Appendix I – Operating Scenario for WIT934

The WIT934 is used in a portable microphone application. The system is set up as a star network with 5 radios, called remotes, all linked to one central base radio. These remote radios are installed in belt packs that fit around the waist of the user. Given this configuration, the remote radios will generally be closer than 2.5 cm to the user and will require a portable designation as part of the grant. The Base radio is placed at some central point, usually as high as possible, in the facility to provide better coverage to all remotes.

Any remote can communicate with any other remote by means of data packets routed back and forth through the base radio. The base radio provides synchronization for the entire system, passes messages from one remote to another, and provides broadcast messages for all remotes to hear.

The WIT934 uses Frequency Hopping technology to mitigate the effects of fading and jamming. The dwell time for this system is fixed at 10 milliseconds. In any 10 ms dwell period, the following process takes place sequentially in time:

Start of dwell

1. Base broadcasts messages to all remotes,
2. Remote #1 sends its message to Base,
3. Remote #2 sends its message to Base,
4. Remote #3 sends its message to Base,
5. Remote #4 sends its message to Base,
6. Remote #5 sends its message to Base

End of dwell

After the Remote #5 sends its message to the Base, the 10 millisecond dwell time is complete and all 6 radios hop to the next frequency channel in their hopset and the cycle is repeated.

We are asking for portable designation of the remote radios since they will be operated in close (< 2.5 cm) proximity to the user.

Appendix II – Calculation of Maximum Transmit Duty Cycle

As outlined in Appendix I, each remote WIT934 can transmit only once during a dwell time. The maximum length of the transmitted packet from each remote is set by the system design and cannot be adjusted by the user. That packet length is calculated as follows:

Preamble	9 bytes
Sync and CRC	10 bytes
Data Payload	13 bytes
Maximum packet length	32 bytes

Bit time (1/345.6 Kbps)	2.984 us
Byte time (bit time * 8)	23.15 us
Maximum packet time (byte time * 32)	740.7 us

The maximum amount of time that our Remote transmitter can operate in any 10 millisecond period is 740.74 us. Therefore, our source-averaged transmit duty cycle becomes 0.074 (740.74 us / 10 ms). Note that this duty cycle is not dependent on our use of Frequency Hopping. We do not claim to average our power over the number of hops. The above calculation is strictly based on the maximum amount of time our transmitter can transmit in any 10 ms time period – regardless of the channel the radio happens to be on at the time.

Appendix III – Calculated Average Power

The Power Threshold for 'General Population' portable designation without SAR testing is: (based on Oct 2005 TCB workshop PPT slide)

(60/ F_{GHz}) mW for distances < 2.5 cm

For the **900 MHz** frequency band, this results in a limit of **67 mW**.

Note that we use the more restrictive "General Population" limit in this case even though the individuals using this product will certainly be aware of its function and would qualify under the 'occupational' category.

Given the maximum transmit duty cycle specified in Appendix II, the average transmitted power of a WIT934 remote can be calculated as:

Maximum Pout = **250 mW** (24 dBm nominal)

Maximum Antenna Gain = 2 **dBi** (for portable use)

Maximum Transmit Duty cycle (per Appendix II) = **0.074**

Pave (Source-based average) = 0.250 * 1.6 * 0.074 = **29.6 mW**

Conclusion:

The WIT934 Remote meets the MPE limits for a 'Portable' device operating in the 'General Population'.