COMPLIANCE
For FCC PART 15 Subpart C

Applicant Name:	Date of Testing
CanTops	March 02, 2016 to March 16, 2016
	Test Site/Location
Address:	#23, Gokhyeon-ro 480 Beon-gil, Mohyeon-myeon, Cheoin-gu, Yongin-si, Gyeonggi-do 449-853, South Korea
A-1208 Digital Empire, 16, Deogyeong-daero 1556beon-gil, Yeongtong-gu, Suwon-si, Gyeonggi-do, 443-702, KOREA	**Test Report No.:** BWS-16-RF-0001
	BWS FRN: 0009936881
FCC ID:	**RMNCTS-STBR-AA**

Model(s):	CTS-STBR-AA
EUT Type:	RFID Reader
Frequency Range:	134.2 KHz
Modulation Type	ASK
FCC Classification:	Low Power Transmitter Below 1705 KHz(DCD)
FCC Rule Part(s):	FCC Part 15 Subpart C §15.209

The product was received on March 02, 2016 and testing was completed on March 16, 2016. We, BWS TECH Inc. would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of BWS TECH Inc. the test report shall not be reproduced except in full.

(Date) 03/16/2016
Tested by **Hyun-Yong, Seol**

(Date)03/16/2016
Reviewed by **Bang-Hyun, Nam**

BWS TECH INC.

#23, Gokhyeon-ro 480 Beon-gil, Mohyeon-myeon, Cheoin-gu, Yongin-si, Gyeonggi-do 449-853, South Korea
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FCC TEST REPORT

Scope – *Measurement and determination of electromagnetic emission(EME) of radio frequency devices including intentional radiators and/or unintentional radiators for compliance with the technical rules and regulations of the U.S Federal Communications Commission(FCC)*

1. General Information

1.1 Applicant

- **Company Name** : CanTops
- **Company Address** : A-1208 Digital Empire, 16, Deogyeong-daero 1556beon-gil, Yeongtong-gu, Suwon-si, Gyeonggi-do, 443-702, KOREA
- **Phone/Fax** : Tel No. : +82-31-303-5231 Fax No. : +82-31-303-5233

1.2 Manufacturer

- **Company Name** : CanTops
- **Company Address** : A-1208 Digital Empire, 16, Deogyeong-daero 1556beon-gil, Yeongtong-gu, Suwon-si, Gyeonggi-do, 443-702, KOREA
- **Phone/Fax** : Tel No. : +82-31-303-5231 Fax No. : +82-31-303-5233

1.3 EUT Description

EUT Type	: RFID Reader
Model Name	: CTS-STBR-AA
S/N	: SR-A3728
Freq. Range	: 134.2 KHz
Number of Channels	: Single Channel
Modulation Method	: ASK
Power source	: DC 24 V
Battery	: N/A

1.4 Other Information

FCC Rule Part(s)	: Part 15 Subpart C §15.209
Test Procedure	: ANSI C63.10-2013 DA 00-705
FCC ID	: RMNCTS-STBR-AA
Date of Test	: March 02, 2016 to March 16, 2016
Place of Test	: BWS TECH Inc.(FCC Registration Number : 287786) #23, Gokhyeon-ro 480 Beon-gil, Mohyeon-myeon, Cheoin-gu, Yongin-si, Gyeonggi-do 449-853, South Korea TEL: +82 31 333 5997 FAX: +82 31 333 0017

2. Description of Test Facility

Site Description

Test Lab. :

Accredited by Industry Canada, February 10, 2015
The Certificate Registration Number is 4963A-2.

Accredited by FCC, September 03, 2013
The Certificate Registration Number is 287786.

Accredited by VCCI, September 11, 2015
The Certificate Registration Number is C-4326

Accredited by RRA(EMC,RF, SAR), December 16, 2016
The Certificate Registration Number is KR0017

Accredited by KOLAS(KS Q ISO/IEC 17025), April 08, 2016
The Certificate Registration Number is KT174

Name of Firm : BWS TECH Inc.

Site Location : #23, Gokhyeon-ro 480 Beon-gil, Mohyeon-myeon, Cheoin-gu, Yongin-si, Gyeonggi-do 449-853, South Korea

3. Test Methodology

The tests documented in this report were performed in accordance with ANSI C63.10: 2013 and FCC CFR 47 2.1046, 2.1047, 2.1049, 2.1051, 2.1053, 2.1055, 2.1057, 15.207, 15.209.

3.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application

3.2 EUT Exercise

The EUT was operated in the engineering mode to fix the TX frequency that was for the purpose of the measurements. According to its specifications, the EUT must comply with the requirements of the Section 15.207, 15.209 under the FCC Rules Part 15 Subpart C.

3.3 FCC Part 15.205 Restricted Bands Of Operations

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
[1]0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	([2])
13.36 - 13.41			

1 Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.
2 Above 38.6

(b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions.
The provisions in Section 15.35 apply to these measurements.

3.4 Description Of Test Modes

The EUT has been tested under operating condition for card identification.

4. Summary of Test Results

Low Power Transmitter Below 1705 KHz(DCD)				
Clause	**TEST Description**	**Standard Section**	**Requirements**	**Result**
5.1	**Power Conducted Emission**	§15.207	§15.207	Pass
5.2	**Radiated Spurious Emission**	§15.209	§15.209	Pass

5. Test Data

5.1 AC Power Conducted Emission

5.1.1 Test Equipment

EQUIPMENT	MODEL	MANUFACTURE	SERIAL NUMBER	Calibration Due date (year/month/date)
Test Receiver	ESPI	ROHDE & SCHWARZ	100063	2017/01/08
#2 Conducted Cable_2.7m	N/A	N/A	N/A	2017/01/08
LISN	NSLK 8127	SCHWARZBECK	8127-414	2017/01/07
Impuls-Begrenzer Pulse Limiter	ESH3-Z2	ROHDE & SCHWARZ	100092	2017/01/06
CE CHAMBER	N/A	SY Corp.	N/A	N/A
DC POWER SUPPLY	IPS-30B03DD	INTERACT	00420502	2016/09/10

5.1.2 Test Limit

For equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table.

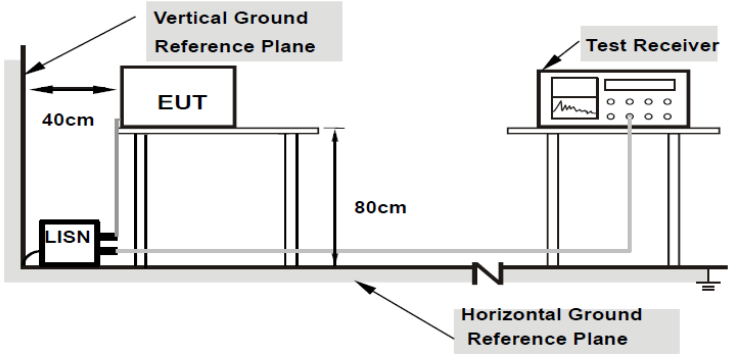
Frequency of emission(MHz)	Conducted limit(dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

5.1.3 Test Procedures

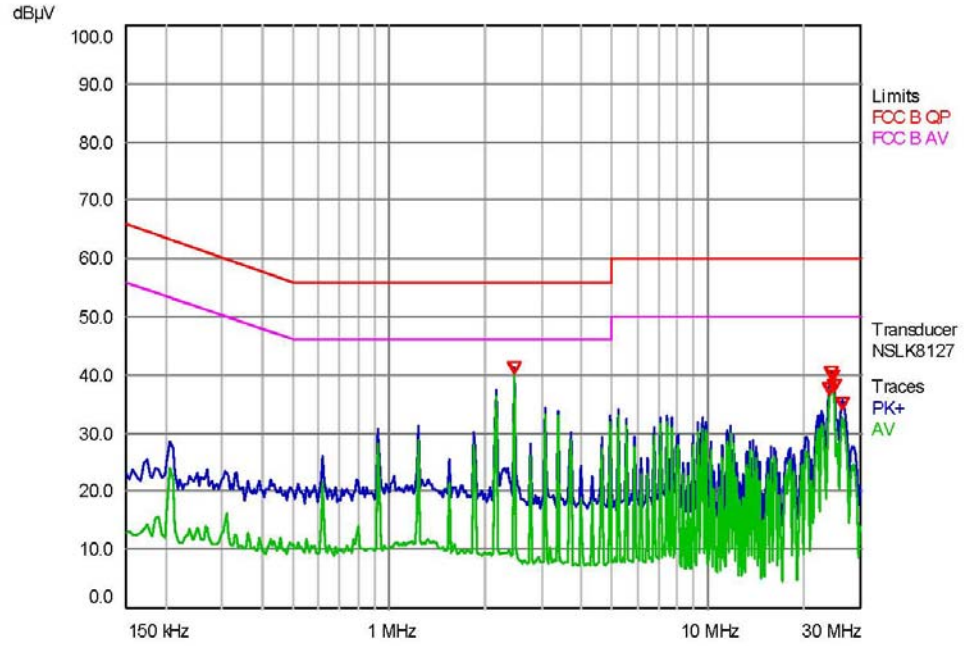
1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network(LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
6. Both sides of AC line were checked for maximum conducted interference.
7. The frequency range from 150 kHz to 30 MHz was searched.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth (IF Bandwidth = 9kHz) with Maximum Hold Mode. Then measurement is also conducted by Average Detector and Quasi-Peak Detector Function respectively.

5.1.4 Block Diagram of Test Setup



5.1.5 Test Result

Direct current +

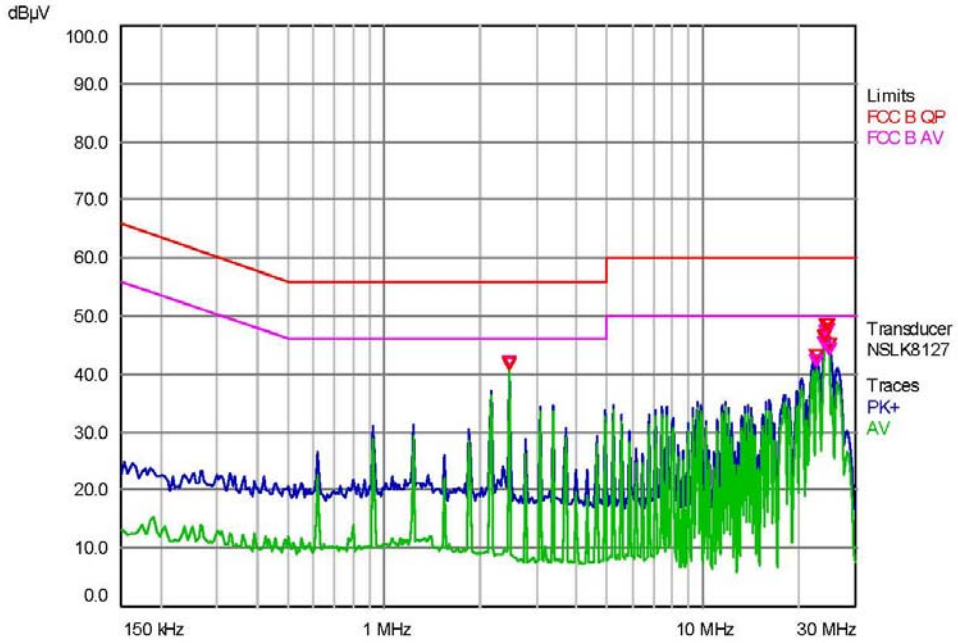


Final Measurement Results

Trace	Frequency (MHz)	Level (dBµV)	Limit (dBµV)	Delta Limit (dB)	Delta Ref (dB)	Comment
1 QP	2.468	40.12	56.00	-15.88		
1 QP	24.08	36.49	60.00	-23.51		
1 QP	24.384	39.47	60.00	-20.53		
1 QP	24.696	38.69	60.00	-21.31		
1 QP	25.0	37.25	60.00	-22.75		
1 QP	26.236	34.07	60.00	-25.93		

* = limit exceeded

Direct current -



Final Measurement Results

Trace	Frequency (MHz)	Level (dBµV)	Limit (dBµV)	Delta Limit (dB)	Delta Ref (dB)	Comment
1 QP	2.468	40.72	56.00	-15.28		
2 CA	2.468	40.97	46.00	-5.03		
1 QP	22.536	42.06	60.00	-17.94		
2 CA	22.536	41.35	50.00	-8.65		
1 QP	24.08	45.55	60.00	-14.45		
2 CA	24.08	44.40	50.00	-5.60		
1 QP	24.388	47.53	60.00	-12.47		
2 CA	24.388	46.29	50.00	-3.71		
1 QP	24.696	47.39	60.00	-12.61		
2 CA	24.696	46.75	50.00	-3.25		
1 QP	25.004	44.23	60.00	-15.77		
2 CA	25.008	43.16	50.00	-6.84		

* = limit exceeded

5.2 Radiated Spurious Emission

5.2.1 Test Equipment

EQUIPMENT	MODEL	MANUFACTURE	SERIAL NUMBER	Calibration Due date (year/month/date)
Bilog Antenna	VULB 9160	SCHWARZBECK	9160-3122	2016/04/02
Loop Antenna	HEH2-Z2	ROHDE & SCHWARZ	881056/6	2017/01/06
EMI Test Receiver	ESH3	ROHDE & SCHWARZ	892580/014	N/A
EMC Analyzer	E7403A	H.P	US39150108	2017/01/06
Chamber Cable_3 m	M17/164-00001	Surprenant	N/A	2017/01/08
Chamber Cable_10 m	SUCOFLEX 104	Hubersuhner	323837/4	2017/01/08
Antenna Master	N/A	AUDIX	N/A	N/A
Antenna Turntable Controller	ACT	AUDIX	N/A	N/A
RE_3 m CHAMBER	N/A	SY Corp.	N/A	N/A
DC POWER SUPPLY	IPS-30B03DD	INTERACT	00420502	2016/09/10

5.2.2 Test Limit

In any 100 kHz bandwidth outside the intentional radiator frequency band, all harmonics/spurious must be at least 20 dB below the highest emission level within the authorized band. In addition, radiated emissions which fall in the restricted bands must also comply with the FCC section 15.209 limits as below.

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

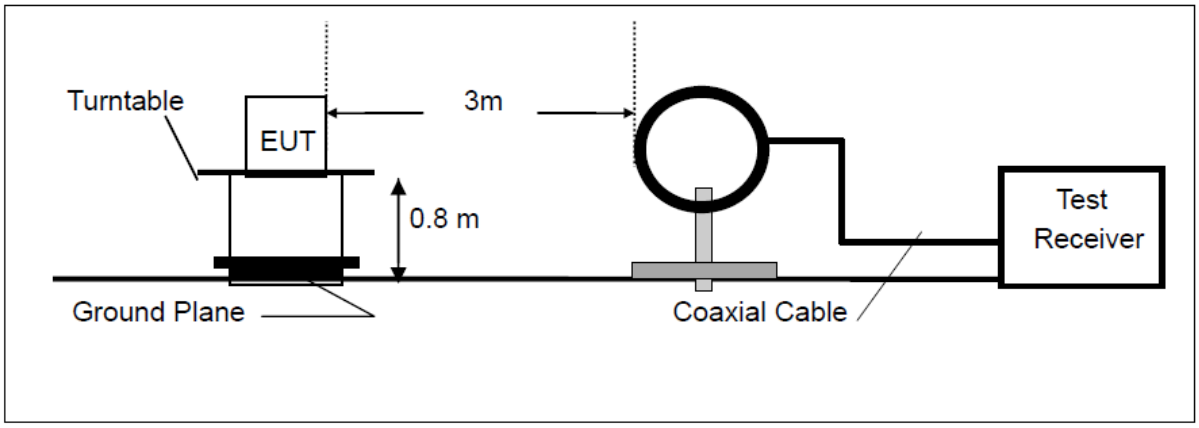
5.2.3 Test Procedure

1. The testing follows the guidelines in Spurious Radiated Emissions of FCC Public Notice DA 00-705 Measurement Guidelines.
2. The EUT was placed on a turntable with 0.8 meter above ground.
3. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
4. For each suspected emission, the EUT was arranged to its worst case and then tune the Antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level to comply with the guidelines.
5. Set to the maximum power setting and enable the EUT transmit continuously.
6. Use the following spectrum analyzer settings:
   (1) Span shall wide enough to fully capture the emission being measured;
   (2) Set RBW=100 kHz for f < 1 GHz, RBW=1MHz for f>1GHz ; VBW ≥ RBW; Sweep = auto; Detector function = peak; Trace = max hold for peak
   (3) For average measurement: use duty cycle correction factor method per 15.35(c).
   Duty cycle = On time/100 milliseconds
   On time = $N_1*L_1+N_2*L_2+...+N_{n-1}*LN_{n-1}+N_n*L_n$
   Where N_1 is number of type 1 pulses, L_1 is length of type 1 pulses, etc.
   Average Emission Level = Peak Emission Level + 20*log(Duty cycle)
7. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level

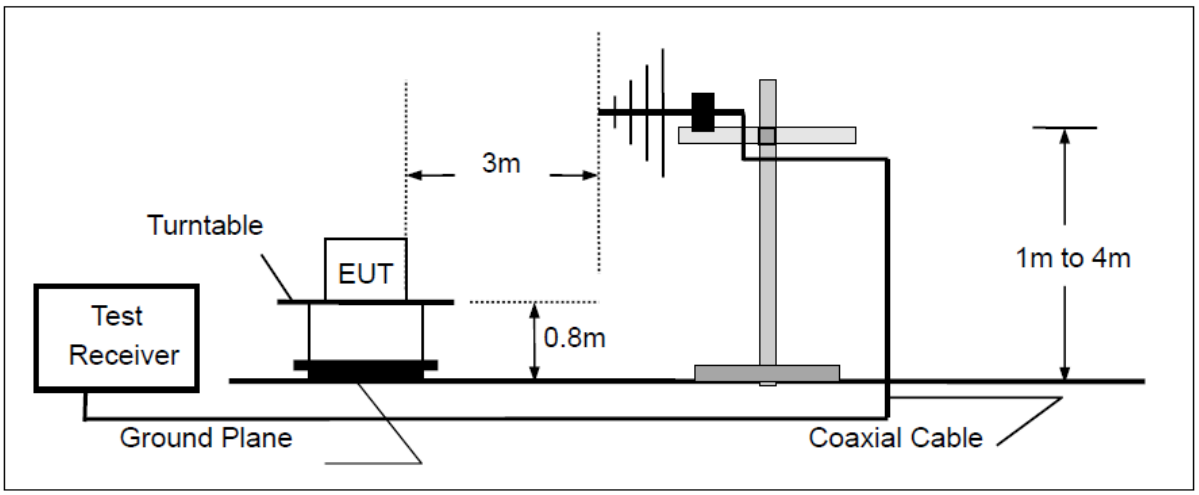
Note: The average levels were calculated from the peak level corrected with duty cycle correction factor (-24.73dB) derived from 20log (dwell time/100ms). This correction is only for signals that hop with the fundamental signal, such as band-edge and harmonic. Other spurious signals that are independent of the hopping signal would not use this correction.

5.2.4 Block Diagram of Test Setup

(A) Radiated Emission Test Set-Up, Frequency Below 30MHz



(B) Radiated Emission Test Set-Up, Frequency Below 1000MHz



5.2.5 Test Result

9 KHz – 30 MHz

Frequency [MHz]	Reading [dB μV]	Polarization [*H/**V]	Ant. Factor [dB]	Cable Loss [dB]	Limit [dB μV/m]	Emission Level [dB μV/m]	Detector
0.01	25.77	H	23.43	0.07	127.60	49.27	PEAK
0.03	25.34	H	20.19	0.07	118.06	45.60	PEAK
0.04	27.62	V	20.15	0.07	115.56	47.84	PEAK
0.09	25.55	H	19.93	0.09	108.52	45.57	PEAK
0.13	25.80	H	19.90	0.09	105.33	45.79	PEAK
2.46	24.17	V	19.63	0.20	69.54	44.00	PEAK
12.72	22.21	V	19.85	0.34	69.54	42.40	PEAK
14.44	22.37	V	19.81	0.35	69.54	42.53	PEAK
16.49	21.71	V	20.01	0.39	69.54	42.11	PEAK
20.59	23.10	H	20.52	0.44	69.54	44.06	PEAK
21.37	24.53	H	20.55	0.45	69.54	45.53	PEAK

30 MHz – 1 GHz

Frequency [MHz]	Reading [dB μV]	Polarization [*H/**V]	Ant. Factor [dB]	Cable Loss [dB]	Limit [dB μV/m]	Emission Level [dB μV/m]	Detector
36.10	25.53	V	10.07	0.56	40.00	36.16	QP
46.60	24.63	V	9.95	0.64	40.00	35.22	QP
109.03	13.93	V	10.79	1.01	43.50	25.73	PEAK
171.99	15.49	V	14.82	1.28	43.50	31.59	PEAK
274.19	21.59	H	12.62	1.64	46.02	35.85	PEAK
495.93	22.20	H	18.14	2.25	46.02	42.59	PEAK