

# Wireless Density

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Whitepaper

In considering how many wireless headsets can be used in a given environment, a range of elements need to be considered. The most critical are:

1. The number of concurrent headset users.
2. The building layout and design.
3. The wireless technology being used (eg Bluetooth® or DECT™).

Bluetooth and DECT systems have completely different operating frequencies and neither will cause the other interference.

## Guidance for DECT (CS60™, CS70™ & SupraPlus® Wireless)

### DECT Summary:

There are many inter-related factors at play when determining the number of wireless headsets that can be deployed- as such, it is very difficult to give absolute recommendations.

It is for that reason that Plantronics strongly recommend a site survey for customers interested in deploying more than 70 wireless headsets. Please contact Plantronics engineering for any proposed deployments of more than 70 headsets on a single site.

As general guidance, 70 headsets can normally be deployed without problems. In typical offices, where people are not on the phone for more than 30-40% of their time, 120 is unlikely to cause issues. Depending on the environment, it is possible to deploy significantly more, but a site survey is required to make specific recommendations.

### Background

Plantronics ranges of DECT wireless headset (eg CS60) are quoted as having 70 'channels'.

Some other DECT products quote 120 channels. In fact, all have access to 120, but for a number of reasons, the use of a number closer to 70 can be guaranteed. This is the same for the vast majority of DECT systems.

Each simultaneous call requires its own channel- suggesting a maximum of 70 concurrent users. This is the figure Plantronics often quote, because there is very little chance of problems below this number of users. In reality, the number of products that can be used is many more, and in fact Plantronics have customers that have deployed up to 500 wireless headsets.

One of the key advantages of DECT is that it is a protected frequency-band. This means that it is NOT affected by inference from other radio signals, such as WiFi or Bluetooth. So compared to Bluetooth, it is possible to deploy many more DECT wireless systems.

## 1: Number of CONCURRENT users.

The maximum number of concurrent users in a 'given area' (something we will come back to) is 70, given the number of channels available. Of course, in a typical office, not everyone is on the phone the whole time. So in simple terms, if call utilisation is 50%, the number of users approximately doubles.

This might suggest that if call utilisation is just 20%, 350 users are possible. Unfortunately, it is not quite that simple. Each headset (whether in use or not) does take up a part of the available channels. As such, the larger the number of headsets in a given area, the fewer channels available for calls.

However, the effects of this are relatively small up to 120 headsets.

## 2: The building layout & design

No office is alike. Some are open plan. Some are spread over many floors. Some are split into sections, broken up by meeting rooms, walls and open space. These physical barriers get in the way of wireless signals, but don't stop them. And it is the extent of interference between areas in a building that impacts density.

If areas are completely separate from a wireless signal perspective, you can have 70 in each assuming 100% call utilisation. Or 120 in each assuming up to 50% call utilisation.

The layout, material and many other facts can have a big impact on the extent to which wireless signals travel through a building. A concrete wall provides more separation than a window, a big central atrium will cause more interference between floors, etc.

Some offices will effectively only have one area, even if it is physically broken into more than this. In this case, the guidance in section 1 applies. At larger sites, there may be closer to 2-3 areas- which allows for the number of headsets deployed to be increased. So assuming 3 well separated areas and 30-40% call utilisation, the number of headsets would be  $120 * 3 = 360$ .

Plantronics have customers that have deployed this number of headsets, and more on single sites. A site survey allows the level of interference between areas's to be assessed, so that specific recommendations can be given.

## Guidance for Bluetooth (Plantronics Voyager™ System, Plantronics Voyager USB)

### Bluetooth Summary:

For Bluetooth wireless headsets usage, a general guide is that there can typically be up to 8 concurrent users (active calls) in a 15m x 20m office. Each time the area doubles, the maximum active calls can be multiplied by 1.5

For example:	15m x 20m office	=	<b>8 active calls</b>
Area doubles:	30m x 20m office	=	<b>12 active calls</b> (= 8 * 1.5)
Area doubles again:	30m x 40m office	=	<b>18 active calls</b> (= 12 * 1.5)

There can typically be many more *users* (as all headset users are unlikely to actually be on calls at the same time).

### Bluetooth and WiFi.

Plantronics Voyager headsets use Adaptive Frequency Hopping (AFH) designed to reduce interference from 802.11 WiFi systems. This system works well with just one or two 802.11 base stations (access points) in the vicinity, though short bursts of interference may occur. Where more than two WiFi access points are in operation within the same area, operation of the Voyager 510 may be subject to interference.

It should also be noted that user density may be reduced when Plantronics Voyager 510's are operated in a WiFi rich environment.