

July 19, 2001

Mr. Joe Dichoso
FCC Application Processing Branch
Federal Communications Commission
7435 Oakland Mills Road
Columbia, MD 21046

Subject: Applicant: Kohler Company
FCC ID: N82PNA1
Confirmation Number: EA93436
Correspondence Ref. No. 19988

Reference: Kohler Waiver Request submitted June 16, 2000.

Attachments: JPEG Photo of sample PCBA, Rev 08.

Related

Exhibits: Kohler VTK System Block Diagram, Rev B, dated 7/18/01 (Confidentiality Requested)
Kohler VTK Schematic, part number KAB-021-0001-12, dated 8/16/00 (Confidentiality Requested)
Kohler VTK Theory of Operation, dated 7/19/01 (Confidentiality Requested)

Dear Mr. Dichoso:

I received your email Tuesday, and would like to answer the questions you pose in it. I hope this will clarify the amendment to the original certification report, and outline the differences between the current VTK design and the one tested on February 2, 1999. The certification report filed on July 10, 2001 contains the original test data (in instances where it has not changed), and added pages containing the test data on those tests where the results have changed.

This unit is the subject of a waiver request, which was submitted as an attachment to this application on July 16, 2001, and originally filed with the Commission on June 16, 2000. It requests a waiver of Section 15.205(a) to allow emission of other than spurious radiation into the restricted bands from 4.5 – 5.25 and 5.35 – 5.46 GHz, and of 15.35(b) to allow an increased limit on peak emissions from 20 dB above the average limit to 60 dB above the average limit. To address possible concerns about emissions very far away from the center frequency, we have added a printed microstrip filter between the transmit oscillator and the transmit antenna. The original unit was designed to operate at 5.8 GHz under Section 15.245, and this unit maintains the underlying transmitter design center frequency and pulse length into the added filter. This filter has a design bandwidth of about 1 GHz, and as described in the waiver request, produces at least 6 dB of attenuation for frequencies more than 850 MHz above and below 5.80 GHz. Because of variations in alignment of the filter and oscillator, the location of the peak, as measured after the filter, is not exactly at 5.8 GHz. However, at all frequencies the emissions are less than the original unit, and are well below 15.209 average levels. Comparing the original and the revised sample units, the emissions are 15 dB lower at 5.2 GHz, 13 dB lower at 5.4 GHz, 11 dB lower at 5.6 GHz, and 13 dB lower at 5.8 GHz.

Likewise, the added filter also lengthens the pulse in the time domain, from 1.1 nsec to about 2.2 nsec in the sample unit. This reduces the pulse desensitization from 59.2 dB to 52.9 dB, and this is the figure that is used in the report to compute the peak level.

If granted the requested waiver, we believe the device will conform to Section 15.209, and as a wideband, but very low power device, that this is the most appropriate classification. In production, the location of the peak frequency and the pulse length will vary, but all emissions will meet the criteria outlined in the waiver request:

- The average emission, at the peak frequency, will comply with Section 15.209: *i.e.*, it will be less than 54 dB $\mu\text{V}/\text{m}$ at 3 meters, measured as the level of the highest spectral line using RBW less than 0.3 times the PRF and VBW greater than or equal to the RBW.
- The peak emission, at the peak frequency, will be no more than 60 dB above the Section 15.209 average limit: *i.e.*, it will be less than 114 dB $\mu\text{V}/\text{m}$ at 3 meters, calculated by adding the pulse desensitization factor to the average emission value. The pulse desensitization factor is calculated as $20\log(T/t)$, where T is the inverse of the pulse repetition frequency and t is the effective pulse length determined by the width of the emission lobe at the -3.92 dB points. The increase of the peak limit from 20 dB above the average limit to 60 dB above the average limit is the requested waiver of Section 15.35(b), referenced in Section 15.209(e).
- The main lobe of the emission will be entirely contained within the frequency range from 5.0 to 6.6 GHz: *i.e.*, any production variations in peak frequency or the width of the main lobe will not result in a main lobe extending more than 800 MHz away from 5.80 GHz, regardless of the actual frequency of the peak emission. The main lobe will not cross into any restricted bands, as specified by Section 15.205, other than the ones extending from 4.5 – 5.25 and 5.35 – 5.46 GHz. These bands are the two delineated by the requested waiver of Section 15.205(a).

Regarding the points you raise in your email, the data for this unit are below, following the same numbering in the email:

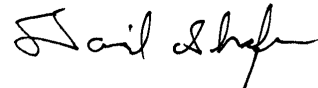
1. The unit tested for the amended certification report is Rev 08 of the design, and incorporates the transmit filter. The data attached to the test report submitted on July 10, 2001 contains some data pages from the test report submitted with the original application (where the data have not changed) and revised data pages (where data have changed as a result of the added filter). Submitted separately today, with a request for confidential treatment, are a current Block Diagram, Schematic and Theory of Operation for the tested product. Also attached to this letter is a photo of the PCBA as mounted in the enclosure. We did not obtain additional photos of the fan and power supply, because these have not changed and we wanted to preserve the unit for testing by the Commission. I believe other than the color of the case, the external photos contained in the test report are similar between the February 2, 1999 and June 28, 2001 tests. The unit does not

balance on its bottom, and is supported in each test setup by an empty cardboard box. The boxes used are different, but not part of the unit.

2. We previously were advised that the test sample should not be submitted until after the equipment authorization was issued. However, in response to your request and to facilitate processing of this application, we sent out the unit tested on June 28, 2001 to your attention yesterday. You should receive it today.
- 3A. The measurement was not included in the data table, but from the line spectrum plot is 45.5 dB μ V. This gives a field strength by this method of 40.8 dB μ V/m at 3 meters, or 13.2 dB below the Section 15.209 limit. For this measurement, the RBW was 1 kHz, the VBW 100 kHz, and an average detector was used.
- 3B. The pulse length, measured by the inverse of the main lobe width 3.92 dB below the peak value, is 2.2 nsec for the sample unit. The measured PRF is 1.01 MHz, giving a pulse desensitization correction of 52.9 dB. This is the value used in the table to compare against the requested peak limit. Using the 40.8 dB μ V/m average reading obtained from the line spectra, and this pulse desensitization factor, the calculated peak emission is 93.7 dB μ V/m at 3 meters. The original unit, which did not incorporate the transmit filter, had a shorter pulse, and therefore a higher pulse desensitization correction of 59.2 dB. For the measurement of the main lobe width, a RBW of 1 MHz, a VBW of 10 Hz, and an average detector were employed.
- 3C. We were not able to measure any spurious emissions, as the main lobe dropped into the noise floor of the preamp before extending more than 800 MHz away from 5.80 GHz.
- 3D. We were not able to measure any harmonic emissions. The analyzer noise floor is reported. We used and RBW of 1 MHz, a VBW of 10 Hz, and an average detector, since we could not see any line spectra at the harmonics.
- 3E. As described above, the pulse length in the sample unit is 2.2 nsec for a main lobe bandwidth of 909 MHz. As you point out this does not fall entirely within any specific higher-emission band, and therefore the device is subject to 15.209. With the requested waiver, we believe the sample tested, and all production devices, will do that with comfortable margins.

I hope the discussion here helps clarify the test data, and provides you with the information you need to process the referenced application. If there are any other technical questions, please don't hesitate to contact me.

Sincerely,



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Attachment A

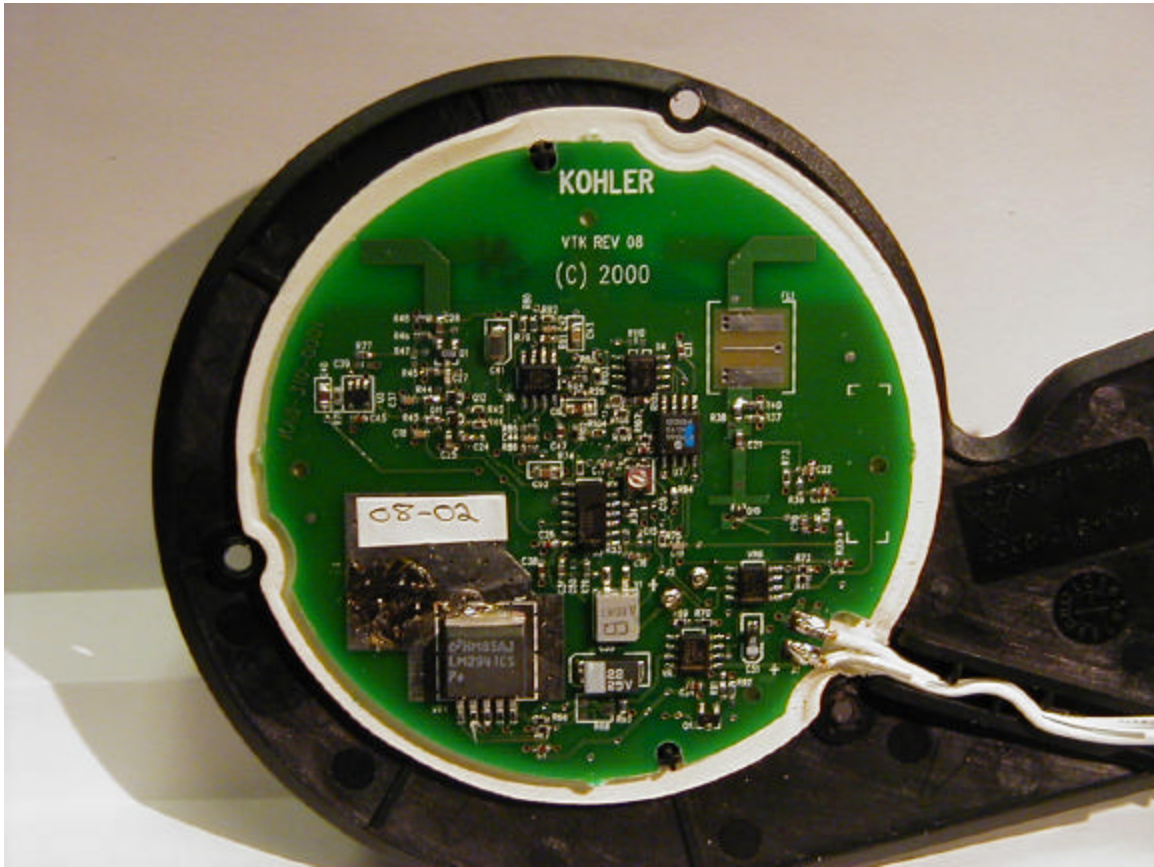


Photo of VTK Unit S/N 08.02 Sensor PCBA, mounted on fan.