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SENSUS
The Measure of the Future

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Federal Communications Commission
Washington, DC

Dear Sir or Madam,

Sensus Spectrum, LLC has submitted an experimental license application per Form 442, with File Number 0499-EX-PL-2013 and Confirmation Number EL248411. Sensus is requesting this experimental license in order to test developmental transmitters at our Durham, NC, Goleta, CA and Covington, LA locations for our existing and potential international customers. This is an integral part of a multi-year system development cycle in coordination with our European partners.

A detailed listing of proposed frequencies and other relevant characteristics are provided in the table below:

Frequency Band 433-435 MHz				
Frequency (MHz)	Duty Cycle (%)	ERP	Data Rate (kb/s)	Comments
f_1=433.725	1	max 25mW	100	
f_2=434.365	10	max 0.5W		
f_3=433.225	1	max 25mW	100	
f_4=434.475	0.1	max 25mW	100	(S-Mode as future option: 433.5 MHz)
f_w=433.225	100	max 25mW		
Frequency Band 868-870 MHz				
f_1=868.420	1	max 25mW	100	
f_2=869.505	10	max 25mW		
f_3=868.175	1	max 25mW	100	
f_4=868.95	0.1%	max 25mW	100	(S-Mode as future option: 433.5 MHz)
f_w=869.850	100	max 25mW		

Further explanation of parameters is provided below:

f_1 = 868.420 MHz. The occupied bandwidth will be in the upper part of a 600 kHz sub-band offering a low duty-cycle of 1% and a maximum power of 25 mW. This duty cycle is even sufficient for transmitting BUP with transmission intervals down to 1 second. So the duty cycle will be no limit for our system but only a benefit, as this means also lower occupation of the band by other ISM-applications.

f_2 = 869.505 MHz. This is close to the center of a 250 kHz sub-band offering the maximum output power of 0.5 watt on 868 MHz. The center itself is not chosen due to the transient components in the spectrum of the applied RF-chip which is mostly contributing to higher frequencies. In order to respect occupied

bandwidth, the transmission rate has to be reduced from 100 to 50 kbps. Note that this frequency is used for communication between SIRT/Collector/Repeater.

When thinking of a Collector, the amount of data can become very large if history-values of hundreds of EPs are to be transmitted. The duty cycle is 10%, saying that a transmitter can be active for 6 minutes an hour, which might not be sufficient. However, there is only one sub-band with 100% duty cycle, but its maximum power is only 5 mW. Also note that this band might be occupied by other devices not stopping to transmit e.g. audio for a long period of time. The option to get independent of a duty cycle limit is to imply Listen Before Talk (LBT) and Adaptive Frequency Agility (AGA), which has to be paid by some additional issues to be met when passing the homologation. For AGA also another frequency has to be applied. It looks feasible that this Frequency is F_1. However, the priority for the Collector is to transmit on F_2 and uses F_1 only to tell that F_2 is busy, so the Collector would not jam the EP's transmissions.

f_3 = 868.175 MHz. The occupied bandwidth will be in the lower part of the same sub-band where F_1 is located. Note that this frequency is used only for the communication to an EP.

f_4 = 868.95 MHz. The frequency is given by EN 13757-4 [8] for wireless M-Bus TMode and is not to be changed in order to be compatible with Open Metering.

Although the duty cycle on this band is 0.1% resulting in 3600 ms per hour, the Open Metering requirements [9] recommend to limit the overall transmission time to 720 ms per hour. Note that this frequency is only used for transmitting by the EP and it is not received by any of the GlobalFlex devices.

f_w = 869.850 MHz. This frequency is used for specific wakeup of Endpoints which are in a pure reception mode. Because a wakeup-sequence has the minimum duration of 1 second, a duty-cycle is limiting the number of devices to be woken up. For constellations like the re-parameterization of many Endpoints in a storage, it is therefore beneficial to operate on this frequency located on a Sub-band without a Duty-Cycle. As for this and any other installation scenario, the range is not as important as for a walk-by or drive-by application, the power limitation to 5 mW is no significant drawback. The applied power might be even further reduced to respect the channel-bandwidth with the applied 100kbps transmission.

For 433 MHz, the following frequency definitions apply:

- f_1 = 433.725 MHz
- f_2 = 434.365 MHz
- $f_3 = F_w$ = 433.225 MHz
- f_4 = 434.475 MHz (S-Mode as future option: 433.5 MHz)

The other physical parameters, such as data-rate or modulation type, remain unchanged. The power is reduced.

Transmitter height is approximately 3ft, as all testing will be conducted at bench level or in an anechoic chamber. All frequencies will use 2GFSK modulation, with a deviation of +/-50 kHz for 100 kb/s and +/-25 kHz for 50kb/s.

Sincerely,

Stanton Woodcock
Spectrum Manager

Enclosures