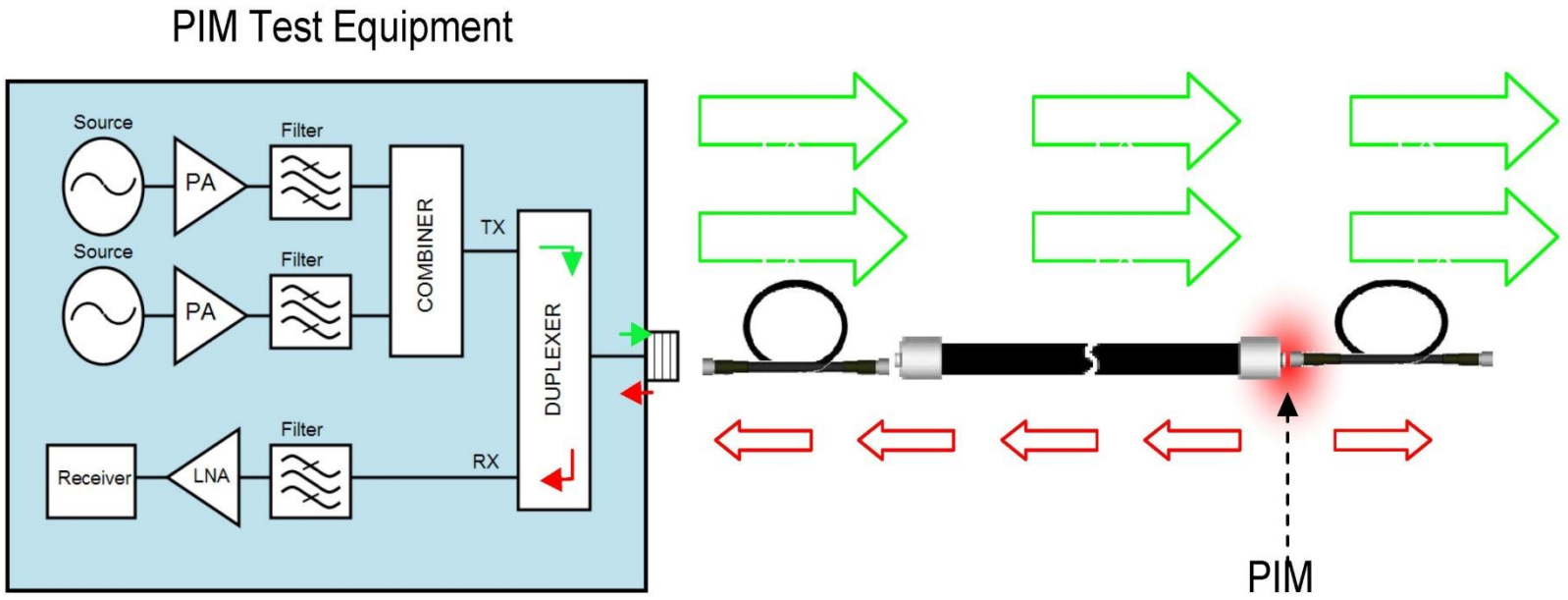
→ Improperly mated / misaligned parts

→ Cracked / cold solder joints

→Loose mechanical fasteners
(screws, rivets)

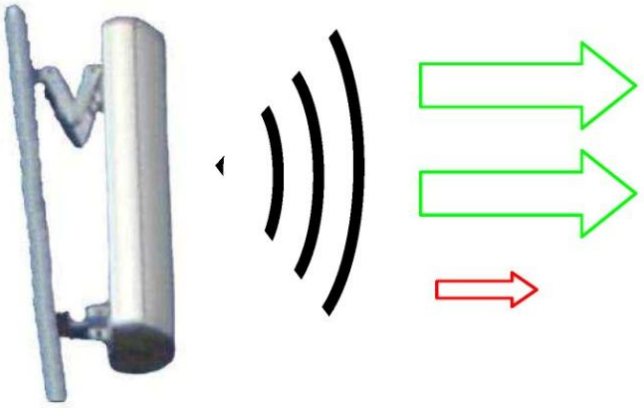
Traditional sweep (RL or DTF) testing many times doesn't identify these problems.
PIM doesn't substitute the VSWR tests, they are as a complementary measurement.

Equipment



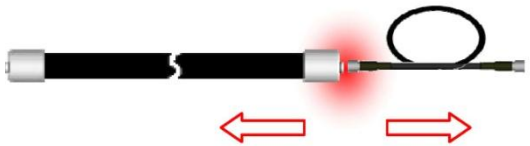
F1 → 2W/33dBm & 20W/43dBm

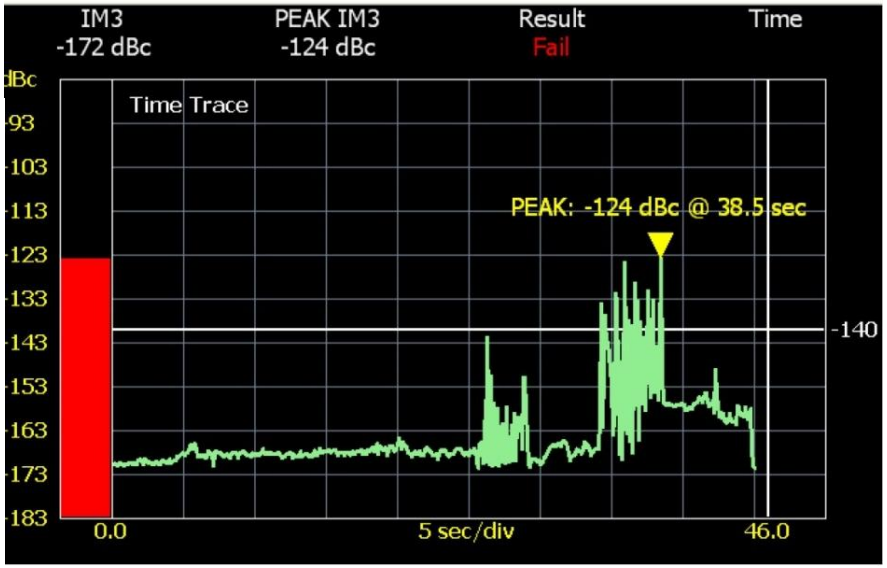
F2 → 2W/33dBm & 20W/43dBm



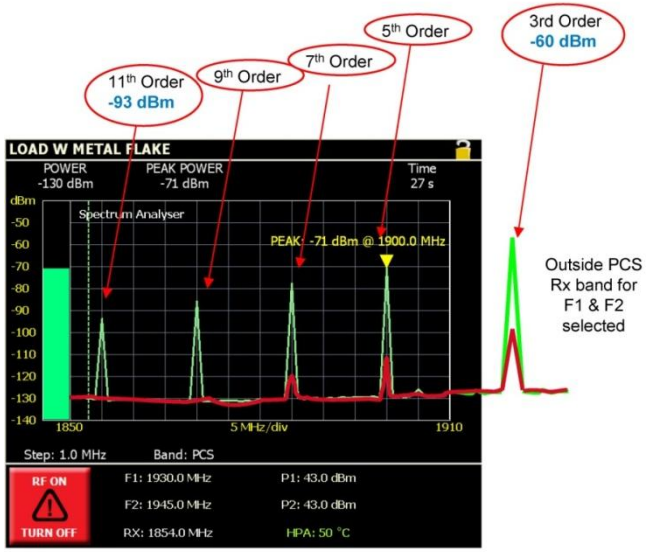
PIM Test equipment transmits 2 frequencies at high power into the system under test and measures the magnitude of the interference generated at the known IM3 frequency.

Results





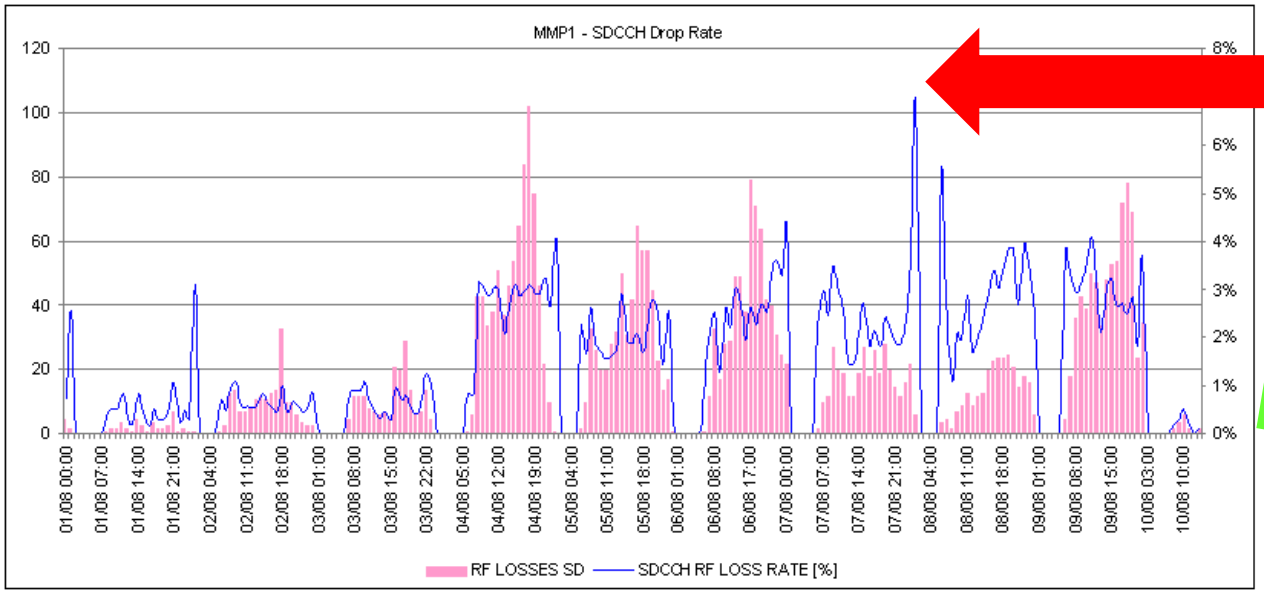
The fault location is found by “tapping” on interconnections and components (dynamic test) during the test looking for spikes in PIM magnitude.



Spectrum Analyzer Mode

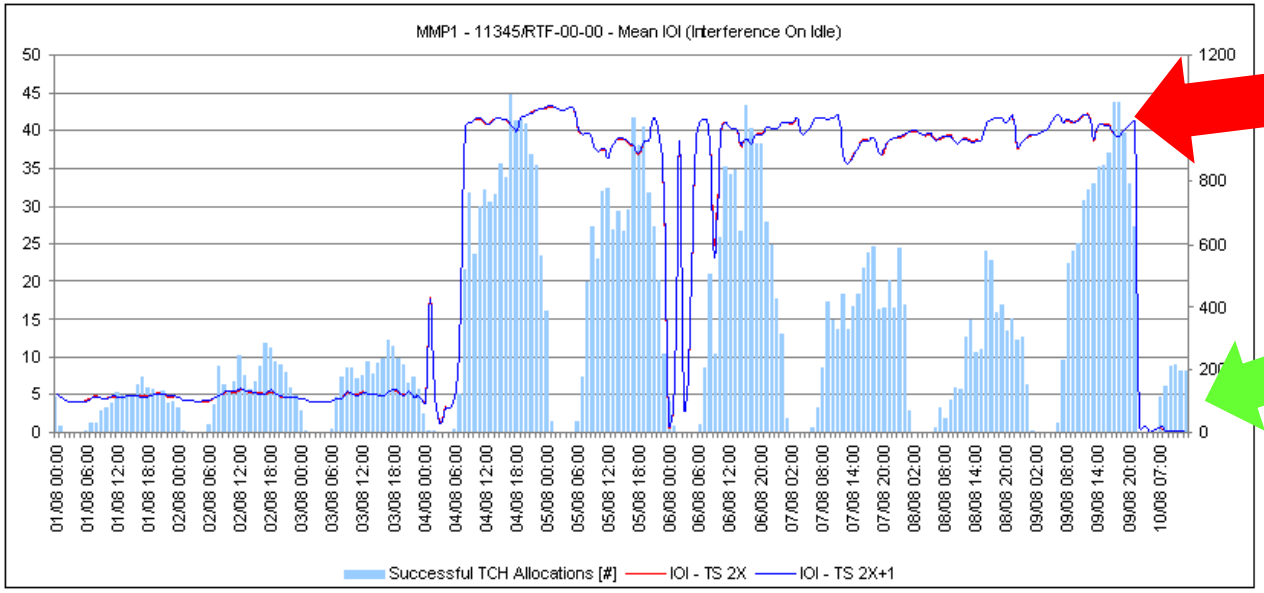
Repairing IM3 reduces ALL IM products.

Case Study – Metro Lisbon



Before
7% of Drops at the BTS station

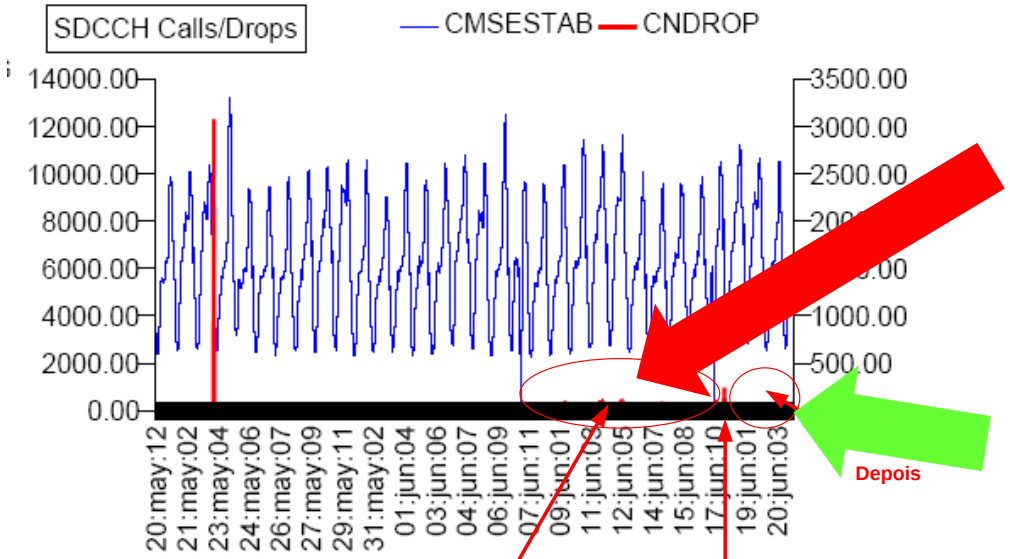
After
0.4% Drops



Before
IOI – Interferência On Idle
45dB

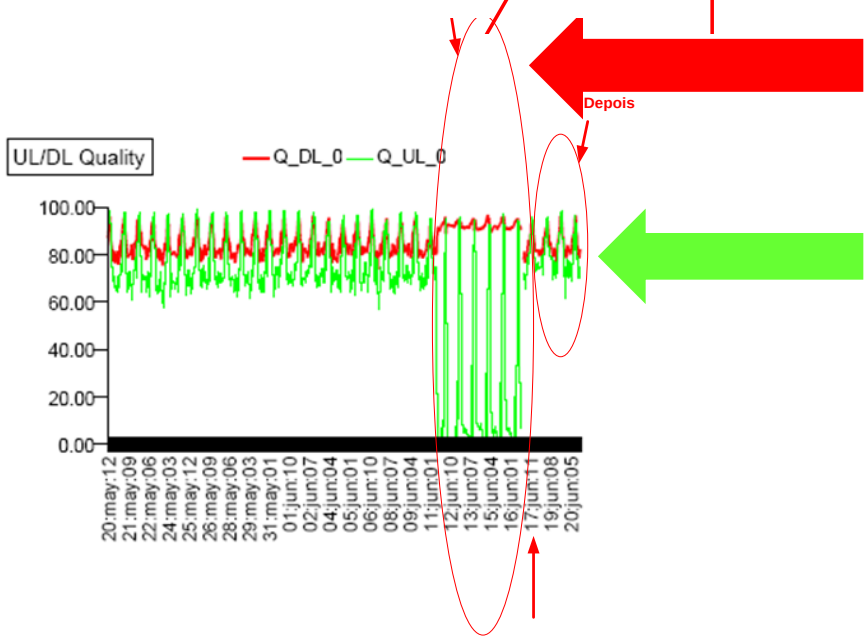
After
0 dB

Case Study – Outdoor Sector



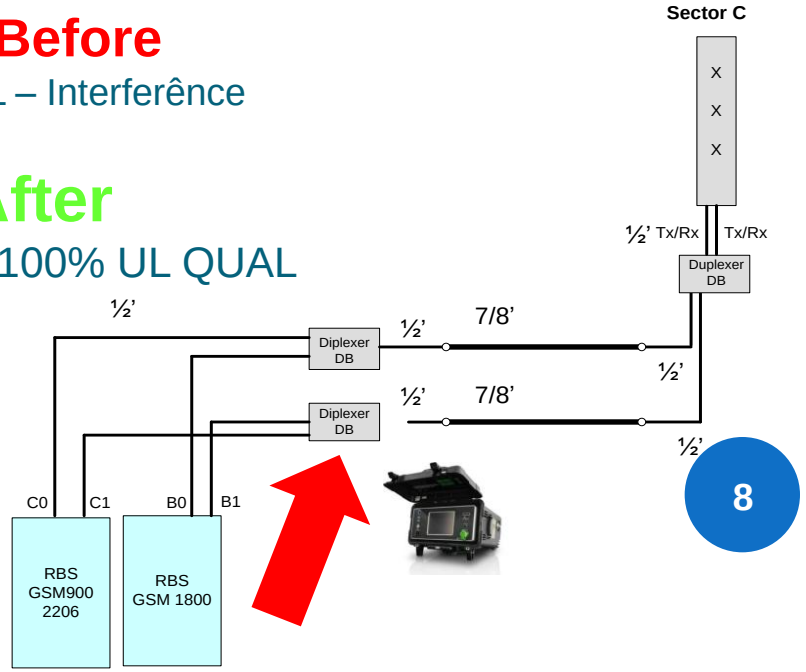
Before
CN DROPS

After
0 CN Drops



Before
Q_UL – Interferência

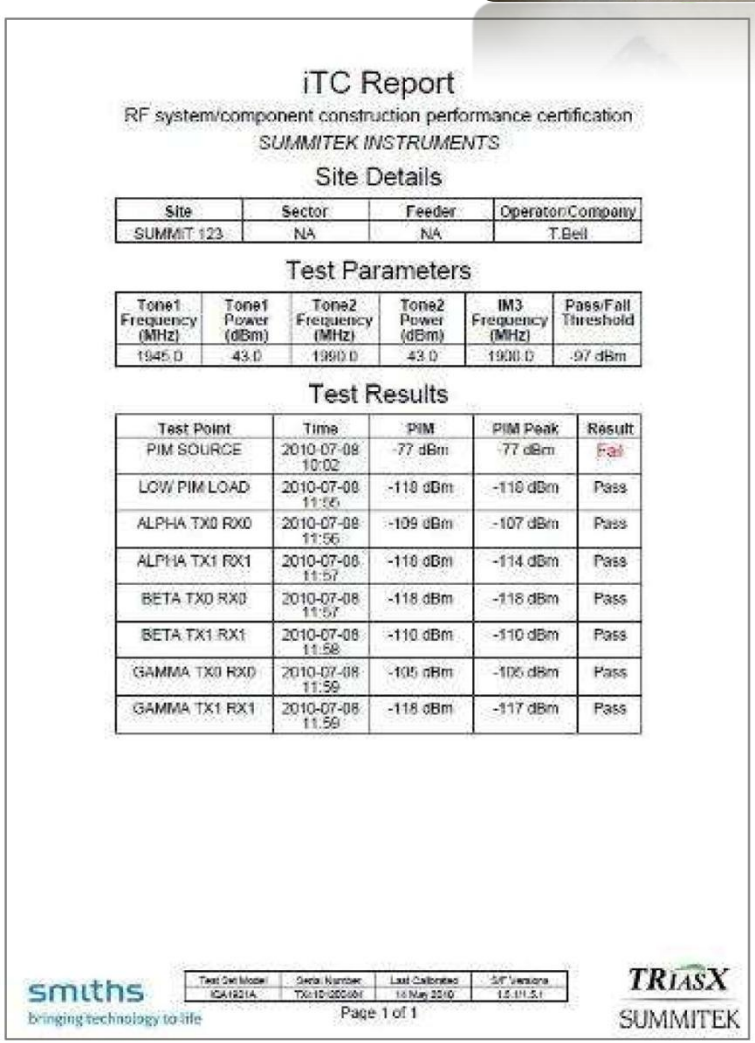
After
80 - 100% UL QUAL



Final Report

iQA Series Reports:

- Build final site report as you go
- No post processing of data required
- Output finished report from the iQA in .PDF format
- Screen shot “pictures” available for engineering reports



iTC Report

RF system/component construction performance certification

SUMMITEK INSTRUMENTS

Site Details

Site	Sector	Feeder	Operator/Company
SUMMIT 123	NA	NA	T.Bell

Test Parameters

Tone1 Frequency (MHz)	Tone1 Power (dBm)	Tone2 Frequency (MHz)	Tone2 Power (dBm)	IM3 Frequency (MHz)	Pass/Fail Threshold
1945.0	43.0	1990.0	43.0	1900.0	-97 dBm

Test Results

Test Point	Time	PIM	PIM Peak	Result
PIM SOURCE	2010-07-08 10:02	-77 dBm	-77 dBm	Fail
LOW PIM LOAD	2010-07-08 11:55	-118 dBm	-118 dBm	Pass
ALPHA TX0 RX0	2010-07-08 11:56	-109 dBm	-107 dBm	Pass
ALPHA TX1 RX1	2010-07-08 11:57	-118 dBm	-114 dBm	Pass
BETA TX0 RX0	2010-07-08 11:57	-118 dBm	-118 dBm	Pass
BETA TX1 RX1	2010-07-08 11:58	-110 dBm	-110 dBm	Pass
GAMMA TX0 RX0	2010-07-08 11:59	-105 dBm	-105 dBm	Pass
GAMMA TX1 RX1	2010-07-08 11:59	-118 dBm	-117 dBm	Pass

Test Set Model	Serial Number	Last Calibrated	S/F Versions
IQA1921A	TX:10/200401	14 May 2010	1.5.1/1.5.1

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TRIASX SUMMITEK

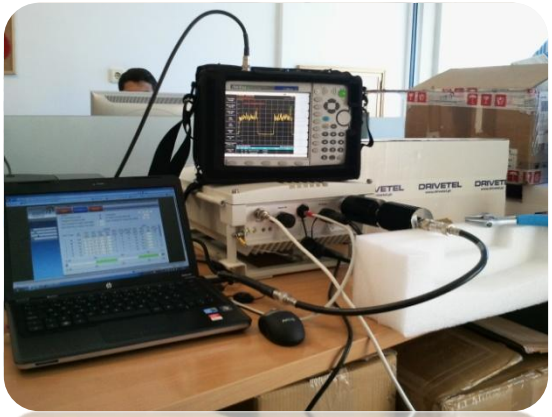
Models

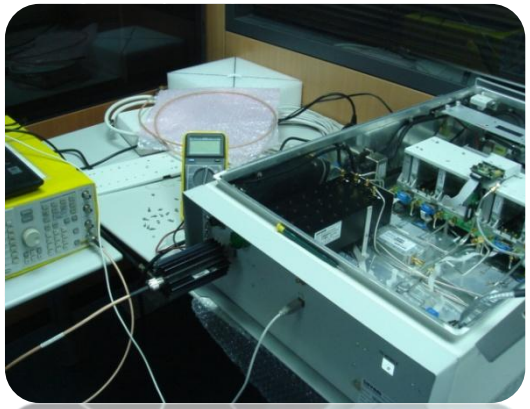
MODELS |

	DESCRIPTION	TX RANGE	RX RANGE (PIM)
iQA-700LB	700MHz (low)	728-746MHz	698-716MHz
iQA-700HB	700MHz (high)	728-757MHz	776-787MHz
iQA-850B	850MHz	869-894MHz	824-849MHz
iQA-900B	GSM900	935-960MHz	890-915MHz
iQA-0901B	EGSM 900	925-960MHz	880-915MHz
iQA-1800B	DCS1800	1805-1880MHz	1710-1785MHz
iQA-1921B	Dual band PCS/AWS	1930-1990MHz/2110-2155MHz	1710-1755MHz/1850-1910MHz
iQA-2101B	UMTS (3rd & 7th order)	2110-2170MHz	1920-2080MHz

Examples

Our Technical Support – Drivetel





1ª Line Supporte: *producthelpdesk@drivetel.pt*

Thank You

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