Agfa NV - Radiology Solutions

From: Jan Vercammen (6233) – R&D Mortsel

Date: October 1st 2024

Concerning: DSRFID type D reader modular Transmitter and 47 CFR part 15 subpart C - FCC ID: HPL-DSRFID-D

This note describes the 47 CFR part 15 subpart C test configuration for radio type testing and the modular character of DSRFID tag reader (or reader for short).

Note that the reader is a replacement for older FCC certified RFID readers.

The reader is a small, printed circuit board with local shielding, local power supply regulation and filtering. The internal code for the reader is A800126.X, where X is version number. The current version number is 7, the mass production version number will be 7 (release of microcontroller firmware code), higher values are possible because of software (bug) fixes.

The reader is an intentional radiator that is based on inductive coupling to power a passive tag (or multiple tags) using ISO protocol. The carrier frequency is 13.56MHz – section 15.225. The reader needs to comply with 47 CFR 15 subpart C – 15.207 and 15.209.

The reader is integrated into diagnostics medical film printers (both the reader and printers are manufactured by Agfa NV) using full modular approval.

The reader complies with all requirements of modular transmitters – section 15.212:

(i) The radio element is shielded by a local PCB shield, i.e. the ST25R95 is shielded

(ii) The data inputs/outputs are buffered by RS232 tranceivers

(iii) The module has local regulators for 3.3V

(iv) The antenna is fixed in the printed circuit board

(v) The module is tested stand-alone, see test report PCC-RAD-6113.pdf

(vi) The module has an FCC ID label on the PCB and a label on the application that it contains a transmitter with FCC ID corresponding to the FCC ID on the reader.

(vii) The reader module is used as drop-in for an existing full modular approved reader. The RFID module is not sold to external parties. The integration is fixed and well documented. Installation is done in production and in the field replacement are done by Agfa field service engineers

(viii) RF exposure is not applicable to the reader – see details next page

Agfa NV - Radiology Solutions

EMF exposure:

DSRFID is a low power short-range inductive RF application, energy is stored in the volume near the loop antenna and very little RF energy is radiated. The maximum tag reading range is about 6cm, in the application the effective reading range is guaranteed to be 4cm. The reader is integrated inside the printer maximizing the distance to the (printer) operator.

The E-field and H-field data are found in the FCC and EN 300 330 testing (at 1m distance).

The DSRFID antenna is inside the printer (tray) and at a (worst-case) distance of > 20cm from the printer operator.

The transmitter of DSRFID is not very active, the worst-case duty cycle (or duty factor) is <0.3%, that is, the RF carrier is present worst-case 0.3% of the time. Note also that the active time for the EM fields generated by DSRFID are limited to ≤1 second and that the frequency of repetition is limited to 10 minutes. This results in a very low duty factor and a low average field exposure.

Based on EN 62311:2020 and ICNIRP PUBLICATION – March 2020 the EM field exposure due to DSRFID is extremely small and, as such, inherently compliant.

We use the procedure defined in EN 62311:2020 (consult figure 1) and the result is that we have we have a single intentional radiator at a single carrier frequency of 13.56MHz. We use whole-body exposure limits for both the E-field and H-field and their combination. We use table 5 for the exposure limits and equation 3 in ICNIRP PUBLICATION – March 2020.

Field value	Measured value	Limit value	Remark
E-field @ 1m	Ei=71.4dBuV/m = 0.04V/m	E_{limit} =300/f $^{0.7}$ = 48.4V/m	No Duty factor
H-field @ 1m	Hi=12dBuA/m = 4.0 10^{-6} A/m	H_{limit} = 2.2/f $^{0.7}$ = 0.355A/m	No Duty factor
Combined E-H fields	$(Ei/E_{limit})^2 + (Hi/E_{limit})^2$ = 6.0 10^{-9}	≤ 1	No Duty factor

The above table shows that the worst-case levels without taking into account the duty factor are far below the limits of the E-field, H-field and their combination. With the duty factor 0.3% (or 0.003) the margin is even larger.

END of Document