



**StreamUnlimited Stream1832AE - Antenna selection
Modular Certification Guidelines**

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1. Document history

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Document Version Management Notice

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2. General Guidelines

The documents list mandatory technical requirements for antennas used with the Stream1832AE module. If using antennas which comply to this specification, the below modular certifications of Stream1832AE remain valid:

- 2AJYB-S1832AE for FCC
- 20504-S1832AE for IC

Antennas must comply with ALL the requirements listed below.

StreamUnlimited advises to use the antennas listed in the “Recommended antennas” section of the product specification.

In any case, a complete measurement of antenna characteristics is required and external Certification Lab opinion is strongly advised.

3. Antenna requirements

Antenna type: Dipole/Monopole
Antenna connector: MHF4
Minimum cable length: 100 mm

Frequency band: 2.400 GHz - 2.483 GHz

Maximum peak gain	Maximum return loss	Maximum VSWR	Minimum Efficiency
3 dBi	-7 dB	2.5	60%

Frequency band: 5.15 GHz - 5.85 GHz

Maximum peak gain	Maximum return loss	Maximum VSWR	Minimum Efficiency
4 dBi	-7 dB	2.5	50%

Remaining Frequency band:

The antenna gain should be as low as possible outside of the above listed frequency bands in order to reduce spurious emissions.

4. Certification aspects of antenna selection

StreamUnlimited selected reference antennas which are competitive, well documented, versatile and have decent RF parameters.

These reference antennas are offered with different cable length. The antenna gain is specified for each available cable length. This is important since the cable length significantly influences the gain which is not always correctly reflected in specifications from other antenna vendors.

Antenna gain is a crucial factor for certifications:

- Legal requirements for radiated emissions base on e.i.r.p. which includes the antenna gain.
- The radiation pattern of a product should be omni-directional since the position of Wi-Fi access point or Bluetooth link partner is unknown.
- Stream1832AE supports antenna diversity, if Wi-Fi signal is poor on one antenna, the second antenna is selected. This is why StreamUnlimited recommended antennas have a moderate gain and are thus not omni-directional. Mounting each antenna in different orientation will provide better overall range.
- Output power of the RF frontend is configured such that legal compliance with recommended reference antennas is granted.
- If using antennas with higher gain, the product may violate legal requirements and must not refer to the modular certifications of Stream1832AE. Output power may need to be reduced, thus reducing overall range.
- using antennas with significantly lower gain/efficiency will also reduce the overall range.
- Even when using a different antenna with the same maximum gain as the reference antennas, there is a risk that the product will not be compliant. This is because every antenna also has a gain outside of the frequency band used for transmission. This gain is often not specified. As an example, for an antenna which has a much higher gain at 10GHz compared to the reference antennas, spurious emissions at this frequency may cause the product to fail a compliance test. A spurious emission test is thus needed if using other antennas than the reference antennas. Such a spurious emission test is however always required to ensure that other electronics in the product do not cause emissions above the legal limits.