

Caterpillar Inc. ("Caterpillar") hereby provides the following information in response to a series of questions forwarded by the FCC from the Military Assignment Group ("MAG"). For convenience, each MAG question is listed below, followed by Caterpillar's answer.

(1) Can Caterpillar Inc. ensure that these critical operations are protected from interference?

Numerous factors help to mitigate any interference to other operations caused by Caterpillar's electromagnetic compatibility (EMC) testing. As demonstrated below, Caterpillar's proposed test site layout, the terrain surrounding the test sites, and the position of the machines under test demonstrate that signal propagation from the EMC testing will be mitigated at both the Peoria and Tucson test sites.

At the Peoria permanent test site, the direction of the strip of land used for testing runs lengthwise north-northeast to south-southwest. As a result, transmittal directions for EMC testing will be east-southeast and west-northwest. The permanent test site is still under development, but interference in the transmittal directions will be mitigated by a naturally occurring berm located directly adjacent to the test site. See Ex. 1, Peoria Site Photographs, South-Southeast and North-Northwest. The antennas used by Caterpillar for EMC testing will never rise above this berm top. Terrain analyses prepared by Cohen, Dippell, and Everist for the transmittal directions (south-southeast and north-northwest) confirm that radiofrequency emissions from Caterpillar's EMC testing will be blocked by naturally occurring geographic formations within the line of sight. See Ex. 2, Peoria Terrain Analysis, South-Southeast and North-Northwest. In addition, Caterpillar intends to further develop the test site by flattening and lowering the exact locations where antennas will be positioned. These steps will further increase the relative berm height and provide even more interference mitigation than that already shown in the Peoria terrain analyses.

In Tucson, Caterpillar will transmit to the east and west. As shown in the attached terrain analysis and photographs, signal propagation will be limited by the existing natural geography surrounding the Tucson test site. See Ex. 3, Tucson Terrain Analysis, East and West; Ex. 4, Tucson Site Photographs, East and West.

Numerous other factors will further limit the likelihood of interference. See Ex. 5, Jan. 2007 Caterpillar Description of EMC Testing; Ex. 6, Nov. 2007 Caterpillar Memorandum to FCC Staff

Regarding Interference Mitigation for EMC Testing in Television Broadcast Band; Ex. 7, Jan. 2007

Caterpillar Engineering Statement. These additional factors include:

- Dwell time on any frequency during EMC testing is less than 10 seconds, and most often less than 5 seconds
- Antennas used in EMC testing are mounted close (1 to 4 meters) to the ground and close (3 to 5 meters) to the equipment under test, which will greatly limit the range of the transmitted signal
- Caterpillar will use directional antennas on military frequencies, with the main lobe directed at machine under test, which will limit the range of the transmitted signal
- Infrequent outdoor testing (no more than seven times per month)

In addition, Caterpillar personnel will be present for all aspects of the investigation; testing will be coordinated with various public safety agencies in the area; and standards of good engineering practice will be followed, with applicable FCC rules available as a reference.

These factors minimize the likelihood of interference to nearby critical operations. Caterpillar is willing to take any reasonable additional steps deemed necessary to ensure protection.

- The output power of 500 watts into free-space has the MAG greatly concerned as the prediction of interference to critical Military Departments (MILDEP) and FAA operations.

(2) What is the centerline of the antenna from the ground? It also helpful if there is a report of the topology of the area to estimate the propagations.

The antenna is placed on a small tripod next to the machine under test and is pointed at the machine. See Exs. 5 and 6. The centerline of the antenna is between 1 and 4 meters above ground. As discussed in the response to question 1, *supra*, the terrain surrounding the outdoor test sites in Tucson and Peoria will limit signal propagation outside of Caterpillar's proving grounds.

In addition, Caterpillar's standard operating procedure sets up testing so that all antenna emissions are directed towards the area at the test site with the greatest natural geographic barriers to signal propagation. For example, at the Tucson test site, all EMC testing will be conducted with the antenna facing east and west, where the natural topology helps limit propagation. At the Peoria site,

antenna directionality will be limited to south-southeast and north-northwest. See Exs. 1-4 and the response to question 1, *supra*, for a full analysis of the surrounding terrain at both locations.

(3) If the antenna is a log-periodic antenna, will the main lobe always be directed at an inclination of -90 degrees (nadir) with the equipment under test directly beneath it?

The antenna will be positioned only 3 to 5 meters from the equipment under test, minimizing the power needed to generate the required field strength. The main lobe will be directed at the equipment under test, so it would be at an inclination of 0 degrees. No accepted testing standard supports mounting the antenna above the equipment under test and pointing downward. Moreover, by doing so, Caterpillar would raise the height of the antenna, which would counteract the effects of pointing it downward and minimize the signal dissipation from surrounding terrain.

(4) The stop buzzer information for Peoria and Tucson is the same; please explain how the stop buzzer can be in two locations?

All machine EMC testing is coordinated through a single group within Caterpillar. That group will be responsible for any testing, and will be the single point of contact for testing regardless of whether it is taking place in Peoria or Tucson. Phone numbers are easily forwarded between Caterpillar's facilities and to mobile phones to ensure contact with the group while on-site. Caterpillar security is also onsite and available 24 hours a day, 7 days a week to address any problems.

- The request states that Caterpillar must "... conduct EMC testing on its prototype equipments across a large number of frequencies to ensure both product safety and compliance under different international regulatory schemes, including those of the European Union."

(5) The MAG is requesting that Caterpillar provide specific information and documentation of this regulatory language.

Caterpillar machinery sold into European Union countries must comply with EU Directive 2004/108/EC (the EMC Directive). To demonstrate compliance with this Directive, machinery is tested to

relevant industry standards (EN13309/ISO13766). Caterpillar has attached a copy of the ISO13766 standard as Exhibit 8. These standards require radiated immunity testing over the 30 MHz to 1 GHz frequency range. These standards require testing at 10 MHz (or 5%) steps in the 225-399 MHz frequency range. To minimize the burden of coordination efforts, Caterpillar is only requesting authorization to operate on three frequencies in this range instead of a frequency every 10 MHz.

- Since the UHF spectrum comprises much more than the 225-399.9 MHz,

(6) Can Caterpillar request access to frequencies above 399.9 MHz to perform the required testing?

Caterpillar has actively pursued authorization to conduct EMC testing on other frequencies, including the UHF band at frequencies above 399.9 MHz, and has received an experimental license to do so. See FCC File No. 0003-EX-PL-2007, Call Sign WE2XBP (experimental license granted Dec. 10, 2007). However, the relevant EMC immunity testing standards require testing over an entire range of frequencies, from 30 MHz to 1 GHz. The 225-399.9 MHz range is the only significant gap remaining in the frequencies for which Caterpillar seeks FCC authorization for testing.

As noted in its response to question 5, *supra*, Caterpillar is only requesting authorization to operate on three frequencies in this range, instead of a frequency every 10 MHz as required by the relevant test standard. Three frequencies other than those requested in the instant application would be acceptable for Caterpillar's current purposes provided that the channels are properly spaced in the 225-399.9 MHz range. However, denial of authorization to test in this entire frequency range would make it impossible for Caterpillar to positively declare conformance with industry standards, and would negatively impact its international business.

(7) Has an EMC immunity test been performed outside the UHF band? If so the MAG would like a copy of the report so that it can be reviewed by their engineering section.

Caterpillar's test reports from EMC immunity testing performed on other machines is highly confidential and very competitively sensitive. Caterpillar will revisit this issue if necessary after the FCC and MAG review the remainder of this answer.

(8) Can Caterpillar explain how the 2K00A3E emission is used when performing "EMC immunity" testing?

The EMC immunity test standards being used specify that the generated electromagnetic field be 80% AM modulated with a 1 kHz tone. This results in a 2K00A3E emission type.

(9) Is this authorization to be used for the purpose of testing equipment manufactured exclusively for export?

EMC immunity testing is only required for machines that will be exported. However, many of the machines that will be tested will also be sold domestically. Caterpillar's internal due diligence efforts require that all machines (those sold domestically, those sold internationally, and those sold both domestically and internationally) undergo EMC testing. In addition, Caterpillar sells certain machinery to customers (such as the Department of Defense) that may use it domestically or internationally.

Exhibit List

To provide further background to the FCC and MAG about the EMC testing, Caterpillar is submitting the following supporting Exhibits via the "add attachments" feature in OET's ELS system:

- Exhibit 1, Photographs of Caterpillar Peoria Proving Grounds EMC test site
- Exhibit 2, Terrain Analysis of Caterpillar's proposed Peoria test site prepared by Cohen, Dippell & Everist, P.C.
- Exhibit 3, Photographs of Caterpillar Tucson Proving Grounds EMC test site
- Exhibit 4, Terrain Analysis of Caterpillar's proposed Tucson test site prepared by Cohen, Dippell & Everist, P.C.
- Exhibit 5, Description of testing from Caterpillar's January 2007 application for an experimental authorization to conduct EMC testing on various frequencies
- Exhibit 6, Caterpillar's November 28, 2007 memorandum to FCC staff describing interference mitigating factors in order to obtain authority to conduct EMC testing in the television broadcast band
- Exhibit 7, Engineering Statement from Caterpillar's January 2007 application
- Exhibit 8, ISO13766 standard