



Product Definition



TAOGLAS®  
**Shift**

LTE Beam Steering  
Smart Antenna System

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ENHANCED SYSTEM PERFORMANCE THROUGH  
CELLULAR BEAM STEERING ANTENNA SYSTEMS

# Introduction

**Taoglas Shift** – the first LTE beam steering antenna system for IoT to delivering up to 25% improvement in throughput and increased coverage. Adant, a Taoglas partner specializing in creating dynamically-modified antenna systems, has developed a 2x2 antenna system for LTE systems. Taoglas is developing several variations of products around this antenna system.

## The Technology

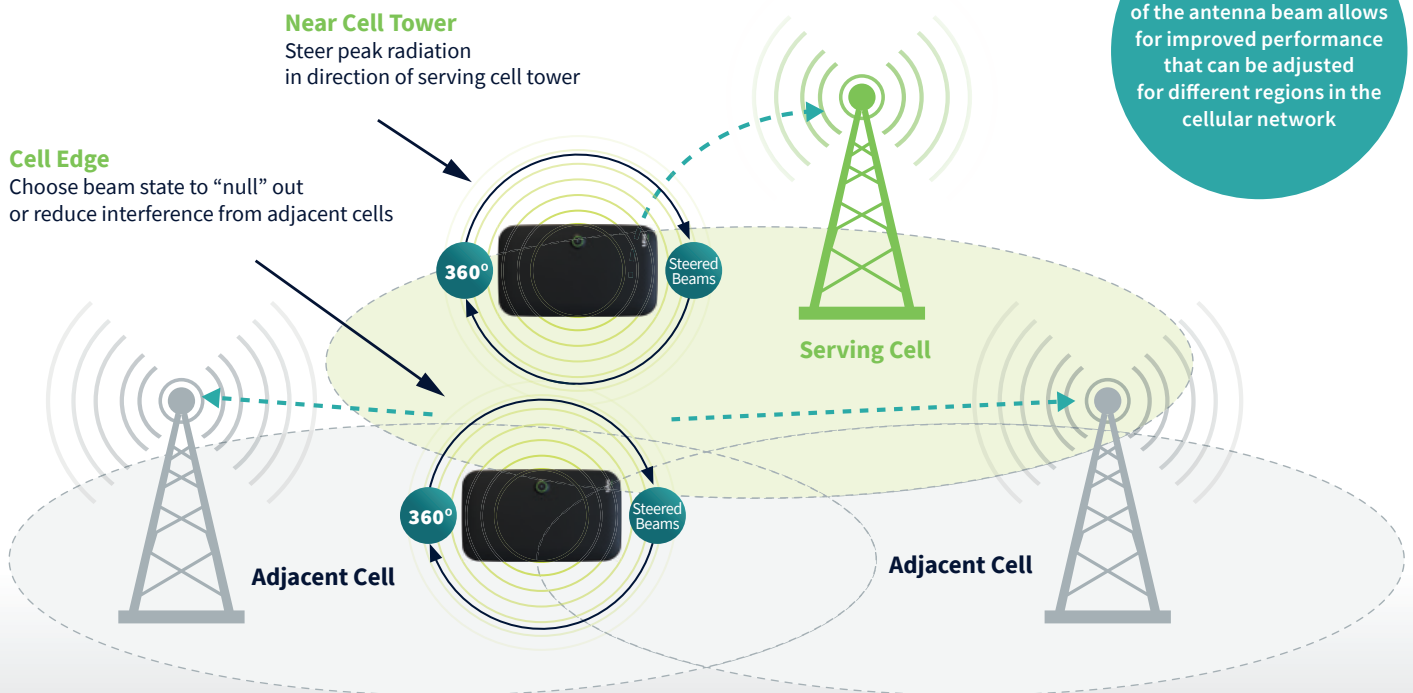
Current LTE modems use a pair of passive antennas to provide MIMO connectivity. The difficulty with passive antennas in mobile or fixed applications where the node location is unknown is that the passive antenna is required to operate in all directions, i.e. omni-directional. This forces the peak antenna gains to the 0 to 3 dBi level, with average gains falling in the -2 to -8 dBi range.

These are the gain values used in a link calculation to determine throughput and range. These parameters are of keen interest to the end user looking for a faster data download or improved reliability from the communication system.

With more nodes being implemented to accommodate more users, interference is also a concern, and a passive antenna is ill-equipped to provide improvement in this area.

Taoglas Shift dynamically adjusts the radiation pattern to optimize the communication link between the user and base station. This dynamic optimization results in an increased antenna gain for each antenna in the MIMO pair which in turn translates into higher throughput – meaning faster downloads.

## Dynamic Optimization for Different Parts of the Cell



**UP TO 50-100% Throughput Gain**  
over passive IoT technology

Interference mitigation is a **key benefit** of Beam Steering compared to a passive antenna

**Adaptive Real-time Coverage**  
Dynamic Radiation pattern

# First Responder



## The Challenges

The need for reliable high-speed data throughput is a challenge facing many police forces and emergency responders in a congested urban environment. An unobtrusive Multi-Band antenna installation with the ability to improve coverage gaps and throughput is the ideal configuration to face these challenges.

## The Shift Advantage

**Taoglas Shift**, an unobtrusively-mounted, multi-band beam-steered antenna system, capable of dynamically adapting the antenna radiation pattern in real-time to improve coverage and improve the link quality over any standard antenna system on the market.

**Taoglas Shift** features dynamic optimization of the antenna beam allowing for improved performance that can be adjusted for different conditions in the cellular network.

**Taoglas Shift** offers greater than 50% throughput improvement over passive antenna technology resulting in higher data throughput and better coverage.

# Fleet Management



## The Challenges

Today the challenges facing fleet managers are changing faster than ever; powered by factors such as competition, environmental responsibility, legal obligations and technology change. Increasingly, fleets are bringing more enhanced connectivity options to the market. City infrastructure brings elementary V2X communication capabilities, while providing wireless connectivity to passengers. These demands are driving the need for enhanced connectivity.

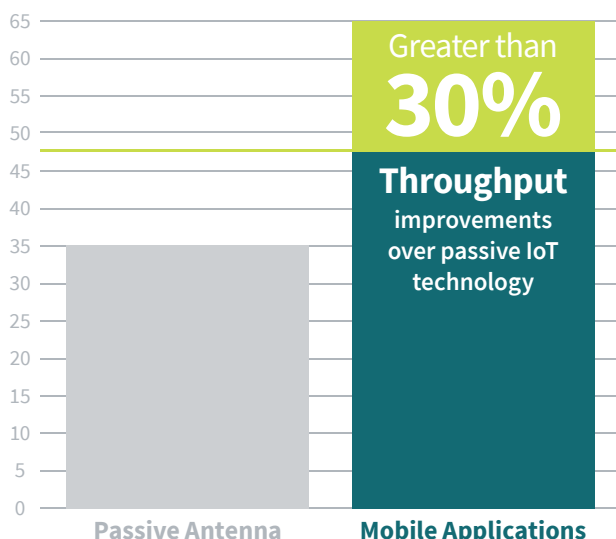
Vehicle driving styles, driver hours, precise locations and schedules need be managed effectively. Driver routes need to be selected to maximise efficiency and exact mileage and driving hours recorded automatically. Advanced behavioural data collection and vehicle diagnostics are now a crucial requirement in this increasingly competitive business environment. A modern fleet manager needs to effectively manage all these challenges.

## The Shift Advantage

Fleet managers are faced with enough challenges – the antenna shouldn't be another. With **Taoglas Shift**, data connections are more robust with less headache.

**Taoglas Shift** is an unobtrusively-mounted, multi- band beam-steered antenna system, capable of dynamically adapting the antenna radiation pattern in real-time to improve coverage and improve the link quality over any standard antenna system on the market.

**Taoglas Shift** features dynamic optimization of the antenna beam improving performance automatically for different conditions in the cellular network.



# IoT Gateways



## The Challenges

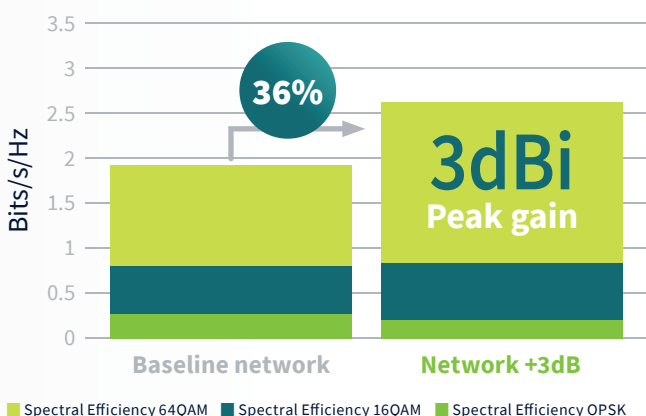
IoT networks can be anywhere in the world – from remote environments to dense urban neighborhoods. To handle this, IoT gateways need to be robust enough to survive a variety of environments and provide a long service life to minimize maintenance cost. The need for connectivity, coverage, high data rates, unobtrusive installation and reliability requires a product that is critical for implementing robust and secure access to multiple devices in real-time. Any such device should be powerful enough to meet the challenges of high data throughput around-the-clock in any environment.

## The Shift Advantage

**Taoglas Shift**, an unobtrusively-mounted, multi-band beam-steered antenna system, capable of dynamically adapting the antenna radiation pattern in real-time to improve coverage and improve the link quality over any standard antenna system on the market.

**Taoglas Shift** increases peak gain by 3dBi in certain bands, improving the link budget and helping to make coverage more robust. This allows networks to extend further than ever before with less infrastructure.

**Taoglas Shift** features dynamic optimization of the antenna beam to improve performance. It automatically adjusts for different areas in the cellular network. The robust design is configured to meet the challenges of harsh outdoor environments and installation requirements in nearly any location worldwide.



# Product Overview

## Shift Product Variations

The Shift series comprises three models:

- **Shift Advantage TSAx00** – LTE Smart Antenna System with USB or Serial Control
- **Shift Advantage+ TSAy00** – LTE Modem + Smart Antenna system with USB2.0 and SIM Card
- **Shift Advantage IoT TSAz00** – LTE Modem + Smart Antenna IoT Gateway with Industrial Interfaces

## Shift Advantage TSAx00

The Shift Advantage TSAx00 LTE Smart Antenna system is a fully-enclosed, ruggedized and waterproof LTE beam-steering Smart Antenna. The TSAx00 has coax cables for direct connection to both LTE antennas, providing the option for use with separate modems and routers. The USB connection provides power and control. The TSAx00 requires commands via the USB connection to control the beam-steering system.

## Shift Advantage+ TSAy00

The Shift Advantage+ TSAy00 is a fully-enclosed, ruggedized and waterproof modem with the Shift smart antenna, fully certified for use with AT&T and T-Mobile networks<sup>1</sup>. The TSAy00 includes a Sierra Wireless WP760x series modem and all supporting circuitry. A USB2.0 High-Speed interface provides high-speed data connectivity. The inclusion of the modem within the Shift Advantage provides tight integration between the modem and the smart antenna system, easing deployment and maximizing performance. Nothing is required to enable the Smart Antenna System – the Shift TSAy00 is plug-and-play.

## Shift Advantage IoT TSAz00

The Shift Advantage IoT TSAz00 builds on the TSAy00 by adding a microcontroller, Bluetooth®, and I/O including CAN and analog I/O. These features make the TSAz00 the first rapidly-deployable IoT gateway with LTE beam steering technology.

As with the TSAy00, nothing is required to enable the Smart Antenna System - it is truly plug-and-play.

<sup>1</sup> Certification expected Q1 2019

Contact [www.taoglas.com](http://www.taoglas.com) for more details, service, and customization options.



# Technical Specifications

Band	LTE700	GSM850	GSM 900	DCS	UMTS1	4G 2300	LTE2600	LTE3500
Frequency [MHz]	698 ~ 824	824 ~ 894	880 ~ 960	1710 ~ 1880	1920 ~ 2170	2200 ~ 2500	2500 ~ 2690	3400 ~ 3600
Peak Gain* (dBi)	3.77	3.98	3.72	6.04	5.41	7.51	6.51	7.57
Overall Efficiency /	-3.35	-1.31	-3.81	-1.36	-0.94	0.37	-1.41	0.14
Return Loss** (dB)	<-6	<-6	<-5	<-5	<-10	<-8	<-6	<-10
ECC	< 0.25							
Polarization	Vertical							
Impedance	50 ohms (TSAx00)							

## Bands & Frequencies

**Supported Operation Bands** (TSAx00): LTE700 (698-803 MHz): Bands 12, 13, 14, 17  
GSM850 (824-894 MHz): Bands 5, 20 | GSM900 (880-960 MHz): Band 8 | DCS (1710-1880 MHz): Band 3 | PCS (1850-1990 MHz): Band 2 | UMTS1 (1920-2170 MHz): Band 1 | LTE2600 (2490-2690 MHz): Band 7 | +4G 2300 + LTE3500MHz: Bands 30, 22, 48, 49, 43

**Supported Frequency Bands** (TSAy00 and TSAz00 only)  
**North America Version**  
LTE Bands: 2, 4, 5, 12 | UMTS Bands: 2, 4, 5  
**EMEA Version**  
LTE Bands: 1, 3, 7, 8, 20, 28 | UMTS Bands: 1, 8 | GSM/GPRS/EDGE Bands: 900, 1800

Characteristic	Value
System Dimensions:	243x141x45mm
Omni-directional Mode:	Yes
Number of directional beams:	4 per antenna; the antennas are independently controlled
Input Voltage Range	4.5 - 5.5V
Input Current Draw	TSAx00: < 500mA   TSAy00 & TSAz00: up to 2A
Interface	TSAx00: USB1.0 Full Speed   TSAy00: USB2.0 High Speed up to 480Mbps   TSAz00: CAN, GPIO
Indicators	Beam direction indicators (green, LED, can be disabled)   Status indicator: RGB LED, can be disabled after power-up
SIMs	Choice of 3FF (removable) or embedded SIM
Standard Cable Type	TSAx00: CFD200, 1m   TSAy00, TSAz00: Multi-conductor, 24~26AWG USB2.0, 1m
Mounting Type	Multiple mounting brackets available, including permanent-mount and pole-mount

## Environmental

Operating Ambient Temperature Range	TSAx00: -40°C ~ +85°C TSAy00 and TSAz00: -40°C ~ +60°C
Storage Temperature	-40°C ~ +70°C
Humidity	95% RH
Ingress Protection	IP67
UV	ASTM G154
Salt Spray	IEC 60068-2
Shock, Vibration, Drop	ISO 16750-3
ESD	IEC 61000-4-2, 8kV contact / 15kV air

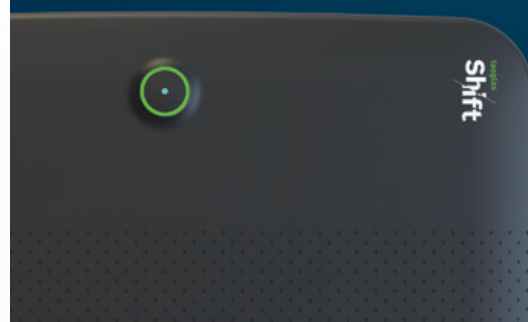
## Compliance

Regulatory	FCC, CE <sup>1</sup>
Carrier	AT&T, T-Mobile <sup>1</sup>
RoHS Compliant	Yes

<sup>1</sup> Certification expected Q1 2019

## Product Features

- Significant throughput increase
- More robust coverage
- Multi-band
- LTE module combined in single enclosure with antenna
- Proprietary antenna technology
- Plug & Play Smart Antenna Modem system (TSAy00)
- Rapidly deployable
- Low profile
- Four directional beams
- Real-time beam adaptation
- Full-time connection monitoring
- Bluetooth gateway (TSAz00 only)
- Higher data throughput
- Signal interference mitigation
- Roof-mount multi-band antenna
- Dynamically intelligent configuration
- Enhanced mobility



# Product Dimensions

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For further details or to arrange a demonstration of **Taoglas Shift Antenna System** please contact your local Taoglas Sales Representative or visit us at:

[www.taoglas.com](http://www.taoglas.com)



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