



TRI153-28_Antenna

Test Report

RPT_ETS-5920c

Version 1

9 May 2024

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1 Version record

Rev	Date	TC #	Change	Author
1	9 May 2024	-	First release	R, Weir

2 Summary

Equipment:	Antenna TRI105-12 for the TRI153-28 RFID	
Client:	Tritium Pty., Ltd. 48 Miller Street, Murarrie, Queensland 4172, AUSTRALIA	
Project:	ETS-5920	
Test Method:	Antenna pattern: Developed in-house. Antenna impedance: NXP Semiconductors application note, AN11019 Rev. 1.5 CLRC663, MFRC630, MFRC631, SLRC610 antenna design guide.	
Instructions:	Characterise the TRI153-28 antenna.	
Modifications:	<i>The sample was tested as received.</i>	
Test dates:	7 May 2024	
Test location:	Tritium Testing Facility 48 Miller Street, Murarrie, Queensland 4172	
Result:	<ul style="list-style-type: none">• The antenna pattern was measured.• The antenna impedance was measured.• The antenna gain was not calculated since only radiated measurements were used to show compliance with FCC and ISSED limits for fundamental and spurious emissions.	
	<i>The results in this report relate only to the sample tested.</i>	
Issue Date:	9 May 2024	
Approved By:		Rob Weir, Lead EMC Engineer

3 Equipment under test (EUT) details

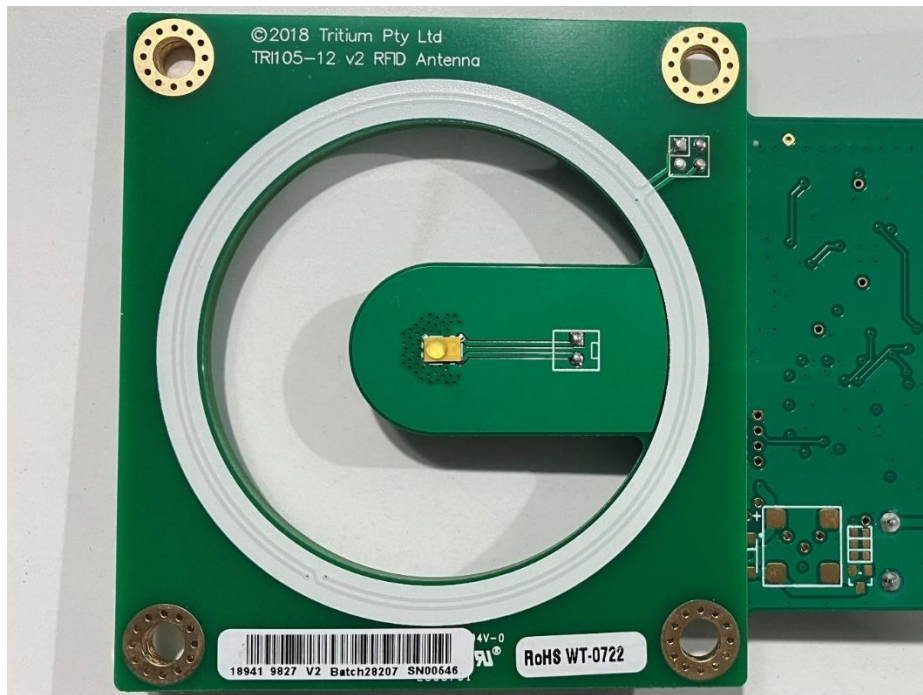
3.1 Specifications

Equipment type	Loop Antenna
Tritium Identifier	Antenna PCB: TRI105-12 RFID Sub-assembly: TRI153-28
Loop Dimensions	65 mm diameter
Operating frequencies	13.56 MHz

3.2 Description

Loop antenna constructed from a Printed Circuit Board (PCB). The radiating element consists of two traces on the PCB. The TRI105-12 antenna PCB is fixed to the TRI153-28 RFID main PCB. An LED circuit was included that illuminated when the RFID was transmitting.

3.3 Photo



3.4 Modifications

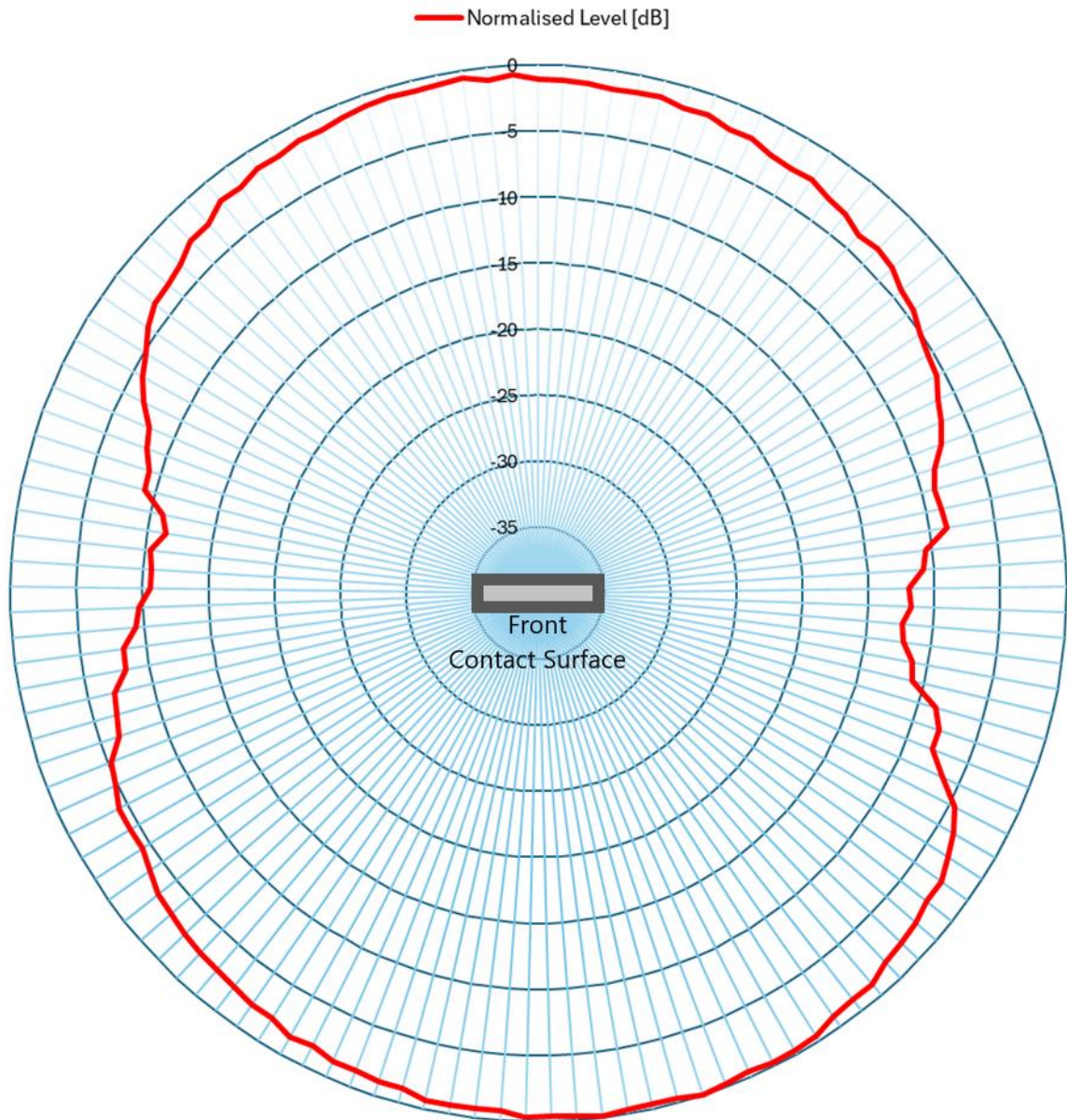
No modifications were made during testing.

4 Antenna Pattern

4.1 Method

A TRI158-28 sample was placed in the centre of a turntable, oriented in a vertical position and configured to transmit continuously. A measurement loop antenna was placed 2.8 metres opposite the sample and oriented parallel to the loop of the sample. The turntable was slowly rotated 360 degrees and the field strength level at the measurement antenna was recorded. The following antenna pattern was generated.

4.2 13.56 MHz Pattern



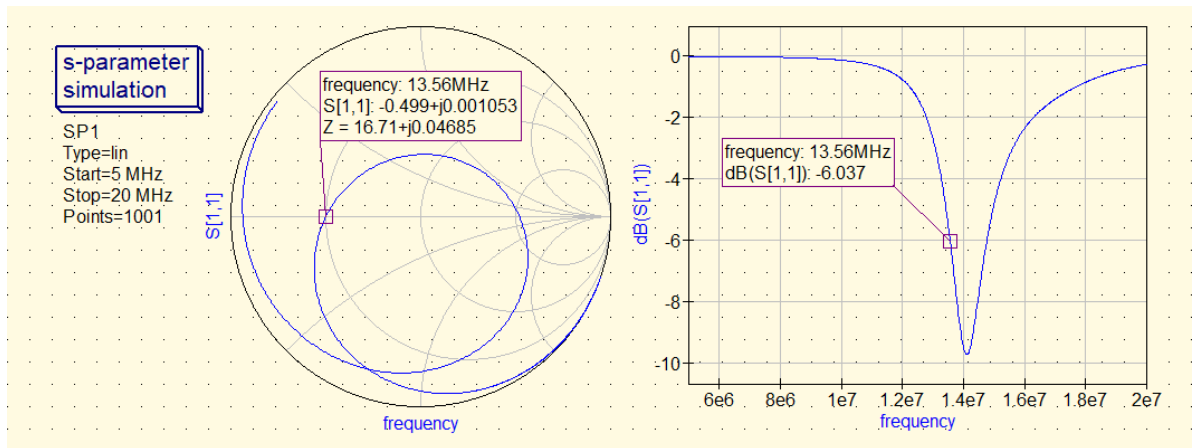
5 Antenna Impedance

5.1 Method

The matching circuit between the antenna and RFID integrated circuit was tuned in accordance with NXP Semiconductors application note, AN11019 Rev. 1.5 CLRC663, MFRC630, MFRC631, SLRC610 antenna design guide.

5.2 Impedance

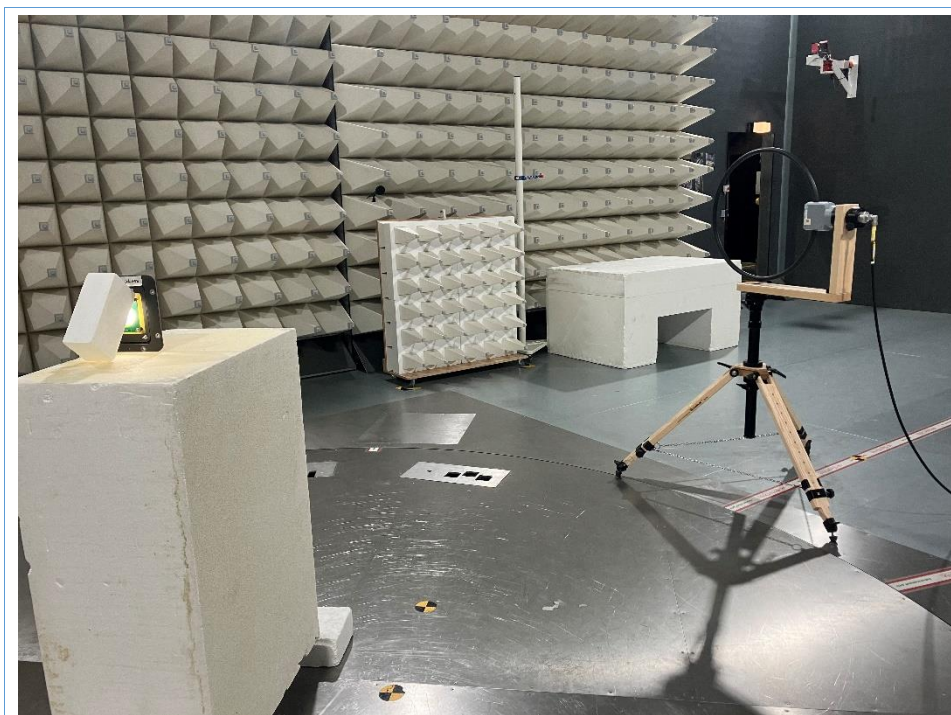
A simulation was performed to calculate the impedance of the output circuit. The target impedance at the fundamental frequency, 13.56 MHz was $Z = 20 + j0$.



6 Laboratory equipment

Asset	Method	Cal. Date	Cal. Due
EQP-1 - Rohde & Schwarz - ESW26 - Receiver, 2Hz ~ 26.5GHz	CISPR 16-1-1	01/Jul/21	01/Jul/24
EQP-14 - Rohde & Schwarz - HFH2-Z2E - Loop Antenna, 8.3kHz ~ 30MHz	Manufacturers Specifications	01/Jul/21	01/Jul/24
EQP-18 - Rohde & Schwarz - IN600 - Bias Unit, 8.3kHz ~ 30MHz	TPR.2774	23/Nov/23	12/Nov/24
EQP-2 - Rohde & Schwarz - EMC32-EB - EMC32 Emissions Software	No Cal. Req'd		
EQP-222 - Frankonia - SAC5-EV1 - NSA and sVSWR	CISPR 16-1-4 ANSI C63.4	31/Jul/21	31/Jul/24

7 Photos



Antenna Pattern Setup