



TEST REPORT

KCTL Inc. 65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea TEL: 82-31-285-0894 FAX: 82-505-299-8311 www.kctl.co.kr	Report No.: KR19-SEF0037-A Page (1) of (20)	
1. Client ◦ Name : Uniden America Corporation ◦ Address : 6225 N. State highway 161, Suite 300, Irving Texas 75038 ◦ Date of Receipt : 2019-02-21		
2. Use of Report : -		
3. Name of Product and Model : RADAR DETECTOR / R7		
4. Manufacturer and Country of Origin : ATTOWAVE Co., Ltd. / Korea		
5. Date of Test : 2019-02-26 to 2019-02-27		
6. Test method used : ANSI C63.4:2014 FCC Part 15 Subpart B, Class B		
7. FCC ID : AMWUA1901		
8. Test Results : Refer to the test result in the test report		
Affirmation	Tested by Name : Byunghwan Min (Signature)	Technical Manager Name : Gunsu Park (Signature)
2019-03-15		
KCTL Inc.		
As a test result of the sample which was submitted from the client, this report does not guarantee the whole product quality. This test report should not be used and copied without a written agreement by KCTL Inc.		

REPORT REVISION HISTORY

Date	Revision	Page No
2019-03-08	Originally issued	-
2019-03-15	Changed contact name	P.4

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Contents

1. Applicant information	4
2. Laboratory information.....	5
3. Test system configuration.....	6
3.1 Operation environment.....	6
3.2 Measurement Uncertainty	7
4. Description of EUT	9
4.1 General information.....	9
4.2 Product description.....	10
4.3 Auxiliary equipments	10
4.4 Test configuration	11
4.5 Operating conditions	12
5. Summary of test results	13
5.1 Summary of EMI emission test results.....	13
6. Test results	14
6.1 Conducted Emissions.....	14
6.2 Radiated Emission	17

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1. Applicant information

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E-mail: sroby@uniden.com
Contact name: Paul Roby

Manufacturer: ATTOWAVE Co., Ltd.
Address: 129, Samsung-ro, Yeongtong-gu, Suwon-si,
Gyeonggi-do, 16677, Rep. of Korea

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Report No.:
KR19-SEF0037-A
Page (5) of (20)

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2. Laboratory information

Address

KCTL Inc. (Suwon Lab.)

65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea

Telephone Number: 82 31 285 0894

Facsimile Number: 82 505 299 8311

FCC Site Designation No: KR0040

VCCI Registration No. : R-3327, G-198, C-3706, T-1849

Industry Canada Registration No. : 8035A

KOLAS NO.: KT231

SITE MAP



3. Test system configuration

3.1 Operation environment

	Temperature	Humidity	Pressure
Chamber 10 m(RE)	22.4 °C	20.2 % R.H.	-
Shielded room(CE)	21.5 °C	19.4 % R.H.	-

Test site

These testing items were performed following locations;

Test item	Test site
Conducted Emission	Shielded Room
Radiated Emission	10 m Chamber

3.2 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC.

The factors contributing to uncertainties are test receiver, cable loss, antenna factor calibration, Antenna directivity, antenna factor variation with height, antenna phase center variation, antenna frequency interpolation, measurement distance variation, site imperfection, mismatch, and system repeatability. Based on CISPR 16-4-2, the measurement uncertainty level with a 95 % confidence level was applied.

Conducted Emission measurement (Confidence level about 95 %, $k = 2$)		
Shielded Room (CE#1)	9 kHz ~ 150 kHz:	3.66 dB
	150 kHz ~ 30 MHz:	3.26 dB
Shielded Room (CE#2)	9 kHz ~ 150 kHz:	3.48 dB
	150 kHz ~ 30 MHz:	3.06 dB
Radiated Emission measurement (Confidence level about 95 %, $k = 2$)		
10 m Chamber (4F)	30 MHz ~ 300 MHz	3 m: 5.32 dB
		10 m: 5.32 dB
	300 MHz ~ 1 000 MHz	3 m: 5.46 dB
		10 m: 5.34 dB
	1 GHz ~ 6 GHz	3 m: 6.32 dB
	6 GHz ~ 18 GHz	3 m: 6.66 dB
10 m Chamber (2F)	30 MHz ~ 300 MHz	3 m: 4.98 dB
		10 m: 4.96 dB
	300 MHz ~ 1 000 MHz	3 m: 5.14 dB
		10 m: 5.00 dB
	1 GHz ~ 6 GHz	3 m: 6.34 dB
	6 GHz ~ 18 GHz	3 m: 6.68 dB
3 m Chamber (3F)	30 MHz ~ 300 MHz	3 m: 4.90 dB
	300 MHz ~ 1 000 MHz	3 m: 5.06 dB
	1 GHz ~ 6 GHz	3 m: 6.70 dB
	6 GHz ~ 18 GHz	3 m: 6.60 dB

3.3 Measurement Program

These test items were performed by software programs;

Test item	Measurement Program		Used
Conducted Emission	EP5CE_V 5.4.0(TOYO)		☒
Radiated Emission	2F	EP5RE_V 4.6.0(TOYO)	☒
	4F	EP5RE_V 5.11.10(TOYO)	

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4. Description of EUT

4.1 General information

Radar Frequencies :

10.500 - 10.550 GHz (X Band)

23.900 - 24.250 GHz (K Band)

33.400 - 35.700 GHz (Ka Superwideband)

Laser Wavelength : 905nm +/-50nm

Operating Temperature Range : -10C to +70C

Power Requirements: Operational 12 to 15 volts DC

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4.2 Product description

Type of product	RADAR DETECTOR
Model name (Basic)	R7
Model name (Variant)	-
Difference	-
Serial no	9A000001
Testing voltage	120 V, 60 Hz(Power supplied from Note PC)
Input rating	DC 12 V ~ DC 15 V
Internal clock frequency	22 MHz
FCC ID	AMWUA1901
Note	-

4.3 Auxiliary equipments

Type	Model / Part #	S/N	Manufacturer
Note PC	NT271B5E-K301S	JGFE91DF600016L	SAMSUNG
Adapter #1	ADP-60ZH D	-	SAMSUNG

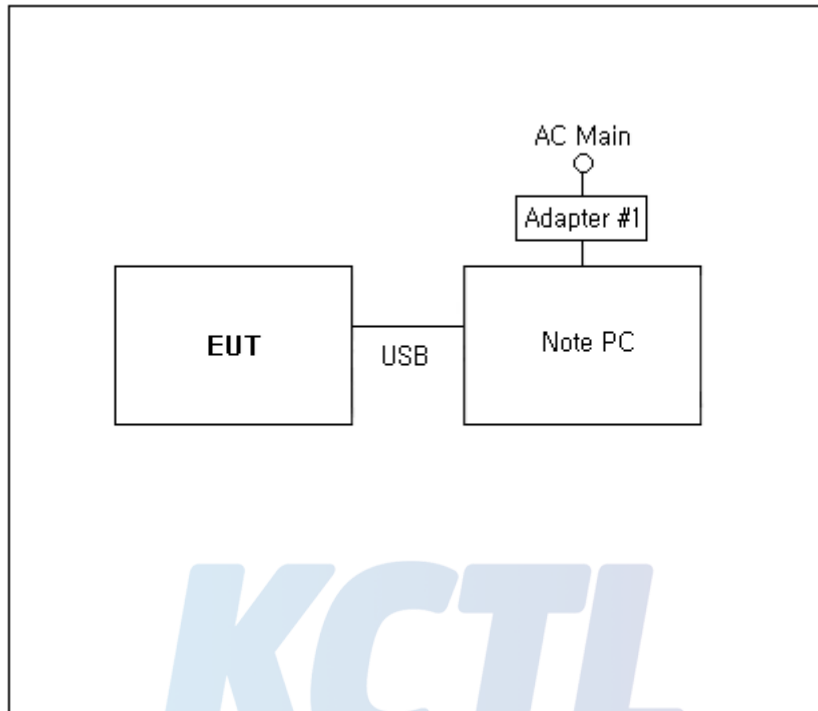
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Report No.:
KR19-SEF0037-A
Page (11) of (20)

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4.4 Test configuration



	Start		End		Cable	
	Name	I/O port	Name	I/O port	Length (m)	Spec.
1	EUT	USB	Note PC	USB	1.2	Shield
2	Note PC	Power	Adapter #1	-	1.5	Unshield

4.5 Operating conditions

The EUT was configured as normal intended use.

Test Mode	Normal operating
Test #1	The equipment under test was operated during the measurement under following conditions: data update mode(program: Uniden R series DB Download Tool V1.11)

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5. Summary of test results

5.1 Summary of EMI emission test results

Applied	Test items	Test method	Result
☒	Conducted Emission	ANSI C63.4:2014 FCC Part 15 Subpart B, Class B	Pass
☒	Radiated Emission	ANSI C63.4:2014 FCC Part 15 Subpart B, Class B	Pass

The data collected shows that EUT the complied with technical requirements of above rules part 15.107(a), (d) and 15.109(a).

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6. Test results

6.1 Conducted Emissions

Test specification	ANSI C63.4:2014 FCC Part 15 Subpart B, Class B		
Testing voltage	120 V, 60 Hz		
Test facility	Shielded room (CE#1)		
Date	2019-02-27		
Temperature (°C)	21.5 °C	Humidity (% R.H.)	19.4 % R.H.
Remarks	Pass		

6.1.1 Limits of conducted emissions measurement

Frequency [MHz]	Class A (dB(μ V))		Class B (dB(μ V))	
	Quasi-peak	Average	Quasi-peak	Average
0.15 ~ 0.5	79	66	66 ~ 56 ¹⁾	56 ~ 46 ¹⁾
0.5 ~ 5	73	60	56	46
5 ~ 30	73	60	60	50

¹⁾ The limit decreases linearly with the logarithm of frequency

6.1.2 Measurement procedure

The measurements were performed in a shielded room. EUT was setup as shown in photograph and placed on a non-metallic table height of 0.8 m above the reference ground plane. The rear of table was located 0.4 m to the vertical conducted plane. EUT was power through the LISN, which was bonded to the ground plane. The LISN power was filtered. Each EUT power lead, except ground (safety) lead was individually connected through a LISN to input power source. EUT signal cables that hung closer than 0.4 m to the Horizontal metal ground 0.3 m ~ 0.4 m long. The power cord was bundles in the center. All peripheral equipment was powered from a sub LISN. The LISN and ISN were positioned 0.8 m from the EUT. Peak and Average detection were used in preliminary testing and Quasi-peak and Average detections were used at final measurement.

6.1.3 Used equipments

Equipment	Model no.	Serial no.	Makers	Next Cal. Date	Used
EMI TEST RECEIVER	ESCI	100001	R&S	2019.08.23	☒
TWO-LINE V-NETWORK	ENV216	101358	R&S	2019.04.05	☒
TWO-LINE V-NETWORK	ENV216	101352	R&S	2019.05.24	☐

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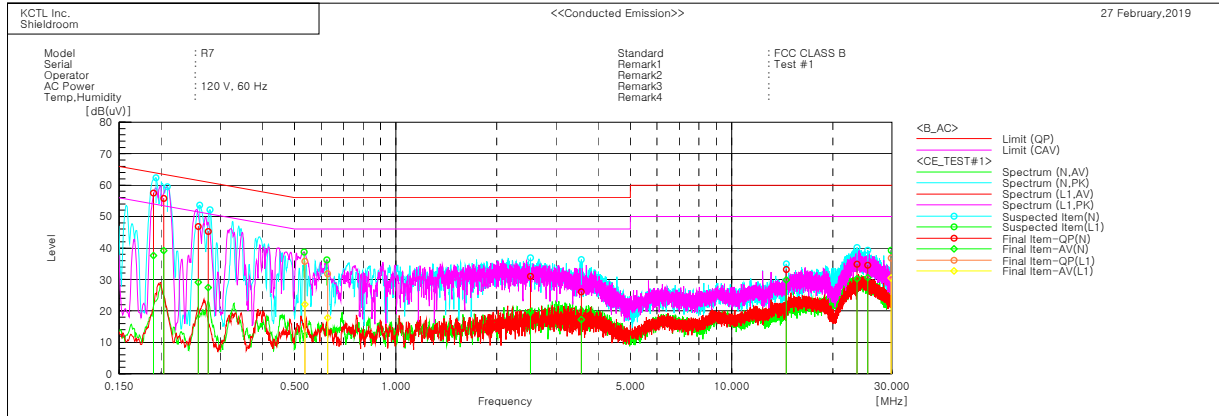
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Report No.:
KR19-SEF0037-A
Page (16) of (20)



6.1.4 Conducted emissions measurement result

AC Main



Final Result

--- N Phase ---										
No.	Frequency	Reading QP	Reading CAV	c.f	Result QP	Result CAV	Limit QP	Limit AV	Margin QP	Margin CAV
	[MHz]	[dB(uV)]	[dB(uV)]	[dB]	[dB(uV)]	[dB(uV)]	[dB(uV)]	[dB(uV)]	[dB]	[dB]
1	0.18987	47.6	27.6	9.9	57.5	37.5	64.0	54.0	6.5	16.5
2	0.20398	46.0	29.4	9.8	55.8	39.2	63.4	53.4	7.6	14.2
3	0.25846	37.3	19.5	9.6	46.9	29.1	61.5	51.5	14.6	22.4
4	0.27623	35.6	17.8	9.6	45.2	27.4	60.9	50.9	15.7	23.5
5	2.51945	21.3	10.0	9.7	31.0	19.7	56.0	46.0	25.0	26.3
6	3.56413	16.3	7.5	9.7	26.0	17.2	56.0	46.0	30.0	28.8
7	14.54753	23.0	19.7	10.1	33.1	29.8	60.0	50.0	26.9	20.2
8	23.61355	24.8	20.1	10.1	34.9	30.2	60.0	50.0	25.1	19.8
9	25.44152	24.4	20.4	10.1	34.5	30.5	60.0	50.0	25.5	19.5

--- L1 Phase ---										
No.	Frequency	Reading QP	Reading CAV	c.f	Result QP	Result CAV	Limit QP	Limit AV	Margin QP	Margin CAV
	[MHz]	[dB(uV)]	[dB(uV)]	[dB]	[dB(uV)]	[dB(uV)]	[dB(uV)]	[dB(uV)]	[dB]	[dB]
1	0.536	25.9	12.3	9.8	35.7	22.1	56.0	46.0	20.3	23.9
2	0.62622	22.0	7.9	9.8	31.8	17.7	56.0	46.0	24.2	28.3
3	29.8293	27.0	20.7	9.8	36.8	30.5	60.0	50.0	23.2	19.5

6.2 Radiated Emission

Test specification	ANSI C63.4:2014 FCC Part 15 Subpart B, Class B		
Testing voltage	120 V, 60 Hz		
Test facility	10 m Chamber (4F)		
Test distance	3 m		
Date	2019-02-26		
Temperature (°C)	22.4 °C	Humidity (% R.H.)	20.2 % R.H.
Remarks	Pass		

6.2.1 Limits of radiated emission measurement

Frequency [MHz]	Class A (dB(μ V/m)) @ 10 m	Class B (dB(μ V/m)) @ 3 m
30-88	39	40
88-216	43.5	43.5
216-960	46.4	46
Above 960	49.5	54

Note- Alternative standard: CISPR, Pub. 22

6.2.2 Measurement procedure

The test was done at a 10 m chamber with a quasi-peak detector. EUT was placed on a non-metallic table height of 0.8 m above the reference ground plane. Cables were folded back and forth forming a bundle 0.3 m to 0.4 m long and were hanged at a 0.4 m height to the ground plane.

Cables connected to EUT were fixed to cause maximum emission. Test was made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna was varied in height above the conducting ground plane to obtain the maximum signal strength.

6.2.3 Used equipments

Equipment	Model no.	Serial no.	Makers	Next Cal. Date	Used
EMI TEST RECEIVER	ESR7	101078	R&S	2019.08.23	☒
Bilog Antenna	CBL 6112D	37876	TESEQ	2020.07.20	☒
AMPLIFIER	310N	293004	SONOMA	2019.08.24	☒
ATTENUATOR	8491B	MY39270292	AGILENT	-	☒
Antenna Mast	MA4640-XP-ET	-	Innco Systems	-	☒
Turn Table	TT 3.0-3t	-	MATURO	-	☒
PREAMPLIFIER	8449B	3008A01802	AGILENT	2019.04.05	☒
DOUBLE RIDGED HORN ANTENNA	3115	00086706	ETS-LINDGREN	2019.08.30	☒
Spectrum Analyzer	FSV40	100988	R&S	2020.01.04	☐

6.2.4 Sample calculation

The field strength is calculated adding the antenna Factor, cable loss and, Antenna pad adding, subtracting the amplifier gain from the measured reading.

The sample calculation is as follow:

$$\text{Result} = \text{M.R} + \text{C.F}(\text{A.F} + \text{C.L} + 6 \text{ dB Att} - \text{A.G})$$

M.R = Meter Reading

C.F = Correction Factor

A.F = Antenna Factor

C.L = Cable Loss

A.G = Amplifier Gain

6 dB Att = 6 dB Attenuator

If M.R is 30 dB, A.F 12 dB, C.L 5 dB, 6 dB, A.G 35 dB

The result is $30 + 12 + 5 + 6 - 35 = 18 \text{ dB } (\mu\text{V/m})$

Bilog Antenna and ATTENUATOR (6 dB) were calibrated together.

AV = CAV : Abbreviation of CISPR Average

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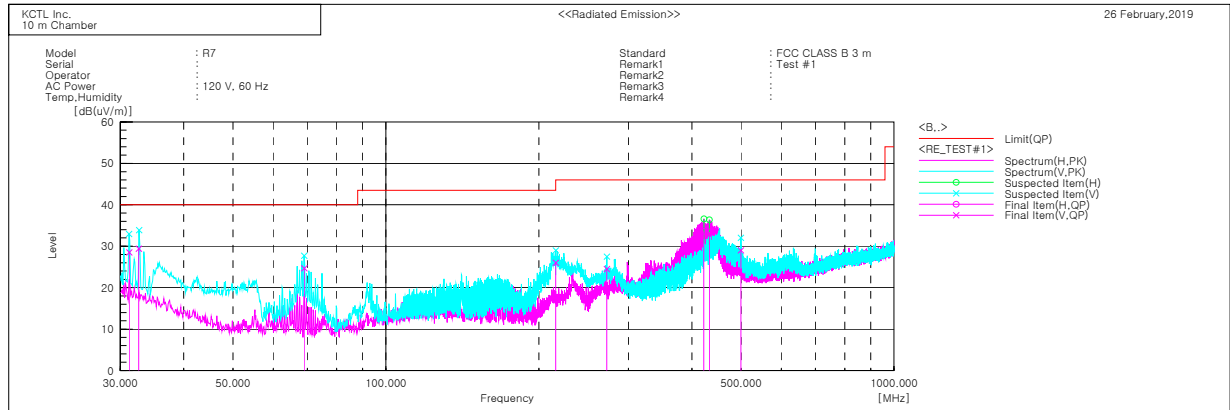
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Report No.:
KR19-SEF0037-A
Page (19) of (20)

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6.2.5 Radiated emission measurement result

30 MHz ~ 1 GHz



Final Result

No.	Frequency [MHz]	(P)	Reading QP [dB(uV)]	c.f [dB(1/m)]	Result QP [dB(uV/m)]	Limit QP [dB(uV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]
1	31.234	V	34.1	-5.6	28.5	40.0	11.5	192.0	267.0
2	32.624	V	35.7	-6.3	29.4	40.0	10.6	100.0	212.0
3	69.047	V	41.1	-16.4	24.7	40.0	15.3	149.0	212.0
4	215.853	V	36.1	-10.1	26.0	43.5	17.5	199.0	61.0
5	272.149	V	30.5	-6.0	24.5	46.0	21.5	223.0	235.0
6	422.424	H	34.6	-1.0	33.6	46.0	12.4	348.0	241.0
7	433.328	H	34.1	-0.7	33.4	46.0	12.6	360.0	243.0
8	499.828	V	28.0	1.0	29.0	46.0	17.0	160.0	322.0

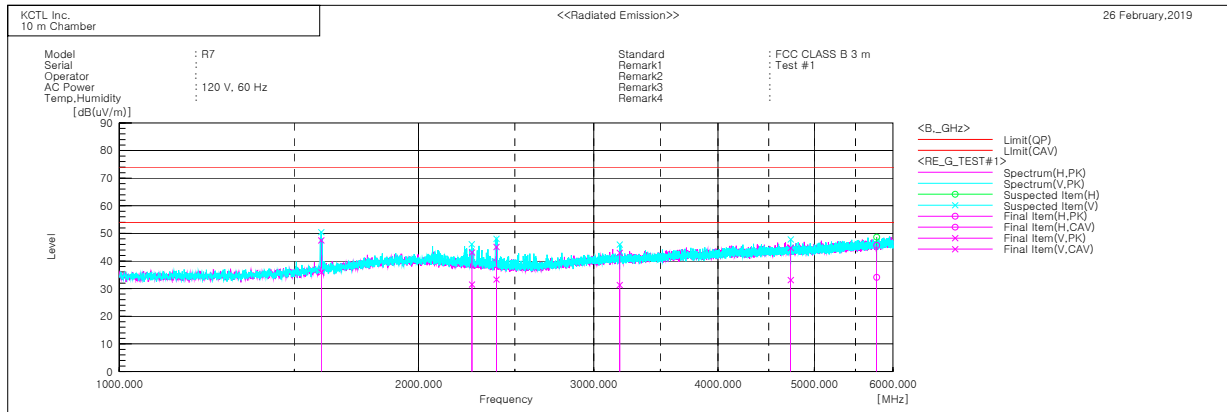
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Report No.:
KR19-SEF0037-A
Page (20) of (20)

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1 GHz ~ 6 GHz



Final Result

No.	Frequency [MHz]	(P)	Reading PK [dB(uV)]	Reading CAV [dB(uV)]	c.f [dB(1/m)]	Result PK [dB(uV/m)]	Result CAV [dB(uV/m)]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin CAV [dB]	Height [cm]	Angle [deg]
1	1596.214	V	54.4	42.8	-6.9	47.5	35.9	74.0	54.0	26.5	18.1	158.0	326.0
2	2262.497	V	46.5	34.9	-3.4	43.1	31.5	74.0	54.0	30.9	22.5	235.0	216.0
3	2394.906	V	49.0	37.2	-3.9	45.1	33.3	74.0	54.0	28.9	20.7	142.0	21.0
4	3186.590	V	43.6	31.9	-0.6	43.0	31.3	74.0	54.0	31.0	22.7	192.0	355.0
5	4735.888	V	40.6	28.9	4.2	44.8	33.1	74.0	54.0	29.2	20.9	128.0	201.0
6	5777.885	H	38.6	27.0	7.1	45.7	34.1	74.0	54.0	28.3	19.9	125.0	261.0

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