

# CERTIFICATE OF ACCREDITATION

This is to certify that:

## **CONCILIUM TECHNOLOGIES (Pty) Ltd**

Laboratory Accreditation No. 706

is a South African National Accreditation System Accredited Laboratory  
for two years one month commencing **March 2004** provided that  
all SANAS conditions and requirements are complied with.

This certificate is valid for:

## **RADIO FREQUENCY METROLOGY**

as per scope on accompanying accreditation schedule

## **THE LABORATORY COMPLIES WITH ISO/IEC 17025**

While this certificate remains valid,  
the Accredited Laboratory named above  
is authorised to issue SANAS certificates.

### **Programme Manager**

*"Recognised as the official national accreditation body by the  
Department of Trade and Industry of the Republic of South Africa"*

This certificate is only valid when accompanied by its schedule of accreditation.

**SCHEDULE OF ACCREDITATION**

**RADIO FREQUENCY METROLOGY**

Laboratory Accreditation Number 706

<p><u>Permanent Address of Laboratory:</u>                  Concilium Technologies (Pty) Ltd                  Building No 3                  Highgrove Office Park                  50 Tegel Avenue                  Highveld Technopark                  Centurion                  0157</p> <p><u>Postal Address</u>                  Postnet Suite No 87                  Private Bag X 65                  Halfway House                  1685</p> <p>Tel : (012) 678-9211 / 9215                  Fax : (012) 665-4160                  Email: <a href="mailto:bart_bremmer@concilium.co.za">bart_bremmer@concilium.co.za</a></p>	<p><u>Technical Signatories</u> : Mr B J H Bremmer                  : Mr G D Schuster</p> <p><u>Nominated Representative</u> : Mr B J H Bremmer</p> <p>Issue No. : 04                  Date of issue : March 2004                  Expiry date : April 2006</p>
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ITEM	FUNCTION	NOMINAL RANGE	NOMINAL FREQUENCY	BEST MEASUREMENT CAPABILITIES EXPRESSED AS AN UNCERTAINTY (±)
1	Power 50 Ω	0 dBm (1 mW) -60 dBm to -20 dBm (1 nW to 10 μW) -30 dBm to +20 dBm (1 μW to 100 mW) -60 dBm to +20 dBm* (1 nW to 100 mW) -60 dBm to +20 dBm* (1 nW to 100 mW) -30 dBm to +20 dBm* (1 μW to 100 mW) -30 dBm to +20 dBm** (1 μW to 100 mW) -30 dBm to +20 dBm** (1 μW to 100 mW) -110 dBm to -30 dBm (10 fW to 1 μW) -110 dBm to -60 dBm (10 fW to 1 nW) -110 dBm to -60 dBm (10 fW to 1 nW) -100 dBm to -30 dBm (100 fW to 1 μW) -100 dBm to -30 dBm (100 fW to 1 μW)	50 MHz 10 MHz to 1 GHz 100 kHz to 1 GHz 1 GHz to 10 GHz 10 GHz to 18 GHz 18 GHz to 26,5 GHz 26,5 GHz to 40 GHz 40 GHz to 50 GHz 100 kHz to 1 GHz 1 GHz to 10 GHz 10 GHz to 18 GHz 18 GHz to 26,5 GHz 26,5 GHz to 40 GHz 40 GHz to 50GHz	0,08 dB 0,2 dB 0,2 dB 0,3 dB 0,4 dB 0,4 dB 0,4 dB 0,5 dB 0,2 dB + 0,005 dB per dBm 0,3 dB + 0,010 dB per dBm 0,4 dB + 0,015 dB per dBm 0,4 dB + 0,015 dB per dBm 0,4 dB + 0,015 dB per dBm 0,5 dB + 0,020 dB per dBm

Original date of accreditation: 1980

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- \* Generation Limitation: 100 kHz to 26,5 GHz: +13dBm
- \*\* Generation Limitation: 26,5 GHz to 50 GHz: +4dBm

The BMC, expressed as an expanded uncertainty of measurement, is stated as the standard uncertainty of measurement multiplied by a coverage factor k = 2, corresponding to a confidence level of approximately 95%

**Programme Manager**

ITEM	FUNCTION	NOMINAL RANGE	NOMINAL FREQUENCY	BEST MEASUREMENT CAPABILITIES EXPRESSED AS AN UNCERTAINTY ( $\pm$ )
1	Power 75 $\Omega$	-30 dBm to +20 dBm* (1 $\mu$ W to 100 mW)	100 kHz to 2 GHz	0,2 dB
		-110 dBm to -30 dBm (1 fW to 1 $\mu$ W)	100 kHz to 2 GHz	0,02 dB + 0,005 dB
2	Attenuation 50 $\Omega$	0 dB to 60 dB	DC	0,002 dB
		60 dB to 80 dB	DC	0,01 dB
		80 dB o 110 dB	DC	0,15 dB
		0 dB to 100 dB	100 kHz to 1 GHz	0,04 dB + 0,005 dB per dB
			1 GHz to 10 GHz	0,10 dB + 0,010 dB per dB
			10 GHz to 18 GHz	0,15 dB + 0,015 dB per dB
		18 GHz to 26,5 GHz	0,2 dB + 0,015 dB per dB	
	0 dB to 100 dB	26,5 to 40 GHz	0,4 dB + 0,015 dB per dB	
	0dB to 100 dB	40 GHz to 50 GHz	0,5 dB + 0,025 dB per dB	
	100 dB to 120 dB	100 kHz to 1 GHz	1 dB	
		1 GHz to 10 GHz	2 dB	
		10 GHz to 18 GHz	3 dB	
	75 $\Omega$	0 dB to 60 dB	DC	0,002 dB
		60 dB to 80 dB	DC	0,01 dB
		80 dB to 110 dB	DC	0,15 dB
		0 dB to 100 dB	100 KHz to GHz	0,04 dB + 0,005 dB per dB

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\* Generation Limitation: 100 kHz to 2 GHz: +13dBm

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**Programme Manager**

ITEM	FUNCTION	NOMINAL RANGE	NOMINAL FREQUENCY	BEST MEASUREMENT CAPABILITIES EXPRESSED AS AN UNCERTAINTY ( $\pm$ )
3	Voltage Reflection Coefficient 50 $\Omega$	Ratio 0 to 0,5 0,5 to 1	5 Hz to 10 MHz 5 Hz to 10 MHz	0,01 0,04
		0 to 0,3 0,3 to 1	10 MHz to 18 GHz 10 MHz to 18 GHz	0,005 0,015
		0 to 0,5 0,5 to 1	18 GHz to 26,5 GHz 18 GHz to 26,5 GHz	0,01 0,03
		0 to 0,5 0,5 to 1	26,5 GHz to 40 GHz 26,5 GHz to 40 GHz	0,03 0,04
	75 $\Omega$	0 to 0,5 0,5 to 1	40 GHz to 50 GHz 40 GHz to 50 GHz	0,05 0,10
		0 to 0,5 0,5 to 1	5 Hz to 100 kHz 5 Hz to 100 kHz	0,01 0,04
		0 to 0,3 0,3 to 1	100 kHz to 100 MHz 100 kHz to 100 MHz	0,005 0,015
		0 to 0,5 0,5 to 1	100 MHz to 1 GHz 100 MHz to 1 GHz	0,03 0,05
		0 to 0,5 0,5 to 1	1 GHz to 2 GHz 1 GHz to 2 GHz	0,07 0,10
4	Impedance (Magnitude) 50 $\Omega$	25 $\Omega$ to 75 $\Omega$	5 Hz to 200 MHz	$3 \cdot 10^{-2} \cdot Z$
		25 $\Omega$ to 100 $\Omega$	500 MHz to 2 GHz 2 GHz to 18 GHz	$5 \cdot 10^{-2} \cdot Z$ $1 \cdot 10^{-1} \cdot Z$
	75 $\Omega$	50 $\Omega$ to 100 $\Omega$	5 Hz to 200 MHz	$3 \cdot 10^{-2} \cdot Z$
5	RF Voltage 50 $\Omega$	1 mV to 2 V	100 KHz to 100 MHz	$6 \cdot 10^{-2} \cdot U$
			100 MHz to 1 GHz	$1 \cdot 10^{-1} \cdot U$

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**Programme Manager**

ITEM	FUNCTION	NOMINAL RANGE	NOMINAL FREQUENCY		BEST MEASUREMENT CAPABILITIES EXPRESSED AS AN UNCERTAINTY ( $\pm$ )
6	Amplitude Modulation 50 $\Omega$	Modulation Depth	Carrier	Modulation	
		0 % to 99 %	100 kHz to 1 MHz	20 Hz to 50 kHz	$2 \cdot 10^{-2} \cdot M + 0,01 \%$
		0 % to 99 %	1 MHz to 1,3 GHz	20 Hz to 100 kHz	$1 \cdot 10^{-2} \cdot M + 0,01 \%$
		1 % to 95 %	1,3 GHz to 18 GHz	60 Hz to 100 kHz	$3 \cdot 10^{-2} \cdot M$
		5 % to 90 %	18 GHz to 50 GHz	60 Hz to 100 kHz	$3 \cdot 10^{-2} \cdot M$
7	Frequency Modulation 50 $\Omega$	Peak Deviation	Carrier	Modulation	
		0 Hz to 75 kHz	100 kHz to 1 MHz	20 Hz to 35 kHz	$5 \cdot 10^{-3} \cdot f + 1 \text{ Hz}$
		0 Hz to 75 kHz	1 MHz to 1,3 GHz	20 Hz to 416 kHz	$5 \cdot 10^{-3} \cdot f + 1 \text{ Hz}$
		480 Hz to 3 MHz	1,3 GHz to 7 GHz	200 Hz to 1,25 MHz	$5 \cdot 10^{-3} \cdot f + 10 \text{ Hz}$
		480 Hz to 10 MHz	7 GHz to 18 GHz	200 Hz to 4,16 MHz	$5 \cdot 10^{-3} \cdot f + 10 \text{ Hz}$
		480 Hz to 8 MHz	18 GHz to 26,5 GHz	200 Hz to 3,33 MHz	$5 \cdot 10^{-3} \cdot f + 10 \text{ Hz}$
		75 kHz to 8 MHz	26,5 GHz to 50 GHz	31,185 kHz to 3,33 MHz	$5 \cdot 10^{-3} \cdot f$

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