



Pirelli Tyre S.p.A.

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Title: Antenna Gain Report  
CTSN-09S  
Doc No: TSR\_10311  
Version: V3.0  
Date: 20/05/2024

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# Antenna Gain Report on CTSN-09S



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**Document Name**

Antenna Gain Report

**Document Description**

For the specific project, eirp measurement and antenna gain characteristic calculation on 3 channels inside the 2.4GHz ISM frequency range

Prepared by	Date	Department	Signature
Edoardo Regini	20/05/2024		
Reviewed by	Date	Department	Signature
Simona Scotti	20/05/2024		

Change Log Author	Date	Version	Description of Changes
Edoardo Regini	19/03/2024	V1.0	First Version
Edoardo Regini	21/03/2024	V2.0	Calibration instrument added
Edoardo Regini	20/05/2024	V3.0	Minor changes



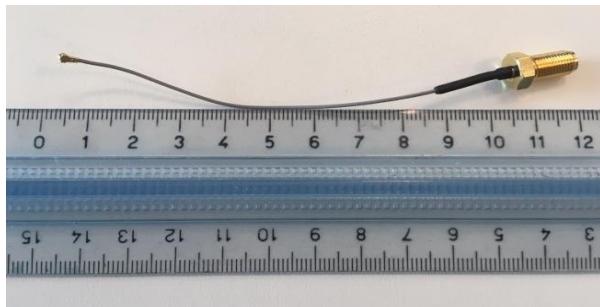
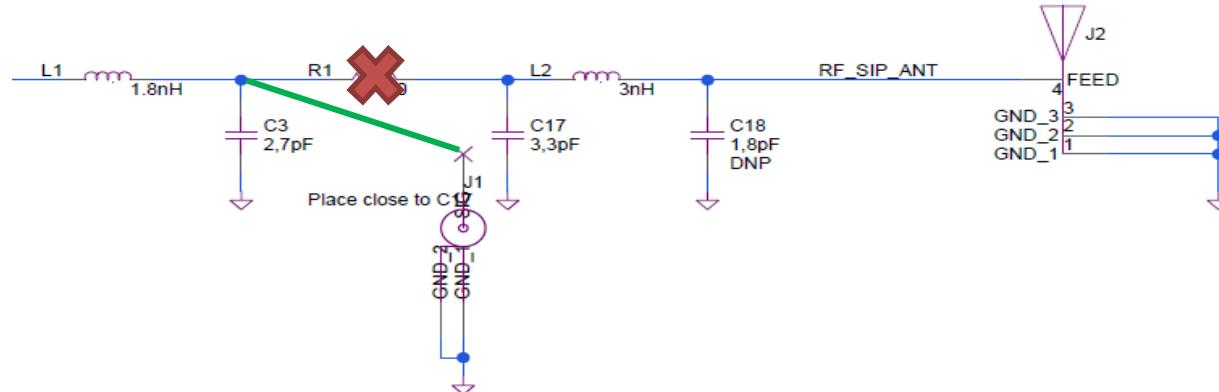
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### Set-up



#### Radiated Measurements:

HW used as it is in picture, with the antenna J2 connected to CT-0618 (U1) RF Out via matching network. In production w.fl connector J1 is not mounted.

HW is also connected to a the CR2032 Battery (with Depth of Discharge 0%) and a layer of potting is inserted between PCB and Battery in order to simulate the dielectric conditions as in field. For the same reason, the black cap has been added for the measurement as in picture.

Measurements done in the anechoic diagnostic chamber in Pirelli Tyre lab

#### Conducted Measurements:

HW used is modified as following: R1 removed and a 0Ohm resistor added between C3 and J1. Antenna J2 is not connected to the RF out.

In order to connect the DuT to a Spectrum Analyzer, a 10cm w.fl - SMA cable as in picture is used. Insertion loss is minimum 1dB over the all BLE band.

Measurements done in UL as from report 24-479111799-3-1-1-RAD-A

Similar results have been achieved in Pirelli with a similar set-up



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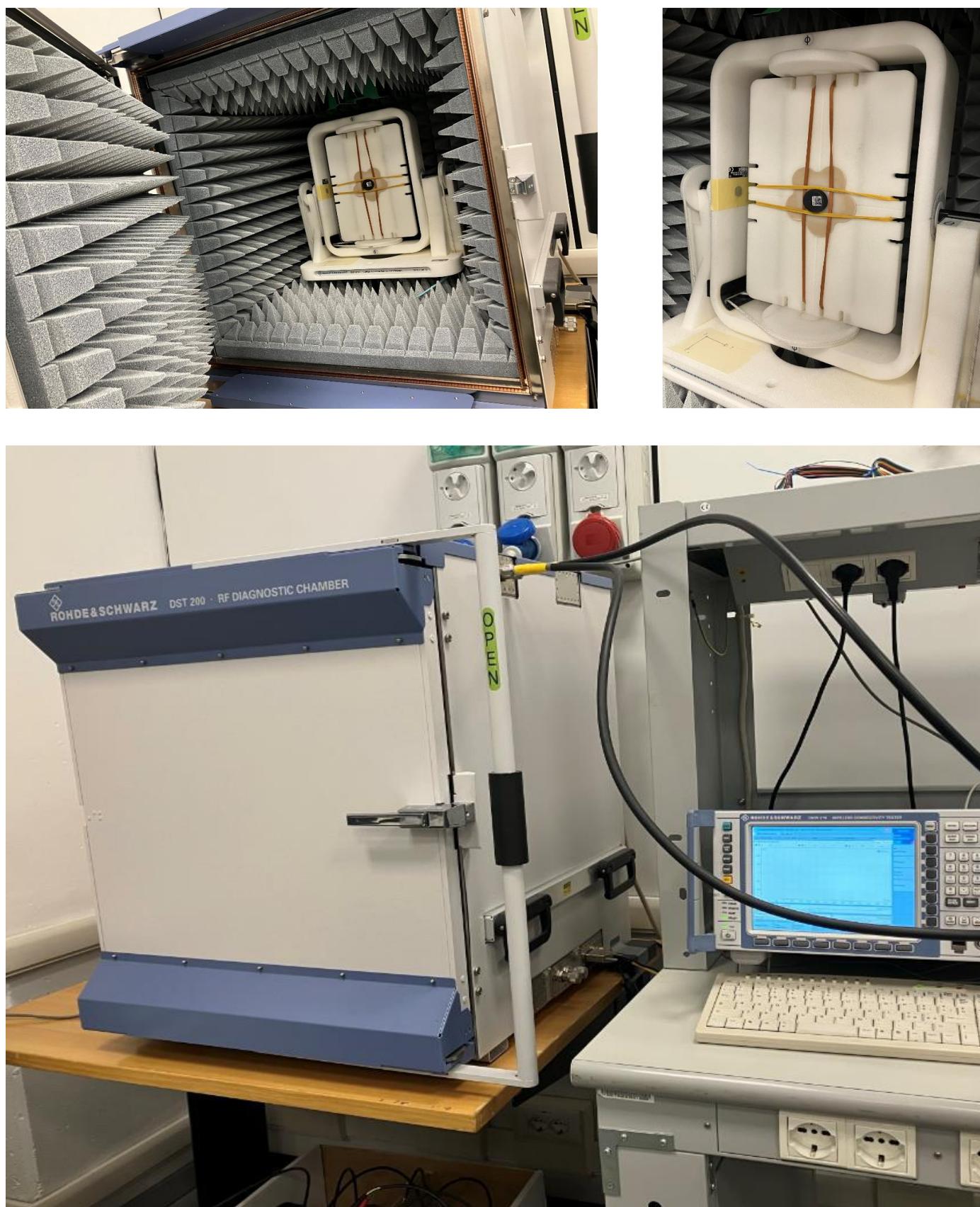
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### Test Bench

The test system is composed by Rohde&Schwarz DST200 (RF Diagnostic Chamber) and CMW 270 (Wireless Connectivity Tester). The DST200 is a compact, RF shielded anechoic chamber with an integrated broadband cross-polarized test antenna for the frequency range from 400 MHz to 18 GHz. Free-space conditions are achieved through the optimized design and layout of the pyramidal RF absorbers. EuT is positioned in a 2 axial rotating fixture so that the system can perform a TRP (Total Radiated Power) in the complete sphere with the desired accuracy. The test SW at the end of the suite can show the obtained eirp power in a 3D plot, reporting also the max eirp value and calculating the directivity of the antenna gain pattern.

Here below some pictures of the test set-up



### List of Test Equipment

Equipment	Type	Manufacturer	Serial Number	Last Cal Date	Cal Due Date(*)
RF Diagnostic Chamber	DST 200	Rohde&Schwarz	101490	12/03/2022	12/03/2024
Wireless Connectivity Tester	CMW 270	Rohde&Schwarz	102149	12/03/2022	12/03/2024

(\*) Measurements in the present report are executed on 22/01/2024 before Calibration Due Date