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November 30, 2005

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Mr. Julius Knapp  
Deputy Chief  
Office of Engineering and Technology  
Federal Communications Commission  
445 12<sup>th</sup> Street, SW  
Washington, DC 20554

**Re: Operation of New RFID System from Savi Technology, Inc.**

Dear Mr. Knapp:

Savi Technology, Inc. ("Savi"),<sup>1</sup> is developing an RFID system for operation under Sections 15.231(a) and 15.240 of the FCC Rules, and the company respectfully requests that OET confirm Savi's understanding of the applicability of the technical requirements in these rule sections to the RF devices that comprise the new system. The new approach is made possible by: (i) the recent change to Section 15.231(a) to allow the transmission of data along with a control signal, and (ii) the flexibility afforded to RFID devices by new rule Section 15.240.

The Savi RFID system consists of a Low Frequency ("LF") Transmitter, a UHF Reader and a Tag. LF Transmitters are fixed devices (e.g., they are mounted on a signpost or entranceway to a building). UHF Readers may be fixed or portable. Savi refers to its fixed UHF Reader as the Savi Reader ("SR") and the portable UHF Reader as the Savi Mobile Reader ("SMR"). Each device's field strength of emissions and signal bandwidth will comply with the requirements in the applicable rule section. This includes compliance with Section 15.35 of the FCC Rules. The system has a number of operational modes as described below.

In accordance with Section 15.231(a), the signals from the UHF Reader and the Tag combine control signals with data. The UHF Reader sends commands along with data to the Tag pursuant to the operational modes described below. Similarly, the Tag signal includes commands that instruct the RFID system to take certain actions

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<sup>1</sup> Savi Technology is a worldwide leader in RFID solutions that enhance homeland security and deliver value through asset management applications. The company is the primary technology provider for the world's largest RFID consignment monitoring network for the U.S. Department of Defense, which employs RFID, barcode, cellular and satellite communications systems to track more than 35,000 conveyances daily across a global network of 1,400 locations in more than 45 countries. Savi's solutions have been proven to enhance operational efficiency, deliver substantial cost savings, reduce capital investment in supply chain assets, and optimize inventory levels.

Mr. Julius Knapp

November 30, 2005

Page 2

in response to the Tag and its associated asset. The Tag's signal includes the Tag ID, LF Transmitter (or UHF Reader) ID, as well as asset routing and status information.

The RFID System uses the information in the UHF Reader and Tag signaling to regulate, direct, and influence actions of the system. In particular, the ability of the Tag to direct certain actions is critical to the overall operation of the system.<sup>2</sup> Savi's RFID system will be used to control and monitor the movement of tagged assets at border crossings, on planes, trains, boats, and trucks, and in warehouses and retail stores. The Tag signal provides direction to the RFID system that is used to take specific actions that control the physical movement of the asset. For example, the Tag signal sent in response to an LF signpost transmission may control the opening and closing of doors and gates, or control the automatic routing of a tagged asset to its intended destination, such as those used with airport baggage handling systems.

The operational modes for the new RFID system are as follows:

**1) LF Transmitter - Signpost Wakeup Command**

In the Signpost mode, the short-range LF Transmitter wakes up a Tag using a 123 kHz modulated signal that complies with Section 15.209 of the FCC Rules.

A Tag that receives the Wakeup command responds by transmitting a 433.92 MHz control signal to a UHF Reader. The Tag may retransmit the same message if the Tag does not receive an acknowledgement from the UHF Reader, but in no event will the Tag's total transmission time exceed 5 seconds. Thus, the Tag transmission sequence complies with Section 15.231(a).

The UHF Reader acknowledges receipt of the Tag message by transmitting a control signal to place the Tag into the Sleep mode. A timing diagram depicting the transmissions from the LF Transmitter, the Tag, and UHF Reader is shown below.

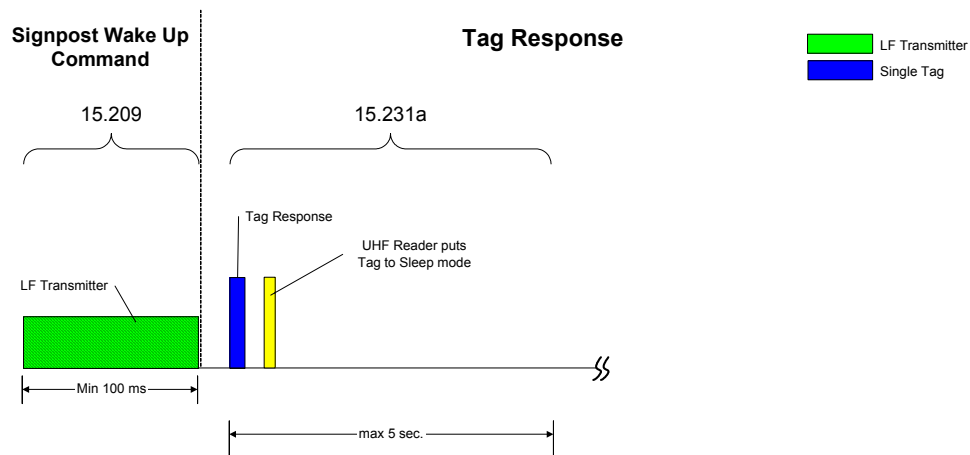
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<sup>2</sup> Savi's RFID system uses the control information in the Tag signal to take action with regard to specific assets. For example, the Tag's request to be interrogated by UHF Readers at inspection locations leads to segregation (and possible human intervention) if specific assets are identified or if security, battery maintenance, asset damage, or environmental threshold alarm flags are activated. The alarm flags associated with an asset may change state at any time. Thus, the Tag transmission commands the system to evaluate these parameters, to update them where appropriate, and to take appropriate action. Additionally, based on the Tag's commands, the system will either initiate follow-on communication or put the Tag to sleep.

Mr. Julius Knapp

November 30, 2005

Page 3



## 2) UHF Reader Wakeup Command

**Fixed Reader.** The Wakeup command from a fixed UHF Reader is comprised of a continuous 31.25 kHz FSK modulated signal on a 433.92 MHz carrier for 4.8 seconds, followed by a silent period and a Hello command. The entire signal lasts for 4.9 seconds, which complies with the 5 second limit set forth in Section 15.231(a). A timing diagram is depicted below.

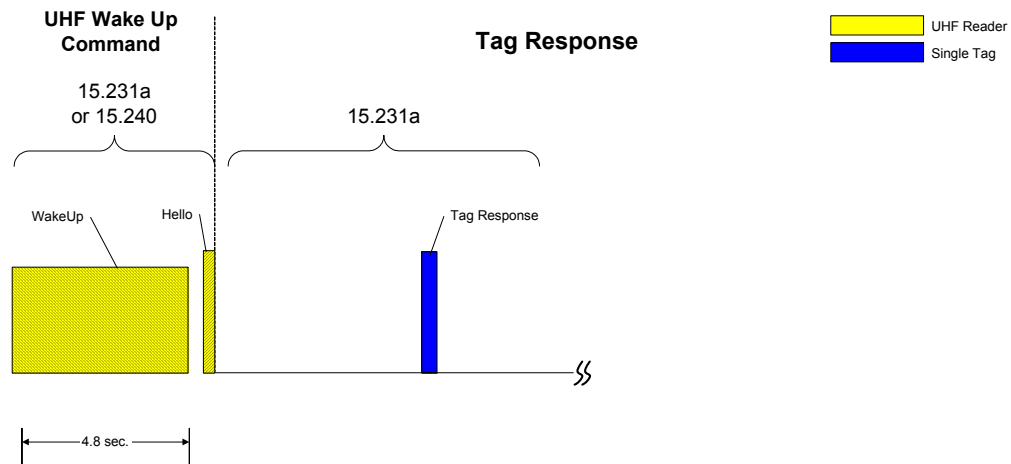
A Tag that receives the Wakeup command responds by transmitting a control signal to the UHF Reader. The Tag transmission is less than 5 seconds in duration and thus complies with Section 15.231(a).

In locations where operation pursuant to Section 15.240 is permitted (i.e., commercial and industrial areas, such as ports, rail terminals, and warehouses that are at least 40 km away from the sites listed in Section 15.240(e)), the Fixed UHF Reader may periodically initiate the Wakeup command with a 10 second silent period in accordance with Section 15.240(b). Fixed UHF Readers equipped to operate under Section 15.240 will be installed and configured by factory-trained service personnel.

Mr. Julius Knapp

November 30, 2005

Page 4



**Mobile (SMR) Reader.** The Wakeup command from a Mobile SMR UHF Reader is comprised of a continuous 31.25 kHz FSK modulated signal on a 433.92 MHz carrier for 2.4 seconds followed by a silent period and a Hello command. The entire signal lasts for less than 5 seconds in compliance with the limit set forth in Section 15.231(a). A timing diagram is depicted below.

A Tag that receives the Wakeup command responds by transmitting a control signal to the UHF Reader. The Tag transmission is less than 5 seconds in duration and thus complies with Section 15.231(a).

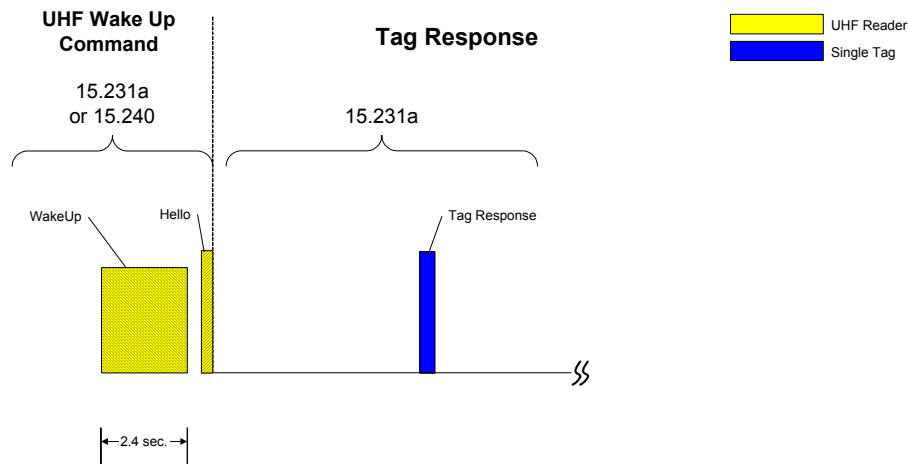
As noted above, in locations where operation pursuant to Section 15.240 is permitted, the UHF Reader may periodically initiate the Wakeup command with a 10 second silent period in accordance with Section 15.240(b). SMR Readers equipped to operate under Section 15.240 will be installed and configured by factory-trained personnel. Moreover, to enable operation under Section 15.240, the Mobile SMR Reader must log into a secure computer network that is installed in a FCC-registered location pursuant to Section 15.240 rules.<sup>3</sup>

<sup>3</sup> An SMR Reader that is removed from the registered site will default to operation under Section 15.231 because the required software key to allow operation under 15.240 will be unavailable.

Mr. Julius Knapp

November 30, 2005

Page 5



### 3) UHF Reader Broadcast Mode

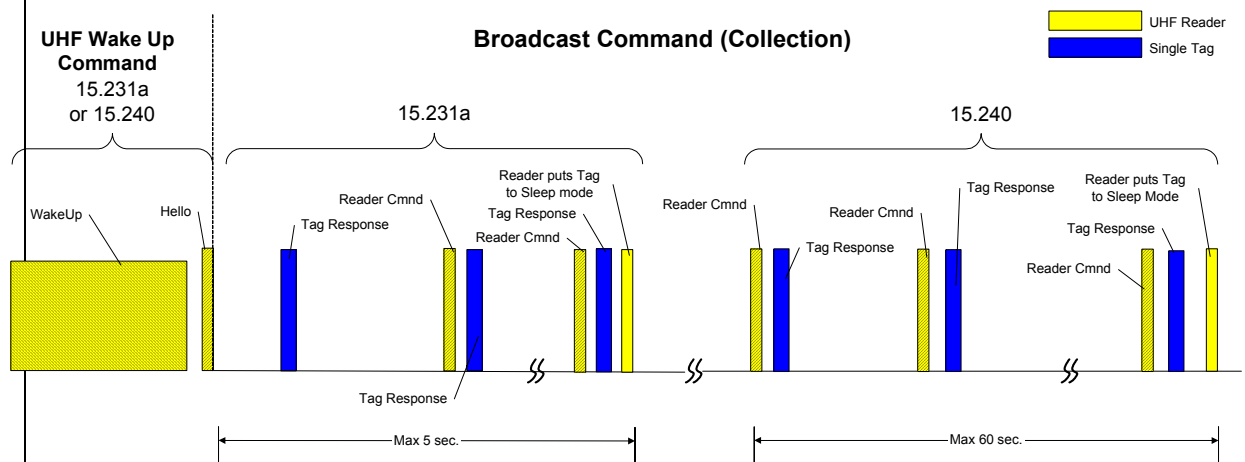
A UHF Reader operating in Broadcast Mode uses control signals to, among other things, identify the Tags within range of the UHF Reader. A Broadcast Mode transmission from the UHF Reader is sent automatically in response to a Tag signal acknowledging receipt of a Wakeup signal from an LF Transmitter or UHF Reader.

UHF Reader Broadcast Mode commands consist of a 433.92 MHz pulsed signal are comprised of a control signal and data in compliance with Section 15.231(a). UHF Reader commands that may be issued in Broadcast Mode are:

- Sleep\_All\_But [TAG ID XYZ] to cause all tags within range of the UHF Reader to go to sleep except for TAG XYZ; and
- Search and Route command that causes each Tag to identify itself and request an RFID system query to determine if the Tag matches criteria for certain cargo and/or routing.

In locations where operation pursuant to Section 15.240 is permitted, the Tag and Reader may transmit for up to 60 seconds. Tag operation under Section 15.240 would be enabled by the UHF Reader, which is registered in accordance with the requirements in Section 15.240(f).

A timing diagram depicting operations pursuant to Section 15.231 and 15.240 is provided below.



In the Beacon Mode, a Tag is configured to periodically transmit a UHF signal burst in accordance with Section 15.231(e). When Beacon mode is enabled the transmission interval is set to a 10 second period. If a tag is momentarily being operated under a different mode (e.g., Signpost, Broadcast or Point to Point mode), Beacon mode transmissions are temporarily suspended.

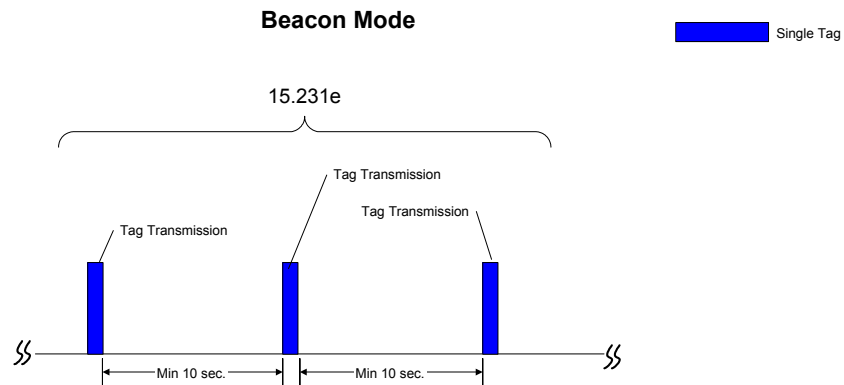
- FCC ID No. KL7-612T-V1 for tag model ST-602
- FCC ID No. KL7-604T-V1 for tag model ST-604

Mr. Julius Knapp

November 30, 2005

Page 7

- FCC ID No. KL7-654T-V1/V2 for tag model ST-654



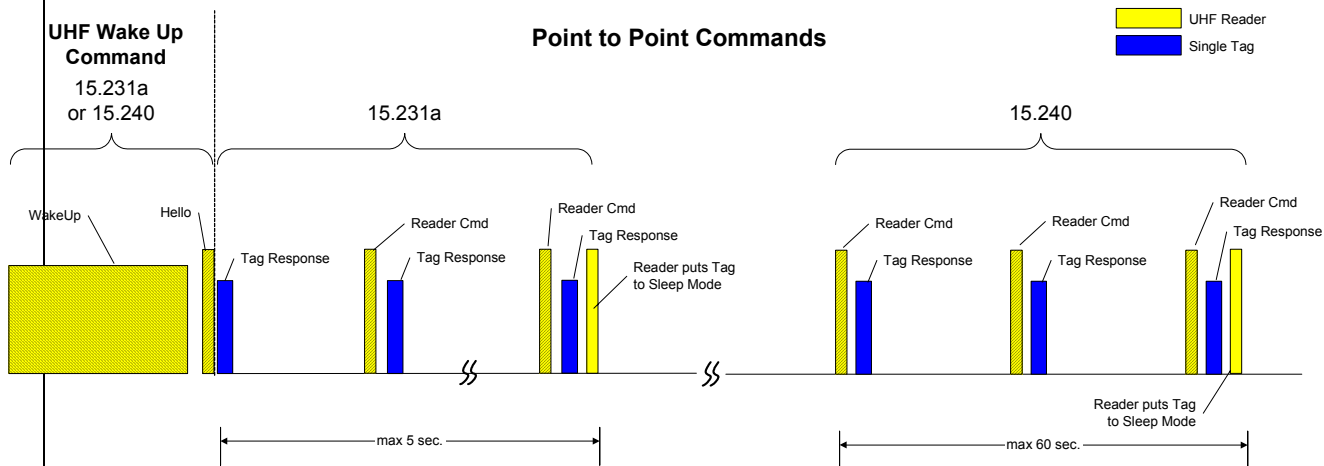
## 5) Point-to-Point Mode

A UHF Reader operating in Point-to-Point Mode uses control signals to transmit commands to a specific Tag. The UHF Reader sends such transmissions after the Tag acknowledges receipt of a Wake Up signal from either the LF Transmitter or UHF Reader. A timing diagram for point-to-point commands is depicted below. The duration of the pulsed transmissions from the UHF Reader is less than 5 seconds in compliance with Section 15.231(a).

Mr. Julius Knapp

November 30, 2005

Page 8



Some point-to-point transmissions include:

- A command to apply a routing code to a Tag for automated cargo handling at ports and rail and truck terminals en route to a final destination;
- A command to apply sensor data to set threshold for measurements and the declaration of limits to be logged when exceeded;
- A request to identify cargo requiring special handling for hazardous material storage and/or security purposes;
- A request for sensor status information recorded by the Tag as part of cargo security monitoring function to determine the system integrity of the Tag.

The transmissions from the Tag in response to the UHF Reader transmission are less than 5 seconds and comply with Section 15.231a.

When the UHF Reader reads or writes data to or from the Tag, the transmission will not exceed the 5 second limitation of 15.231(a) unless the Reader and Tag are operating in commercial and industrial areas, such as ports, rail terminals, and warehouses that are at least 40 km away from the sites listed in Section 15.240, i.e.,

Mr. Julius Knapp

November 30, 2005

Page 9

locations where operation pursuant to Section 15.240 is permitted. In these locations, the Tag and Reader may transmit for up to 60 seconds in compliance with Section 15.240.

Tag operation under Section 15.240 would be enabled by a UHF Reader registered in accordance with the site and registration requirements in that section. UHF Readers equipped to operate under Section 15.240 will be installed and configured by factory-trained service personnel. In all other locations, Tag operation will default to the modes that comply with Section 15.231.

**6) Sleep Command**

The UHF Reader sends the Sleep command to certain Tags that successfully acknowledge transmissions from the UHF Reader or LF Transmitter. A Tag also may receive a Sleep command in response to a service request that the Tag sends to the UHF Reader. In either case, the maximum transmission duration of the Sleep command does not exceed 5 seconds and complies with Section 15.231(a). A typical command sequence that includes the sleep command is shown above.

\* \* \*

We hope that OET finds this information helpful in its assessment of the operation of Savi's new RFID system. We would appreciate confirmation that the devices described above comply with and may be certified under Rule Section 15.231(a). Additionally, we request confirmation that Tags and Readers that will operate in locations permitted under Section 15.240 may be certified under both Sections 15.231 and 15.240.

Please feel free to contact me or John Kuzin at 202.719.3506 and [jkuzin@wrf.com](mailto:jkuzin@wrf.com) if OET has any questions regarding the RFID system operation described above. Thank you for your assistance and consideration of this matter.

Respectfully submitted,

*/s/ Robert L. Pettit*

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Counsel for Savi Technology, Inc.