TOYO

RN200
"All-In-One" mmWave OTA Test System
PRODUCT BROCHURE

INTRODUCTION

The RN200 OTA (Over-the-Air) test system (see *figures 1 & 2*) is highly suitable for performing transceiver tests on 5G mmWave devices and phase array antennas/modules. It is available in a variation called RN200A; the RN200A and RN200 differ in the frequency range they support.

The RN200 features a compact size, a large quiet zone, and serves as an all-in-one mmWave test solution. It provides a complete solution that can act both as a "test platform and test system." The RN200 is a general software platform and cloud service platform designed for R&D applications. With this system, engineers can verify a DUT's OTA performance and conduct signal processing and algorithm tests according to user requirements.

Functioning as an all-in-one test platform, the RN200 supports numerous functions, including arbitrary vector signal generation (VSG), arbitrary vector signal analysis (VSA), passive/active antenna measurement, spectrum analysis, and phase array antennas measurements, as well as signal quality analysis. The RN200 can also be upgraded to perform mmWave radar/module phase and amplitude calibration and target simulation. The software platform provides a convenient development method that enables the running of user-defined tests.

Figure 1: RN200 "All-In-One" mmWave OTA Test System

- Frequency Range: 57 - 74GHz (RN200); 24 - 43.5GHz (RN200A)
- Compact size, large quiet zone, multi-function, an all-in-one mmWave OTA test system.
- Amplitude Variation <±1dB Phase Variation <±5°
- Customizable test functions and test modes configurations
- Light weight and small footprint, provides handy desktop test station
- Built-in VSG/VSA functions, support passive,active,spectrum and phase array antenna measurements

HIGHLY INTEGRATED SYSTEM

The RN200 integrates a mmWave chamber with a test module, an RF interface unit, and a controller. The entire system architecture is easy to understand and use. It can handle passive tests, active tests, and RF tests using the built-in instruments. In the future, the system will also support mmWave phase/amplitude calibration and radar target simulation.

The RN200 addresses mmWave device test requirements, covering everything from antenna design to whole device R&D, manufacturing, and hardware repair. It serves as a convenient test station for mmWave engineers during UE debugging and performance verification. Its integrated design ensures superior system test accuracy compared to the conventional chamber and instrument model.

COST-EFFECTIVE

The built-in test module offers general-purpose, high-performance test functions, including basic VSA, VNA, and VSG tests. By eliminating unneeded test functions, the RN200 becomes a cost-effective all-in-one solution compared to conventional mmWave OTA systems.

PATENTED CATR REFLECTOR

The CATR reflector of the RN200 is surrounded by absorbers; such a design improves the quality of the quiet zone. It boasts an amplitude variation of <±1dB and a phase variation of <±5°.

FLEXIBLE CONFIGURATION

The test function configuration of the RN200 is highly flexible. Different users or applications can utilize specific test functions to meet their testing needs, including passive tests, active tests, RF tests, amplitude/phase calibrations, and target simulations. Users have the flexibility to select one or multiple test functions for the system, helping to save costs and eliminate system redundancy.

COMPACT SIZE, VERSATILE TOOL

With a small footprint, the RN200 weighs less than 100kg, enabling engineers to conduct debugging and verification tests in limited spaces.

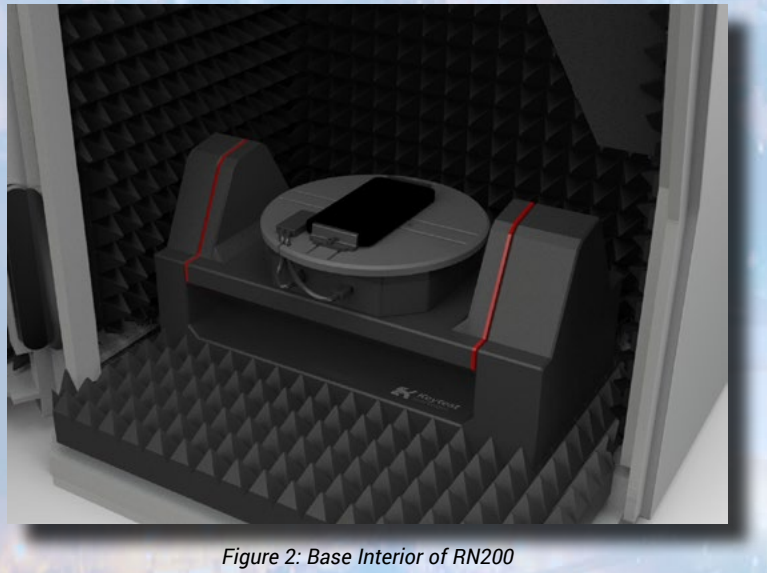


Figure 2: Base Interior of RN200

AUTOMATED SELF–CALIBRATIONS

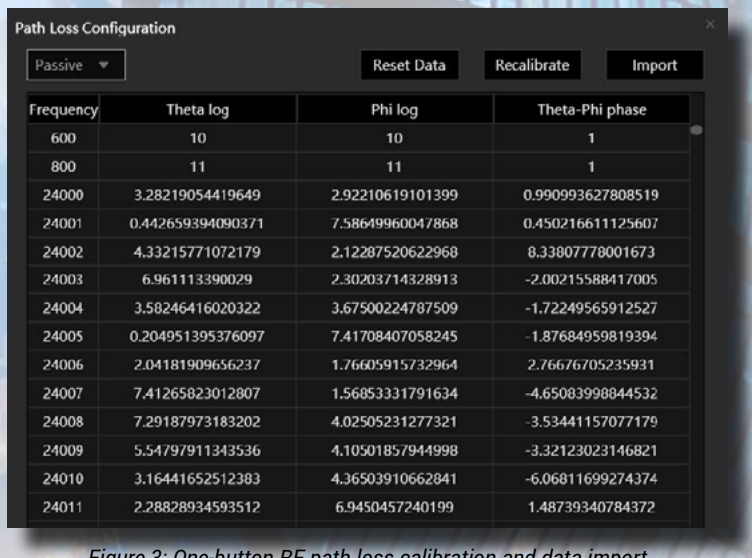
The RN200 products support automated self-calibration using standard power meters and calibration kits. The calibration process is facilitated through software guidance and automated procedures, simplifying the complexity of system calibration and providing great convenience for users.

mmWAVE TEST SOFTWARE

The mmWave test automation software provided is based on the .NET Framework platform. It fully complies with 3GPP test standards and conforms to the latest test specifications. Featuring an easy-to-use GUI, the software supports a wide range of applications, flexible configurations, smooth test processes, and stable operations. It can meet various test requirements at different stages of the product development cycle, providing different functions for diverse users (refer to *table 1*). There are single-button controls for RF path loss calibration and data import (see *figure 3*). And the software provides 2D/3D measurements and displays with the ability to select arbitrary cuts (see *figure 4)*. Lastly, the software supports multi-system controls (see *figure 5)*.

USER TYPE	FUNCTIONS
mmWave RF Engineer	Spectrum analysis, network analysis, time-domain analysis and signal analysis. System can be used as a test instrument
mmWave Antenna Engineer	Passive antenna pattern measurements
System Engineer	Follow 3GPP standard, perform 3D beam scan, TRP, EIRP and signal quality test (includes EVM, ACLR, OBW, SEM and other TRx tests)

Table 1: Multi-User Type Support



Frequency	Theta log	Phi log	Theta-Phi phase
600	10	10	1
800	11	11	1
24000	3.28219054419649	2.92210619101399	0.999993627808519
24001	0.442659394090371	7.58649960047868	0.450216611125607
24002	4.33215771072179	2.12287520622968	8.33807778001673
24003	6.961113390029	2.30203714328913	-2.00215588417005
24004	3.58246416020322	3.67500224787509	-1.72249565912527
24005	0.204951395376097	7.41708407058245	-1.87684959819394
24006	2.04181909656237	1.76605915732964	2.76676705235931
24007	7.41265823012807	1.56853331791634	-4.65083998844532
24008	7.29187973183202	4.02505231277321	-3.53441157077179
24009	5.54797911343536	4.10501857944998	-3.32123023146821
24010	3.16441652512383	4.36503910662841	-6.06811699274374
24011	2.28828934593512	6.9450457240199	1.48739340784372

Figure 3: One-button RF path loss calibration and data import

Figure 4: 2D/3D Measurements and Display

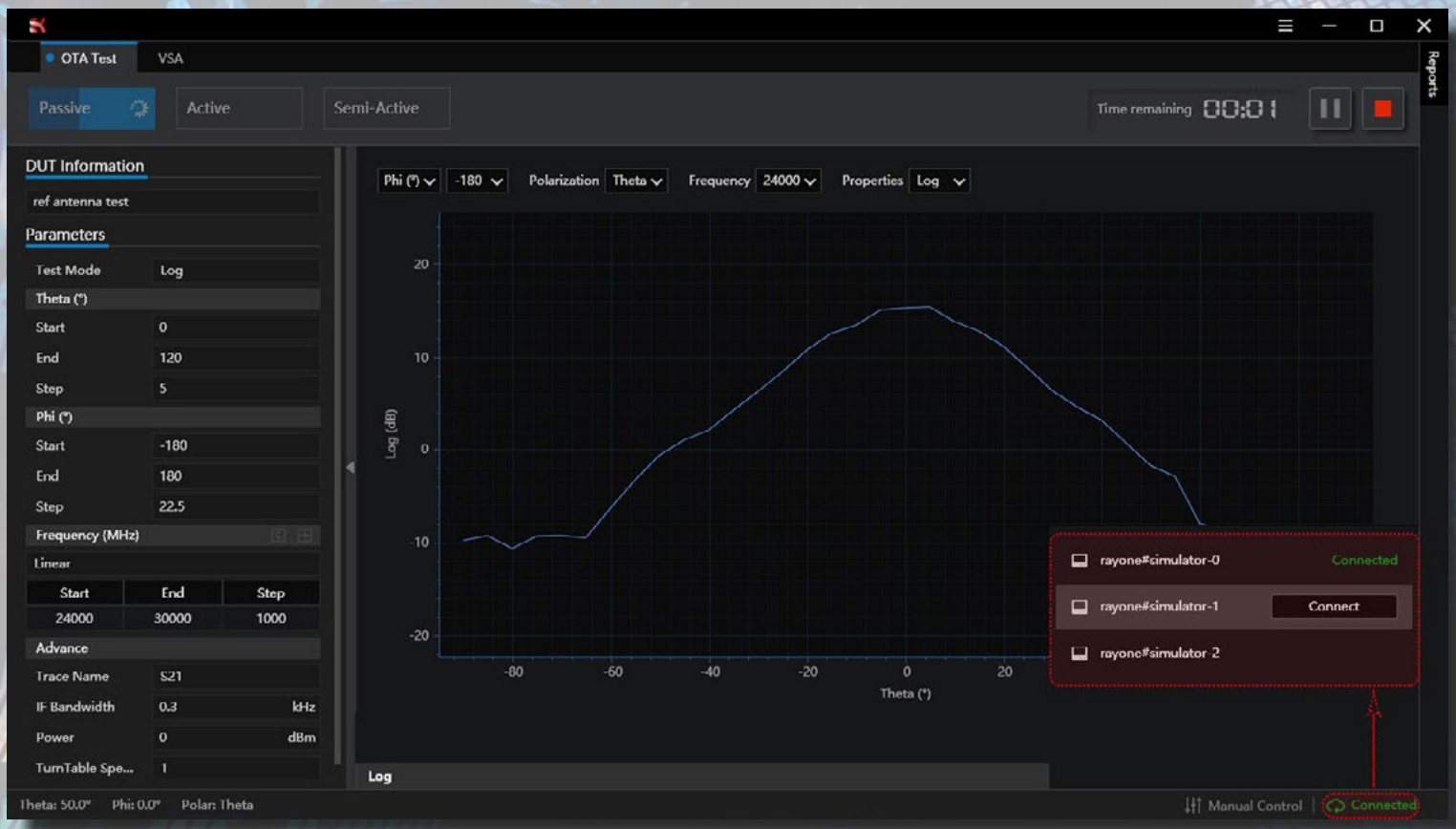


Figure 5: Multi-system Control Support

RN200 FUNCTIONS		
FUNCTION	TEST CASE	DESCRIPTION
Passive Test	Antenna pattern for more than a half hemisphere	S21 amplitude & phase meas-urement
Active Non-signaling Test	Tx Test	Transmission Antenna Pattern, TRP, 3D beam scan and spherical coverage, Spectrum analysis (OBW, SEM, ACLR) and signal quality test (optional: frequency error, LO leakage, EVM included) Note: Tx signal can be a use-de¬fined arbitrary wave
	Rx Test	Rx power level, Rx sensitivity (DUT supports demodulation) Note: Receive arbitrary signal from DUT, then send data to PC for data/algorithm analysis
Semi-Active Test	Phase Array Measurement	OTA P1dB Test; Maximum EIRP Test; Total Gain Test; 3D Patterns Test; DUT Integration
RF TEST	Spectrum Analysis	Observe signal spectrum
	Network Analysis	S21 amplitude/phase response
	Time Domain Analysis	Analyze time-domain signal from DUT
Other	mmWave radar calibration, radar target simulations	Upgradable

CONFIGURATION & ORDERING	
Shielding Enclosure	Includes shielding box, door, reflector, feed, power supply, cables, positioner and controller etc.
Baseband Test Module	ODC200 VSG/VSA for basebandsignal generation, analysis and processing
mmWave Frequency Converter	Frequency Convertor 24 - 44GHz / 57 - 74GHz; neccesary RF components including Amplifier, Switches,and Filters
mmWave Switch	1-to-2 RF switch, change the signal channel for different test directions

SERVICE & SUPPORT	
System calibration	One no-cost calibration at system delivery
Warranty	No cost for the first year
Software upgrade	No cost for the first year

SPECIFICATIONS	
Frequency	57 - 74GHz (RN200) 24 - 43.5GHz (RN200A)
Shielding	70dB
Weight	< 100kg
Power	200W
Positioner	Phi: -180° - 180° Theta: -135° - 135°
Quiet Zone	200 × 200 × 200mm
QZ Amplitude Variation	< ±1dB
QZ phase Variation	< ±5°
Dimensions	620 × 945 × 705mm (W x H ×D)
Max. DUT size	200 × 200 × 200mm (W x H ×D)
Max. DUT weight	< 5kg
Passive Test Accuracy	< 1dB
TRP Accuracy	< 1dB
Repeatability	< 0.5dB

TOYO TOYOTech

47623 Lakeview Blvd, Fremont, CA 94538
Phone: 510-438-9548 | E-mail: info@toyotechus.com
http://www.toyotechus.com

03/17/2025 (SCW)