



TEST REPORT

Report Number. : 13619076-E7V3

Applicant : DISH TECHNOLOGIES LLC
90 INVERNESS CIRCLE EAST
ENGLEWOOD, CO 80112, UNITED STATES

Model : D45

Brand : DISH

FCC ID : DKNRW33

EUT Description : TV SET TOP BOX

Test Standard(s) : FCC 47 CFR PART 1 SUBPART I
FCC 47 CFR PART 2 SUBPART J

Date Of Issue:

June 03, 2021

Prepared by:

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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
V1	5/4/2021	Initial Issue	---
V2	5/17/2021	Updated report to address TCB's question	Tina Chu
V3	6/3/2021	Updated report to address TCB's question	Tina Chu

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: DISH TECHNOLOGIES LLC
90 INVERNESS CIRCLE EAST
ENGLEWOOD, CO 80112, UNITED STATES

EUT DESCRIPTION: TV SET TOP BOX

MODEL: D45

BRAND: DISH

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
FCC PART 1 SUBPART I & PART 2 SUBPART J	Complies

UL Verification Services Inc. tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. All samples tested were in good operating condition throughout the entire test program. Measurement Uncertainties are published for informational purposes only and were not taken into account unless noted otherwise.

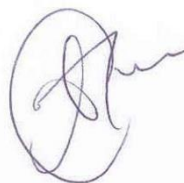
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Approved & Released For
UL Verification Services Inc. By:



Francisco de Anda
Staff Engineer
UL Verification Services Inc.

Prepared By:



Tina Chu
Senior Project Engineer
UL Verification Services Inc.

2. TEST METHODOLOGY

All calculations were made in accordance with FCC Parts 1.1310, 2.1091, 2.1093, KDB 447498 D01 v06, KDB 447498 D03 V01, IEEE Std C95.1-2005, IEEE Std C95.3-2002.

3. REFERENCES

This report contains data provided by the customer which can impact the validity of results. UL Verification Services Inc. is only responsible for the validity of results after the integration of the data provided by the customer.

All measurements were made as documented in test reports;
UL Verification Services Inc. Document 13619076-E1 for BLE operation in the 2.4 GHz band,
UL Verification Services Inc. Document 13619076-E2 for BT operation in the 2.4 GHz band,
UL Verification Services Inc. Document 13619076-E3 for Zigbee operation in the 2.4 GHz,
UL Verification Services Inc. Document 13619076-E4 and 13619076-E5 for Wlan operation in the UNII 5 GHz.

Duty cycle data is excerpted from the applicable test reports.

Manufacturer maximum declared output power and antenna gain data are provided by the customer.

4. FACILITIES AND ACCREDITATION

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0, for all testing performed within the scope of this report. Testing was performed at the locations noted below.

	Address	ISED CABID	ISED Company Number	FCC Registration
<input type="checkbox"/>	Building 1: 47173 Benicia Street, Fremont, California, USA	US0104	2324A	208313
<input type="checkbox"/>	Building 2: 47266 Benicia Street, Fremont, California, USA	US0104	22541	208313
<input checked="" type="checkbox"/>	Building 4: 47658 Kato Rd, Fremont, California, USA	US0104	2324B	208313

5. MAXIMUM PERMISSIBLE EXPOSURE (LIMITS AND EQUATIONS)

5.1. FCC RULES

§1.1310 The criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in §1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of §2.1093 of this chapter.

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposure				
0.3-3.0	614	1.63	*100	6
3.0-30	1842/f	4.89/f	*900/f ²	6
30-300	61.4	0.163	1.0	6
300-1,500			f/300	6
1,500-100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*100	30
1.34-30	824/f	2.19/f	*180/f ²	30
30-300	27.5	0.073	0.2	30
300-1,500			f/1500	30
1,500-100,000			1.0	30

f = frequency in MHz

* = Plane-wave equivalent power density

Notes:

- (1) Occupational/controlled exposure limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when a person is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.
- (2) General population/uncontrolled exposure limits apply in situations in which the general public may be exposed, or in which persons who are exposed as a consequence of their employment may not be fully aware of the potential for exposure or cannot exercise control over their exposure

5.2. EQUATIONS

POWER DENSITY

Power density is given by:

$$S = \text{EIRP} / (4 * \text{Pi} * D^2)$$

Where

S = Power density in mW/cm²

EIRP = Equivalent Isotropic Radiated Power in mW

D = Separation distance in cm

Power density in units of mW/cm² is converted to units of W/m² by multiplying by 10.

DISTANCE

Distance is given by:

$$D = \text{SQRT} (\text{EIRP} / (4 * \text{Pi} * S))$$

Where

D = Separation distance in cm

EIRP = Equivalent Isotropic Radiated Power in mW

S = Power density in mW/cm²

SOURCE-BASED DUTY CYCLE

Where applicable (for example, multi-slot cell phone applications) a duty cycle factor may be applied.

$$\text{Source-based time-averaged EIRP} = (\text{DC} / 100) * \text{EIRP}$$

Where

DC = Duty Cycle in %, as applicable

EIRP = Equivalent Isotropic Radiated Power in mW

MIMO AND COLOCATED TRANSMITTERS (IDENTICAL LIMIT FOR ALL TRANSMITTERS)

For multiple chain devices, and colocated transmitters operating simultaneously in frequency bands where the limit is identical, the total power density is calculated using the total EIRP obtained by summing the EIRP (in linear units) of each transmitter.

$$\text{Total EIRP} = (\text{EIRP1}) + (\text{EIRP2}) + \dots + (\text{EIRPn})$$

where

EIRPx = Source-based time-averaged EIRP of chain x or transmitter x

The total EIRP is then used to calculate the Power Density or the Distance as applicable.

6. RF EXPOSURE RESULTS

In the table(s) below, Power and Gain are entered in units of dBm and dBi respectively and conversions to linear forms are used for the calculations.

Multiple chain or colocated transmitters									
Band	Mode	Chain for MIMO	Separ. Dist. (cm)	Output AVG Power (dBm)	Ant. Gain (dBi)	Duty Cycle (%)	EIRP (mW)	FCC PD (mW/cm ²)	FCC PD Limit (mW/cm ²)
2.4 GHz	BT/BLE	N/A		10.00	4.20	100.0	26.30		
2.4 GHz	Zigbee	N/A		6.00	4.10	100.0	10.23		
5 GHz	WLAN	1		23.00	3.20	80.1	333.95		
5 GHz	WLAN	2		23.00	3.20	80.1	333.95		
5 GHz	WLAN	3		23.00	3.20	80.1	333.95		
Combined			20				1038.40	0.21	1.00

Multiple chain or colocated transmitters								
Band	Mode	Chain for MIMO	FCC Limit (mW/cm ²)	Output AVG Power (dBm)	Ant. Gain (dBi)	Duty Cycle (%)	EIRP (mW)	Separ. Distance FCC (cm)
2.4 GHz	BT/BLE	N/A		10.00	4.20	100.0	1.0	
2.4 GHz	Zigbee	N/A		6.00	4.10	100.0	1.0	
5 GHz	WLAN	1		23.00	3.20	80.1	333.9	
5 GHz	WLAN	2		23.00	3.20	80.1	333.9	
5 GHz	WLAN	3		23.00	3.20	80.1	333.9	
Combined			1.00				1003.7	8.94

Notes:

- 1) Above results are based on manufacturer declared maximum output power including tolerances. .
- 2) The output power in the tables above is the maximum power per antenna among various channels and various modes within the specific band.
- 3) The antenna gain in the tables above is the maximum measured uncorrelated total antenna gain among various channels within the specified band.

END OF REPORT