

# Plasma Antennas

**July 2016**  
**Executive Summary**

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## Executive Summary

Plasma Antennas is an SME with a robust track record of supplying specialised antennas for a wide range of applications around the world. The company is founded on the principles of a disruptive antenna technology, Plasma Silicon. Plasma Silicon Antenna technology has been validated independently by QinetiQ for the UK's Ministry of Defence and has recently been demonstrated to two major equipment vendors (one European one Chinese). With the arrival of WiGig and 5G technologies in millimetre wave frequencies (28GHz and above), this technology becomes relevant and beneficial to mass market applications needing gigabits of bandwidth and ultra-low latency (round trip delay) such as 8K video, holography, virtual and augmented reality.

- The technology has applications in mobile telecommunications (access, backhaul and devices), satellite communications, point to point and point to multipoint links, sensing and automotive as well as our established markets in defence, homeland security, public safety, mobile broadband and oil and gas.
- It is based on low cost, silicon integrated circuit (IC) manufacturing processes.
- Plasma Silicon technology has the potential to dramatically reduce the unit price of smart electronically steered antennas with increasing frequency.

Plasma Antennas business plan is to exploit the opportunity presented by established mass markets (e.g. mobile multimedia communications) by developing 28GHz - 60GHz devices for integration into WiGig and 5G access points. Future opportunities for technology exploitation include consumer devices and related products (backhaul - where we already deliver products) and the existing high value low volume markets (e.g. defence). We will also develop a 77GHz device for automotive scanning radar for autonomous vehicles.

Figure 1: Plasma Antennas facilitate connected living in the connected world



Plasma Antennas's Plasma Silicon Device (PSiD) technology delivers very high throughput, low latency, directional beams so generating less Interference and maximising energy efficiency.

For consumers the rapid beam steering (as little as 500 nanoseconds per transition) provides real time tracking to maintain optimum connectivity, or if needed, a reorganisation of the signal path. In backhaul or point to point/point to multi point applications the network can reorganise, rehome without humans having to physically adjust or align the dish. Furthermore, the antennas will maintain perfect alignment for maximum efficiency in high wind/vibration scenarios minimising the long term cost of ownership.

In short Plasma Silicon technology addresses the challenges of millimetre wave communications while also delivering the low cost and low power consumption of a single monolithic silicon chip.

### **Key Products**

Plasma Antennas currently design build and ship a range of lower frequency switched beam antennas based on the same principles as Plasma Technology but using discrete components. We supply 4G mobile access and backhaul antennas, as well as antennas for defence, homeland security, public safety, mobile broadband and oil and gas applications.

We have plans and designs ready to go to deliver market ready 28GHz antennas in a two-year programme that will also deliver 60GHz and 77GHz Silicon for onward device development and integration.

### **Market**

Current figures from Gartner, ABI and Infonetics demonstrate a current addressable market of over one billion devices. The so called Internet of Things (IoT) will multiply the number of wireless devices many fold, but just using today's numbers for mobile devices, games consoles, small cells, and WiFi routers a 10% market penetration would see Plasma Antennas having a \$1.5Bn+ revenue stream per annum in 5-7 years, and we project Autonomous Vehicle radar will add \$0.25Bn to that. This is without adding in smaller but significant markets like satellite communications, point to point and point to multipoint links, sensing and our established markets in defence, homeland security, public safety, mobile broadband and oil and gas.

### **Sales Strategy**

By their nature our products are typically designed in and integrated into our customer's systems. End users are typically major telecoms companies, corporations and government agencies.

For our mass market products, we will leverage our existing routes to telecoms companies but need to open new channels. We are making good progress connecting with leading companies in the silicon chip Industry, radio subsystem suppliers and major telecoms equipment manufacturers in the US, Europe and China. Two major telecoms equipment manufacturers (one European the other Chinese) have seen and reviewed the Plasma Silicon Antenna demonstrator with very favourable feedback and we continue to keep in touch with them.

### **Unique Technology**

Plasma Antennas main strength is its intellectual property. The knowhow to successfully develop plasma silicon technology is specialised and we have protected the knowhow with a series of patents and we are in the process of filing patents for our latest developments. We have 13 patents granted, published or being filed.

We have a strong eco system of semiconductor and electro-mechanical manufacturing partners in the UK, Europe and China.

### Financials

Plasma Antennas is privately owned. It has developed its technologies using grant funding, recycling revenue from sales and a small amount of seed funding. Our backhaul and access products are going through the product approval process with a Tier 1 US Mobile Network Operator. Once network acceptance is completed and sales ramp, we will achieve a significant contribution from sales but that will not accelerate development sufficiently to meet the mass market opportunity, hence the funding.

### Fundraising Rationale

WiGig and 5G present a clear opportunity to build on our position in mobile backhaul and access and enter multibillion dollar mass markets. Funding is sought to take us through the design and simulation phase for 28GHz, 60GHz and 77GHz devices, onward to deliver silicon and appropriate mass market packaging (a flip chip to bond directly to a radio or Antenna in Package configuration) and volume manufacturing partnerships. We have already started to engage with equipment manufacturers who will design in the antennas.

### Exit

Plasma Antennas positions itself as a disruptive low cost, high efficiency alternative to existing approaches. We aim to penetrate the multibillion dollar mobile access and device market. Our unique IP and the ability to Integrate our technology in silicon within a system on chip will make us attractive to semiconductor companies, the differentiation and performance will make us attractive to mobile device and games console manufacturers, and the ability to license the technology for wide adoption will attract a range of acquirers keen to Influence and profit from the mobile market.

### Key messages for Investors

- **Proven technology** - validated at 8-9GHz by QinetiQ for the UK's Ministry of Defence. Demonstrated to two major mobile equipment vendors (one European one Chinese) with positive feedback.
- **Clear technology roadmap and plan** - to deliver 28GHz and 60GHz devices for telecoms and 77GHz devices for scanning automotive radar.
- **Strong Intellectual property** - 13 Patents granted, published or being filed.
- **Wide range of existing markets** - the migration to mmWave, WiGig and 5G mobile is inevitable
- **Routes to mass market through existing customers.**
- **Highly competent management team** - technically strong, long telecommunication industry experience, experience of successful exit by trade sale.
- **Clear exit opportunities** - Plasma Silicon technology rights will be attractive to dominant players in the semiconductor and telecoms sector.

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