

CERTIFICATE OF ACCREDITATION

In terms of section 22(2) (b) of the Accreditation for Conformity Assessment, Calibration and Good Laboratory Practice Act, 2006 (Act 19 of 2006), read with sections 23(1), (2) and (3) of the said Act, I hereby certify that:-

CONCILIUM TECHNOLOGIES (PTY) LTD
Co. Reg. No.: 1999/013330/07

Facility Accreditation Number: **706**

is a South African National Accreditation System accredited Calibration laboratory provided that all SANAS conditions and requirements are complied with

This certificate is valid as per the scope as stated in the accompanying schedule of accreditation Annexure "A", bearing the above accreditation number for

RADIO FREQUENCY METROLOGY

The facility is accredited in accordance with the recognised International Standard

ISO/IEC 17025:2005

The accreditation demonstrates technical competency for a defined scope and the operation of a laboratory quality management system

While this certificate remains valid, the Accredited Facility named above is authorised to use the relevant SANAS accreditation symbol to issue facility reports and/or certificates

Mr R Josias
Chief Executive Officer

Effective Date: 31 January 2017
Certificate Expires: 30 January 2022

ANNEXURE A

SCHEDULE OF ACCREDITATION

RADIO FREQUENCY METROLOGY

Facility Number: 706

Permanent Address of Laboratory: Concilium Technologies (Pty) Ltd 1 Standford Office Park 12 Bauhinia Street Highveld Technopark Centurion 0157		Technical Signatories: Mr BJH Bremmer Mr GD Schuster	
Postal Address: P O Box 67611 Highveld 0169		Nominated Representative: Mr BJH Bremmer	
Tel: (012) 678-9200 Fax: (012) 665-4160 E-mail: bart_bremmer@concilium.co.za		Issue No.: 19 Date of Issue: 30 September 2019 Expiry Date: 30 January 2022	
ITEM	MEASURED QUANTITY OR TYPE OF GAUGE OR INSTRUMENT	NOMINAL FREQUENCY	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY (\pm)
1 1.1	RF Power N-Type Connector (50 Ω)		
	0 dBm (1 mW) -60 dBm to -20 dBm (1 nW to 10 μ W) -30 dBm to +20 dBm (1 μ W to 100 mW) -60 dBm to +20 dBm (1 nW to 100 mW) -60 dBm to +20 dBm (1 nW to 100 mW)	50 MHz 10 MHz to 1 GHz 100 kHz to 1 GHz 1 GHz to 10 GHz 10 GHz to 18 GHz	0,08 dB 0,2 dB 0,2 dB 0,3 dB 0,4 dB
1.2	PC – 3.5 Connector (50 Ω)		
	-30 dBm to +20 dBm (1 μ W to 100 mW) -30 dBm to +20 dBm (1 μ W to 100 mW) -30 dBm to +20 dBm (1 μ W to 100 mW)	50 MHz to 1 GHz 1 GHz to 10 GHz 10 GHz to 26,5 GHz	0,2 dB 0,3 dB 0,4 dB
	-100 dBm to -30 dBm (10 fW to 1 μ W) -100 dBm to -60 dBm (10 fW to 1 nW) -100 dBm to -60 dBm (10 fW to 1 nW)	10 MHz to 1 GHz 1 GHz to 10 GHz 10 GHz to 26,5 GHz	0,2 dB + 0,005 dB per dBm 0,3 dB + 0,010 dB per dBm 0,4 dB + 0,015 dB per dBm

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* Generation Limitation: 100 kHz to 26,5 GHz: + 13 dBm

** Generation Limitation: 26,5 GHz to 50 GHz: +4 dBm

The CMC, 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%

Accreditation Manager

ANNEXURE A

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ITEM	MEASURED QUANTITY OR TYPE OF GAUGE OR INSTRUMENT	NOMINAL FREQUENCY	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY (\pm)
1 1.3	RF Power		
	PC – 2.4 Connector (50 Ω)		
	-60 dBm to - 20 dBm (1 nW to 10 μ W)	50 MHz to 1 GHz	0,2 dB
	-60 dBm to - 20 dBm (1 nW to 10 μ W)	1 GHz to 10 GHz	0,3 dB
	-60 dBm to - 20 dBm (1 nW to 10 μ W)	10 GHz to 40 GHz	0,4 dB
	-60 dBm to - 20 dBm (1 nW to 10 μ W)	40 GHz to 50 GHz	0,6 dB
	-30 dBm to + 20 dBm (1 μ W to 100 mW)	50 MHz to 1 GHz	0,2 dB
	-30 dBm to + 20 dBm (1 μ W to 100 mW)	1 GHz to 10 GHz	0,3 dB
	-30 dBm to + 20 dBm (1 μ W to 100 mW)	10 GHz to 40 GHz	0,4 dB
	-30 dBm to + 20 dBm (1 μ W to 100 mW)	40 GHz to 50 GHz	0,5 dB
	-100 dBm to - 30 dBm (10 fW to 1 μ W)	10 MHz to 1 GHz	0,2 dB + 0,005 dB per dBm
	-100 dBm to - 30 dBm (10 fW to 1 μ W)	1 GHz to 10 GHz	0,3 dB + 0,010 dB per dBm
	-100 dBm to - 30 dBm (10 fW to 1 μ W)	10 GHz to 40 GHz	0,4 dB + 0,015 dB per dBm
	-100 dBm to - 30 dBm (10 fW to 1 μ W)	40 GHz to 50 GHz	0,5 dB + 0,020 dB per dBm
1.4	N-Type Connector (75 Ω)		
	-30 dBm to +20 dBm (1 μ W to 100 mW) (Generation limitation : + 13 dBm)	100 kHz to 2 GHz	0,2 dB
	-110 dBm to -30 dBm (10 fW to 1 μ W)	100 kHz to 2 GHz	0,2 dB + 0,005 dB per dBm
2 2.1	Attenuation		
	DC Attenuation (50 Ω all connector types)		
	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
2.2 2.2.1	RF Attenuation		
	N-Type Connector (50 Ω)		
	0 dB to 100 dB	100 kHz to 1 GHz	0,04 dB + 0,005 dB per dB
	0 dB to 100 dB	1 GHz to 10 GHz	0,1 dB + 0,010 dB per dB
	0 dB to 100 dB	10 GHz to 18 GHz	0,15 dB + 0,015 dB per dB
	100 dB to 120 dB	100 kHz to 1 GHz	1 dB
	100 dB to 120 dB	1 GHz to 10 GHz	2 dB
	100 dB to 120 dB	10 GHz to 18 GHz	3 dB
2.2.2	PC -3.5 Connector (50 Ω)		
	0 dB to 100 dB	10 MHz to 1 GHz	0,04 dB + 0,005 dB per dB
	0 dB to 100 dB	1 GHz to 10 GHz	0,10 dB + 0,010 dB per dB
	0 dB to 100 dB	10 GHz to 18 GHz	0,15 dB + 0,015 dB per dB
	0 dB to 100 dB	18 GHz to 26,5 GHz	0,2 dB + 0,015 dB per dB

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Accreditation Manager

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2.2	RF Attenuation		
2.2.3	PC-2.4 Connector (50 Ω)		
	0 dB to 100 dB	10 MHz to 1 GHz	0,04 dB + 0,015 dB per dB
	0 dB to 100 dB	1 GHz to 10 GHz	0,1 dB + 0,020 dB per dB
	0 dB to 100 dB	10 GHz to 18 GHz	0,15 dB + 0,020 dB per dB
	0 dB to 100 dB	18 GHz to 26,5 GHz	0,2 dB + 0,020 dB per dB
	0 dB to 100 dB	26,5 GHz to 40 GHz	0,4 dB + 0,015 dB per dB
	0 dB to 100 dB	40 GHz to 50 GHz	0,5 dB + 0,025 dB per dB
2.3	DC Attenuation (75 Ω, N-Type connector)		
	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
2.4	RF Attenuation (75 Ω, N-Type connector)		
	0 dB to 100 dB	100 kHz to 2 GHz	0,04 dB + 0,005 dB per dB
3	Voltage Reflection Co-efficient		
3.1	N-Type Connector (50 Ω)		
	Ratio 0 to 1	5 Hz to 10 MHz	0,010 + 0,056 ρ^2
	Ratio 0 to 1	10 MHz to 15 GHz	0,011 + 0,031 ρ^2
	Ratio 0 to 1	15 GHz to 18 GHz	0,013 + 0,100 ρ^2
3.2	PC -3.5 Connector (50 Ω)		
	Ratio 0 to 1	10 MHz to 15 GHz	0,017 + 0,037 ρ^2
	Ratio 0 to 1	15 GHz to 18 GHz	0,013 + 0,100 ρ^2
	Ratio 0 to 1	18 GHz to 26,5 GHz	0,018 + 0,172 ρ^2
3.3	PC -2.4 Connector (50 Ω)		
	Ratio 0 to 1	10 MHz to 15 GHz	0,011 + 0,057 ρ^2
	Ratio 0 to 1	15 GHz to 18 GHz	0,013 + 0,100 ρ^2
	Ratio 0 to 1	18 GHz to 26,5 GHz	0,018 + 0,172 ρ^2
	Ratio 0 to 1	26,5 GHz to 40 GHz	0,050 + 0,167 ρ^2
	Ratio 0 to 1	40 GHz to 50 GHz	0,059 + 0,290 ρ^2
3.4	N-Type Connector (75 Ω)		
	Ratio 0 to 1	5 Hz to 10 MHz	0,010 + 0,056 ρ^2
	Ratio 0 to 1	10 MHz to 2 GHz	0,014 + 0,081 ρ^2

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4	Modulation			
4.1	Amplitude Modulation (50 Ω)			
	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	$3 \cdot 10^{-2} \cdot M$
4.2	Frequency Modulation (50 Ω)			
	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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