

Faaftech Tecnologia Ltda

Rua 90, N.929, Setor Sul
Goiânia, GO – Brazil
CNPJ: 12.223.212/0001-17

Antenna Specification

SHIFTPOWER PRO – Model family SPNNP (SP00P–SP99P) – PCB FSP5B

1. Description

The SHIFTPOWER PRO uses a single passive printed antenna implemented as a copper trace on the main PCB (FSP5B), following the Renesas DA14531 printed-antenna reference design (ZOR antenna, 1.6 mm substrate; AN-B-027 Rev. 2.5, Section 4.4). The RF output of the DA14531 BLE SoC is routed through a passive matching network ($L1 = 3.3 \text{ nH}$, $L2 = 1.6 \text{ nH}$, with C13–C16) to the printed antenna. The antenna is integral to the device: it has no RF connector, is enclosed within the housing, and is not accessible or replaceable by the end user. There is no provision for any external or alternative antenna.

2. Specifications

Parameter	Specification
Antenna type	Passive printed antenna (PCB trace), integral to the main board (PCB FSP5B)
Reference design	Renesas DA14531 printed-antenna reference design – ZOR antenna, 1.6 mm substrate (AN-B-027 Rev. 2.5, Section 4.4); matching adapted for the FSP5B board and enclosure
Antenna manufacturer	Faaftech Tecnologia Ltda – Rua 90, N.929, Setor Sul, Goiânia, GO, Brazil (the antenna is integral to the PCB; it is manufactured by the device manufacturer, not a third party)
Antenna model / designation	Integrated PCB trace antenna on PCB FSP5B (no separate antenna part number; per Renesas AN-B-027 reference design)
Antenna connector	None – permanently integrated; no RF connector
User-replaceable	No – not accessible or replaceable by the end user
Matching network	$L1 = 3.3 \text{ nH}$, $L2 = 1.6 \text{ nH}$ (with C13–C16) between the SoC RF port and the antenna
Operating frequency	2402–2480 MHz (2.4 GHz ISM band), 40 channels / 2 MHz
Modulation / emission	GFSK / F1D (Bluetooth® Low Energy 5.1)
Conducted output power	0 dBm (1 mW) nominal
Peak gain (max.)	Low-gain, omnidirectional. Maximum measured peak gain 1.04 dBi over the 2.4 GHz band. Per-frequency maxima: 2400 MHz = 1.04 dBi; 2450 MHz = 1.00 dBi; 2500 MHz = 0.60 dBi. Determined by measurement (BACL, project R2605183, test date 22 June 2026).
Radiation pattern (2D / 3D)	2D radiation patterns measured in three orthogonal planes (XY, XZ, YZ) at 2400, 2450 and 2500 MHz, for both horizontal and vertical polarization. The polar plots are provided in Section 4 (Radiation Patterns) of this datasheet. Measured by BACL (project R2605183).
Polarization	Linear

Note: This is an integral PCB trace antenna. There is no separate antenna component and therefore no third-party antenna datasheet; the antenna manufacturer is the device manufacturer (Faaftech). Peak gain and the 2-D radiation patterns have been determined by measurement (BACL, project R2605183, test date 22 June 2026); the radiation-pattern plots are included in Section 4 of this document.

3. Compliance

The antenna is a low-gain (omnidirectional) passive PCB trace permanently integrated into the device and not removable or replaceable by the user; the equipment therefore has a permanently attached antenna. The conducted output power is nominally 0 dBm (1 mW); at this power and frequency the device operates within the limits applicable to its equipment class, and no antenna-connector or unique-coupling provisions apply. RF exposure (MPE/SAR) evaluation is not required at this output power.

Manufacturer: Faaftech Tecnologia Ltda – CNPJ 12.223.212/0001-17 – Rua 90, N.929, Setor Sul, Goiânia, GO, Brazil.

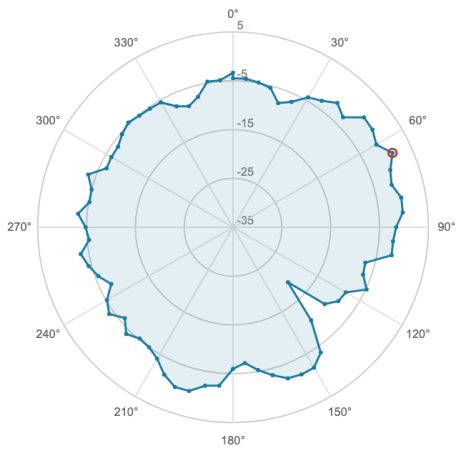
4. Radiation Patterns

The following polar plots present the measured 2-D radiation patterns of the integrated PCB-trace antenna (PCB FSP5B) at 2400, 2450 and 2500 MHz, in three orthogonal planes (XY, XZ, YZ) for both horizontal and vertical polarization. Values are antenna gain in dBi (radial scale -35 to +5 dBi); the red marker indicates the peak of each pattern. Patterns were measured by BACL (Bay Area Compliance Laboratories Corp.), project R2605183, on 22 June 2026. The maximum measured peak gain over the band is 1.04 dBi.

2.4 GHz Radiation Patterns — 2400 MHz

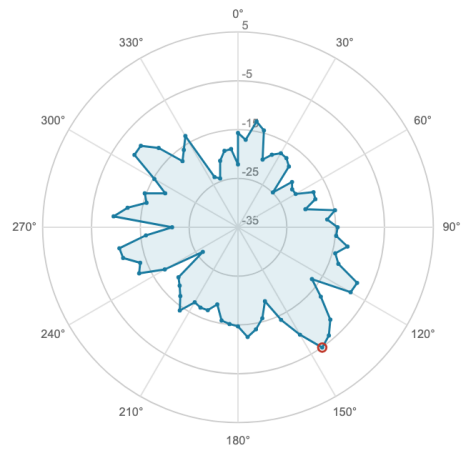
SHIFTPOWER PRO (Model SP02P) · Integrated PCB antenna (FSP5B) · Gain in dBi, radial scale -35 to +5 dBi · Measured by BACL (project R2605183)

XY-Plane · Horizontal



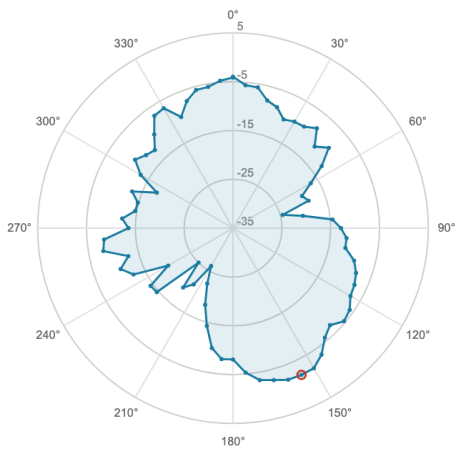
Peak 1.04 dBi

XY-Plane · Vertical



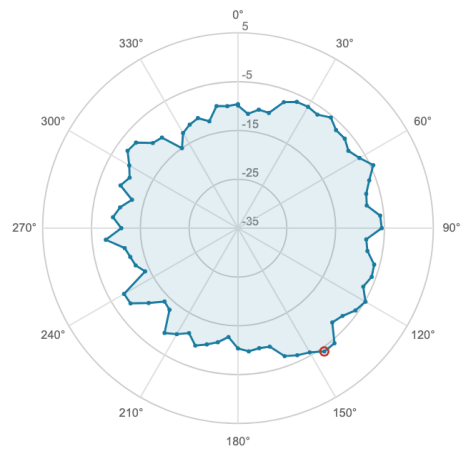
Peak -4.92 dBi

XZ-Plane · Horizontal



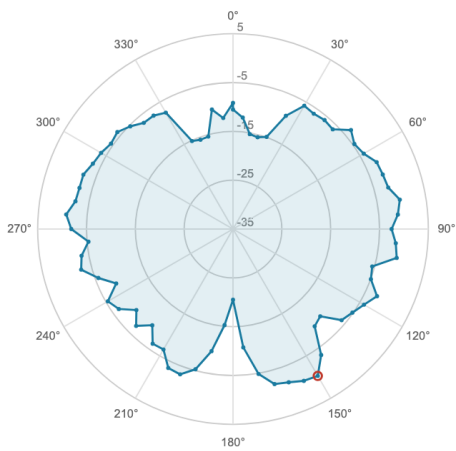
Peak -1.83 dBi

XZ-Plane · Vertical



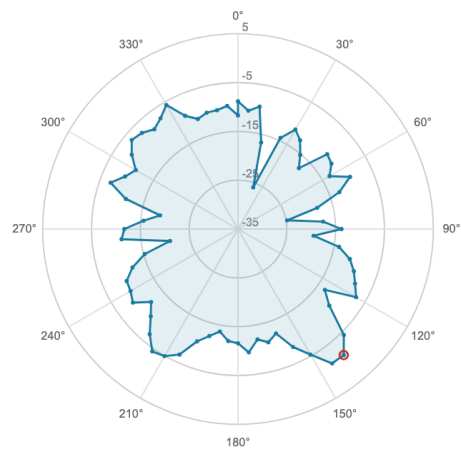
Peak -4.16 dBi

YZ-Plane · Horizontal



Peak -0.26 dBi

YZ-Plane · Vertical

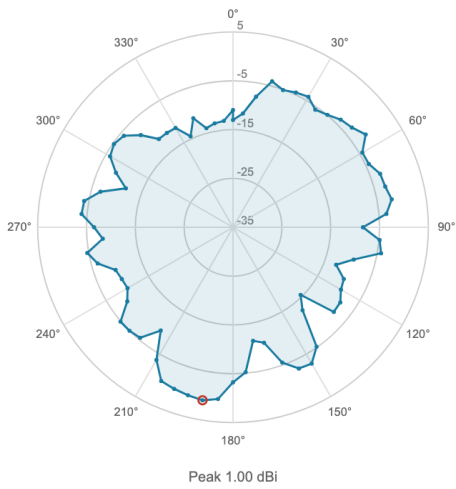


Peak -1.30 dBi

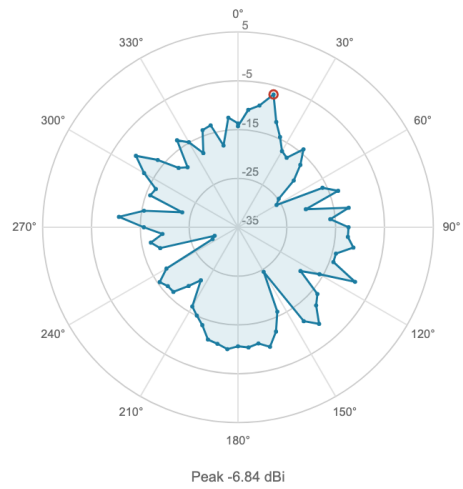
2.4 GHz Radiation Patterns — 2450 MHz

SHIFTPOWER PRO (Model SP02P) · Integrated PCB antenna (FSP5B) · Gain in dBi, radial scale -35 to +5 dBi · Measured by BACL (project R2605183)

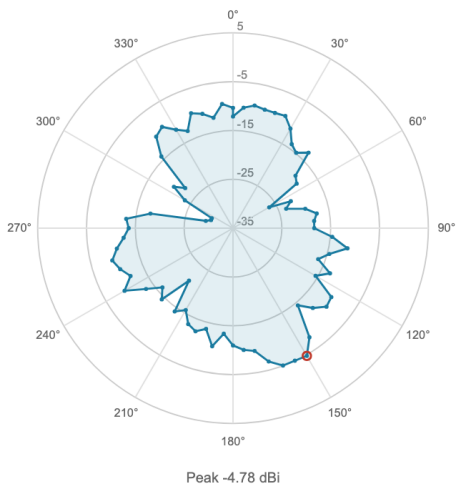
XY-Plane · Horizontal



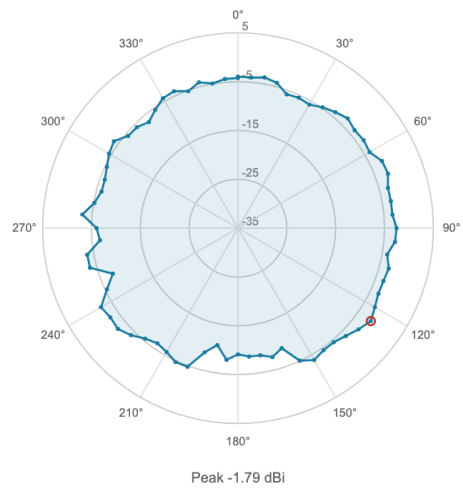
XY-Plane · Vertical



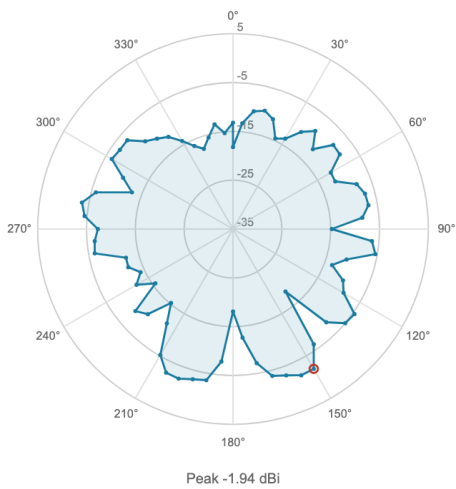
XZ-Plane · Horizontal



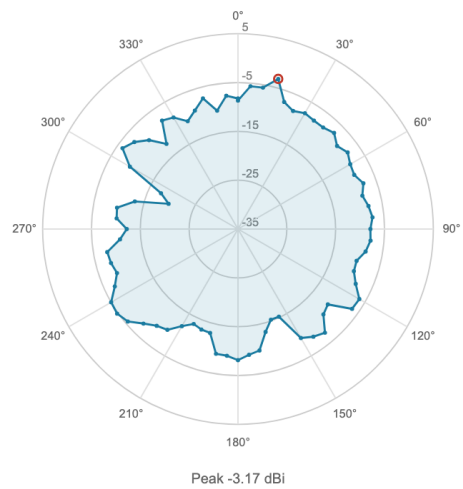
XZ-Plane · Vertical



YZ-Plane · Horizontal



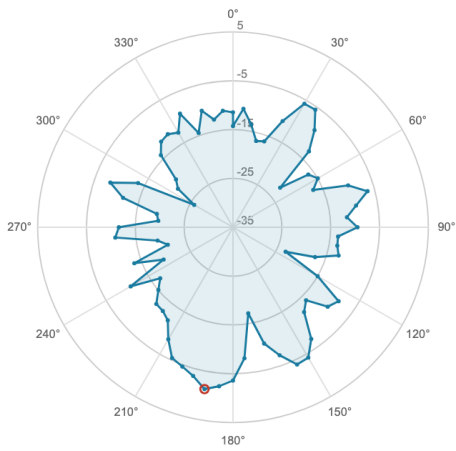
YZ-Plane · Vertical



2.4 GHz Radiation Patterns — 2500 MHz

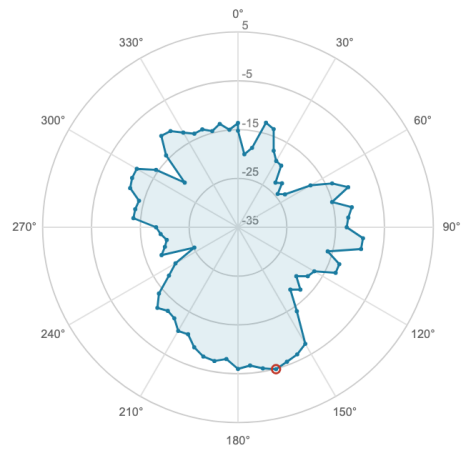
SHIFTPOWER PRO (Model SP02P) · Integrated PCB antenna (FSP5B) · Gain in dBi, radial scale -35 to +5 dBi · Measured by BACL (project R2605183)

XY-Plane · Horizontal



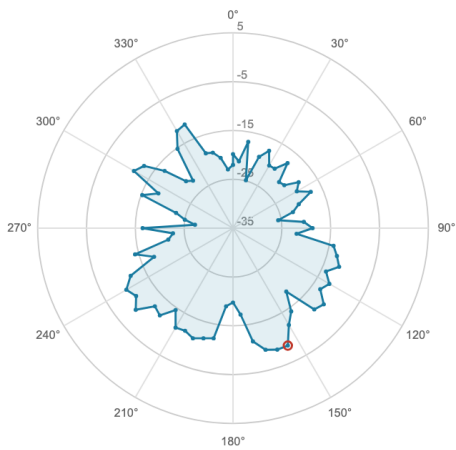
Peak -1.33 dBi

XY-Plane · Vertical



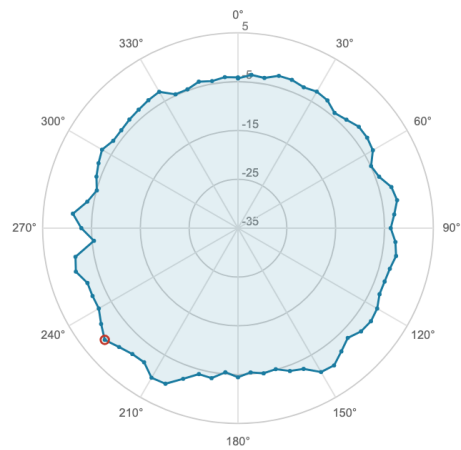
Peak -4.91 dBi

XZ-Plane · Horizontal



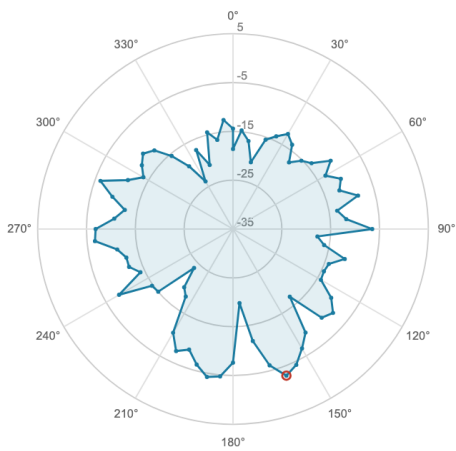
Peak -8.45 dBi

XZ-Plane · Vertical



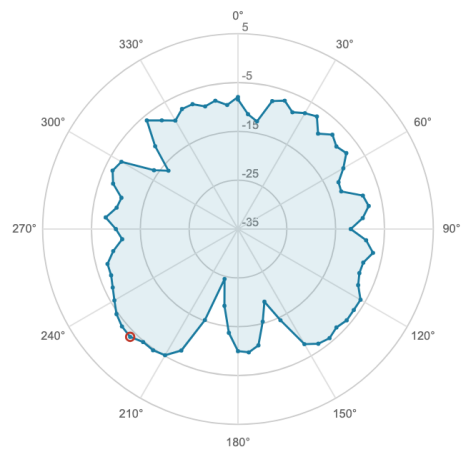
Peak 0.60 dBi

YZ-Plane · Horizontal



Peak -3.05 dBi

YZ-Plane · Vertical



Peak -3.78 dBi