

## SpotCell – System Isolation Measurement

### Introduction

The SpotCell Donor Unit (DU) and Coverage Unit (CU) must be installed in a manner that maximizes isolation to optimize system performance. This technical note will define isolation and how it relates to the SpotCell system.

### Isolation

Isolation is defined as the path loss between two points- the SpotCell DU and CU in this case. Greater isolation allows for more gain to be introduced by SpotCell into the uplink and downlink. This increased level of gain translates into an increased coverage area provided by the CU. The two main factors that will affect isolation are distance between the DU and CU and building penetration loss. (Table 1)

### Design

The SpotCell 100 system has a 93dB dynamic gain range (SpotCell 111/112: 92dB). Generally, a value of 120dB is the highest isolation that can be expected in most building types, and has been used as an upper limit in system design for determining available coverage. Since 120dB exceeds the maximum system gain by 27/28 dB a higher level of isolation will not have an impact on performance.

The LCD display on the CU is used as a guide during system installation to determine whether adequate isolation is attained. The System Isolation Indicator (commonly referred to as coverage area indicator) displays a number of bars that represents system gain not introduced as a result of insufficient isolation when the system is in 'Active' mode. The more bars displayed the better the isolation, with five bars being best case for the application. (Table 2) The SpotCell system

will display "In Service" when the system isolation indicator has at least three bars, recognizing that fewer bars indicates reduced system gain and therefore reduced coverage area.

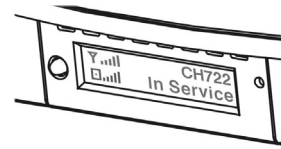


Figure 1 - Active mode with system Isolation Indicator (bottom left indicator)

Typical Penetration Losses	
All metal attenuation	26 dB
Foil Insulation	3.9 dB
Concrete block wall	13-20 dB
Ceiling Duct	1-8 dB
Metal Stairs	5dB

Table 1 - Typical Penetration Losses

During system alignment, a software algorithm calculates the system gain required to generate optimum output power to the base station and the handset. From this, a minimum isolation level required to generate the desired gain is also calculated. If adequate isolation has been attained to allow the system to generate the required gain for optimum output power, five bars on the LCD will be displayed. Inadequate isolation, represented by one to four bars, will limit the output power of the SpotCell system.

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## Application Examples

The isolation measurement performed by the system is not an absolute measurement but a measurement in conjunction with the system gain that is required to generate optimum output power on a per application basis.

The following two examples illustrate how two different applications requiring different levels of gain can both indicate that the desired level of isolation has been attained.

### Example 1

The received signal level at the DU is approx. -60dBm, therefore the system is required to generate minimum gain to provide the maximum coverage area. The low gain requirement indicates the system isolation requirement will also be low, around 60dB. Therefore the maximum isolation indication of five bars would be displayed as long as  $\geq 60$ dB of isolation is available.

### Example 2

The received signal level at the DU is approximately -100dBm, therefore the system is required to generate higher gain to provide the maximum coverage area. The high gain requirement indicates a higher level of isolation is required. In this example, the isolation must be in excess of 100dB to achieve the full five bar isolation indication on the CU.

## Summary

System isolation is directly related to the amount of gain applied by the SpotCell system. If a required gain level is not achieved, system output will be reduced. Each application will differ in its isolation requirements and in all cases the SpotCell system will automatically respond to the environment and provide maximum gain possible.

Bars	Gain Reduction
	0-5dB
	5-10dB
	10-15dB
	15-20dB
	20-25dB

**Table 2 - Gain reduction represented by number of bars on coverage area indicator**