

# **U.S. Indoor Small Cells: A Five Year TCO for 100k and 500k SqFt Office Buildings**

Market Study  
Fourth Quarter 2018





---

# U.S. Indoor Small Cells: A Five Year TCO for 100k and 500k SqFt Office Buildings

---

## Market Study

Published Fourth Quarter 2018

Version 1.0

Report Number: 04Q2018-02

*iGR*

12400 W. Hwy 71

Suite 350 PMB 341

Austin TX 78738

# Table of Contents

<b>Abstract .....</b>	<b>1</b>
<b>Executive Summary .....</b>	<b>2</b>
Table A: Total Cost of Ownership, Active DAS, 100K and 500K Square Feet.....	3
Figure A: Total Cost of Ownership, Active DAS, 100K and 500K Square Feet .....	3
<b>What This Means.....</b>	<b>4</b>
<b>Methodology.....</b>	<b>5</b>
<b>Basic Mobile Operator Network Architecture .....</b>	<b>6</b>
Figure 1: Basic Components of Cellular Voice/Data Network .....	6
<b>Wireless Spectrum.....</b>	<b>8</b>
<b>Cell Sites.....</b>	<b>9</b>
<b>Setting the Stage for Small Cells .....</b>	<b>12</b>
<b>Network “Pain Points” .....</b>	<b>13</b>
<b>Different Types of Small Cells .....</b>	<b>14</b>
<i>iGR’s</i> Definitions of Small Cells .....	14
Table 1: Different Types of Small Cells, Licensed and Unlicensed Spectrum .....	14
Distributed Antenna Systems (DAS) .....	15
Figure 2: Basic DAS Configuration .....	16
Figure 3: DAS, BTS Hotels, and Remote Radio Heads.....	17
DAS Lite .....	17
Signal Boosters .....	18
Femtocells and Picocells.....	19
Multi-band Small Cells.....	20
Figure 4: 3GPP Approaches to Network Sharing .....	21
<b>Pros and Cons of In-building Small Cells.....</b>	<b>22</b>
<b>Benefits of Deploying In-Building Small Cells .....</b>	<b>22</b>
<b>Cons of Deploying In-Building Small Cells.....</b>	<b>22</b>
<b>Advantages Provided by DAS.....</b>	<b>23</b>
Table 2: Advantages of DAS.....	23
<b>Challenges with DAS Deployments .....</b>	<b>24</b>
Table 3: Challenges of DAS.....	24
<b>General Trends / Assumptions around Indoor Small Cells.....</b>	<b>26</b>
<b>Market inhibitors.....</b>	<b>27</b>
<b>Indoor Small Cells TCO: Assumptions.....</b>	<b>30</b>
Table 4: Total Cost of Ownership, Active DAS, 100K and 500K Square Feet .....	34
Figure 5: Total Cost of Ownership, Active DAS, 100K and 500K Square Feet.....	34
<b>The 100K Square Foot Model .....</b>	<b>35</b>
Table 5: TCO of an Active DAS, Network Build portion, 100,000 square foot building .....	35

Table 6: TCO of an Active DAS, Operational Spending portion, 100,000 square foot building .....	36
<b>The 500K Square Foot Model .....</b>	<b>37</b>
Table 7: TCO of an Active DAS, Network Build portion, 500,000 square foot building .....	37
Table 8: TCO of an Active DAS, Operational Spending portion, 500,000 square foot building .....	38
<b>Summary .....</b>	<b>38</b>
<b>Small Cell Vendor Profiles.....</b>	<b>40</b>
<b>Accelleran.....</b>	<b>40</b>
<b>Airspan Networks .....</b>	<b>42</b>
<b>CellXica.....</b>	<b>44</b>
<b>Comba Telecom .....</b>	<b>45</b>
<b>CommScope .....</b>	<b>47</b>
<b>Corning SpiderCloud Wireless.....</b>	<b>50</b>
<b>Druid Software .....</b>	<b>54</b>
<b>Ericsson .....</b>	<b>56</b>
<b>Gemtek .....</b>	<b>58</b>
<b>Huawei.....</b>	<b>60</b>
<b>ip.access.....</b>	<b>62</b>
<b>JMA Wireless.....</b>	<b>65</b>
<b>Juni.....</b>	<b>66</b>
<b>Kathrein .....</b>	<b>68</b>
<b>Microlab (Wireless Telecom Group).....</b>	<b>70</b>
<b>NEC .....</b>	<b>71</b>
<b>NextNav .....</b>	<b>73</b>
<b>Nokia Networks.....</b>	<b>74</b>
<b>Oracle.....</b>	<b>77</b>
<b>Quortus .....</b>	<b>80</b>
<b>Samsung Electronics .....</b>	<b>82</b>
<b>Sercomm .....</b>	<b>84</b>
<b>TeleWorld Solutions .....</b>	<b>86</b>
<b>ZTE Corporation.....</b>	<b>87</b>
<b>Definitions .....</b>	<b>90</b>
Definitions Table .....	90
<b>About iGR.....</b>	<b>112</b>
<b>Disclaimer .....</b>	<b>112</b>

## Abstract

---

This report presents an in-building wireless total cost of ownership model for an Active DAS installed in a 100,000 square foot and 500,000 square foot office building. The model focuses on Active DAS, but it can be adapted to contrast and compare any type of in-building wireless system. All of the assumptions *iGR* used to reach its cost estimate are included in the report.

Key questions addressed in this market study include:

- What is an in-building wireless system? What are indoor small cells, indoor DAS, active, passive and hybrid DAS, signal boosters, DAS Lite, femtocells and picocells and Cloud RAN?
- What are some of the issues with deploying indoor small cells in the U.S.?
- How do these issues impact the cost of deploying indoor small cells in the market?
- Where are indoor small cells most likely to be located? What's their role?
- What are the main drivers of indoor small cell deployment costs?
- How much does it cost to deploy indoor small cells?

Who should read this report?

- Mobile operators
- Infrastructure OEMs
- Small cell product and solution vendors
- Backhaul service providers and equipment OEMs
- Financial analysts and investors.