FCC Test Report (Part 1)

RF Exposure (EMF)

Test report no.:	EMC_BO_002307 (v1.0)	**Date of report:**	30-Jul-2020
Number of pages:	15	**Project support engineer:**	Oliver Flecke
Test period:	30-Jun to 01-Jul-2020		

Applicant:	Molex CVS Dabendorf GmbH, Märkische Straße 72, 15806 Zossen, Germany, Mr. Michael Schmidt
Manufacturer:	Molex CVS Dabendorf GmbH, Märkische Straße 72, 15806 Zossen, Germany
EUT identification:	Wireless Mobile Interface (WMI), WCH-302 (WCH-302a, WCH-302b, WCH-302c, WCH-302d, WCH-302e, WCH-302f, WCH-302g, WCH-302h, WCH-302i)
FCC ID:	RK7WCH-302

Testing laboratory:	Molex CVS Lab, Molex CVS Bochum GmbH, Meesmannstr.103, 44807 Bochum, Germany	
	Tel.:	+49 234 51668-0
	e-mail:	Product.Validation.Bochum@molex.com
	FCC designation no.:	DE0017
	Laboratory manager:	Robert Müller

Test result:	The EUT complies with the requirements made in the referred test documents.

Approver:	Robert Müller	**Technical review:**	Frank Wittmann
Title:	Laboratory Manager	**Title:**	Senior Test Engineer EMC
Signature:		**Signature:**	

Contents

VERSION HISTORY 3

1. SUMMARY FOR FCC EMF TEST REPORT 4

1.1. EUT AND ACCESSORY INFORMATION 4
1.2. TECHNICAL CHARACTERISTICS 5
1.3. APPLIED STANDARDS 6
1.4. MEASUREMENT UNCERTAINTIES 7
1.5. DECISION RULE 7
1.6. SUMMARY OF TEST RESULTS 8

2. TEST SETUPS 9

2.1. EMF TEST SETUP 9

3. RF EXPOSURE (EMF) 10

3.1. TEST METHOD AND LIMIT 10
3.2. TEST RESULTS H-FIELD 12

4. TEST EQUIPMENT 14

4.1. RF EXPOSURE 14

Version History

Report Number	Date	Comment
EMC_BO_002307 (v1.0)	30-July-2020	1st approved version
-	-	-
-	-	-
-	-	-

1. Summary for FCC EMF Test Report

Date of receipt	30-June-2020
Testing completed	01-July-2020
The customer's contact person	Mr. Michael Schmidt
Test sample / setup pictures	none
HW change / difference document	2.1_WCH-302_Difference_document_1.0.pdf
Notes	none

1.1. EUT and accessory Information

The EUT is an inductive wireless power transfer device (wireless charger) with load modulation only, operating at 127.55 kHz. The WPT device supports a maximum charging power level of 5 W. The highest output power is available at 127.55 kHz.

The EUT is tested with a commercially available mobile phone (highest duty cycle of 100 %). The maximum current consumption was observed between 5 % and 50 % charging level of the mobile phone, so that measurement is done up to 50 %.

The following test samples provided by the customer were tested.

ID	Description	Manufacturer	Type	S/N	HW Version	SW Version
DAB200493E	WMI	Molex	WCH-302a	000002511C05	V16	RC36+

The following accessories have been provided by the customer and belong to the equipment under test (EUT).

ID	Description	Manufacturer	Type	S/N	HW Version	SW Version
DAB191876E	DC power cable long	Molex	-	-	-	-
DAB17096E	Cellular RF cable with Bias-T (50 Ω, 10 kΩ)	Molex	-	-	-	-
DAB191907E	External NFC Antenna	-	-	-	-	-
Note 10+	Mobile Phone (@5 W)	Samsung	Note 10+	-	-	-

1.2. Technical characteristics

Power Supply [V]	Lead-acid battery (vehicle regulated) – 12 V DC		
Voltage Range [V]	U_{nom} = 12.0	U_{min} = 10.2	U_{max} = 13.8
Charging cut-off Voltage [V]	$U_{cut\text{-}off}$ = 8.8 (wireless power transfer is stopped for U < $U_{cut\text{-}off}$)		
Temperatures Range [°C]	-40 to +60		
Radio Type	WPT transceiver		
Product Category	Category I radio apparatus (type 3)		
Operating Frequency Range [kHz]	127.55		
Communication Frequency [kHz]	Same as operating frequency range		
Operating Channels	Not channelized		
Antenna Type	Integral inductive loop coils (no customization allowed)		
Antenna Gain [dBi]	n.a.		
Modulation Type	5W BPP: H-field for charging is not modulated		
Modulation Technique	5W BPP: H-field for charging is not modulated		

Above technical information was provided by the applicant. For more details, please refer to the User's manual of the EUT.

1.3. Applied standards

Standard / Rule Part	Version	Year
CFR 47, FCC Part 2	-	Jul-2020
CFR 47, FCC Part 1	-	Jul-2020
KDB 680106 D01	v03	Apr-2018

Deviations or clarifications to these standards are noted in the related test result under “test method and limit”.

1.4. Measurement uncertainties

Parameter	Measurement Uncertainty	Maximum Uncertainty
H-field probe 100 cm^2	3.33 %	< 30 %
H-field probe 3 cm^2	4.17 %	
H-field level tester	12.60 %	

These uncertainties represent an expanded uncertainty expressed approximately at the 95% confidence level using a coverage factor of k=2

1.5. Decision rule

In this test report the measurement uncertainty is not included in the test result.

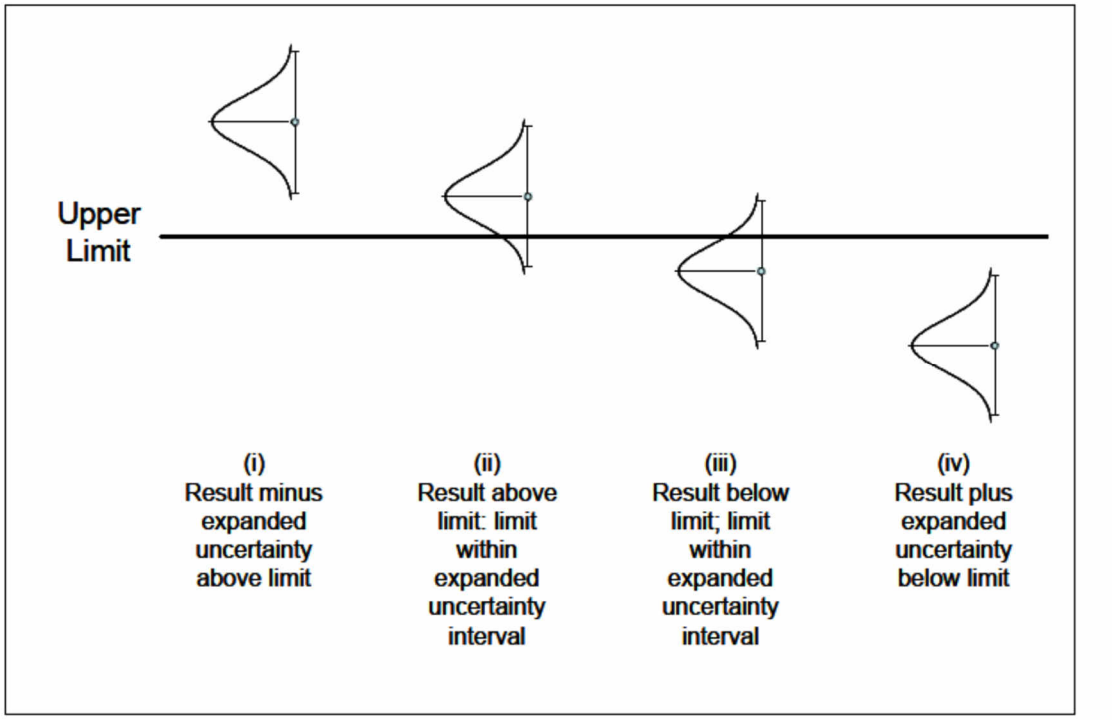


Figure 1: Assessment of Compliance with an Upper Limit (Source: EURACHEM/CITAC Guide: Use of uncertainty information in compliance assessment; First edition 2007)

(i) measurement value is clearly above the limit, result is failed
(ii) measurement value is above the limit, result is failed
(iii) measurement value is below the limit, result is passed
(iv) measurement value is clearly below the limit, result is passed

1.6. Summary of test results

Section	Section in CFR 47	Name of the test	Result
3.2	1.1307(b), 1.1310	RF Exposure (H-field)	PASSED *
-	1.1307(b), 1.1310	RF Exposure (E-field)	NA

PASSED: The EUT complies with the essential requirements in the standard.
FAILED: The EUT does not comply with the essential requirements in the standard.
NP: The test was not performed.
NA: The test was not applicable.

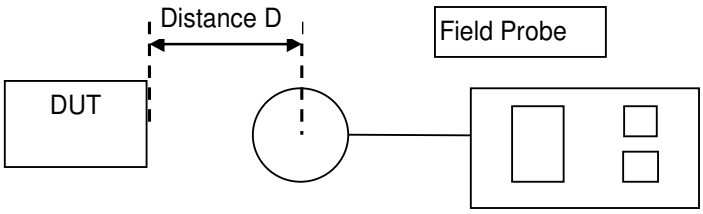
* The table below shows the worst-case minimum distances where the FCC limit is just reached.

FCC Limit [A/m]	Pos A Distance [cm]	Pos B Distance [cm]	Pos C Distance [cm]	Pos D Distance [cm]	Pos Top Distance [cm]	Result
1.63	4.40	4.30	3.90	2.50	2.50	PASSED

The EUT must maintain the minimum distances in the respective positions to pass the FCC limit requirement.

2. Test setups

2.1. EMF test setup



H-Field Probe: Narda ELT-400 + ELT Probe 100 cm^2 (3 cm^2 for D < 6 cm) (1 Hz – 400 kHz)

3. RF Exposure (EMF)

EUT with DUT number	DAB200493E
Accessories with DUT numbers	DAB191876E, DAB17096E, DAB191907E, Note 10+
Operation Voltage [V] / [Hz]	12 V / DC
Result	PASSED
Remarks	-
Temp [°C] / Humidity [%RH]	23.6 °C / 42.5 %
Date of measurement	30-Jun to 01-Jul-2020
Test Engineer	Bhushan Pawar
Test system SW version	n.a.

3.1. Test method and limit

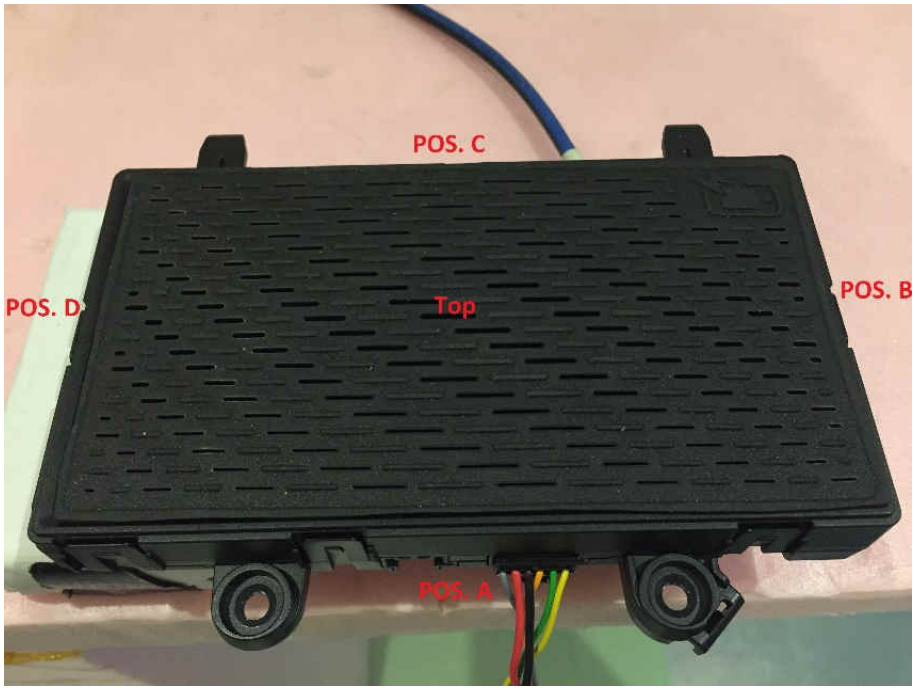
The mobile phone is placed in the centre of the charging area of each coil (left, right) with minimum distance between the primary coil in the DUT and the secondary coil in the mobile phone (best coupling).

The DUT is working on the operating frequency (127.55 kHz) with the highest output power (worst case, 5 W).

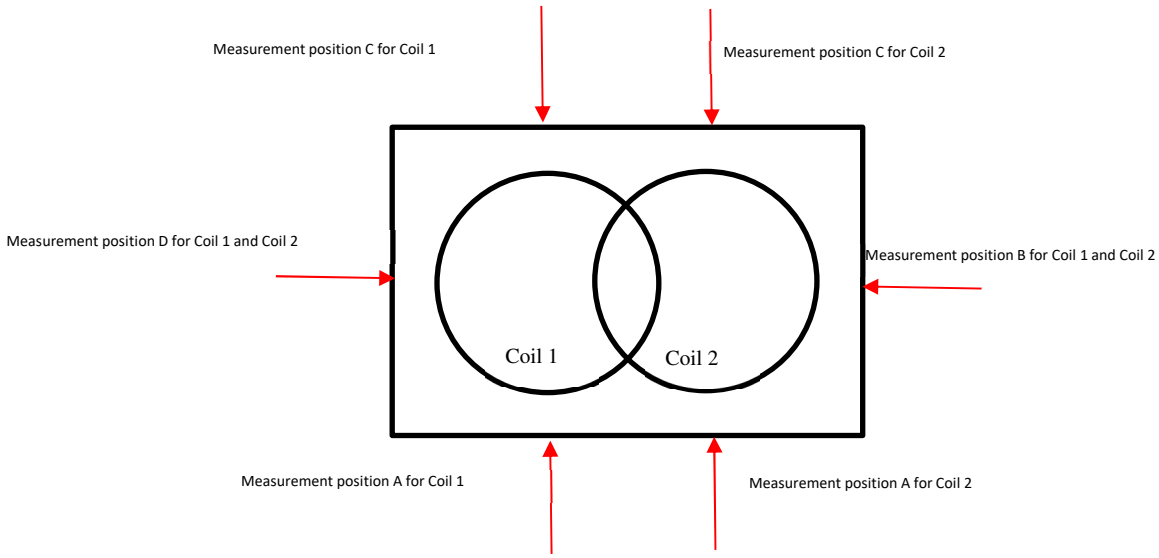
The measurement was performed at all sides of the DUT in 15 cm and 20 cm distance and in addition in 2 cm steps between 2 and 10 cm, if possible (e.g. limited by the probe dimension).

Different probes were used for E- an H-field measurement and the highest emission level was recorded.

The following picture shows the side definition for positioning of the E- and H-field probe.



The following figure shows the measuring positions of the two coils.



FCC limits for maximum permissible exposure

Frequency range [MHz]	Electric Field Strength Limit [V/m]	Magnetic Field Strength Limit [A/m]	Power Density [mW/cm²]	Average Time [minutes]
(B) Limits for General Population / Uncontrolled Exposures				
0.3 – 1.34	614	**1.63**	100	30
1.34 – 30	824 / $f_{[MHz]}$	2.19 / $f_{[MHz]}$	180 / $f_{[MHz]}^2$	30
30 – 300	27.5	0.073	0.2	30
300 – 1500			$f_{[MHz]}$ / 1500	30
1500 – 100000			1.0	30

Note: According to DUT operating frequency and installation definition, the limit in bold letters (300 kHz) was applied.

⇨ FCC limit calculation for f ≤ 300 kHz:

- H-field: 1.63 A/m

3.2. Test results H-field

3.2.1 H-field (Coil 1)

Detector: RMS, Mode: 320 µT, Range: normal, Low Cut: 10 Hz

Distance [cm]	Level Pos A [A/m]	Level Pos B [A/m]	Level Pos C [A/m]	Level Pos D [A/m]	Level Top [A/m]	FCC Limit [A/m]	Result
20	0.08	0.07	0.08	0.14	0.10	1.63	PASSED
15	0.12	0.08	0.11	0.09	0.18	1.63	PASSED
10	0.23	0.14	0.23	0.08	0.45	1.63	PASSED
8	0.30	0.16	0.36	0.21	0.72	1.63	PASSED
6	0.74	0.41	0.70	0.43	0.95	1.63	PASSED
4	1.63	0.60	1.42	0.61	1.27	1.63	PASSED
2	5.18	1.43	4.30	1.29	Note5	1.63	FAILED

Note1: Measurement values were transformed from µT to A/m, where 1 A/m = 1.256 µT.

Note2: Measurements for distances > 6 cm were performed with 100 cm^2 H-field probe.

Note3: Measurements for distances ≤ 6 cm were performed with 3 cm^2 H-field probe.

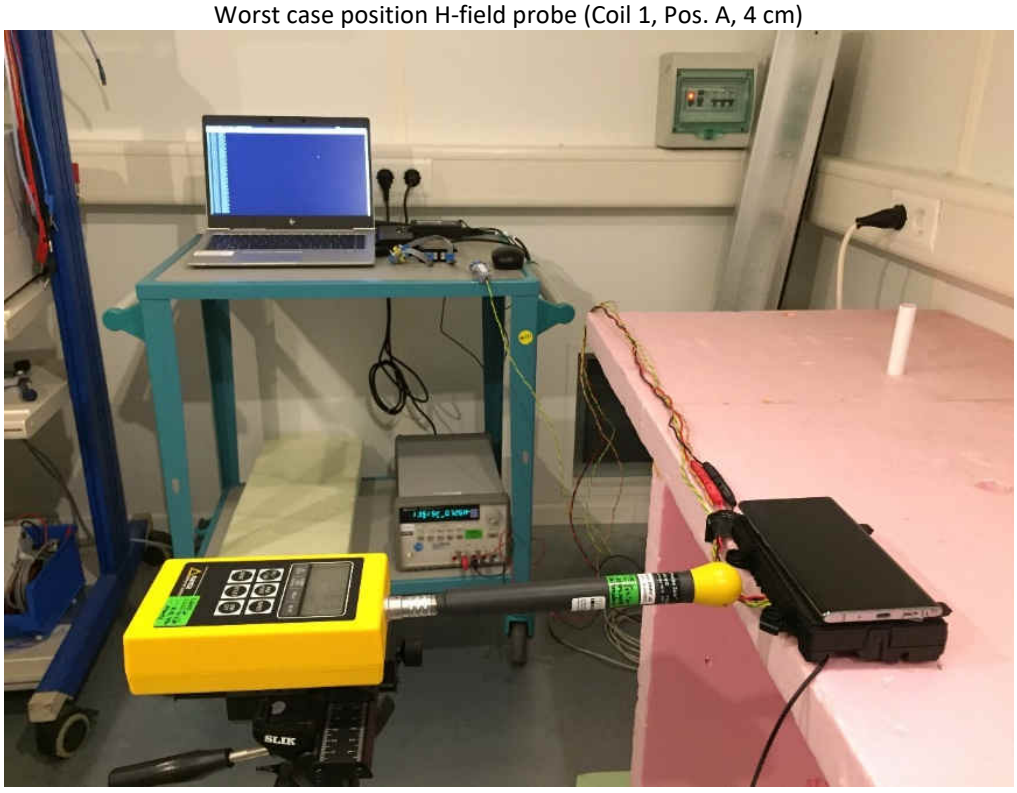
Note4: Result declaration relates only to the columns with measured values within each row.

Note5: Measurements not possible due to mechanical dimensions of the mobile phone and the probe.

The table below shows the worst-case minimum distances where the FCC limit is just reached.

FCC Limit [A/m]	Pos A Distance [cm]	Pos B Distance [cm]	Pos C Distance [cm]	Pos D Distance [cm]	Pos Top Distance [cm]	Result
1.63	4.0	1.9	3.7	1.8	2.5	PASSED

Worst case position H-field probe (Coil 1, Pos. A, 4 cm)



3.2.2 H-field (Coil 2)

Detector: RMS, Mode: 320 µT, Range: normal, Low Cut: 10 Hz

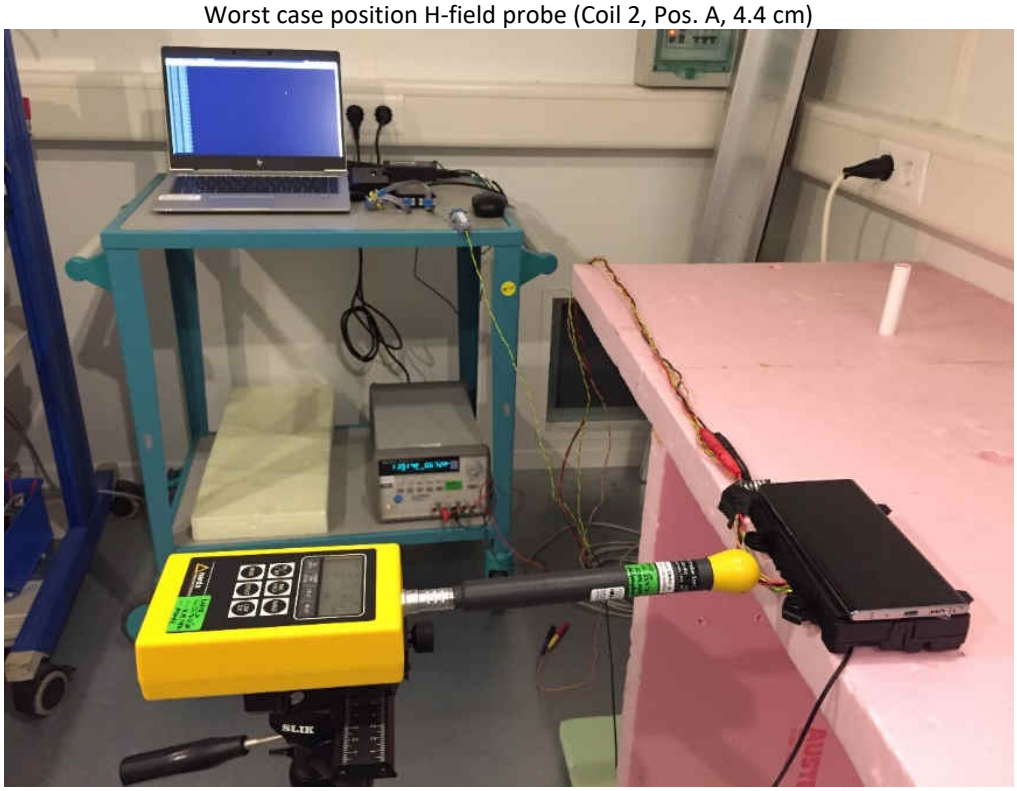
Distance [cm]	Level Pos A [A/m]	Level Pos B [A/m]	Level Pos C [A/m]	Level Pos D [A/m]	Level Top [A/m]	FCC Limit [A/m]	Result
20	0.09	0.11	0.09	0.10	0.13	1.63	PASSED
15	0.14	0.20	0.14	0.15	0.24	1.63	PASSED
10	0.31	0.46	0.29	0.31	0.57	1.63	PASSED
8	0.38	0.72	0.43	0.42	0.65	1.63	PASSED
6	0.91	1.00	0.84	0.64	0.98	1.63	PASSED
4	1.89	1.83	1.58	0.96	1.39	1.63	FAILED
2	5.73	4.18	3.96	1.89	Note5	1.63	FAILED

Note1: Measurement values were transformed from µT to A/m, where 1 A/m = 1.256 µT.
Note2: Measurements for distances > 6 cm were performed with 100 cm^2 H-field probe.
Note3: Measurements for distances ≤ 6 cm were performed with 3 cm^2 H-field probe.
Note4: Result declaration relates only to the columns with measured values within each row.
Note5: Measurements not possible due to mechanical dimensions of the mobile phone and the probe.

The table below shows the worst-case minimum distances where the FCC limit is just reached.

FCC Limit [A/m]	Pos A Distance [cm]	Pos B Distance [cm]	Pos C Distance [cm]	Pos D Distance [cm]	Pos Top Distance [cm]	Result
1.63	4.4	4.3	3.9	2.5	2.5	PASSED

Worst case position H-field probe (Coil 2, Pos. A, 4.4 cm)



4. Test Equipment

4.1. RF Exposure

Equipment	Manufacturer	Type	Serial No.	Actual Calibration	Next Calibration
Exposure Level Tester	Narda Safety Test Solutions GmbH	ELT-400	N-0385	07.12.2017	07.12.2020
H-field Probe 3 cm^2	Narda Safety Test Solutions GmbH	2300/90.20	C-0150	23.04.2018	23.04.2021
H-Field Probe 100 cm^2	Narda Safety Test Solutions GmbH	Probe	M-0823	07.12.2017	07.12.2020

END OF REPORT