

General information

<u>FCC ID</u>	<u>Model name</u>
2BQPBPPXXUK-Y	PPxxUK-y

The PatchPro® – RFID Panel Upgrade Kit is a RFID reader designed to operate with multiple antennas using time division multiplex (TDM). The system can monitor up to 48 RFID tags built into network cables. The RFID Panel Upgrade Kit integrates 48 identical PCB-based spiral antennas, each functioning as a small inductive loop.

Antenna description

Antenna Type:	printed inductive near-field loop antenna
Feed Type:	Differential feed via RF matching network (see Figure 2)
Max Output Power:	23dBm (200mW)
Gain:	<57 dBi (see appendix)
EIRP:	<0.38 μ W (see appendix)

The transceiver operates at 13.56 MHz in compliance with ISO15693 standards.

This antenna is designed for inductive near-field coupling only and is not intended for radiative far-field operation.

The design ensures efficient inductive energy transfer while maintaining minimal far-field emissions, as typical for NFC and HF RFID systems.

Appendix

Gain calculation

The worst-case theoretical gain of an antenna can be calculated from its effective aperture (approx. antenna area) using the following formula:

$$G_{max}[\text{dBi}] = 10 \log_{10} \left(\eta \frac{4\pi A}{\lambda^2} \right)$$

With

$\eta = 1$	efficiency
$A \approx 75 \times 10^{-6} \text{m}^2$	aperture
$\lambda = \frac{c}{f} = 22.11 \text{m}$	wavelength

Result:

$$G_{max}[\text{dBi}] = -57.15 \text{ dBi}$$

Even under ideal conditions, assuming perfect efficiency ($\eta=1$) and that the entire physical area contributes effectively to radiation, the maximum achievable gain is limited to -57 dBi. This illustrates that, due to the very small aperture and antenna length compared to the wavelength, no higher gain can be physically realized at this frequency 13.56 MHz. This antenna is a magnetic loop designed for inductive coupling in the near field. The radiated field is purely magnetic and has no electric components in the farfield. For this reason, this antenna has no significant gain and thus the resulting EIRP is also marginal.

EIRP calculation

The analog front end (TRF7961RHBT) has a maximal programmable Output Power of 200mW (23dBm).

$\text{EIRP} = \text{maximum rated conducted output power (dBm)} + \text{tune-up tolerance} - \text{maximum path loss to antenna} + \text{antenna gain(dBi)}$

Due to the small gain the EIRP is marginal:

$$\text{EIRP}_{\text{worst case}} \approx 23\text{dbm} - 57.15\text{dBi} = -34.15 \text{ dBm} = 0.38 \mu\text{W}$$