



TEST REPORT NO: RU1014/3804  
COPY NO: 2  
ISSUE NO: 2  
FCC ID: K68ND2585

**REPORT ON THE CERTIFICATION TESTING OF A  
Radiodetection Ltd.  
Wireline DataSonde  
WITH RESPECT TO  
THE FCC RULES CFR 47, PART 15.209  
INTENTIONAL RADIATOR SPECIFICATION**

TEST DATE: 21<sup>st</sup> - 22<sup>nd</sup> May 2002

TESTED BY: J CHARTERS

APPROVED BY: P GREEN  
PRINCIPAL ENGINEER

DATE: 31<sup>th</sup> July 2002

Distribution:

- Copy Nos:
1. Radiodetection Ltd.
  2. FCC EVALUATION LABORATORIES
  3. TRL EMC

THIS DOCUMENT MAY BE REPRODUCED ONLY IN ITS ENTIRETY AND WITHOUT CHANGE

**TRL COMPLIANCE SERVICES LTD** EMC DIVISION  
LONG GREEN FORTHAMPTON GLOUCESTER GL19 4QH UNITED KINGDOM  
TELEPHONE +44 (0)1684 833818 FAX +44 (0)1684 833858  
E-MAIL [test@trlcompliance.com](mailto:test@trlcompliance.com) [www.trlcompliance.com](http://www.trlcompliance.com)



0728



## CONTENTS

	PAGE
CERTIFICATE OF CONFORMITY & COMPLIANCE	3
APPLICANT'S SUMMARY	4
EQUIPMENT TEST CONDITIONS	5
TESTS REQUIRED	6
SAMPLE CALCULATIONS	6
TEST RESULTS	7-8

## ANNEX

PHOTOGRAPHS	A
PHOTOGRAPH No. 1: Test setup	
PHOTOGRAPH No. 2: Transmitter front view	
PHOTOGRAPH No. 3: Transmitter PCB track side	
PHOTOGRAPH No. 4: Transmitter PCB component side	

APPLICANT'S SUBMISSION OF DOCUMENTATION LIST	B
BAND OCCUPANCY PLOT	C

### Notes:

- |    |                                                                                                                                                                                                  |     |                                     |
|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-------------------------------------|
| 1. | Component failure during test                                                                                                                                                                    | YES | <input type="checkbox"/>            |
|    |                                                                                                                                                                                                  | NO  | <input checked="" type="checkbox"/> |
| 2. | If Yes, details of failure:                                                                                                                                                                      |     |                                     |
| 3. | The facilities used for the testing of the product contained in this report are FCC Listed.                                                                                                      |     |                                     |
| 4. | The contents of the attached applicants declarations and other supplied information are not covered by the scope of this laboratory's UKAS or FCC accreditations' and is provided in good faith. |     |                                     |





## CERTIFICATE OF CONFORMITY & COMPLIANCE

FCC IDENTITY: K68ND2585

PURPOSE OF TEST: Certification

TEST SPECIFICATION: FCC RULES CFR 47, Part 15.209

TEST RESULT: Compliant to Specification

EQUIPMENT UNDER TEST: Wireline DataSonde

EQUIPMENT SERIAL No: Engineering sample

ITU EMISSION CODE: 4K80A3D

EQUIPMENT TYPE: 10/ND2585 Wireline DataSonde

PRODUCT USE: Location of horizontal boring machine drill bits

CARRIER EMISSION: 13.96 $\mu$ V/m @ 300metres

ANTENNA TYPE: Integral

ALTERNATIVE ANTENNA: None

BAND OF OPERATION: 9kHz – 90kHz

CHANNEL SPACING: Wideband

NUMBER OF CHANNELS: 1

FREQUENCY GENERATION: SAW Resonator [ ] Crystal [ ] Synthesiser [X]

MODULATION METHOD: Amplitude [ ] Digital [X] Angle [ ]

POWER SOURCE(s): +24Vdc

TEST DATE(s): 21<sup>st</sup> – 22<sup>nd</sup> May 2002

ORDER No(s): 9186

APPLICANT: Radiodetection Ltd.

ADDRESS: Western Drive  
Bristol  
BS14 0AZ  
United Kingdom

TESTED BY: \_\_\_\_\_ J Charters

APPROVED BY: \_\_\_\_\_ P Green  
Principal Engineer



## APPLICANT'S SUMMARY

EQUIPMENT UNDER TEST (EUT):	Wireline DataSonde
EQUIPMENT TYPE:	10/ND2585 Wireline DataSonde
SERIAL NUMBER OF EUT:	Engineering Sample
PURPOSE OF TEST:	Certification
TEST SPECIFICATION(s):	FCC RULES CFR 47, Part 15.209
TEST RESULT:	COMPLIANT      Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
APPLICANT'S CATEGORY:	MANUFACTURER <input checked="" type="checkbox"/> IMPORTER <input type="checkbox"/> DISTRIBUTOR <input type="checkbox"/> TEST HOUSE <input type="checkbox"/> AGENT <input type="checkbox"/>
APPLICANT'S ORDER No(s):	9186
APPLICANT'S CONTACT PERSON(s):	Mr Keith Jones
E-mail address:	<a href="mailto:keith.jones@radiodection.com">keith.jones@radiodection.com</a>
APPLICANT:	Radiodetection Ltd.
ADDRESS:	Western Drive Bristol BS14 0AZ United Kingdom
TEL:	0117 988 6433
FAX:	0117 976 7775
EUT(s) COUNTRY OF ORIGIN:	United Kingdom
TEST LABORATORY:	TRL EMC
UKAS ACCREDITATION No:	0728
TEST DATE(s)	21 <sup>st</sup> – 22 <sup>nd</sup> May 2002
TEST REPORT No:	RU1014/3804



## EQUIPMENT TEST / EXAMINATIONS REQUIRED

1.	TEST/EXAMINATION	RULE PART	DETECTOR	APPLICABILITY
	Intentional Emission Frequency:	15.209	Average	Yes
	Intentional Emission Field Strength:	15.209	Average	Yes
	Intentional Emission Band Occupancy:	Performed for information		Yes
	Intentional Emission ERP (mW):			No
	Spurious Emissions – Conducted:			No
	Spurious Emissions – Radiated <1000MHz:	15.209	Quasi Peak & Average	Yes
	Spurious Emissions – Radiated >1000MHz:			No
	Maximum Frequency of Search:	15.33	N/A	Yes
	Antenna Arrangements Integral:	15.203	N/A	Yes
	Antenna Arrangements External Connector:			No
	Restricted Bands			No
	Extrapolation Factor	15.31(f)	N/A	Yes

2. Product Use: Location of horizontal boring machine drill bits

3. Emission Designator: 4K80A3D

4. Duty Cycle: <100%

5. Transmitter bit or pulse rate and level: 4800Bps

6. Temperatures: Ambient (Tnom) 18°C

7. Supply Voltages: Vnom +24.0Vdc

Note: Vnom voltages are as stated above unless otherwise shown on the test report page

8. Equipment Category: Single channel [X]  
Two channel [ ]  
Multi-channel [ ]

9. Channel spacing: Narrowband [ ]  
Wideband [X]



## TRANSMITTER TESTS

### TRANSMITTER SPURIOUS EMISSIONS – RADIATED – PART 15.209

Ambient temperature	=	18°C(<1GHz)	3m measurements <1GHz	[X]
Relative humidity	=	58% (<1GHz),	1m measurements >1GHz	[ ]
Conditions	=	Open Area Test Site (OATS)	3m extrapolated from 1m	[ ]
Supply voltage	=	+24Vdc		
Channel number	=	1		

	FREQUENCY (MHz)	FIELD STRENGTH (dBμV/m)	EXTRAP. FACTOR (dB)	FIELD STRENGTH (μV/m)	LIMIT (μV/m)
0.009MHz - 0.490MHz	0.06758 0.10137 0.16895 0.20274	38.7 75.0 81.4 55.8	80 80 80 80	0.00861 0.05620 1.17000 0.06170	35.5 23.6 14.2 11.8
0.490MHz - 1.750MHz					
1.750MHz - 30MHz					
30MHz - 88MHz					
88MHz - 216MHz					
216MHz - 960MHz					
960MHz - 1GHz					
1GHz - 5GHz					
Limits	0.009MHz to 0.490MHz	2400/F(kHz) @ 300m			
	0.490MHz to 1.705MHz	24000/F(kHz) @ 30m			
	1.705MHz to 30MHz	30μV/m @ 30m			
	30MHz to 88MHz	100μV/m @ 3m			
	88MHz to 216MHz	150μV/m @ 3m			
	216MHz to 960MHz	200μV/m @ 3m			
	960MHz to 1GHz	500μV/m @ 3m			
	1GHz to 5GHz	500μV/m @ 3m			

See next page for notes and test method.



**Notes:**

- 1 Results quoted are extrapolated as indicated
- 2 Emissions were searched to: (x) 1000MHz inclusive, as per Part 15.33a
- 3 Extrapolation factor 9.5dB from 1m to 3m, as per Part 15.31f
- 4 Extrapolation factor 80dB from 3m to 300m, as per Part 15.31f
- 5 Measurements >1GHz @ 1m as per Part 15.31f(1)  
Receiver detector <30GHz = CISPR, Quasi-Peak, 10kHz bandwidth apart from 9kHz-90kHz and 110kHz-490kHz were Average detector was used at per Part15.31d
- 6 Receiver detector >1GHz = CISPR, Quasi-Peak, 120kHz bandwidth
- 7 Receiver detector >1GHz = Peak Hold, 1MHz resolution bandwidth
- 8 New batteries used for battery powered products.
- 9 Emissions below 20dBs of the limits are not recorded
- 10 For emissions below 30MHz, the loss due to the antenna factor of the loop antenna is automatically compensated for by the measuring receiver. This loss is 20dB's across the measurement range 9kHz to 30MHz.
- 11 For emissions below 30MHz the cable losses are assumed to be negligible.

**Test Method:**

- 1 As per Radio – Noise Emissions, ANSI C63.4: 1992
- 2 Measuring distances as Notes 1 to 4 above
- 3 EUT 0.8 metre above ground plane
- 4 Emissions maximised by rotation of EUT, on an automatic turntable.  
Raising and lowering the receiver antenna between 1m & 4m(above 30MHz only).  
Horizontal and vertical polarisations, of the receive antenna.  
EUT orientation in three orthogonal planes.  
Maximum results recorded.

The test equipment used for the Transmitter Spurious Emissions – Radiated – Part 15.209 tests is shown overleaf:



TYPE OF EQUIPMENT	MAKER/ SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
AE, LOOP, Z2, 9kHz - 30MHz	ROHDE & SCHWARZ	HFH2	881058 - 53	07	<b>X</b>
HORN ANTENNA	EMCO	3115	9010-3580	138	
HORN ANTENNA	EMCO	3115	9010-3581	139	
SPECTRUM ANALYSER	TEKTRONIX	2756P	B010109	164	
BICONE ANTENNA	CHASE	BBA9106	N/A	193	
ANTENNA, LOG PERIODIC 300MHz – 1GHz	CHASE	UPA6108	1061	203	
RECEIVER	ROHDE & SCHWARZ	ESHS20	837960/003	237	
ANTENNA, BICONE 20MHz - 300MHz	CHASE	VBA6106A	1193	251	
BILOG ANTENNA	CHASE	CBL6112	2098	274	
RECEIVER	ROHDE & SCHWARZ	ESVS10	837948/003	317	
RECEIVER	ROHDE & SCHWARZ	ESVS10	844594/003	352	
RECEIVER	ROHDE & SCHWARZ	ESHS10	825892/003	UH03	<b>X</b>
V / UHF RECEIVER 20MHz - 1GHz	ROHDE & SCHWARZ	ESVS 20	838804 / 005	415	
BILOG ANTENNA	SCHAFFNER	CBL6112B	2761	431	
RECEIVER	ROHDE & SCHWARZ	ESHS 10	830051/001	UH03	
RECEIVER	ROHDE & SCHWARZ	ESVS 10	825892/003	UH04	<b>X</b>
RANGE 1	TRL	3 METRE	N/A	UH06	<b>X</b>
AE, LOOP, Z2, 9kHz - 30MHz	ROHDE & SCHWARZ	HFH2	881058 - 53	07	<b>X</b>
BILOG ANTENNA	CHASE	CBL6112	2129	UH93	
SPECTRUM ANALYSER	MARCONI	2386/2380	152076/004	UH120	<b>X</b>



## TRANSMITTER TESTS

### TRANSMITTER INTENTIONAL EMISSION – RADIATED – Part 15.209

Ambient temperature	=	18°C(<1GHz),	3m measurements @ fc	[ X]
Relative humidity	=	58%(<1GHz),	10m measurements @ fc	[ ]
Conditions	=	Open Area Test Site (OATS)	30m measurements @ fc	[ ]
Supply voltage	=	+24Vdc	300m extrapolated from 3m	[X]
Channel number	=	1	30m extrapolated from 10m	[ ]

FREQ. (kHz)	FIELD STRENGTH (dBµV/m)	EXTRAPORLATION FACTOR (dB)	FIELD STRENGTH (µV/m)
33.79	102.9	80	13.96
Limit value @ fc		71.0µV/m	
Band occupancy @ -20dBc See spectrum analyser plot – Annex D		f lower	f higher
		33.686kHz	34.097kHz

#### Notes:

- 1 Results quoted are extrapolated as indicated
- 2 Receiver detector @ fc = Average 10kHz bandwidth
- 3 When battery powered the EUT was powered with new batteries
- 4 For emissions below 30MHz, the loss due to the antenna factor of the loop antenna is Automatically compensated for by the measuring receiver. This loss is 20dB's across the measurement range 9kHz to 30MHz.
- 5 For emissions below 30MHz the cable losses are assumed to be negligible.

#### Test Method:

- 1 As per Radio – Noise Emissions, ANSI C63.4: 1992
- 2 Measuring distance 3m
- 3 EUT 0.8 metre above ground plane
- 4 Emissions maximised by rotation of EUT, on an automatic turntable.  
Raising and lowering the receiver antenna between 1m & 4m(above 30MHz only).  
Horizontal and vertical polarisations, of the receive antenna.  
EUT orientation in three orthogonal planes.  
Maximum results recorded

The test equipment used for the Transmitter Intentional Emission – Radiated – Part 15.209 tests is shown overleaf:



TYPE OF EQUIPMENT	MAKER/ SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
AE, LOOP, Z2, 9kHz - 30MHz	ROHDE & SCHWARZ	HFH2	881058 - 53	07	<b>X</b>
HORN ANTENNA	EMCO	3115	9010-3580	138	
HORN ANTENNA	EMCO	3115	9010-3581	139	
SPECTRUM ANALYSER	TEKTRONIX	2756P	B010109	164	
BICONE ANTENNA	CHASE	BBA9106	N/A	193	
ANTENNA, LOG PERIODIC 300MHz – 1GHz	CHASE	UPA6108	1061	203	
RECEIVER	ROHDE & SCHWARZ	ESHS20	837960/003	237	
ANTENNA, BICONE 20MHz - 300MHz	CHASE	VBA6106A	1193	251	
BILOG ANTENNA	CHASE	CBL6112	2098	274	
RECEIVER	ROHDE & SCHWARZ	ESVS10	837948/003	317	
RECEIVER	ROHDE & SCHWARZ	ESVS10	844594/003	352	
RECEIVER	ROHDE & SCHWARZ	ESHS10	825892/003	UH03	<b>X</b>
V / UHF RECEIVER 20MHz - 1GHz	ROHDE & SCHWARZ	ESVS 20	838804 / 005	415	
BILOG ANTENNA	SCHAFFNER	CBL6112B	2761	431	
RECEIVER	ROHDE & SCHWARZ	ESHS 10	830051/001	UH03	
RECEIVER	ROHDE & SCHWARZ	ESVS 10	825892/003	UH04	
RANGE 1	TRL	3 METRE	N/A	UH06	<b>X</b>
AE, LOOP, Z2, 9kHz - 30MHz	ROHDE & SCHWARZ	HFH2	881058 - 53	07	
BILOG ANTENNA	CHASE	CBL6112	2129	UH93	
SPECTRUM ANALYSER	MARCONI	2386/2380	152076/004	UH120	<b>X</b>

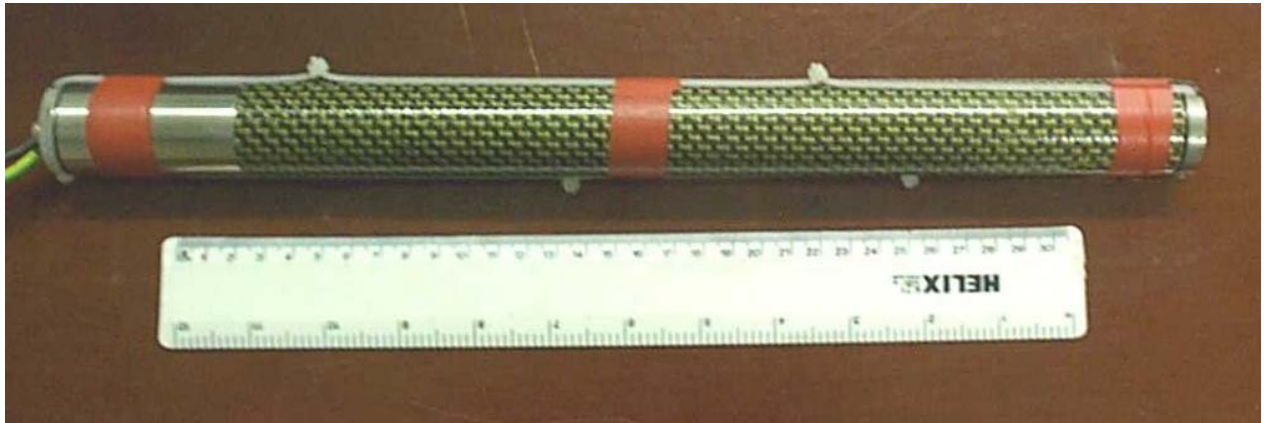


**ANNEX A**  
**PHOTOGRAPHS**

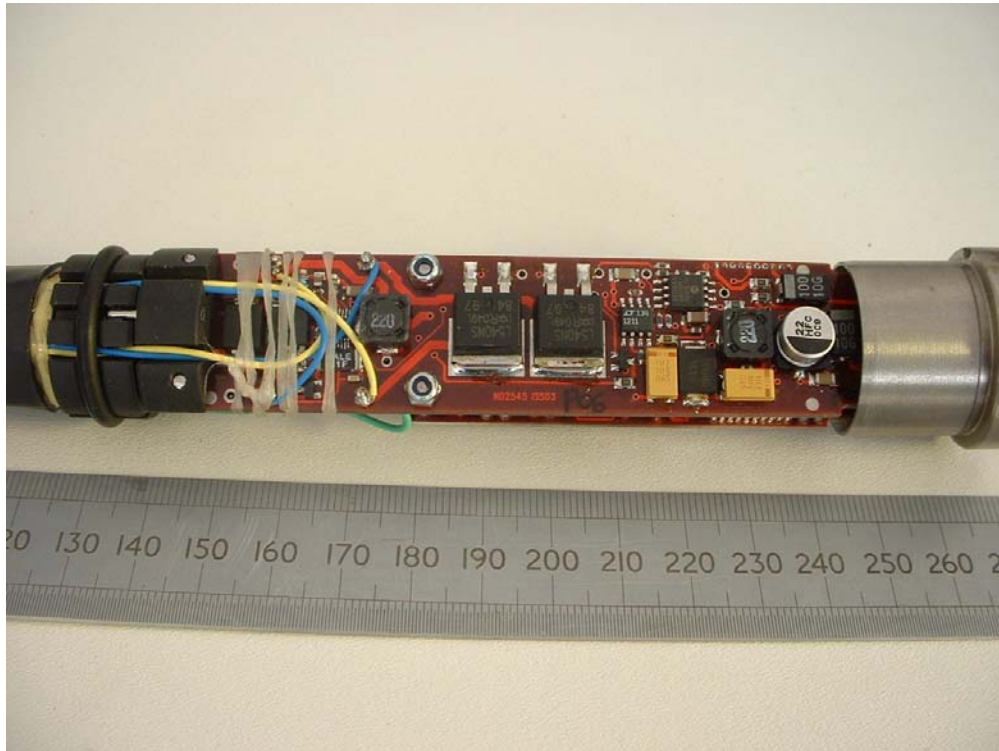




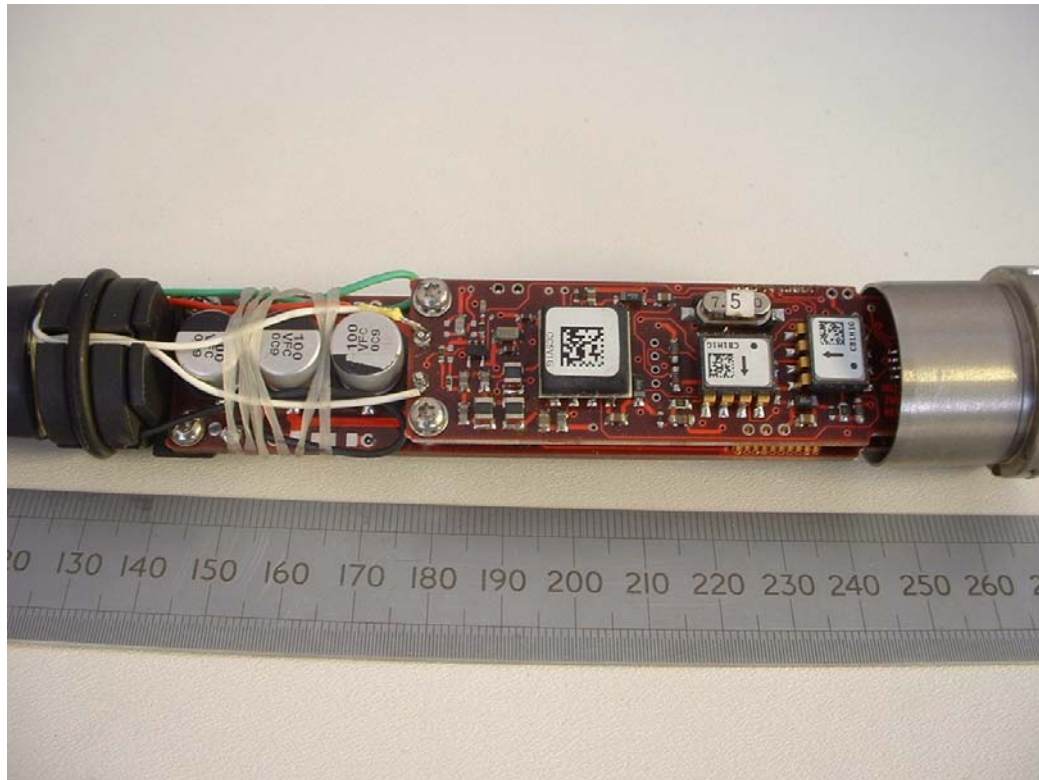














**ANNEX B**

**APPLICANT'S SUBMISSION OF DOCUMENTATION LIST**



## APPLICANT'S SUBMISSION OF DOCUMENTATION LIST

a.	TCB	-	APPLICATION	[X]
		-	FEE	[X]
b.	AGENT'S LETTER OF AUTHORISATION	-		[X]
c.	MODEL(s) vs IDENTITY	-		[X]
d.	ALTERNATIVE TRADE NAME DECLARATION(s)	-		[X]
e.	LABELLING	-	PHOTOGRAPHS	[X]
		-	DECLARATION	[X]
		-	DRAWINGS	[X]
f.	TECHNICAL DESCRIPTION	-		[X]
g.	BLOCK DIAGRAMS	-	Tx	[X]
		-	Rx	[ ]
		-	PSU	[ ]
		-	AUX	[ ]
h.	CIRCUIT DIAGRAMS	-	Tx	[X]
		-	Rx	[ ]
		-	PSU	[ ]
		-	AUX	[ ]
i.	COMPONENT LOCATION	-	Tx	[X]
		-	Rx	[ ]
		-	PSU	[ ]
		-	AUX	[ ]
j.	PCB TRACK LAYOUT	-	Tx	[X]
		-	Rx	[ ]
		-	PSU	[ ]
		-	AUX	[ ]
k.	BILL OF MATERIALS	-	Tx	[X]
		-	Rx	[ ]
		-	PSU	[ ]
		-	AUX	[ ]
l.	USER INSTALLATION / OPERATING INSTRUCTIONS	-		[X]



**ANNEX C**  
**BANDWIDTH PLOT**



# BANDWIDTH PLOT

