Device: OBD-II Vehicle Unit

Device Name: VRB101
FCC ID: B80VRB101

Source Based Time Average transmitter Power Evaluation

The device under test supports GSM Technologies in GPRS modes. The device maximum uplink time slots are 2 and device multi-slot class is 10. It is not possible for the user or installer to configuration the device to deviate from the operation uplink description outlined in this document.
The device uses 2 timeslot to transmit. Therefore a source based time average calculation is used to reduce the calculated average transmit power. In a single GSM/GPRS burst is 8 and only 2 of these are used during transmission therefore the duty factor would be = 2/8.

Description of device control and data transfer description include network latching time and idle time:

The device is self-contained and has no user control interface. It connects directly to the OBD-II connector in a vehicle. Among all the signals provided by OBD-II connector, only four are passed through to the device. They are: Battery, Ground, CAN High, and CAN Low. Two LED are used to indicate the status of the device.

All communications are initiated by the device. The device requests data, such as VIN and status information, from the vehicle. The data is encrypted and then transmitted to a remote server through a GSM network. The number of call per day is defined by the remote server, typically once a day. The length of each transmission depends of the amount of data needed to be transferred. An average transfer is approximately 75 bytes. However, the maximum buffer size that we have set is 1K (or 1024) bytes which dictate the largest number of bytes we can send per transmission. The remote server will acknowledge each data transfer. The device enters sleep mode once an acknowledgement is received. In an event that an acknowledgement is not received, the device will retry, up to two times, before entering into sleep mode. During sleep mode, no data will be exchanged between the device and the vehicle. As well, there will be no transmission between the remote serve and the vehicle.

General specification of GPRS Class 10:

Technology	Download (kbit/s)	Upload (kbit/s)	TDMA Timeslots allocated (DL+UL)
GPRS	60.0	40.0 (Class 10 and CS-4)	3+2

Please note this is a general maximum upload rate when using coding scheme 4. If worst case 1024 bytes = 8192 bits is sent using 2uplink time slot at a speed of 40.0kbps, it will take (8.192/40) = 205 ms to transmit.

Manufacturer has declared the worst case Normal tx time is 30sec which is restricted by software not exceed this given duration. During the 30 second tx the maximum data transmission occurs and network handoff.

The device repeats or retries the transmission in a 10 minutes (600 second) interval which is controlled and restricted by manufacturer coded firmware. This is the cases for both GSM operating frequencies (GSM850 and PCS1900) bands. Access to the device firmware is not accessible by user and therefore cannot be changed by the user of the device.

The unit uses 2 uplink time slots. There are 217 frames per second in each GSM frame is about (1/217) = 4.61ms. With each GSM frame having 8 time slots in each slot is about (4.61ms / 8) = 576 microsecond. For 2 uplink a maximum of 434 transmitting timeslots per second, therefore for 600 second there are (434*6000 per slots per 600 second = 4340)

Calculation:

Source based time avg. duty factor for tx period = 30 / 600 sec = 0.05 = 5% equ (1):
GPRS Class 10 duty factor for 2 uplink = 2/8 = 0.25 equ (2):
Maximum worst case duty factor = equ(1) * equ (2) = 0.05 * 0.25 = 0.0125 equ (4):

At 850MHz the device measured average power = 1510 mW equ (5):

With duty factor applied average power = equ (4) * 1510 = 0.0125*1520 = 18.875mW equ (6):

At 1900MHz the device measured average power = 870 mW equ (7):

With duty factor applied average power = equ (4) * 870 = 0.0125*870 = 10.875mW equ (8):

Limit for SAR applicability → $60/f_{(GHz)}$

At 850 MHz: 60/0.85 = 70.6 mW

At 1900 MHz: 60/1.9 = 31.6 mW

Conclusion:
SAR is not required at GSM850 band as output power < 60/f
SAR is not required at GSM850 band as output power < 60/f