



Williams Sound, LLC

FM T55C

FCC 2.1091:2022

FM Transmitter Radio

Report: WILM0087.3, Issue Date: August 19, 2022



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CERTIFICATE OF EVALUATION

Last Date of Evaluation: August 19, 2022
Williams Sound, LLC
EUT: FM T55C

RF Exposure Evaluation

Standards

Specification	Method
FCC 2.1091:2022	FCC 447498 D01 General RF Exposure Guidance v06

Results

Method Clause	Description	Applied	Results	Comments
7.1	Maximum Permissible Exposure	Yes	Pass	None

Deviations From Evaluation Standards

None

Approved By:



Donald Facteau, Process Architect

Product compliance is the responsibility of the client; therefore, the tests and equipment modes of operation represented in this report were agreed upon by the client, prior to testing. The results of this test pertain only to the sample(s) tested. The specific description is noted in each of the individual sections of the test report supporting this certificate of test. This report reflects only those tests from the referenced standards shown in the certificate of test. It does not include inspection or verification of labels, identification, marking or user information. As indicated in the Statement of Work sent with the quotation, Element's standard process is to always use the latest published version of the test methods even when earlier versions are cited in the test specification. Issuance of a purchase order was de facto acceptance of this approach. Otherwise, the client would have advised Element in writing of the specific version of the test methods they wanted applied to the subject testing

REVISION HISTORY



Revision Number	Description	Date (yyyy-mm-dd)	Page Number
00	None		

ACCREDITATIONS AND AUTHORIZATIONS



United States

FCC - Designated by the FCC as a Telecommunications Certification Body (TCB). Certification chambers, Open Area Test Sites, and conducted measurement facilities are listed with the FCC.

A2LA - Each laboratory is accredited by A2LA to ISO / IEC 17025, and as a product certifier to ISO / IEC 17065 which allows Element to certify transmitters to FCC and IC specifications.

Canada

ISED - Recognized by Innovation, Science and Economic Development Canada as a Certification Body (CB) and as a CAB for the acceptance of test data.

European Union

European Commission – Recognized as an EU Notified Body validated for the EMCD and RED Directives.

United Kingdom

BEIS – Recognized by the UK as an Approved Body under the UK Radio Equipment and UK EMC Regulations.

Australia/New Zealand

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Korea

MSIT / RRA - Recognized by KCC's RRA as a CAB for the acceptance of test data.

Japan

VCCI - Associate Member of the VCCI. Conducted and radiated measurement facilities are registered.

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MIC – Recognized by MIC as a CAB for the acceptance of test data.

SCOPE

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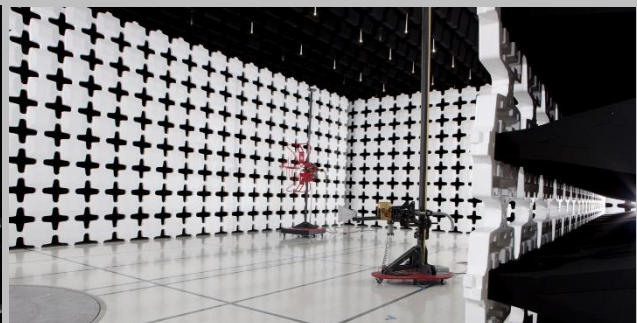
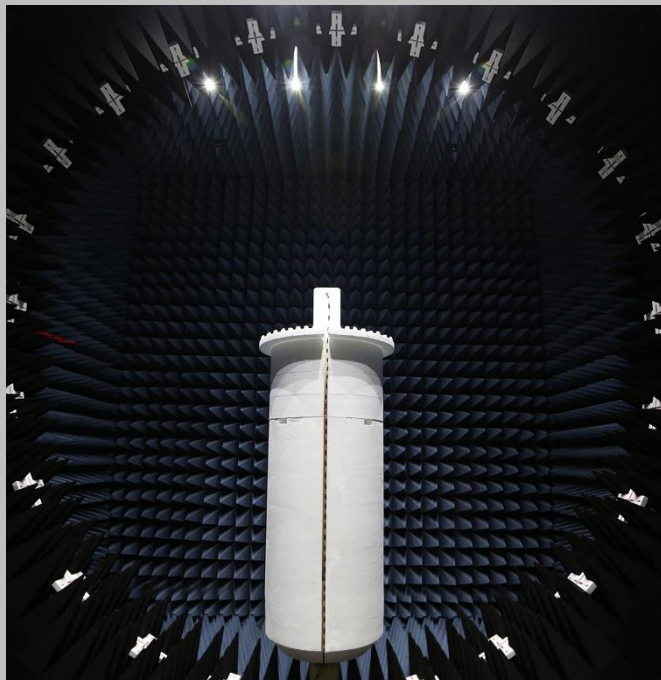
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FACILITIES



California Labs OC01-17 41 Tesla Irvine, CA 92618 (949) 861-8918	Minnesota Labs MN01-11 9349 W Broadway Ave. Brooklyn Park, MN 55445 (612)-638-5136	Oregon Labs EV01-12 6775 NE Evergreen Pkwy #400 Hillsboro, OR 97124 (503) 844-4066	Texas Labs TX01-09 3801 E Plano Pkwy Plano, TX 75074 (469) 304-5255	Washington Labs NC01-05 19201 120 th Ave NE Bothell, WA 98011 (425)984-6600
A2LA				
Lab Code: 3310.04	Lab Code: 3310.05	Lab Code: 3310.02	Lab Code: 3310.03	Lab Code: 3310.06
Innovation, Science and Economic Development Canada				
2834B-1, 2834B-3	2834E-1, 2834E-3	2834D-1	2834G-1	2834F-1
BSMI				
SL2-IN-E-1154R	SL2-IN-E-1152R	SL2-IN-E-1017	SL2-IN-E-1158R	SL2-IN-E-1153R
VCCI				
A-0029	A-0109	A-0108	A-0201	A-0110
Recognized Phase I CAB for ISED, ACMA, BSMI, IDA, KCC/RRR, MIC, MOC, NCC, OFCA				
US0158	US0175	US0017	US0191	US0157



PRODUCT DESCRIPTION

Client and Equipment Under Evaluation Information

Company Name:	Williams Sound, LLC
Address:	10300 Valley View Road
City, State, Zip:	EDEN PRAIRIE, MN 55344
Evaluation Requested By:	Jacob Lewis
EUT:	FM T55C
Date of Evaluation:	8/18/2022

Information Provided by the Party Requesting the Evaluation

Functional Description of the Equipment:

The FM T55C is an FM transmitter operating at 72-76 MHz (Assistive Listening Band) with wired networking capabilities (an Ethernet jack). It receives analog audio as the input signal for transmission. The FM T55CD features an add-on board to receive digital audio via a separate Ethernet connection (Dante audio). Both models use the same FM transmitter, front panel and network interface.

The FM T55C can be used with the following antennas:

ANT 005

- Manufactured by Lee Manufacturing. P/N: ANT 005B
- This is a remote coaxial antenna. It includes a 22' long overall cable, with an 80" section providing the active antenna. This antenna is connected to the FM T55C(D) via the standard F-connector port on the rear of the unit.
- Gain of +2.4dBi max – dipole

ANT 021

- Manufactured by Mobil-Advance Industrial Co LTD. P/N: AM168-002/Rev D
- This is a rubber ducky antenna. It is 9" long and is screwed directly onto the transmitter board. The port of this antenna is a #10-32 screw hole, which matches the non-standard #10-32 screw post mount on the FM T55C(D).
- Gain of -2.8dBi max - monopole

ANT 024

- Manufactured by Williams AV. P/N: ANT 024
- This is a wall mounted telescoping dipole whip antenna for remote installation. It is 40" long with both whips fully extended. This antenna comes with a 75Ω RG-9U coaxial cable with F-connectors to connect the ANT 024 to the F-connector port on the rear of the FM T55C(D).
- Gain of -1.7dBi max - dipole

ANT 025

- Manufactured by Mobil-Advance Industrial Co LTD. P/N: AM168-004/Rev C
- This is a PCB mount telescoping whip antenna. It is 39" long when fully extended. The port of this antenna is a non-standard #10-32 screw hole, which matches the #10-32 screw post mount on the FM T55C(D).
- Gain of 2.4dBi max - monopole

PRODUCT DESCRIPTION

ANT 028

- Manufactured by Mobil-Advance Industrial Co LTD. P/N: STEM-1F-SW / Rev A
- This is a rear mount telescopic whip antenna on a 180° swivel. It is 39" long when fully extended. This antenna connects directly to the F-connector port on the rear of the FM T55C(D).
- Gain of -2.6dBi max - monopole

ANT 029

- Manufactured by Williams AV. P/N: ANT 029
- This is a rubber ducky antenna. It is 9" long and is screwed into a rack mount female to female F-connector port, which is in turn connected to the rear F-connector antenna port on the FM T55C(D) via a coaxial cable.
- Gain of 0dBi max – monopole

Objective:

To demonstrate compliance with FCC requirements for RF exposure for 2.1091 mobile/fixed devices

RF EXPOSURE CONDITION



The following RF Exposure conditions were used for the assessment documented in this report:	
Intended Use	Mobile
Location on Body (if applicable)	NA
How is the Device Used	The equipment is used at a distance greater than 20 cm from the user.
Radios Contained in the Same Host Device	FM Transmitter Radio
Simultaneous Transmitting Radios	None
Body Worn Accessories	NA
Environment	General Population/Uncontrolled Exposure

MAXIMUM PERMISSIBLE EXPOSURE (MPE)



OVERVIEW

Human exposure to RF emissions from mobile devices (47 CFR §2.1091) may be evaluated based on the MPE limits adopted by the FCC for electric and magnetic field strength and/or power density, as appropriate, since exposures are assumed to occur at distances of 20 cm or more from persons. ANSI C95.1:2005 + Amd 1:2010 specifies a minimum separation distance of 20 cm for performing reliable field measurements to determine adherence to MPE limits. If the minimum separation distance between a transmitter and nearby persons is more than 20 cm under normal operating conditions, compliance with MPE limits may be determined at such distance from the transmitter. When applicable, operation instructions and prominent warning labels may be used to alert the exposed persons to maintain a specified distance from the transmitter or to limit their exposure durations and usage conditions to ensure compliance. If the use of warning labels on a transmitter is not effective or desirable, the alternative of performing SAR evaluation with the device at its closest range to persons under normal operating conditions may be used. The field strength and power density limits adopted by the FCC are based on whole-body averaged exposure and the assumption of RF field levels relate most accurately to estimating whole-body averaged SAR. This means some local values of exposures exceeding the stated field strength and power density limits may not necessarily imply non-compliance if the spatial average of spatially averaged RF fields over the exposed portions of a person's body does not exceed the limits.

COMPLIANCE WITH FCC 2.1091

47 CFR §1.1307

"(b)(1) Requirements. (i) With respect to the limits on human exposure to RF provided in §1.1310 of this chapter, applicants to the Commission for the grant or modification of construction permits, licenses or renewals thereof, temporary authorities, equipment authorizations, or any other authorizations for radiofrequency sources must either:

(A) Determine that they qualify for an exemption pursuant to §1.1307(b)(3);

(B) Prepare an evaluation of the human exposure to RF radiation pursuant to §1.1310 and include in the application a statement confirming compliance with the limits in §1.1310; or

(C) Prepare an Environmental Assessment if those RF sources would cause human exposure to levels of RF radiation in excess of the limits in §1.1310.

47 CFR §2.1091

"A mobile device is defined as a transmitting device designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20 centimeters is normally maintained between the RF source's radiating structure(s) and the body of the user or nearby persons. In this context, the term "fixed location" means that the device is physically secured at one location and is not able to be easily moved to another location while transmitting. Transmitting devices designed to be used by consumers or workers that can be easily re-located, such as wireless devices associated with a personal desktop computer, are considered to be mobile devices if they meet the 20-centimeter separation requirement."

The device will only be used with a separation distance between the antenna and the body of the user or nearby persons as shown in the table below and can therefore be considered a mobile transmitter per 47 CFR 2.1091(b).

COMPLIANCE WITH FCC KDB 447498 D01 General RF Exposure Guidance v06

"KDB 447498 D01 General RF Exposure Guidance v06" provides the procedures, requirements, and authorization policies for mobile and portable devices.

MAXIMUM PERMISSIBLE EXPOSURE (MPE)



Devices operating in standalone mobile device exposure conditions may contain a single transmitter or multiple transmitters that do not transmit simultaneously are covered in section 7.1.

Devices containing multiple transmitters capable of simultaneous transmissions are covered in section 7.2.

LIMITS

Limits for General Population /Uncontrolled Exposure: 47 CFR 1.1310

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Averaging Time (minutes)
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 - 1500			f/1500	30
1500 - 100000			1	30

f = frequency in MHz

* = Plane-wave equivalent power density

ASSESSMENT

The exposure level for the radio is evaluated at a 20 cm distance from the radio's transmitting antenna using the general equation:

$$S = \frac{P * G}{4 * \pi * R^2}$$

Where: S = power density (mW/cm²)

P = power input to the antenna (mW)

G = numeric power gain relative to an isotropic radiator

R = distance to the center of the radiation of the antenna (20 cm = limit for MPE estimates)

P*G = EIRP

Solving for S, the maximum power density 20 cm from the transmitting antenna is determined. This level is then compared to the applicable limit for the transmit frequency. If limits were not met at the 20 cm boundary the evaluation distance is increased until the limit is met as shown in the table below.

For co-located radios, the ratio of the calculated level to the limit is determined. The ratios for each co-located radio are summed. If the sum is less than or equal to one, then the device is excluded from testing and is deemed compliant.

The standalone MPE and summed MPE ratios are summarized in the following table(s):

FM Transmitter Radio	Transmit Frequency (MHz)	Conducted Output Power	Power Tolerance (dB)	Duty Cycle	Antenna Assembly Gain (dBi)	Minimum Separation Distance (cm)	Power Density (mW/cm ²)	Limit (mW/cm ²)	Compliant
ANT 029 (PN: ANT 029)	72.1 – 75.9	0.004 W	0.25	100.0%	0	20	0.0	0.2	Yes
ANT 028 (PN: STEM-1F-SW/Rev A)	72.1 – 75.9	0.004 W	0.25	100.0%	-2.6	20	0.0	0.2	Yes

MAXIMUM PERMISSIBLE EXPOSURE (MPE)



ANT 025 (PN: AM168-004/Rev C)	72.1 – 75.9	0.004 W	0.25	100.0%	2.4	20	0.0	0.2	Yes
ANT 024 (PN: ANT 024)	72.1 – 75.9	0.004 W	0.25	100.0%	-1.7	20	0.0	0.2	Yes
ANT 021 (PN: AM168-002/Rev D)	72.1 – 75.9	0.004 W	0.25	100.0%	-2.8	20	0.0	0.2	Yes
ANT 005 (PN: ANT 005B)	72.1 – 75.9	0.004 W	0.25	100.0%	2.4	20	0.0	0.2	Yes

The information in the table above was obtained from:

The rated value was used in these calculations. From client supplied information. See product description for more information on the antennas.

Evaluator: Brian Fahey

End of Test Report