# RF Exposure Compliance

Per KDB 680106, the applicant made a KDB inquiry to obtain FCC guidance concerning the RF exposure requirements for their inductive charger. The guidance was followed; therefore the exposure condition documented herein is compliant with FCC rules.

The following are the relevant excerpts and attachments from the KDB Inquiry

## FCC KDB Inquiry submitted 11/07/2011

"We are developing the contactless charger for a footswicth that is used in surgical instrument (ophthalmic).
Charging frequency is 50kHz, and data transfer at frequency 125kHz - 134 KHz. Data tranfer at a very low rates to monitor battery status. Power transfer to charging battery 7 - 10 watts Max.
OET Bulletin 56 - FCC limits for MPE starts from 300 kHz and above. But our application utilized 50 kHz.
Does this contactless charging require MPE calculation?
Can we test this system under Part 15 (instead of Part 15 and Part 18)?
Please advice - thanks."

## Reply from Customer 02/15/2012

Thank you for the response.
Per requested , please see the attached detailed explanation of charging process.
Please note that system is classified as mobile device (the charging process only occurred when the system is not in use, and is considered greater than 20cm distance from the user or bystander).
The magnetic field strength calculated at distance 5 cm is 74 A/m (see attachment for details).
What is MPE or SAR limits applicable for this application at the stated frequencies?
Please advise

## Reply from Customer 04/23/2012

Sam,

Thank you for speaking with me on Friday. This is Greg Kiemel of Northwest EMC. Alcon Labs has authorized me to contact the FCC to help them with this KDB Inquiry (please see attached authorization). Initially, Alcon submitted the inquiry on their own to seek guidance on their inductive charging circuit (per KDB 680106). Now, they've asked me to help them complete the inquiry process.

Attached are two photos of their device. The doctor (user) and patient are on the side opposite of the charging loop which is located on the backside of the console (pedestal) near the floor. Several feet separate the user and patient from the charging loop. Alcon has specified previously that users and nearby persons will be greater than 20 cm from the loop. To charge the foot switch, it is removed from the floor on the user side of the console and placed in the vertical charging cradle (that contains the loop) on the rear of the console. It is not possible to use the foot switch while it is being charged. When the foot switch is in use, it is taken from the charging cradle and place on the floor on the user side. The charging loop is powered off when the foot switch is removed from the charging cradle.

Per our conversation, Alcon has provided excerpts from the user manual that show the dimensions of the unit and provide insight into it's intended use. (Please see attachment).

Based upon the distance from the user and nearby persons, and the inability to use the foot switch while it is being charged, we believe the RF exposure potential to users and bystanders is low. Any requested measurements should be 20 cm or greater away. We look forward to your updated compliance requirements for this device.

Best regards,

Greg Kiemel, Director of Engineering
Northwest EMC, Inc.
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## FCC Response 05/09/2012

General Information:

Wireless battery chargers /wireless power pads operating at frequencies above 9 kHz are intentional radiators and are subject to either Part 15 and/or Part 18 of the FCC rules. The specific applicable rule part depends on how the device operates, and if there is communication between the charger and device being charged.
It is possible for the device to be approved under Part 18 for the charging mode and Part 15 for the communications mode, if it can be shown that (1) the device complies with the relevant rule parts and (2) the functions are independent. Part 18 consumer devices can be either certified or approved under DoC, only after the required SAR guidance has been given ( . . by submitting an inquiry at www.fcc.gov/labhelp" . . ) and the necessary test requirements have been completed. Finally, it is possible that the power charging function could be approved under Part 15 rather than Part 18 if the device meets all of the requirements of the appropriate Part 15 rule.

Now concerning your device, if Part 15 is applied to the charging, the rationale and analysis should be included in the RF exposure exhibit. If Part 18 is applied, TCB/manufacurere should keep a copy of the rationale and analysis in their equipment verification record (that is, update the descriptions and calculations etc). For Part 15, test lab can go to the TCB without a PBA to ensure that all rule are applied as mentioned above.

2.Please include proper instructions in the user manuals etc. to alert users to park the system in locations that can provide 20 cm between the outer surface of the charging foot switch and lingering bystanders to maintain RF exposure compliance.

There is an error in the equation used to estimate the H-field strength; it should be a ?+? sign instead of ?x?. The numbers are OK, just the symbol is incorrect. Please correct.

Please submit to TCB for approval upon review if all the above have been corrected.

## Analysis Submitted with KDB Inquiry

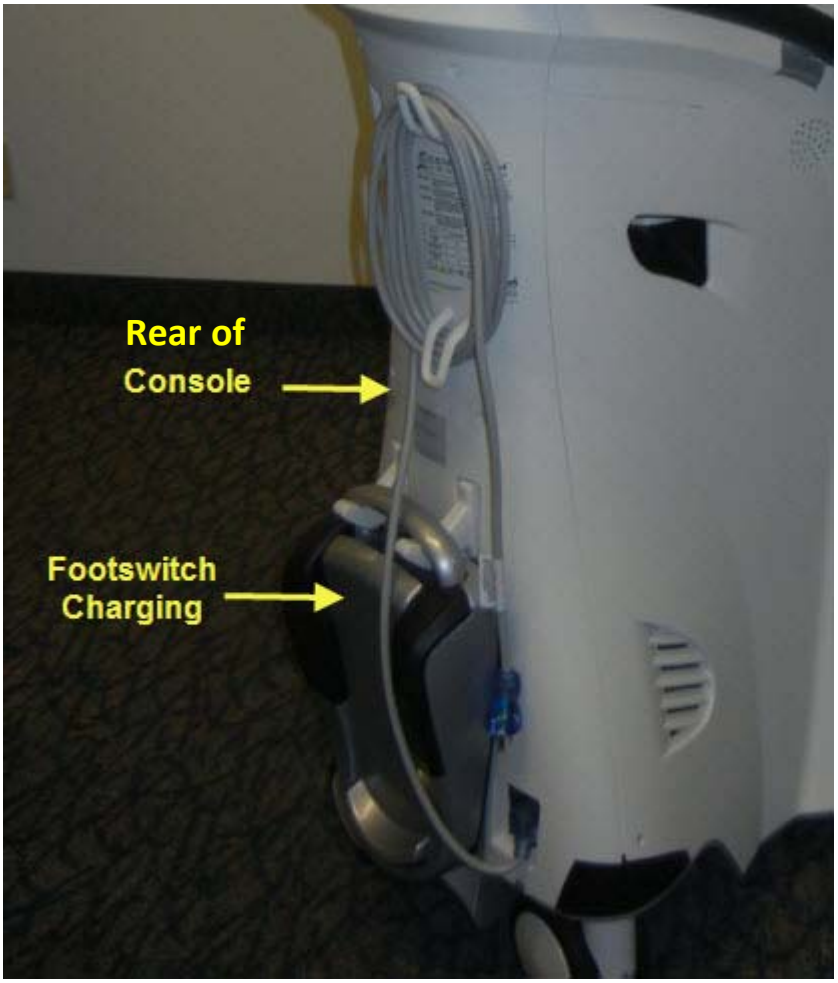
### Operational Parameters:

Optical Sensor Range: approximately 10cm.
Nominal Coil Separation: 7mm +/- 1 mm
Charging Efficiency (Power into battery/transmitted power): 60% @ nominal separation
Charging Frequency: 50 kHz
Charge Rate: 10W
Charging Current I: 5 A p-p = 1.8 rms
Number of turns in transmitting coil n: 11
Communication Frequency: 115 kHz
Communication Charge Rate: 3W
Communication Rate: ~200 bits per second (5ms/bit)
Communication Payload: ~100 bits (duration ~0.5 sec)
Charge Query Rate: 10sec-30 sec.
Recharge Time: approximately 10 hours for 2000 mAh 7.2V battery pack.

### Magnetic Field Calculation:

At distance of z = 5 cm from the center, the axial magnetic field:

$H = I \times n \times R^2 / 2 (z^2 + R^2)^{3/2} = 1.8 \times 11 \times (0.057)^2 / 2 [(0.05)^2 + (0.05\ \ 7)^2]^{3/2} = 74$ A/m


Rear of
Console
Footswitch
Charging