



element

Abbott Laboratories GLP12220 Input/Output Module

**FCC 2.1091:2021
13.56 MHz RFID Radios**

Report: ABBO0076.3, Issue Date: September 13, 2021



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CERTIFICATE OF EVALUATION

Last Date of Evaluation: September 10, 2021

Abbott Laboratories

EUT: GLP12220 Input/Output Module

RF Exposure Evaluation

Standards

Specification	Method
FCC 2.1091:2021	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:



Johnny Candelas, Department Manager, EMC

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.

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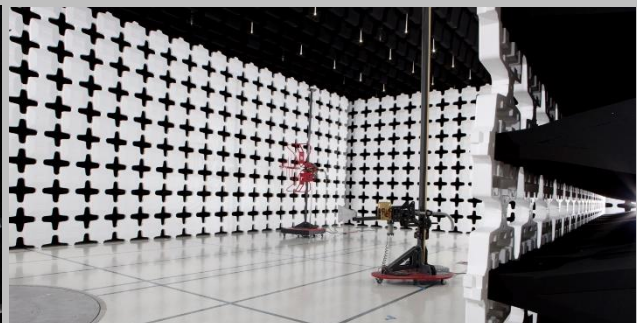
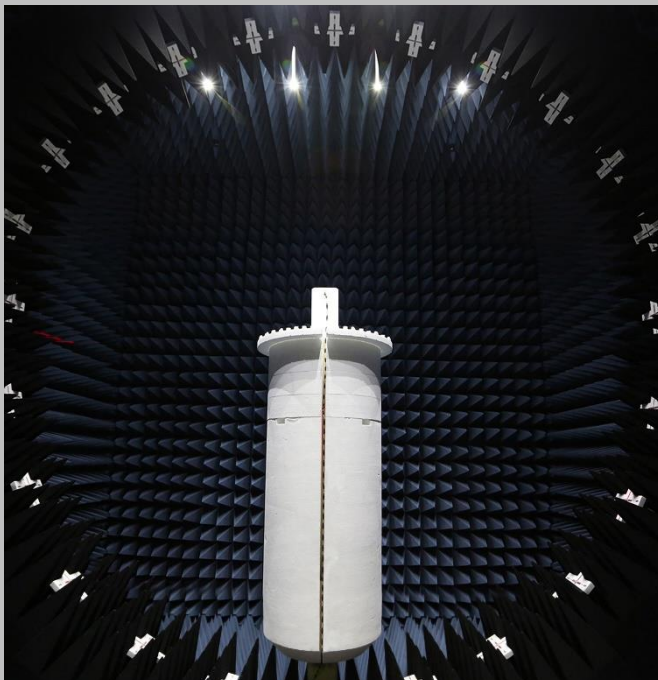
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Lab Code: 3310.04	Lab Code: 3310.05	Lab Code: 3310.02	Lab Code: 3310.03	Lab Code: 3310.06
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2834B-1, 2834B-3	2834E-1, 2834E-3	2834D-1	2834G-1	2834F-1
BSMI				
SL2-IN-E-1154R	SL2-IN-E-1152R	SL2-IN-E-1017	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/RRA, MIC, MOC, NCC, OFCA				
US0158	US0175	US0017	US0191	US0157



PRODUCT DESCRIPTION

Client and Equipment Under Evaluation Information

Company Name:	Abbott Laboratories
Address:	1921 Hurd Drive
City, State, Zip:	Irving, TX 75038
Evaluation Requested By:	Don Mendell
EUT:	GLP12220 Input/Output Module
Date of Evaluation:	September 10, 2021

Information Provided by the Party Requesting the Evaluation

Functional Description of the Equipment:

The IOM is the central module for the input and output of sample tubes. This module contains 4 drawers, which can be configured as an archive or for loading and unloading device specific racks. Each drawer configuration type has a specific RFID tag, which is read by a drawer reader when the drawer opens/closes.

The drawer opens/closes when the customer/user presses a button in the front of the module. When triggered, the reader would turn on for 16ms.

The largest dimension of the GLP12220 Input/Output Module is 188cm

Don Mendell, EMC Safety Manager at Abbott Laboratories provided the following information about the duty cycle of the radios:

Radio (include radioband if needed)	Duty Cycle: over 6 minutes	Duty Cycle: over 30 minutes	Provide an explanation if the duty cycle is < 100%
13.56 MHz RFID Drawer 1	0.1%	0.1%	See explanation in the analysis section below
13.56 MHz RFID Drawer 2	0.1%	0.1%	See explanation in the analysis section below
13.56 MHz RFID Drawer 3	0.1%	0.1%	See explanation in the analysis section below
13.56 MHz RFID Drawer 4	0.1%	0.1%	See explanation in the analysis section below

Supporting Duty Cycle Analysis:

The Input Output Module (IOM) is used to load and unload samples to and from the laboratory automation system. The IOM processes standard sample tubes of different sizes; contains 4 drawers with racks and a sample robot. For the input function, the robot removes the sample from the rack and places it in a CAR. For the output function, the robot removes the sample from a CAR and places it in the rack.

Under the most ideal and optimal condition, the throughput of the IOM is determined to be 900 tubes/hour (either input or output). 900 tubes, when spread across 4 drawers, would result in 225 tubes/hour. Under the worst-case scenario where the drawer has to open once per tube, this would result in 225 triggers/hour for each drawer reader.

PRODUCT DESCRIPTION

Each RFID radio within the drawer would be triggered to momentarily turn on (16ms) when a magnet contained within the drawer RFID tag passes over the hall sensor in the PCB containing the radio. The duty cycle of the radio (worst case) is then calculated as below:

$$\begin{aligned}
 \text{Duty Cycle (RFID 13.56MHz radio)} &= t[\text{on}] \left(\frac{s}{\text{trigger}} \right) \times \text{CARs throughput} \left(\frac{\text{trigger}}{\text{hour}} \right) \\
 &= 0.016 \times 225 = 3.6 \left(\frac{s}{\text{hour}} \right) = \left(\frac{3.6}{3600} \right) * 100 = 0.1\%
 \end{aligned}$$

The worst-case duty cycle does not expect to be different over 6 minutes or 30 minutes.

***Note: 100% Duty Cycle was used as worst case.

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)	N/A
How is the Device Used	The radios are located more than 20 cm from the user.
Radios Contained in the Same Host Device	4x 13.56 MHz RFID Radios
Simultaneous Transmitting Radios	None
Body Worn Accessories	N/A
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).

MAXIMUM PERMISSIBLE EXPOSURE (MPE)

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.

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

MAXIMUM PERMISSIBLE EXPOSURE (MPE)



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 values are summarized in the following table:

13.56 MHz RFID Radio	Transmit Frequency (MHz)	Field Strength at 30 m	Power Tolerance (dB)	Duty Cycle	Minimum Separation Distance (cm)	Power Density (mW/cm ²)	Limit (mW/cm ²)	Compliant
Drawer 4	13.56	23.4 dBuV/m	1.76	100.0%	20	0.000	1.0	Yes
Drawer 3	13.56	23.1 dBuV/m	1.76	100.0%	20	0.000	1.0	Yes
Drawer 2	13.56	19.9 dBuV/m	1.76	100.0%	20	0.000	1.0	Yes
Drawer 1	13.56	17.5 dBuV/m	1.76	100.0%	20	0.000	1.0	Yes

The information in the table above was obtained from:

A measured value was used in these calculations. From customer supplied information and Element Report No. ABBO0076 Rev. 3.

End of Test Report