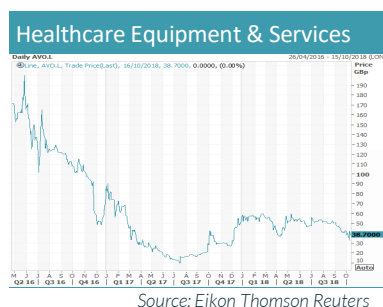




16 October 2018

**Market data**

EPIC/TKR	AVO
Price (p)	38.7
12m High (p)	64.8
12m Low (p)	25.0
Shares (m)	169.6
Mkt Cap (£m)	65.6
EV (£m)	58.6
Free Float*	48%
Market	AIM

*As defined by AIM Rule 26

Description

Advanced Oncotherapy (AVO) is developing next-generation proton therapy systems for use in radiation treatment of cancers. The first system is expected to be installed in Harley Street, London, during 2019; it will be operated through a JV with Circle Health.

Company information

Exec. Chairman Michael Sinclair
CEO Nicolas Serandour

+44 203 617 8728

www.advancedonctherapy.com**Key shareholders**

Board & Management	13.0%
Yantai CIPU	26.5%
Brahma AG	5.3%
AB Segulah	3.8%
Hargreaves Lansd.	3.6%
Handelsbanken	3.5%

Diary

2Q'19	Finals
1H'19	Harley Street ready

Analysts

Martin Hall	020 7194 7632 mh@hardmanandco.com
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ADVANCED ONCOTHERAPY

Four components integrated

AVO's goal is to deliver an affordable and novel proton therapy system (PT), based on state-of-the-art technology developed originally at the world-renowned CERN. Achievement of major technical milestones has boosted confidence greatly, and the group remains on track with its strategy. AVO has successfully integrated the four types of structures that constitute the LIGHT accelerator and has overcome technical challenges. The proton beam has been recorded at an energy of 52MeV, sufficient to treat superficial tumours. With the distribution agreement in place for SE Asia, partnerships with both RaySearch and the STFC, and strengthening of its financing structure, AVO is now on a much firmer footing.

- **Strategy:** AVO is developing a compact and modular PT system at an affordable price for the payor, financially attractive to the operator, and generating superior patient outcomes. AVO benefits from the technology know-how developed by ADAM, Geneva, and relies on a base of world-class suppliers.
- **Major milestone achieved:** The biggest technical challenge for the proton accelerator has now been overcome. Integration of all the four components at CERN's testing facility in Geneva is, in our opinion, a major milestone that significantly de-risks the whole project. AVO now has an accelerator that has been powered-up, demonstrated its ability to perform as predicted, and accelerated a proton beam to an energy of 52MeV.
- **Interims:** Investment in LIGHT during 2018 has been broadly in line with our forecasts. Moreover, to date in fiscal 2018, AVO has raised ca.£40m, which has left the balance sheet debt-free and with net cash of £3.3m, boosted subsequently by a Placing (£6.4m gross) and a tax credit of £2.9m, providing flexibility in future funding discussions.
- **Risks:** With funding secured so far in 2018, AVO's visibility and its ability to maintain the fast pace of its development plan have improved. Execution risk remains, but the more complex technical challenges have now been overcome, and integration of the remaining CCL units is a technically easy step towards getting a fully functional accelerator.
- **Investment summary:** Demand for PT is increasing worldwide, and the need for a small, flexible, affordable and close-to-patient system is desirable. AVO has attracted strong partners, and discussions with potential customers are advancing. Progress at the flagship Harley Street site has been substantial and installation of the first LIGHT system is planned to start in mid-2019. The latest technical update has brought further assurance and boosted confidence.

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Technology and financial overview

The four components that consist the LIGHT accelerator have been integrated, and is now able to generate a proton beam with an energy of 52MeV

AVO is at the stage where the four components (the proton source, the RFQ, the SCDTLs and the CCLs) that constitute the LIGHT accelerator are being integrated at its Geneva testing site. This also means that AVO now has an accelerator capable of generating a proton beam with energies (>50MeV) required to treat superficial tumours – demonstrated and modelled through a case study of a patient with a periocular tumour. This represents a major milestone. Successful integration of the different components of the LIGHT system highlights the greatly reducing technical risk inherent in complex development of the LIGHT accelerator.

The second part of the Harley Street project has started

Meanwhile, the challenging Harley Street site remains on schedule for the fitting out to start in mid-2019. All of the excavation and preparative work has been completed. Currently, it is at the “Landlord fitting” contract stage with the reconstruction of the sub-basement, basement and ground floor walls. This can be visualised in the latest (August 2018) time-lapse video: <https://www.avoplc.com/Our-Technology/Toward-the-First-Installation-of-LIGHT>. AVO, together with its construction (Deconstruct) and development (The Howard deWalden Estate) partners, is confident it can adhere to its timeline to have the first LIGHT PT system installed and operational at the Harley Street site by 2H'20.

AVO is now debt-free

To date during 2018, AVO has raised ca.£40m of cash from its new commercial partner, Yantai CIPU, and other investors, which has enabled the company to clear all its debts, provide working capital and bring additional stability. Further capital will be required, which could come from a number of sources. However, AVO, on the back of its continuous and successful operational progress, has greater flexibility now with its improved and clean balance sheet.

Development highlights

- ▶ **Integration of four components:** Shortly after the release of its interim results, AVO announced that integration of the proton source, the RFQ, four SCDTLs and the first two CCL modules had been achieved. The beam has been successfully accelerated through all these four components to reach the design-anticipated energy output of 52MeV, which is capable of treating superficial tumours.
- ▶ **UK testing and assembly site:** A new development has been the establishment of a UK testing and assembly site at the UK Government's Science and Technology Facilities Council (STFC), in Daresbury (Cheshire), which will become home to the first full energy LIGHT system. This will be used to obtain regulatory approval (CE marking) ahead of installation at the Harley Street site.
- ▶ **Treatment planning system (TPS) and oncology information system (OIS):** The strategic collaboration agreement with RaySearch, the leader in PT software solution systems, will enable AVO to equip the LIGHT system at Harley Street with the full spectrum of the company's RayStation software functionality for treatment planning, as well as for patient experience and management with RayCare.
- ▶ **Harley Street site:** Construction work remains on schedule. With all of the demolition, excavation and preparative work done, rebuilding has commenced, with much of the sub-basement, basement and ground floor reconstruction already completed. The site is now in the landlord fitting phase, with installation of lifts, air conditioning systems, etc.

Corporate highlights

- ▶ **Commercial distribution agreement:** In December 2017, AVO signed an exclusive distribution agreement with Liquid Harmony for China, Hong Kong, Macau, Taiwan and South Korea, which is progressing well, with a number of discussions ongoing in these important markets.
- ▶ **Financing:** In addition to a £13.5m equity investment from Yantai CIPU as part of a £16.8m fund raise, together with AB Segulah's loan conversion, AVO received a £16.5m up-front distribution payment fee from Yantai CIPU for exclusive distribution rights for specified territories in SE Asia. Also, post period-end, AVO raised an additional £6.41m (gross) of new capital via a Placing of shares, mostly with investors from Switzerland, which will be used for working capital purposes and to support the LIGHT development at STFC.

Financial highlights

- ▶ **Administration:** Operating costs were in line with expectations (£12.5m est.), at £12.95m.
- ▶ **Capitalised expenditure:** Capital expenditure on intangible assets (capitalised) in the period increased 38% to £4.6m (£3.3m), which is to be expected, as progress towards a completed LIGHT system gets ever closer.
- ▶ **Cashburn:** Significant investment in the development of LIGHT has seen the average monthly cashburn increase to £2.3m in 1H'18, compared with a £1.5m monthly average during fiscal 2017, which was in line with forecasts.
- ▶ **Tax credit:** Post period-end, AVO received a £2.8m R&D tax credit from HMRC.

Advanced Oncotherapy's 1H'18 results – actual vs. expectations

Period-end (£m)	1H'17 actual	1H'18 actual	Change (%)	1H'18 forecast	Delta Δ
Administration costs	-6.7	-8.9	+15%	-9.5	+0.6
Underlying PBT	-7.2	-9.1	+33%	-9.6	+0.5
Statutory PBT	-7.9	-11.5		-10.5	-1.0
Tax credit	+0.7	+0.0	N/M	+1.0	-1.0
Net income	-6.5	-9.1	+43%	-8.6	+0.5
Net cash/(debt)	-6.5	3.3	N/M	3.0	+0.3

Figures may not add up exactly due to rounding

Source: Advanced Oncotherapy, Hardman & Co Life Sciences Research

Energy to treat superficial tumours

Four components aligned, and operational

Integration of the four different components that constitute the LIGHT accelerator is a major milestone that significantly de-risks the whole project

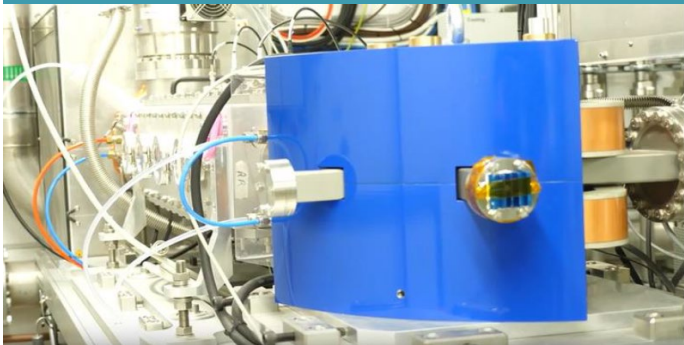
LIGHT can now generate a proton beam capable of treating superficial tumours

The biggest technical challenge for the proton accelerator has now been overcome. Integration of all four components at CERN's testing facility in Geneva is, in our opinion, a major milestone that significantly de-risks the whole project. AVO now has an accelerator that has been energised, demonstrated its ability to perform as predicted theoretically, and accelerate a proton beam to an energy of 52MeV, which is sufficient to treat superficial tumours. This represents twice the energy level used in the case study released on 27 September 2018.

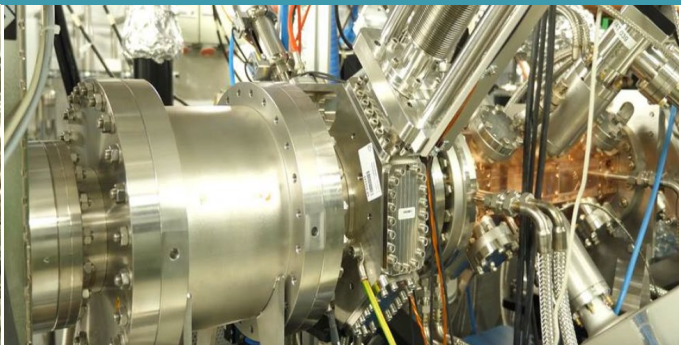
To reach such an energy level, AVO has put together all the four units that constitute the LIGHT system (see Appendix), and it has been powered-up and it is working:

- ▶ the proton source;
- ▶ the RFQ component;
- ▶ the four 'low speed accelerating' SCDTL units – the SCDTL component; and
- ▶ two 'high speed accelerating' CCL units – the CCL component.

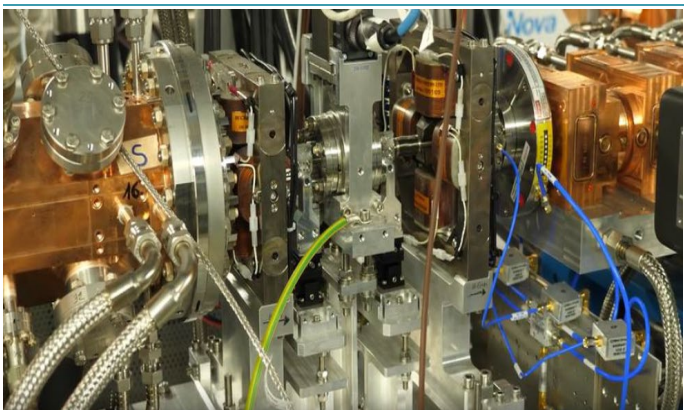
The LIGHT accelerator in the testing facility, Geneva



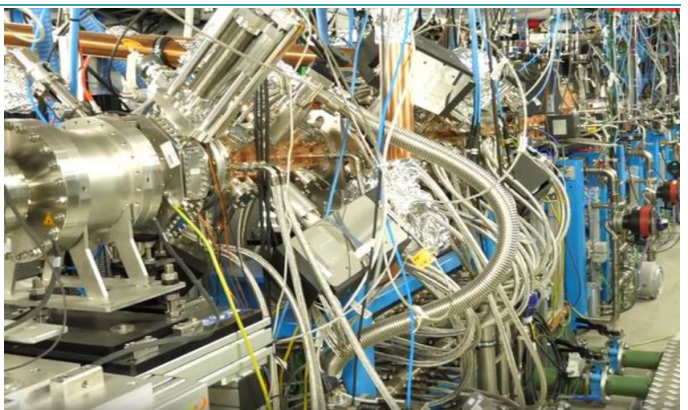
The proton source...



... to the Low Energy Beam Transfer and RFQ...



...to the RFQ and SCDTL...



... and through the CCLs

Source: Advanced Oncotherapy

Addition of further accelerating CCL units will increase the energy of the proton beam to a level that would be capable of treating deeper tumours. Depending on customer requirements, AVO is expecting to integrate up to 15 CCLs within each LIGHT system, which would equate to a maximum energy level of 230MeV.

The case study

Background

To validate the LIGHT accelerator's energy performance, AVO chose to reproduce a case report published in the literature of a patient that had been treated with an X-ray system¹. It involves a 73-year-old man with recurrent basal cell carcinoma, the most common malignant periocular tumour. The man was treated using the CyberKnife modality, a highly conformal type of X-ray radiation therapy. For comparison, a similar patient is planned for PT representative of the energy capable in the LIGHT system today. Because the tumour is located very close to a sensitive organ, in this case the eye, this represents a typical example demonstrating the superiority of the PT compared with other X-ray therapies where irradiation could occur and damage surrounding tissue.

Data of the case study were integrated and processed using RayStation's TPS

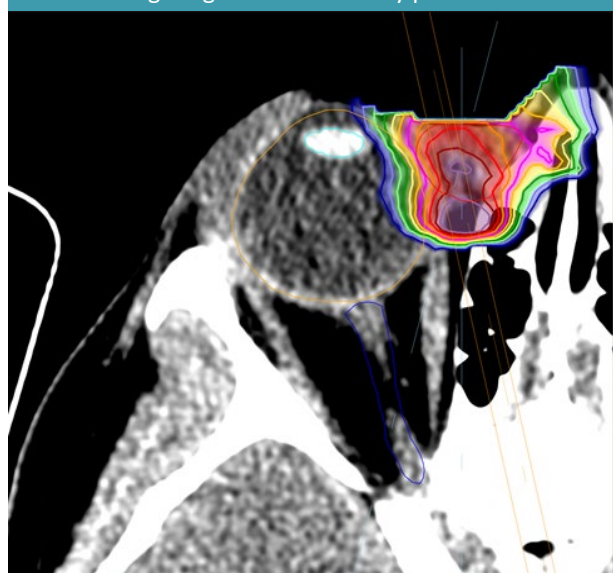
Data of the periocular tumour case study were integrated and processed into the commercial version of RayStation's Treatment Planning System from RaySearch. The planned dose, generated by the LIGHT accelerator is 40Gy in 10 fractions to a tumour, as per the literature example (the radiation dose expressed in terms of absorbed energy per unit mass of tissue with 100cGy = 1Joule/kg).

The characteristics of the LIGHT system enable its energy level to be changed electronically. Dose calculation was obtained through the RayStation Monte Carlo algorithm, the gold standard method to compute doses in radiation therapy, taking into consideration the heterogeneity of tissues.

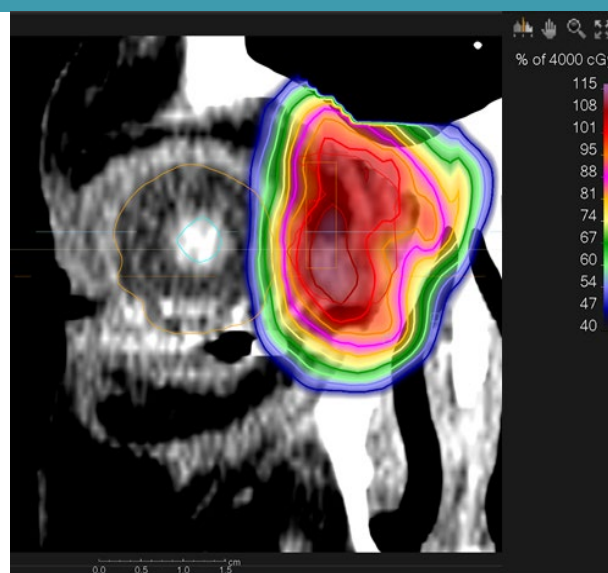
Results

As highlighted in the following two images of the tumour, the tumour was selectively targeted by the proton beams, with most of the highest radiation being visualised in red.

Selective targeting of the tumour by proton beams



Resulting plan – View from above showing tight proton dose conformity away from the eye



Resulting plan – Front view showing tumour coverage with eye and lens sparing

Source: Advanced Oncotherapy 27 September 2018 Technical update – Illustrations

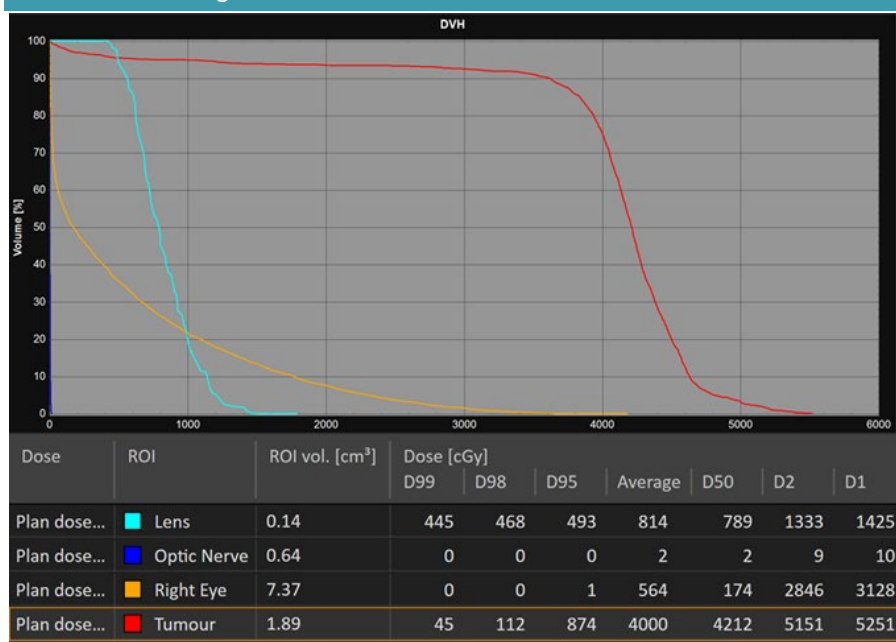
¹ Pontoriero, A., G. Iati, A. Conti, F. Minutoli, A. Bottari, S. Pergolizzi and C. De Renzis. "Treatment of periocular basal cell carcinoma using an advanced stereotactic device." *Anticancer Res.*, **2014**, 34(2): 873-875.

Advanced oncotherapy

*Most of the proton beam targeted the tumour
with higher precision*

In addition, the Dose Volume Histogram (DVH), which represents a plan evaluation tool to compare doses from the different structures, indicates that most of the proton beam targeted the tumour and spared the adjacent sensitive/healthy tissue. Basically, DVH summarises 3D dose distribution in a graphical 2D format based on a 3D reconstruction of a computed tomography (CT) scan. Here, the DVH indicates a high beam precision whereby most of the tumour received the proton radiation, with radiation in the lens well controlled and sparing the optic nerve.

Dose Volume Histogram on LIGHT data



Dose volume histogram and reported doses – The optic nerve DVH is difficult to see at the left side of the DVH graph because it received essentially zero dose from the PT

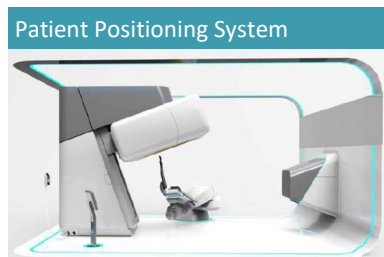
Source: Advanced Oncotherapy 27 September 2018 Technical update – Illustrations

Although not exactly comparable because of the different base patient data, the proton plan suggests essentially zero (13 cGy) average optic nerve dose, compared with 1538 cGy reported for the X-ray plan. The lens dose was slightly reduced with PT and the lateral eye dose showed significant reduction with PT, 192 cGy vs. 920 cGy with X-ray. These results can be observed in the proton and X-ray DVHs.

Additional development progress

Proton delivery

Creation of Patient Positioning System (PPS)



Source: Advanced Oncotherapy.

AVO aims to deliver not only the next-generation proton accelerating system but also a turnkey solution that provides everything a hospital or clinic would require and adhering to the specific requests from radiotherapists/physicians.

While the focus has been largely on the back-end of the LIGHT system, significant progress has been made also on the front-end, PPS. Multiple components of the treatment room have been manufactured, inspected and tested by the company's partner, P-Cure Ltd. This encompasses the treatment chair and the robotic arm that moves and aligns the chair and patient to the proton beam. The connectivity between the PPS and the accelerating units has also been established and evaluated.

As other sub-systems are completed, such as the imaging and treatment management software, they will be integrated to form the whole PPS.

The LIGHT system will be equipped with imagery modules such as:

- ▶ **Diagnostic Quality CT scanner:** This has been manufactured, and the integration testing has been completed. It will provide the image of the patient in a seated position.
- ▶ **Orthogonal real-time X-ray imaging:** The system is fluoroscopy-capable and is intended to map the 3D tumour motion in a continuous imaging process.
- ▶ **CT gating system:** This provides clean images for planning so that clinicians can more clearly visualise the target with fewer image artefacts associated with respiratory motion.
- ▶ **The scanning magnets:** In December 2017, the scanning magnets were produced. This component will enable use of the Multi-Painting Spot Scanning technique (see below).

Treatment planning system (TPS)

Recently, AVO announced the collaboration agreement with RaySearch to fully support the LIGHT system at Harley Street, and also to enhance patient experience and management with the best-in-class RayStation for the treatment planning system (TPS) and the newly launched RayCare oncology information system (OIS), respectively. By selecting RayStation as the software for its TPS made by RaySearch, AVO has chosen the market leader in solutions for flexible systems. The collaboration agreement is for the LIGHT system to be installed at the Harley Street site.

- ▶ **RayStation:** The software integrates all the functionalities needed to operate the PT system. The TPS will give users access to the full spectrum of RayStation's functionality, including the fast proton Monte Carlo dose engine, robust 4D optimisation, Linear Energy Transfer (LET)-driven optimisation, simulated organ motion, deformable registration, dose accumulation, plan adaptation, multi-criteria optimisation and Plan Explorer for automatic plan generation. RayStation, the software controlling the treatment planning system, is being used in 466 centres in 31 countries in 2018, and, more precisely, by 43 particle centres in 14 countries. The main components of RayStation already support a full range of features used in PT, and only a few adjustments will be needed to support the LIGHT system at Harley Street.

AVO has entered into a collaboration agreement with RaySearch for the development of the treatment planning system and the oncology information system

- **RayCare:** Integrated into the RayStation platform, RayCare connects all the oncology discipline to support comprehensive cancer care for a seamless patient experience and management. It combines all the patient's schedules, treatment progress and the clinical workflow.

Accuracy in proton delivery

The ionisation chamber has been manufactured by Pyramid Technical Consultants. It will be situated at the delivery end of the LIGHT accelerator, after the beam has been fully accelerated through the CCLs.

The ionisation chamber has been designed specifically for use with the LIGHT system, enabling precise measurement of the position of the proton beam (both horizontal and vertical axes) on a pulse-by-pulse basis (up to every five milliseconds), and monitoring the dose/intensity delivered to the target – beam energy, intensity and point size. All these features allow for better tumour targeting, particularly in the case of moving targets, and also help to minimise side effects. AVO has also developed a Time-of-Flight (TOF) measurement system that allows the precise measurement, control and adjustment of the energy of each proton beam.

The scanning magnets

The scanning magnets have been produced and will enable the use of the Multi-Painting Spot Scanning technique; this technique enables rapid movement of the proton beam and delivery of a very short energy pulse. Unlike traditional techniques, which deposit the dose of radiation in the whole tumour volume in one go, this technique employs a focused proton pencil beam approach, which uses multiple successive dose applications to small elements called voxels. The method allows delivery of the maximum dose, spread precisely over the whole tumour, while reducing the dose received by the surrounding healthy tissues.

Future developments

AVO, together with its partners, is investigating new imaging techniques that will allow a beam to represent the tumour and other structures within the patient. This could improve patient outcomes by reducing radiation exposure and improving tumour targeting.

The use of light ions, such as helium, for treating tumours is also an application currently in development for the LIGHT system. Such ions provide improved radiobiological effectiveness, in addition to lower toxicity and higher suitability for paediatric patients than heavier ions.

New testing and assembly site

A testing site in the UK

In May 2018, a lease was signed between AVO and the UK Government's Science and Technology Facilities Council (STFC) to establish a UK testing and assembly site at Daresbury (Cheshire). The facility will be used to assemble a complete and operational version of the LIGHT system for testing and validation for regulatory approval (CE Mark). It will then be relocated to the Harley Street site to be ready for first patient treatment in 2H'20. Building work is now under way to prepare the existing bunker to receive the LIGHT system components. The STFC has indicated that work is progressing apace to be ready for the installation and assembly of the LIGHT system installation next month and ready for full-energy testing next year. The concrete shielding for the proton injector and RF test bunkers is already in place, and the supporting steel work and necessary electrical installations are well underway. AVO has indicated that some of the components are already on site.

AVO has set up a plan to further improve the quality of the proton beam and the medical outcome post first system

STFC will be used to assemble and test the LIGHT accelerator for validation and regulatory approval

This sets up a new manufacturing infrastructure for the LIGHT system and provides risk mitigation. It does not change AVO's well-advanced plan for high-volume production, and, together with its industrial partner, the company is looking at its options for the industrialisation of LIGHT and supply chain strategy to make the system more affordable and attractive to potential customers.

Meanwhile, AVO is retaining its existing testing facility at CERN, Geneva, where further technological developments are ongoing.

Part of the proceeds from the recent (3 September) £6.4m (gross) Placing will be used to support the costs related to the preparation of the site for LIGHT.

The STFC facility

STFC is an independent, non-departmental public body of the UK government's Department for Business, Energy & Industrial Strategy (BEIS), and one of Europe's largest multi-disciplinary research organisations. It was established in 2007 and headquartered at Polaris House, Swindon. Having been an active partner in the initial installation and upgrades of the Large Hadron Collider at CERN, it confers many advantages for AVO and its accelerator technology.

The Daresbury Laboratory in Cheshire, which is part of the STFC, has expertise in world-leading scientific research in fields such as accelerator science, bio-medicine, physics, chemistry, materials, engineering and computational science. It is a particularly good fit for the LIGHT system and its testing and assembly requirement, as it is home to the Accelerator Science and Technology Centre (ASTeC), which studies all aspects of the science and technology of charged particle accelerators, ranging from large-scale international and national research facilities through to specialised industrial and medical applications.



Source: STFC website

Harley Street development

The development of the Harley Street site is on track, and will be ready for installation in mid-2019

Progress at the 141-143 Harley Street site continues apace and remains on track. The building work is divided into three contracts.

Three stages of construction work

Contract	Description	Status
#1	Excavation, piling and wall and roof reconstruction	Completed
#2	Landlord fitting, including lifts, air extractors, etc	In progress
#3	Tenant fitting	Due mid-2019

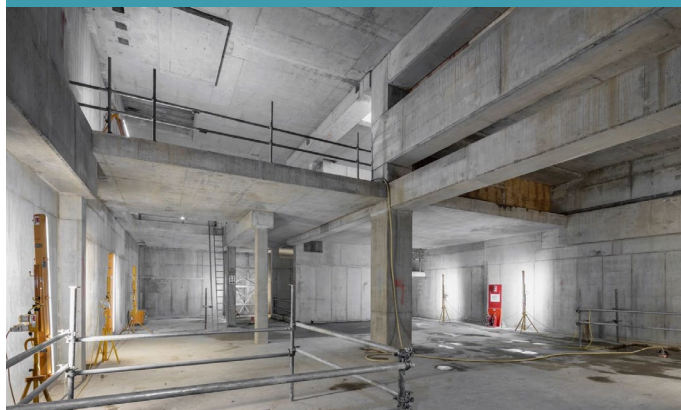
Source: Hardman & Co Life Sciences Research

Contract 1 included the demolition of the existing building, excavation, piling and shell build works, all of which have now been completed, which represents tremendous progress (see following pictures and video highlighted earlier).

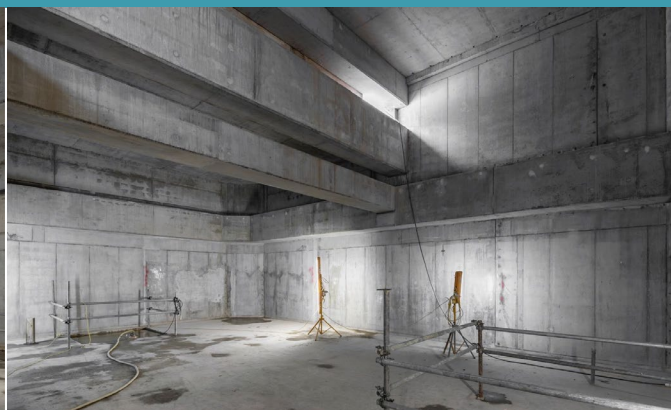
Currently, work is focused on the Landlord fit-out (contract 2), which includes the steel framing, roofing, fitting of lifts, air extractors, water pipes and general electricity work. Howard de Walden Estate, the freeholder of the site, continues to bear the cost of construction.

AVO is still confident that the construction work remains on schedule to begin installation of the LIGHT system from mid-19, allowing first patient treatment in 2H'20.

Construction work at 141-143 Harley Street



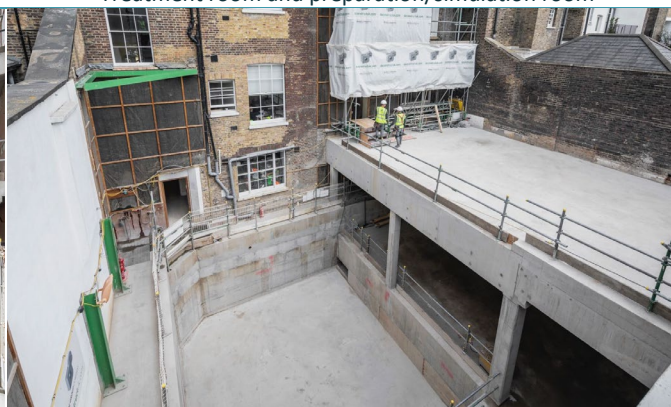
Treatment room at the sub-basement level



Treatment room and preparation/simulation room



Accelerator hall and the changing area above



Aerial view of the project

Source: Advanced Oncotherapy 27 September 2018 Technical update – Illustrations

Corporate matters

Transformed financial position

Distribution agreement and capital increase

2018 has seen a significant transformation on AVO's balance sheet. The strategic distribution agreement signed with Yantai CIPU, through its affiliated entity Liquid Harmony, provided AVO with a total of £33.5m of new capital, made up of an up-front distribution payment fee of £16.5m and a £16.8m gross equity investment, of which £13.5m was subscribed by Liquid Harmony. Yantai CIPU has become AVO's largest shareholder, with 26.5% of the current share capital. Concomitantly with the equity raise, the consortium of investors, led by AB Segulah, which made a loan facility of £3.9m available to AVO in July 2017, has converted the loan and related interest into 13.70m new ordinary shares, equivalent to £4.1m. This was completed on 22 February 2018.

Loan-free

The capital increase allowed AVO to take the opportunity to repay the loan made by Blackfinch Investment Ltd. for a total aggregate nominal value of £6.7m, including interest, leaving the company debt-free and providing greater flexibility. As part of the loan agreement, AVO issued Blackfinch with 1m warrants @ 70p. In 2017, the average monthly cash burn was -£1.45m, which has risen to -£2.3m in 1H'18. The distribution deal with Yantai CIPU, coupled with the equity raise and loan conversion, resulted in a debt-free net cash position of £3.3m at 30 June 2018.

Placing

Post the interims, AVO undertook a Placing to raise £6.41m (gross) with Swiss-based investors and healthcare providers. Funds will be used to support the software development and costs relating to prepare the STFC site at Daresbury. Warrants have also been granted to the participants of the Placing at one warrant for five ordinary shares, at a price of 100p.

Board changes

Given the recent financing arrangements, new major shareholders, and the push in the Chinese market, changes to the Board of Directors were expected. New board members include the following:

- ▶ **Peter Sjostrand, Vice Chairman and Non-Executive Director (NED):** Peter is currently a director of Sweden-listed biotech company, Active Biotech, which focuses on therapeutics that modulate the immune system. He also holds other board member positions in Acturum and Vatera.
- ▶ **Gabriel Urwitz, NED:** Gabriel is the founding partner, managing partner and executive chairman of Nordic private equity firm Segulah Advisor AB. A consortium of shareholders, led by Segulah, owns 3.8% of AVO.
- ▶ **RenHua Zhang, NED:** RenHua represents Liquid Harmony (Yantai CIPU), which holds 26.5% of AVO. She is the co-founder, CEO and vice chairman of Realcan Pharmaceuticals Co Ltd, a large distributor of medical drugs and equipment in China.
- ▶ **Chunlin Han, NED:** Chunlin represents Liquid Harmony. He is the head of investment and financing for Realcan Pharmaceuticals.

- **Yuelong Huang, NED:** Yuelong also represents Liquid Harmony. He holds the role of general manager of the Medical Technology Department of Realcan Pharmaceuticals.

Board of Directors	
Name	Position
Dr Michael Sinclair	Executive Chairman
Nicolas Serandour	Chief Executive Officer
Peter Sjostrand	Vice-Chairman
Michael Bradfield	Non-executive Director
Hans von Celsing	Non-executive Director
Chunlin Han	Non-executive Director
Dr Yuelong Huang	Non-executive Director
Prof. Steve Myers	Non-executive Director, ADAM executive Chairman
Dr Nick Plowman	Non-executive Director
Gabriel Urwitz	Non-executive Director
Dr Enrico Vanni	Non-executive Director
RenHua Zhang	Non-executive Director

Source: Company reports

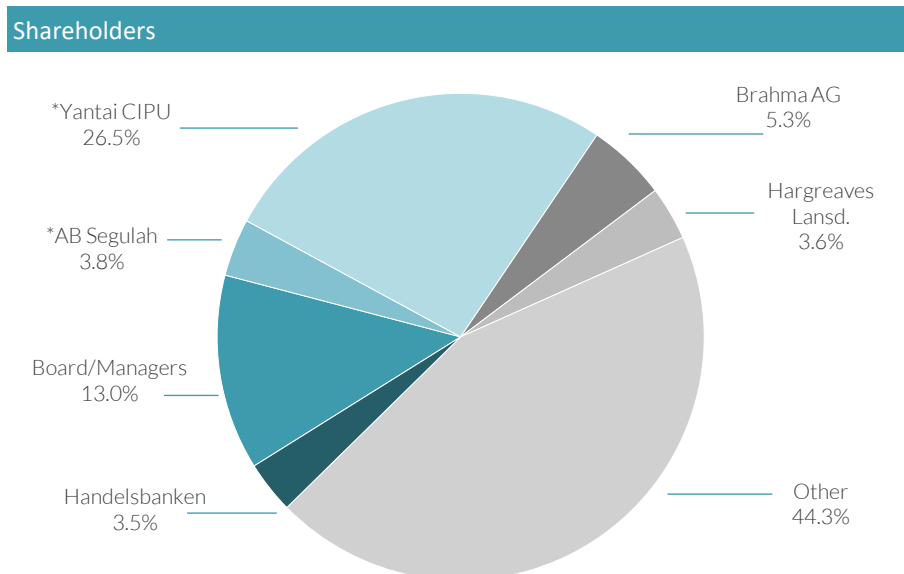
Medical Advisory Board

Medical Advisory Board	
Name	Affiliation
Prof. Ugo Amaldi	Founder and President of the TERA Foundation
Dr Hanne Kooy	Associate Director of Medical Physics at Harvard Medical School
Dr Margaret Spittle, OBE	Clinical oncologist at University College Hospital London
Dr Jay S Loeffler	Professor of Radiation Oncology at Harvard Medical School and Chair of Radiation Oncology at the Massachusetts General Hospital

Source: Company reports

Share capital

AVO has 169,566,092 ordinary shares in issue. There are currently 9.60m options, and 29.8m warrants outstanding.



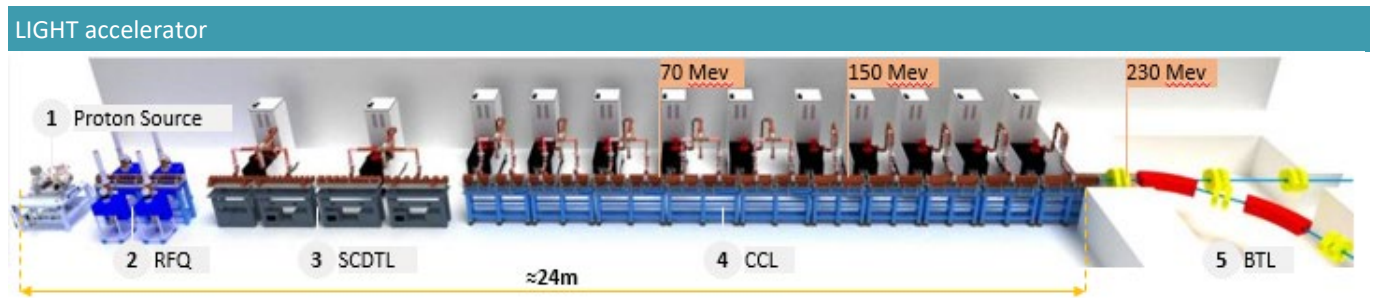
*Also members of the Board

Source: Company announcements, Hardman & Co Life Sciences Research

Appendix

The LIGHT accelerator

The LIGHT proton beam accelerator unit is composed of four main structures, which are integrated with delivery and patient positioning systems:



Source: Advanced Oncotherapy investor presentation

- ▶ **Proton source:** The proton source generates a very high rate of up to 200 pulses of protons per second (a rate higher than any competitor) from a source of hydrogen gas. The protons are accelerated to an energy level of 40keV.
- ▶ **Radio Frequency Quadrupole (RFQ):** This focuses the beam and accelerates the protons from 40keV to 5MeV. The RFQ structure is composed of four units, each designed to match the proton velocity. The RFQ unit has been designed by CERN. It operates at the highest frequency in the world, at 750MHz (compared with the closest RFQ at 400MHz), which allows the wavelength to be much shorter; this, in turn, allows the RFQ component to be shorter and more affordable.
- ▶ **Side Coupled Drift Tube Linac (SCDTL):** Manufactured by TSC and VDL, the SCDTLs, each with their own power unit, sit between the RFQ and the CCL components. The four low-speed accelerating units aim to accelerate the protons from 5MeV to 37.5MeV. Again, each unit is different, so that it matches the increasing velocity of the protons.
- ▶ **Coupled Cavity Linac (CCL):** This structure of high accelerating units is composed of up to 15 separate units to accelerate the proton beam from 37.5MeV to the clinically relevant energy of up to 230MeV (0.6x the speed of light).
- ▶ **Dose Delivery System (DDS, or 'nozzle'):** Once fully accelerated, the high-energy beam passes into the DDS, which ensures that the proton beam is both measured and targeted to maximise its effectiveness in cancer treatment.
- ▶ **Patient Positioning System (PPS):** This represents the end-part of the system and comprises several components that allow the optimal positioning of the patient for both imaging and therapy.

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