

1. Introduction

Fujitsu seeks approval for use of the Sierra Wireless module originally listed under **FCC ID: N7NEM7355** and now via FCC ID change to **Fujitsu ID: EJE-EM7355D** for use in a co-located mobile configuration. This Maximum Permissible Exposure (“MPE”) report demonstrates compliance for the Sierra Wireless module with 47 CFR §1.1310 and 2.1091 for standalone and collocated simultaneous transmission in mobile exposure conditions. This MPE analysis is valid for the transmitters operating within the **Product Declaration** parameters defined below. Antenna location info is shown in the last section of this report.

Any collocated transmitter must have a valid FCC ID documenting equivalent or degraded RF characteristics with the collocated parameters defined in this MPE analysis.

The mobile classification applies when 20 cm or more separation distance is maintained between the end user and both WWAN and WLAN transmission antennas.

The WWAN MPE calculations in the filing are based on conservative conducted transmit power exceeding those listed in the FCC ID: EJE-EM7355D filing and the maximum allowable antenna gains per relevant grant notes. The higher transmit power levels are used to present a worst case assessment. Portable user conditions or additional collocated modules are not permitted based on this RF exposure analysis, and will require a Class II permissive change including updated MPE or SAR report.

2. Product Declarations

Module vendor Sierra Wireless conditions listed below are met for the products covered by this report.

The EM7355 modem has been granted modular approval for mobile applications. Integrators may use the EM7355 modem in their final products without additional FCC / IC (Industry Canada) certification if they meet the following conditions. Otherwise, additional FCC / IC approvals must be obtained.

1. At least 20 cm separation distance between the antenna and the user’s body must be maintained at all times.
2. To comply with FCC regulations limiting both maximum RF output power and human exposure to RF radiation, the maximum antenna gain including cable loss in a mobile-only exposure condition must not exceed values shown in Table 1
3. The EM7355 modem may transmit simultaneously with other collocated radio transmitters within a host device, provided the following conditions are met:
 - Each collocated radio transmitter has been certified by FCC / IC for mobile application.
 - At least 20 cm separation distance between the antennas of the collocated transmitters and the user’s body must be maintained at all times.
 - The output power and antenna gain must not exceed the limits and configurations stipulated in the following table.
4. A label must be affixed to the outside of the end product into which the EM7355 modem is incorporated, with a statement similar to the following:
 - This device contains FCC ID: EJE-EM7355D
 - Contains transmitter module IC: 337J-EM7355D
5. A user manual with the end product must clearly indicate the operating requirements and conditions that must be observed to ensure compliance with current FCC / IC RF exposure guidelines.

MPE Evaluation for Fujitsu Notebook Computers E734 & E744

Table 1 summarizes typical transmitter parameters associated with this FCC ID.

Antenna gain is original design specification of Module vendor

Device	Technology	Band	Frequency (MHz)	Maximum conducted power (dBm)	Maximum antenna gain (dBi)
EM7355 Embedded Module	LTE	2	1850–1910	24	3
		4	1710–1755	24	6
		5	824–849	24	3
		13	777–787	24	6
		17	704–716	24	6
		25	1850–1915	24	3
	UMTS	2	1850–1910	24	3
		4	1710–1755	24	6
		5	824–849	24	3
	GSM	850	824–849	33	3
		1900	1850–1910	30	3
	CDMA	BC0	824–849	25	3
		BC1	1850–1910	25	3
		BC10	816–823.975	25	3
Collocated transmitters ¹	WLAN		2400–2500	29	5.0
			5150–5850	29	5.0
	WiMAX		2300–2400	29	5.0
			2500–2700	29	5.0
			3300–3800	29	5.0
	BT		2400–2500	15	5.0

1. Valid collocated transmitter combinations: WLAN+BT; WiMAX+BT.
(WLAN+WiMAX+BT is not permitted.)

MPE Evaluation for Fujitsu Notebook Computers E734 & E744

This MPE analysis is applicable to the co-located transmitters listed in Table 2. Specific FCC IDs for devices other than those listed are not included with this analysis. A 100% duty cycle is used for calculations to present a worst-case analysis.

Table 2 Co-located WLAN transmitters Output Power in Watts as shown in the respective Grants

Frequency Band	Intel WLAN Module FCC ID: PD97260H
2400~2462 MHz	0.476 W
5150~5250 MHz	0.037W
5250~5350 MHz	0.041 W
5470~5725 MHz	0.053 W
5725~5850 MHz	0.523 W

The modules are combo modules with WLAN + Bluetooth. The co-located Bluetooth, has output power below the low threshold of 60/f and is, therefore, excluded from the calculations as its contribution to the MPE at 20cm from the device would be negligible.

6. Transmitter Summary

The WWAN modes of operation listed reflect EJE-EM7355D parameters associated with this module. Integration of a WLAN module that exceeds the parameters requires a new FCC authorization or permissive change application.

FCC ID:	Original Grant Date	Maximum Conducted RF Power			Maximum Declared Antenna Gain across Fujitsu Notebooks under review	
		850 MHz	1900 MHz	1700MHz	850 MHz	1700/1900 MHz
EJE-EM7355D	5-6-2013	1.841 W	0.91 W	0.2 W	+3 dBi	+6 dBi

7. RF Exposure Limits and Equations

According to FCC CFR 47 §1.1310, the criteria listed in the following table shall be used to evaluate the environmental impact of human exposure to radio frequency (RF) radiation as specified in 1.1307(b).

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Average Time (Minutes)
(A) Limits For Occupational / Control Exposures (f = frequency)				
30-300	61.4	0.163	1.0	6
300-1500	...	...	f/300	6
1500-100,000	...	...	5.0	6
(B) Limits For General Population / Uncontrolled Exposure (f = frequency)				
30-300	27.5	0.073	0.2	30
300-1500	...	...	f/1500	30
1500-100,000	...	...	1.0	30

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Classic Friis transmission formula:

$$P_d = \frac{P_{out} \times G}{4\pi R^2}$$

Where,

P_d = power density (mW/cm²)

P_{out} = output power to antenna (mW)

G = gain of antenna in linear scale

R = distance between observation point and center of the radiator (cm)

8. MPE Calculations

The **power density calculations** for standalone transmitters at an exposure separation distance of 20 cm are shown below.

Module	Intel WLAN MODULE FCC ID: PD97260H			
Mode				
Frequency (MHz)	2400 MHz	5150-5350 MHz	5470-5725 MHz	5725-5850 MHz
Output power (dBm)	16.5	16	16.5	16.5
Gain (dBi)	1.80	3.03	3.29	2.71
Duty Cycle	1	1	1	1
EIRP (mW) (RF exposure)	68	80	95.5	83.4
Distance (cm)	20	20	20	20
Power density (mW/cm ²)	0.014	0.02	0.02	0.02
Limit	1.00	1.00	1.00	1.00
% of limit	1.4%	2%	2%	2%
Antenna gains listed are the highest gains across all platforms covered by this C2PC.				

Module	SIERRA WWAN			Module EJE-EM7355D		
Mode	GPRS/EDGE	CDMA/WCDMA	WCDMA	GPRS/EDGE	CDMA/WCDMA	LTE
Frequency (MHz)	836	836	1732	1880	1880	750/1750
Output power (dBm)	27	24	23	26	24	23
Gain (dBi)	2.5	2.5	3.0	3.0	3.0	3.0
Duty Cycle	0.25	1	1	0.25	1	1
EIRP (mW) (RF exposure)	223	447	398	199	502	398
Distance (cm)	20	20	20	20	20	20
Power density (mW/cm ²)	0.18	0.09	0.08	0.16	0.1	0.08
Limit	0.56	0.56	1.00	1.00	1.00	1.00
% of limit	32.14%	16.07%	8%	16%	10%	8%

9.0 Conclusion:

Maximum 'worst case' co-located power density levels at 20cm expressed as a percentage of the limits for RF exposure are 2% for the WLAN modules and 32.14% for the WWAN module. The combined value for power density represents 34.14% of the limit. The E734 and E744 comply with FCC's MPE requirements.

