



## Tempest 2.4GHz vs 900MHz: How to Choose?

**Objective:** Tempest Wireless intercom is offered in several different models. Tempest offers two wireless communications in two different frequency ranges: 900MHz and 2.4GHz. In addition, Tempest offers both 2-channel and 4-channel systems in both frequencies. When using 2-channel or 4-channel Tempest systems, there is no difference in the Radio Frequencies (or RFs); they are totally compatible. This document will focus on the different frequency ranges and help you select the right product for your application. While the user interface and feature sets of the Tempest 2.4GHz and the Tempest 900MHz systems are very similar, there are a few important points of consideration when choosing between models.

### Why are there two choices for frequencies?

RFs are a bit like audio frequencies. Lower frequencies can use greater power and can penetrate walls and other obstacles fairly easily. Higher frequencies can use less power, but will reflect off of dense surfaces. The 900MHz radio system is at a lower frequency and will penetrate surfaces more easily. Tempest 2.4GHz systems are more reflective and tend to be affected more by bodies, foliage, or moisture that can attenuate the signal. In addition, some large venues are not suitable for the 2.4 RF signal due to potential destructive reflective signals. It really is application and environment specific.

So you might ask: why not just go with 900MHz? There are many considerations in choosing a system, and while the operating features of both systems are extremely similar, the scale of covering large areas, number of users, and worldwide government regulations all need serious consideration. In some respects, it is better to go through a process of elimination in selecting the best system for you. It is important to also remember that all Tempest systems are legal for use with no end user licensing, but not all Tempest systems are legal for use everywhere.

### Here are some questions and answers that can help you decide:

- 1. Are you planning on using the system outside of North America?**
  - Tempest 900MHz systems are legal for use only in North America. Tempest 2.4GHz systems can be used worldwide. If you are planning on using the system outside of North America, your only choice is the Tempest 2.4GHz system.
- 2. How many full duplex users do you expect to have on the Tempest system?**
  - In most cases, Tempest 2.4GHz systems can use up to eleven co-located BaseStations with no performance reduction. With up to 5 full duplex users per base, that allows you up to fifty-five full duplex users on Tempest in a single RF area.
  - Tempest 900MHz can use three to five BaseStations in a given RF zone, depending on the environment and application. That means a maximum of 15-25 users in a given RF area with full duplex operation.
  - Each system can also use alternate "Shared" modes for unlimited additional users sharing resources.
- 3. What is the overall size of the coverage area? Is it inside? Outside? A basement, a loading dock, etc?**
  - Tempest 900MHz can often do an amazing job of RF coverage in large and complex areas with a fast and simple set-up. While 900MHz does generally have greater coverage and penetration, there are certainly limits to its range.
  - Tempest 2.4GHz offers a unique "Seamless Roaming" feature that allows a user to seamlessly move from one BaseStation to another with no user intervention. This standard feature, combined with our remote transceiver and line extender products, can offer you coverage in greater distances than any other wireless intercom.
- 4. Are there walls or other RF obstacles in the coverage area, or is it a large open space?**
  - In large covered spaces like some sports complexes and arenas, Tempest 2.4GHz can suffer from an RF effect called Multi-Path. This can cause reduced range as well as reduced audio quality. Tempest 900MHz is better suited for these environments. In this case, it is best to consult a Tempest applications specialist to assist in determining the best solution.
  - While Tempest 900MHz does have excellent range, like all RF products, it does have limitations too. If you need coverage beyond the "RF Zone" that 900MHz is reaching, such as in a basement, indoors and outdoors, or in completely different buildings, then Tempest 2.4GHz with Seamless Roaming may be your best solution.

### 5. Are there any limitations for antenna placement?

- While both 2.4GHz and 900MHz systems are considered line-of-sight devices, the 900MHz can be more forgiving with less than optimum antenna placement. Also, if you are considering extending the antenna location via coax cable, 900MHz systems do allow over two times the cable length of 2.4GHz systems.
- Again, if antenna placement is an issue, or required coverage for your application is not achieved, 2.4GHz with Roaming may be your best solution.

### 6. What other RF devices are in use in the required coverage area?

- Both Tempest 2.4GHz systems and 900MHz systems are designed to work well in difficult RF environments, but it is possible for all RF products being used in a given band to affect each other. Some customers carry both Tempest system models because of this issue. Unfortunately, in many cases, it is very difficult to manage and be informed of every RF device in use.
- Whenever possible, consider all RF sources in your coverage area, including proximity and power of the other devices. Sometimes just moving your equipment a short distance will effect a positive change. Sometimes, due to the nature or power of the other devices, it is impossible to improve the performance. Unfortunately, this is true of all RF devices and all frequencies. Consult a Tempest applications specialist for possible solutions.

As with any RF system, you can never fully determine coverage and performance without an on-site, in-application test. Testing a theatre or stadium while empty may yield a very different performance from Tempest Wireless than a full theatre or stadium. Testing Tempest with no other RF devices on in the area may also provide a different result than at show time. Whenever possible, plan your installation, test your application, and consult a Tempest applications specialist for assistance.

### Tempest 900MHz and 2.4GHz Comparison

	Tempest 900MHz	Tempest 2400GHz
Frequency Range	902-928 Hz	2400-2480 Hz
Maximum # of Co-Located Bases	3-5	11
Potential # of Full Duplex Belts	15-25	55
Propagation Tendencies	Penetrates hard surfaces	Reflects off hard surfaces
Line-of-site antenna placement	Not as important	Very important
Frequency Agile capability	No	Yes
Roaming Capable	No	Yes
Global Operation	No	Yes

\*When co-locating more than three Tempest900 BaseStations, it is highly recommended to contact your Tempest applications specialist for assistance.



Pliant Technologies, LLC  
 Tempest®  
 205 Technology Parkway  
 Auburn, AL 36830 USA  
 www.plianttechnologies.com  
 Phone +1.334.321.1160  
 Toll-Free 1.844.475.4268 or 1.844.4PLIANT  
 Fax +1.334.321.1162

Tempest2.4v900-HowtoChoose\_D0000273\_A

Copyright © 2016 Pliant Technologies, LLC. All rights reserved. The Pliant™ word mark and the Pliant "P" logo are trademarks of Pliant Technologies, LLC. The Tempest® and SmartBoom® word marks are trademarks of CoachComm LLC. Any and all other trademark references within this document are property of their respective owners.