

NGENCO™
PAINT PROTECTION FILM



**Whatever The
Road Throws
at You**

Adaptive Cruise Control Radar Performance Test

**OEM Bumper Coated With
Ngenco Paint Protection Spray (PPS)**

Unit 4, West Court, Buntsford Park Road, B60 3DX
Email: technical@ngenco.com Website: ngenco.com

Report on the Radio Testing
for
Ngenco
Limited
on
Processed Car Bumper Pieces
Report no. TRA-049966-45-00A
16 March 2020

RF908 7.0

Report Number: TRA-049966-45-00A
Issue: A

REPORT ON THE RADIO TESTING OF A
Ngenco Ltd
Processed Car Bumper Pieces
ABSORPTION CHARACTERISTICS ON 76 GHz CW SIGNAL

TEST DATE: 2020-03-05

Written by:



Digitally signed by A Wong
DN: cn=AWong, o=Element Materials
Technology Warwick Ltd., ou,
email=alan.wong@element.com,
c=GB
Date: 2020.03.16 16:36:30 Z

A. L. Y. Wong
Radio Test Engineer

Approved by:



Digitally signed by John Charters
DN: cn=John Charters, o=Element
Materials Technology Ltd.,
email=john.charters@element.com, c=GB
Reason: I am approving this document
Date: 2020.03.16 16:35:43 Z

J. Charters
Lab Manager

Date: 16 March 2020

Disclaimers:

[1] THIS DOCUMENT MAY BE REPRODUCED ONLY IN ITS ENTIRETY AND WITHOUT CHANGE
[2] THE RESULTS CONTAINED IN THIS DOCUMENT RELATE ONLY TO THE ITEM(S) TESTED

RF908 7.0

1 Revision Record

<i>Issue Number</i>	<i>Issue Date</i>	<i>Revision History</i>
A	16 March 2020	Original

2 Summary

TEST REPORT NUMBER: TRA-049966-45-00A

WORKS ORDER NUMBER: TRA-049966-01

PURPOSE OF TEST: Measurement of RF power absorption by samples

EQUIPMENT UNDER TEST (EUT): Processed Car Bumper Pieces

MANUFACTURER/AGENT: Ngenco Ltd

ADDRESS: West Court
Bromsgrove
B60 3DX
United Kingdom

CLIENT CONTACT: Ngenco Limited
☎ +44 (0) 1527 570077
✉ technical@ngenco.com

ORDER NUMBER: PO:6998

TEST DATE: 2020-03-05

TESTED BY: A. L. Y. Wong
Radio Test Engineer
Element

2.1 Test Summary

<i>Test Method and Description</i>	<i>Requirements</i>	<i>Applicable</i>
Absorption of 76 GHz continuous wave	As requested by the client	<input checked="" type="checkbox"/>

Notes:

The results contained in this report relate only to the items tested, in the condition at time of test, and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.

The apparatus was set up and exercised using the configurations, modes of operation and arrangements defined in this report only. Any modifications made are identified in Section 8 of this report.

Particular operating modes, apparatus monitoring methods and performance criteria required by the standards tested to have been performed except where identified in Section 5.2 of this test report (Deviations from Test Standards).

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4 Introduction

This report TRA-049966-45-00A presents the results of the Radio testing on a Ngenco Ltd, Processed Car Bumper Pieces for absorption characteristics of 76 GHz continuous wave.

The testing was carried out for Ngenco Ltd by Element, at the address detailed below.

- | | | | |
|-------------------------------------|---|--------------------------|--|
| <input checked="" type="checkbox"/> | Element Hull
Unit E
South Orbital Trading Park
Hedon Road
Hull
HU9 1NJ
UK | <input type="checkbox"/> | Element Skelmersdale
Unit 1
Pendle Place
Skelmersdale
West Lancashire
WN8 9PN
UK |
|-------------------------------------|---|--------------------------|--|

This report details the configuration of the equipment, the test methods used and any relevant modifications where appropriate.

All test and measurement equipment under the control of the laboratory and requiring calibration is subject to an established programme and procedures to control and maintain measurement standards. The quality management system meets the principles of ISO 9001, and has quality control procedures for monitoring the validity of tests undertaken. Records and sufficient detail are retained to establish an audit trail of calibration records relating to its test results for a defined period. Under control of the established calibration programme, key quantities or values of the test & measurement instrumentation are within specification and comply with the relevant traceable internationally recognised and appropriate standard specifications, which are UKAS calibrated as such where these properties have a significant effect on results. Participation in inter-laboratory comparisons and proficiency testing ensures satisfactory correlation of results conform to Elements own procedures, as well as statistical techniques for analysis of test data providing the appropriate confidence in measurements.

5 Test Specifications

5.1 Normative References

- Specific test requirements and methods to investigate the amount of RF power absorbed by the samples when 76 GHz continuous wave signals propagated through them.

6 Glossary of Terms

§	denotes a section reference from the standard, not this document
AC	Alternating Current
ACK	Acknowledgement signal
AFH	Adaptive Frequency Hopping
BW	bandwidth
C	Celsius
CCA	Clear Channel Assessment
COT	Channel Occupancy Time
CW	Continuous Wave
dB	decibel
dBm	dB relative to 1 milliwatt
DAA	Detect And Avoid
DC	Direct Current
EIRP	Equivalent Isotropically Radiated Power
EN	European Normative document
EUT	Equipment Under Test
FHSS	Frequency Hopping Spread Spectrum
Hz	hertz
ITU	International Telecommunication Union
LBT	Listen Before Talk
m	metre
max	maximum
min	minimum
N/A	Not Applicable
PCB	Printed Circuit Board
PDF	Portable Document Format
R&TTE	Radio and Telecommunications Terminal Equipment
RE	Radio Equipment
RF	Radio Frequency
RH	Relative Humidity
RMS	Root Mean Square
Rx	receiver
s	second
Tx	transmitter
UKAS	United Kingdom Accreditation Service
V	volt
W	watt
Ω	ohm

7 Equipment Under Test

7.1 EUT Identification

- Name: Processed Car Bumper Pieces

7.2 System Equipment

Equipment listed below forms part of the overall test setup and is required for equipment functionality and/or monitoring during testing. The compliance levels achieved in this report relate only to the EUT and not items given in the following list.

Not Applicable – No support/monitoring equipment required.

7.3 EUT Parameters

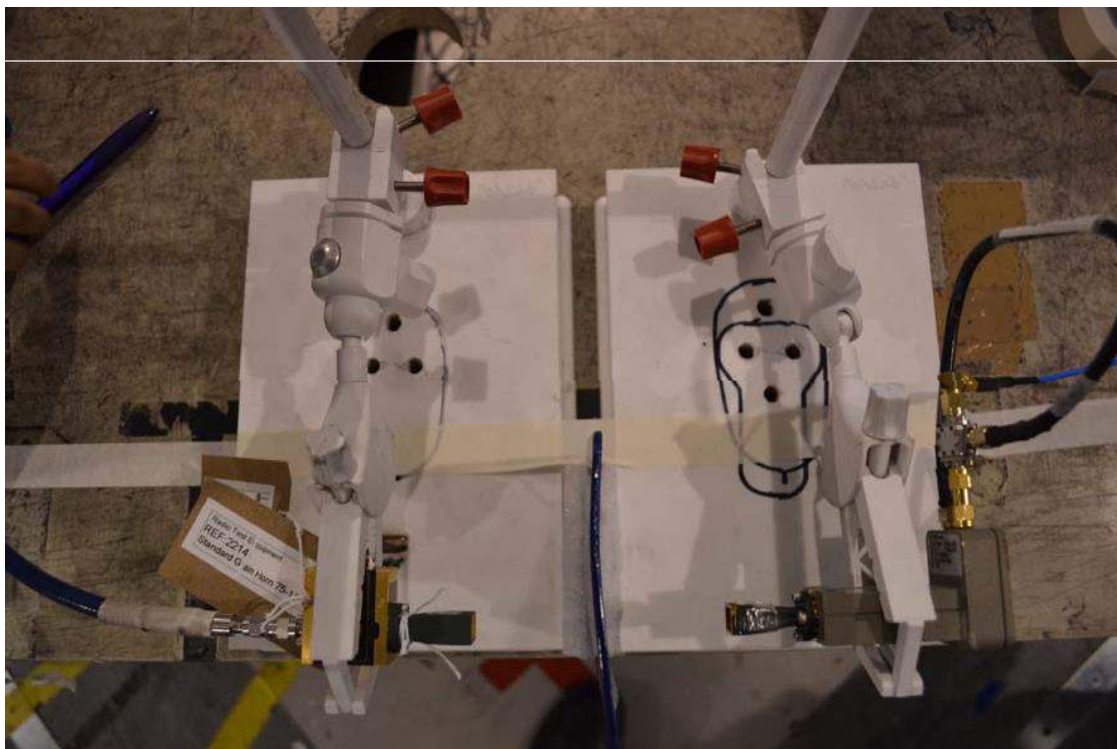
Sample:	Cut-outs from a modern automotive bumper
Process:	Sanding
Coating:	Ngenco CPPS

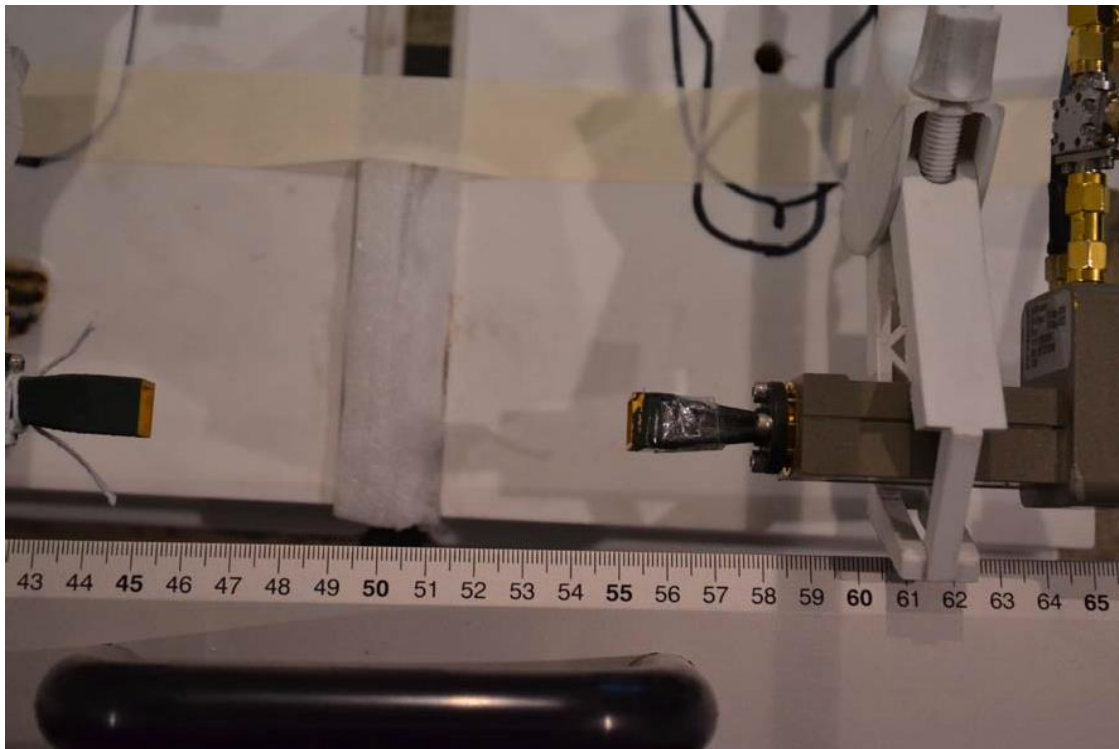
7.4 EUT Description

The EUT are pieces of car bumper, with different processes and treatments.

8 Photographs

The following photographs shows basic EUT set-up:





9 RF Signal Attenuation

9.1 Definition

The RF power absorbed by the material.

9.2 Test Parameters

Test Location:	Element Hull
Test Chamber:	Wireless Laboratory 2
Frequency Measured:	76 GHz
Measurement BW:	1 MHz
Measurement Detector:	RMS

Environmental Conditions (Normal Environment)

Radiated

Temperature: 23 °C	Standard Requirement: +15 °C to +35 °C
Humidity: 33 %RH	Standard Requirement: 20%RH to 75%RH

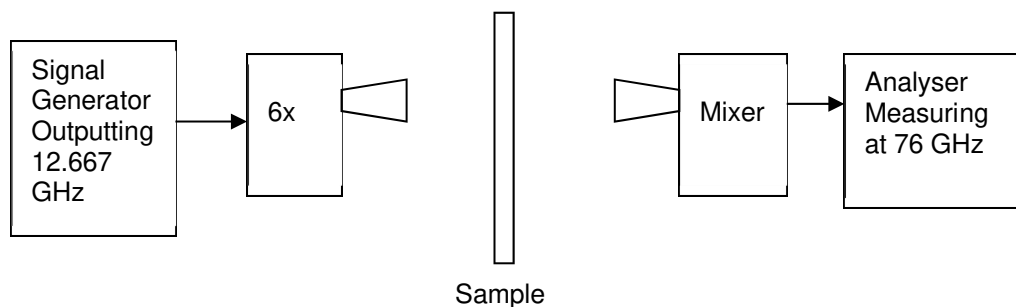
9.3 Radiated Measurement

9.3.1 Test Method

With the EUT setup as per section 9 of this report and connected as per Figure ix, the testing of the level of attenuation of four bumper samples was performed.

1. A test bed was used, consisting of a 76 GHz CW transmitter and a tuned receiver to measure received signal strength in a controlled environment (semi-anechoic chamber), with space between the two antennas to insert the bumper samples. Separation between bumper sample and each antenna was ≈ 50 mm unless otherwise specified in writing.
2. The system was calibrated to give a known received signal strength at 76 GHz with no bumper sample present and this figure was recorded.
3. A bumper sample was inserted between the two antennas and the received signal strength was measured to obtain attenuation result.
4. The received signal strength at 76 GHz with no bumper sample present was measured again to ensure consistency and this figure was recorded.
5. Steps 2, 3 and 4 was repeated again for each of the different samples.

Figure ix Test Setup



9.3.2 Test Equipment

Equipment Description	Manufacturer	Equipment Type	Element No	Due For Calibration
Spectrum Analyser	Agilent	N9030A	REF2167	2020-08-12
Signal Generator	Agilent	PSG E8257D	REF2168	2020-12-09
75-110 GHz	FM Ltd	Horn Antenna	REF2214	Cal. before use
6x W-band	MI-WAVE	Mixer	REF2211	Cal. before use
K-Type RF coaxial cable	Teleydyne	Cable	REF2185	Cal. before use
75-110 GHz	Agilent	Mixer	TRLUH367	Cal. before use

9.3.3 Test Results

Sample	Arbitrary Power Levels (dBm)			RF Power Absorbed (dBm)
	Before (no sample)	Sample Present	After (no sample)	
1	-52.0	-52.9	-52.0	0.9
2	-51.8	-53.2	-51.8	1.4
3	-52.2	-53.3	-52.2	1.1
4 (Simulated rain on 1)	-52.1	-53.7	-52.1	1.6

KEY: Four samples of cut-outs from a modern automotive bumper with different treatments

1. "Control" sample, as from the production line.
2. "Repaired" sample, as from the production line and then sanded, primed, and repainted.
3. "Triple coated" sample, as from the production line and treated with Ngenco PPS anti-chip coating, then repainted, then treated again with Ngenco stage 3 anti-chip coating.
4. "Simulated rain" sample, made by spraying "Control" sample with de-ionized water to simulate rain spray.

Unit 4, West Court, Buntsford Park Road, B60 3DX Email:
technical@ngenco.com Website: ngenco.com