

TEST REPORT

of

FCC Part 15 Subpart C

☒ New Application; ☐ Class I PC; ☐ Class II PC

Product : Towable Tire Pressure Monitor System

Brand: TIRE INSIGHT

Model: CT63

VS-68R002-X, VS-68R002-XXXX-X (Where X may be any alpha character "a"-"z", "A"-"Z", or numeric character "0"-"9", or -, (,), or blank

Model Difference: Market Segmentation

FCC ID: ZPNVS68R002

FCC Rule Part:

VERIFICATION OF COMPLIANCE

Applicant: CUB ELECPARTS INC.

Product Description: Towable Tire Pressure Monitor System

Brand Name: TIRE INSIGHT

FCC ID: ZPNVS68R002

FCC Rule Part:

Version

Version No.	Date	Description
00	2017/05/03	Initial creation of document

Uncertainty of Measurement

Description Of Test	Uncertainty
Conducted Emission (AC power line)	2.586 dB
Field Strength of Spurious Radiation	<=30MHz: 2.96dB 30-1GHz: 4.22 dB 1-40 GHz: 4.08 dB
Conducted Power	2.412 GHz: 1.30 dB 5.805 GHz: 1.55 dB
Power Density	2.412 GHz: 1.30 dB 5.805 GHz: 1.67 dB
Frequency	0.0032%
Time	0.01%
DC Voltage	1%

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1. GENERAL INFORMATION

1.1 Product Description

Product Name	Towable Tire Pressure Monitor System
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1.4 Test Facility

The measurement facilities used to collect the 3m Radiated Emission and AC power line conducted data are located on the address of **International Standards Laboratory** <Lung-Tan LAB> No. 120, Lane 180, Hsin Ho Rd., Lung-Tan Dist., Tao Yuan City 325, Taiwan which are constructed and calibrated to meet the FCC requirements in documents ANSI C63.10: 2013. FCC Registration Number is: 872200; Designation Number is: TW1036, Canada Registration Number: 4067B-3.

1.5 Special Accessories

Not available for this EUT intended for grant.

1.6 Equipment Modifications

Not available for this EUT intended for grant.

2. SYSTEM TEST CONFIGURATION

2.1 EUT Configuration

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

2.2 EUT Exercise

The EUT (Transmitter) was tested with a test program to fix the Tx frequency that was for the purpose of the measurements. For more information please see test data and APPENDIX 1 for set-up photographs.

2.3 Test Procedure

2.3.1 Conducted Emissions (Not apply in the report)

The EUT is a placed on as turn table which is 0.8 m above ground plane. According to the requirements in Section 6.2 of ANSI C63.10: 2013. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR 16-1-1 Quasi-Peak and Average detector mode.

2.3.2 Radiated Emissions

The EUT is a placed on as turn table which is 0.8 m/1.5m(Frequency above 1GHz) above ground plane. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter(EUT) was rotated through three orthogonal axes according to the requirements in Section 6 and 11 of ANSI C63.10: 2013.

2.4 Limitation

(1) Conducted Emission

According to section RSS-Gen §8.8 Conducted Emission Limits is as following.

Frequency range MHz	Limits dB (uV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50
Note 1.The lower limit shall apply at the transition frequencies 2.The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.		

(2) Radiated Emission

According to (e) Intentional radiators may operate at a periodic rate exceeding that specified in paragraph (a) of this section and may be employed for any type of operation, including operation prohibited in paragraph (a) of this section, provided the intentional radiator complies with the provisions of paragraphs (b) through (d) of this section, except the field strength table in paragraph (b) of this section is replaced by the following:

Fundamental frequency (MHz)	Field strength of fundamental (microvolts/meter)	Field strength of spurious emission (microvolts/meter)
40.66-40.70	1,000	100
70-130	500	50
130-174	500 to 1,500 ¹	50 to 150 ¹
174-260	1,500	150
260-470	1,500 to 5,000 ¹	150 to 500 ¹
Above 470	5,000	500

¹Linear interpolations.

- Remark:
1. Emission level in dBuV/m = $20 \log (\mu\text{V/m})$
 2. Measurement was performed at an antenna to the closed point of EUT distance of meters.
 3. Only spurious frequency is permitted to locate within the Restricted Bands specified in provision of § 15.205
 4. Emission spurious frequency which appearing within the Restricted Bands specified in provision of § 15.205, then the general radiated emission limits in § 15.209 apply.
 5. For the band 130-174MHz, $\mu\text{V/m}$ at 3meters = $22.72727 * F(\text{MHz}) - 2454.545$;
For the band 260-470MHz $\mu\text{V/m}$ at 3meters = $16.6667 * F(\text{MHz}) - 2833.333$;
Where F is the frequency in MHz.
 6. $433.92\text{MHz AV limit} = 16.6667 * 433.92(\text{MHz}) - 2833.333 = 4398.68 \mu\text{V/m}$
 $= 72.86\text{dBuV/m}$
 7. $433.92\text{MHz Peak limit} = \text{AV Limit} + 20\text{dB} = 92.86\text{MHz}$

2.5 Configuration of Tested System

Fig. 1 Configuration of Tested System

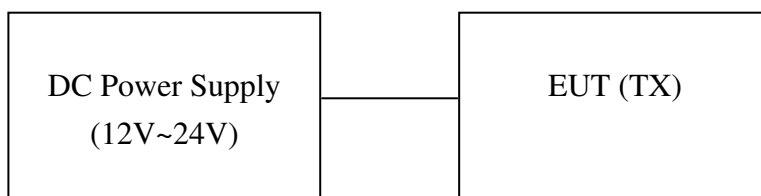


Table 2-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/ Type No.	Series No.	Data Cable	Power Cord
1.	Power supply	MRL	TH-3205	N/A	N/A	Non-shielding
2.						

3. SUMMARY OF TEST RESULTS

FCC /IC Rules	Description Of Test	Result
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5. AC CONDUCTED EMISSIONS TEST

5.1 Measurement Procedure:

1. The EUT was placed on a table which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured were complete.

5.2 Test SET-UP (Block Diagram of Configuration)

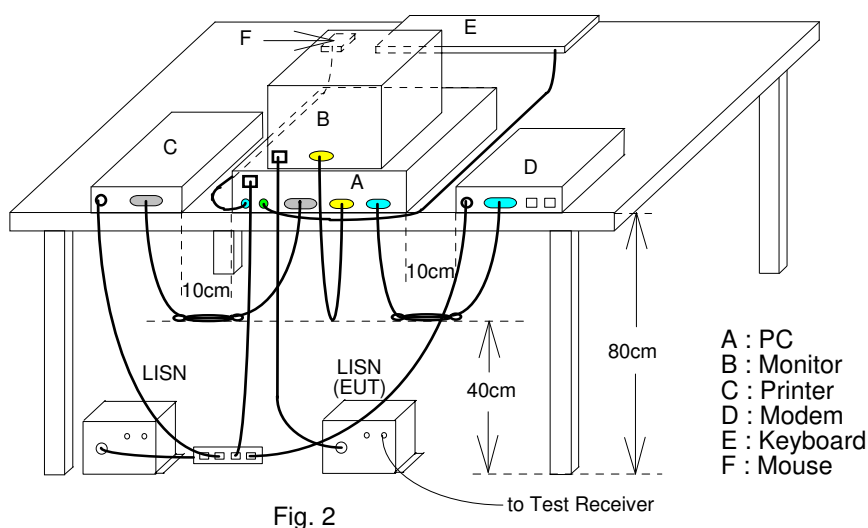


Fig. 2

5.3 Measurement Equipment Used:

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Conduction 04-3 Cable	WOKEN	CFD 300-NL	Conduction 04 -3	09/12/2016	09/11/2017
EMI Receiver 16	Rohde & Schwarz	ESCI	101221	10/24/2016	10/23/2017
LISN 18	ROHDE & SCHWARZ	ENV216	101424	02/05/2017	02/04/2018
LISN 19	ROHDE & SCHWARZ	ENV216	101425	03/07/2017	03/06/2018
Test Software	Farad	EZEMC Ver:ISL-03A2	N/A	N/A	N/A

5.4 Measurement Result:

N/A

6. RADIATED EMISSION TEST

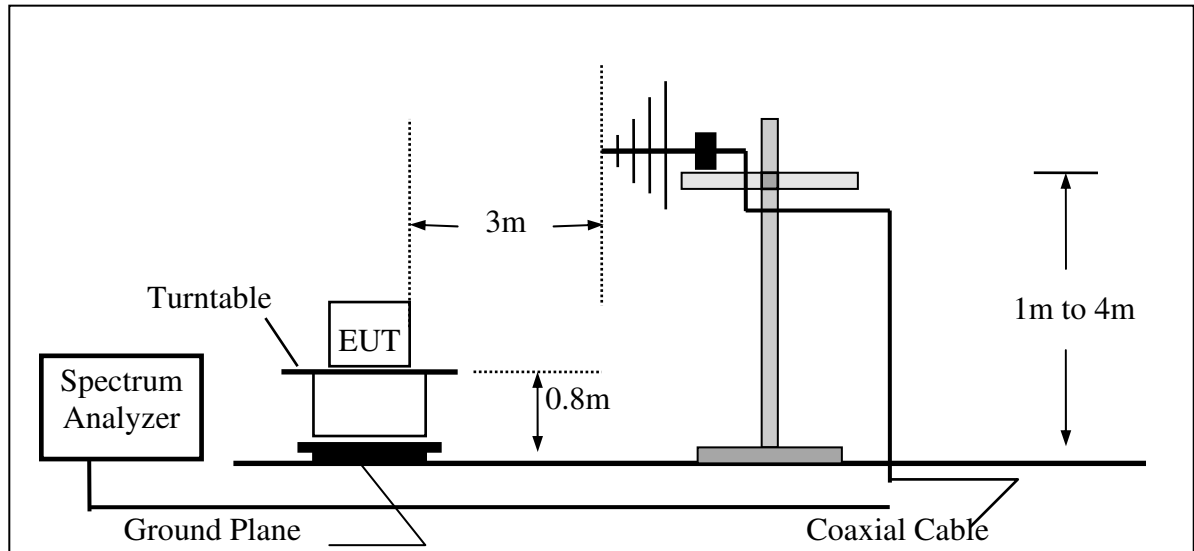
15.231 (e) Intentional radiators may operate at a periodic rate exceeding that specified in paragraph (a) of this section and may be employed for any type of operation, including operation prohibited in paragraph (a) of this section, provided the intentional radiator complies with the provisions of paragraphs (b) through (d) of this section, except the field strength table in paragraph (b) of this section is replaced by the following:

6.1 Measurement Procedure

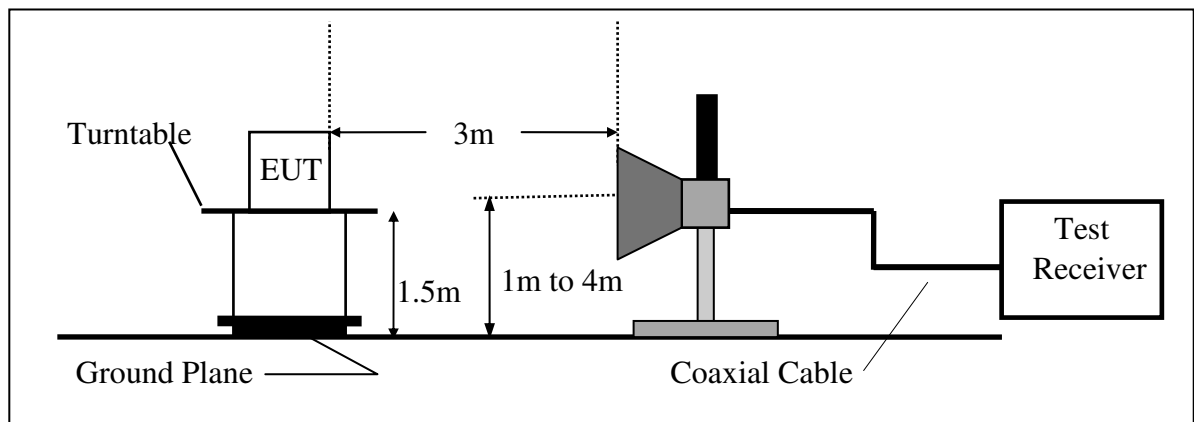
1. The EUT was placed on a turn table which is 0.8/1.5m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measured were complete.

6.2 Test SET-UP (Block Diagram of Configuration)

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



(B) Radiated Emission Test Set-UP Frequency Over 1 GHz



6.3 Measurement Equipment Used:

Chamber 19					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer 21(3Hz-44GHz)	Agilent	N9030A	MY51360021	11/14/2016	11/13/2017
Loop Antenna (9K-30M)	A.H.SYSTEM	SAS-564	294	06/17/2015	06/16/2017
Bilog Antenna (30M-1G)	SCHWARZBECK	VULB9168 w 5dB Att	736	07/22/2016	07/21/2017
Horn antenna (1G-18G)	SCHWARZBECK	9120D	9120D-1627	07/22/2016	07/21/2017
Horn antenna (18G-26G)	Com-power	AH-826	081001	07/24/2015	07/23/2017
Preamplifier (9k-1000M)	HP	8447F	3113A06362	11/13/2016	11/12/2017
Preamplifier(1G-26G)	Agilent	8449B	3008A02471	08/25/2016	08/24/2017
Preamplifier (26G-40G)	MITEQ	JS4-26004000- 27-5A	818471	07/23/2015	07/22/2017
RF Cable (9k-18G)	HUBER SUHNER	SUCOFLEX 104A	MY1397/4A	08/25/2016	08/24/2017
RF cable (18G~40G)	HUBER SUHNER	Sucoflex 102	27963/2&37421/2	11/03/2015	11/02/2017

6.4 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CL - AG$$

Average Value = Peak Value + 20 Log (Ton/Tp)Pulse Modulation Duty Cycle Correction Factor

Where	FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
	RA = Reading Amplitude	AG = Amplifier Gain
	AF = Antenna Factor	

6.5 Measurement Result

Fundamental Measurement Result

Operation Mode: Transmitting Mode
Fundamental Frequency: 433.92MHz
Temp: 25

Test Date: 2017/03/28
Test By: Dino

Radiated Spurious Emission Measurement Result (below 1GHz)

Operation Mode: Transmitting Mode

Test Date: 2017/03/28

Fundamental Frequency: 433.92MHz

Test By: Dino

Temperature : 25

Radiated Spurious Emission Measurement Result (above 1GHz)

Operation Mode: Transmitting Mode

Test Date: 2017/03/28

Fundamental Frequency: 433.92MHz

Test By: Dino

Temperature : 25

7. 20DB OCCUPIED BANDWIDTH

7.1 Measurement Procedure

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Set EUT as normal operation
3. Set SPA Center Frequency = fundamental frequency, RBW= 10KHz, VBW= 30KHz, Span =3MHz.
4. Set SPA Max hold. Mark peak, -20dB. 99% Bandwidth

7.2 Test SET-UP (Block Diagram of Configuration)

Same as 6.2 Radiated Emission Measurement.

7.3 Measurement Equipment Used:

Same as 6.3 Radiated Emission Measurement.

7.4 Measurement Results

Refer to attached data chart.

The center frequency f_c is **433.92MHz**, according to the Rules, section 15.231(C), the Bandwidth of Center Frequency at-20dB should be calculated as following:

$$433.92 \times 0.0025 = 1.0848(\text{MHz})$$

So, the Uper/Lower frequencies limit should be specified as:

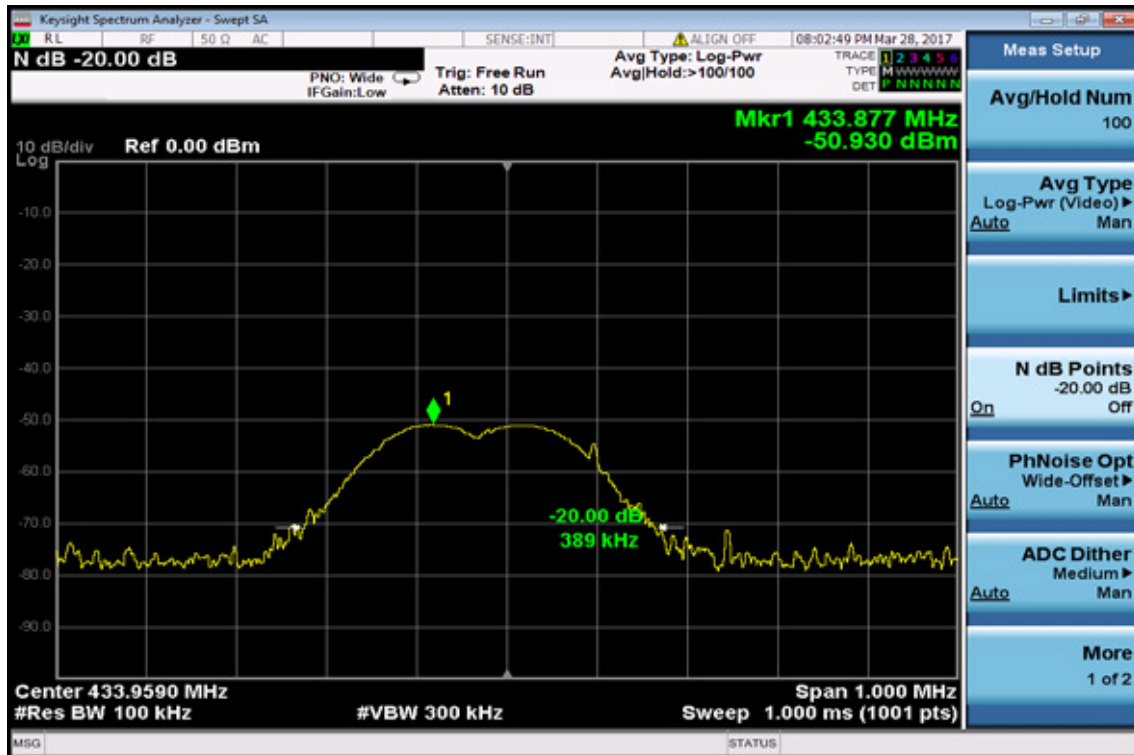
$$f_{(U)} = f_c + \Delta f/2 = 433.92 + 0.5424 = 434.46(\text{MHz})$$

$$f_{(L)} = f_c - \Delta f/2 = 433.92 - 0.5424 = 433.377 (\text{MHz})$$

7.5 Measurement Result:

389 KHz < limit 1.0848MHz

20dB Band Width Test Data



8. DUTY CYCLE (AVERAGE CORRECTION FACTOR) MEASUREMENT

8.1 Measurement Procedure

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Set ETU normal operating mode.
3. Set SPA Center Frequency = fundamental frequency, RBW, VBW= 1.0MHz, Span =0 Hz. Adjacent sweep.
4. Set SPA View. Mark delta.

8.2 Test SET-UP (Block Diagram of Configuration)

Same as 6.2 Radiated Emission Measurement.

8.3 Measurement Equipment Used:

Same as 6.3 Radiated Emission Measurement.

8.4 Measurement Results: N/A

Duty cycle correction factor is not used for average value.

9. SILENT PERIOD TIME MEASUREMENT:

15.231 (e)

devices operated under the provisions of this paragraph shall be provided with a means for automatically limiting operation so that the duration of each transmission shall not be greater than one second and the silent period between transmissions shall be at least 30 times the duration of the transmission but in no case less than 10 seconds.

RSS 210 A1.1.5

(2) In addition, devices operated under the provisions of this section (A1.1.5) shall be capable of automatically limiting their operation so that the duration of each transmission shall not be greater than 1 second and the silent period between transmissions shall be at least 30 times the duration of the transmission, but in no case less than 10 seconds. However, devices that are designed for limited

use for the purpose of initial programming, reprogramming or installation, and not for regular operations, may operate up to 5 seconds provided that such devices are used only occasionally in connection with each unit being programmed or installed.

9.1 Measurement Procedure

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Set SPA Center Frequency = fundamental frequency, RBW, VBW= 1MHz, Span =0Hz
3. Set EUT Power on as normal operation
4. Set SPA Max hold. Delta Mark.

9.2 Test SET-UP (Block Diagram of Configuration)

Same as 6.2 Radiated Emission Measurement.

9.3 Measurement Equipment Used:

Same as 6.3 Radiated Emission Measurement.

9.4 Measurement Results

Total transmission time of transmissions calculation:

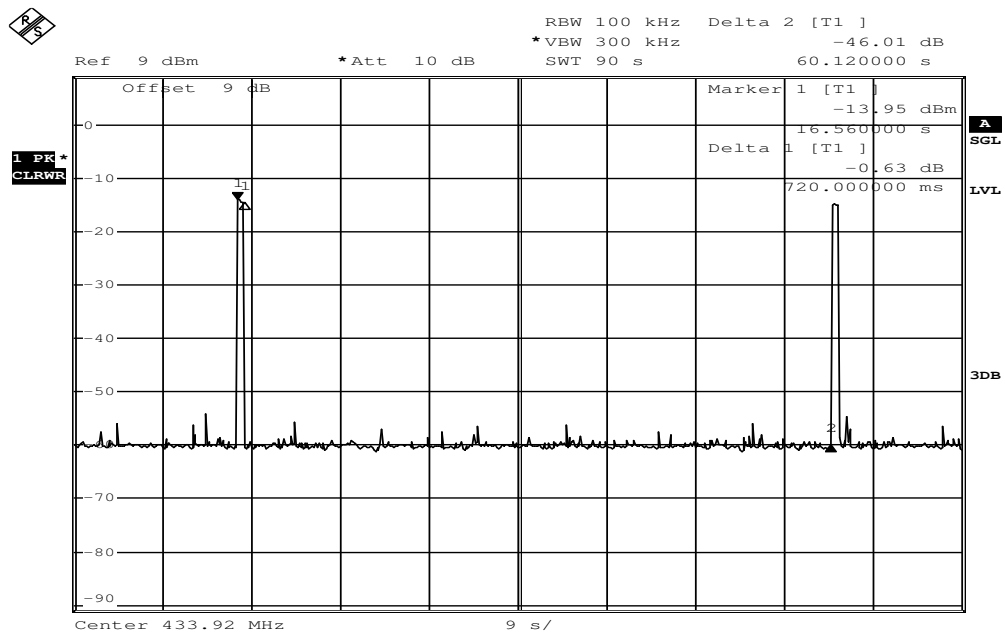
Ton: 720 ms, < 1s

Tp: 60.12s

silent period limit(which one is lower): 10s or 720ms *30 = 21.6s

T silent period = 60.12s – 0.72s = 59.4s > 10s

The result : PASS.



Date: 2.MAY.2017 10:30:34