The value and capital layout of PET global technological innovation

Featured Article

Preface

In July of this year, Siemens Healthineers and Neusoft Medical successively released their latest PET/CT products. So far, National Medical Products Administration (NMPA) has issued “licenses” for the PET/CT products to be launched in China for more than ten medical companies such as GPS (short for GE, Philips and Siemens), Neusoft, United Imaging, and Canon. The medical giants and China's new medical companies are jointly competing for the huge market of China's high-end imaging of RMB 600-800 billion (the estimated data for the Chinese market in 2020).

Although some Chinese medical imaging companies have obtained "tickets" to compete with GPS on the same track, from the perspective of market share, the medical giants are still GPS. Some Chinese medical imaging companies still have gaps compared with GPS. However, Chinese medical imaging companies are also increasing investment in basic imaging technology, opening up their own innovation paths, differentiated technology paths and product layouts. All of those attract capital investment in subdivision of the track, and are taken as an entry point for them into a new track of high-end imaging.

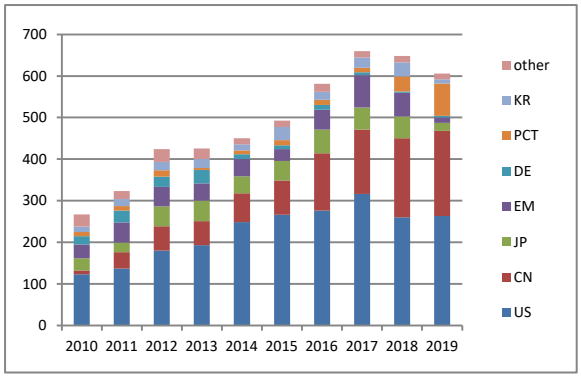
Taking patent intelligence as a starting point, this article discusses the trend of PET technology innovation from a global perspective, and provides a new perspective for companies and capital to find new opportunities.

1. The data basis of global PET field technical intelligence analysis

This article analyzes the patent information in the field of PET or PET related technologies, and then reflects the technical development trend in this field. To this end, through patent information retrieval, there are a total of 6,810 technological innovations in this technical field worldwide, involving 30,778 patents, which are located in more than 20 countries including the United States, China, Japan, Germany, and EU and PCT patent organizations.

In order to avoid repeated statistics and truly reflect the content of technological innovation, the following analysis is based on 6,810 technological innovations.

2. Overview of technology development in the global PET field

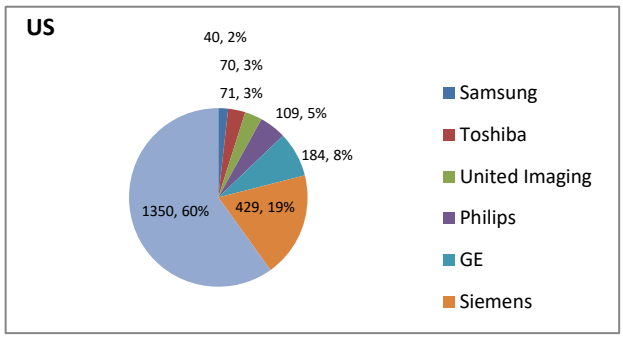


In the past ten years, the patent layout of PET in global technological innovation has been steadily increasing year by year. In recent years, it has maintained an annual output of 600+ technological innovations. Among them, the United States is the most important country in this field of technological innovation and commercial target markets.

Since 2010, China has increased investment in research and development, and the results of technological innovation have grown rapidly. At the same time, China's high-end medical imaging equipment (PET is one of them) has a commercial market of hundreds of billions and is an important market for multinational companies to compete for. Patents go ahead to build a technical firewall in the commercial market.

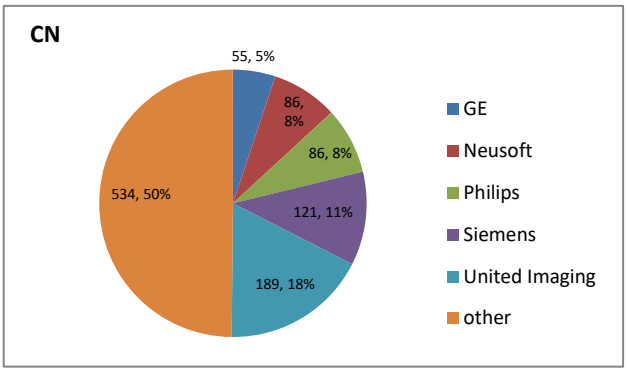
In addition, Japan has maintained a certain amount of innovative technology output, among which Toshiba, Hitachi, and Canon have a certain accumulation in the PET field. In the field of technological innovation in Europe, Germany, as an innovation representative in the PET field, directly applies for EP patent protection for its core technological output to obtain a greater legal and commercial market protection.

3. Comparison and analysis of technology holders in the PET field between China and US in the past decade



As shown in the figure above, in the past ten years, the companies that hold the patent technology holdings in the PET field in the United States include Siemens, GE, and Philips. The United Imaging from China is close to Philips in terms of patent holdings, which is equivalent to Toshiba from Japan. Among them, United Imaging's technical reserves and technological innovations in the past five years have produced a batch of patents to be deployed in the US market and serve future business goals. In addition, more than half of the innovation patents are scattered in many companies and scientific research institutions with a small number of patents, for example Japanese companies such as Canon and Hitachi, and Stanford University in the United States, etc.

For this reason, the United States has diversified sources of technological innovation in the field of PET technology, and the industrial realization comes from a few leading companies, forming a trend of "GPS super, some companies strong, and much more companies research".

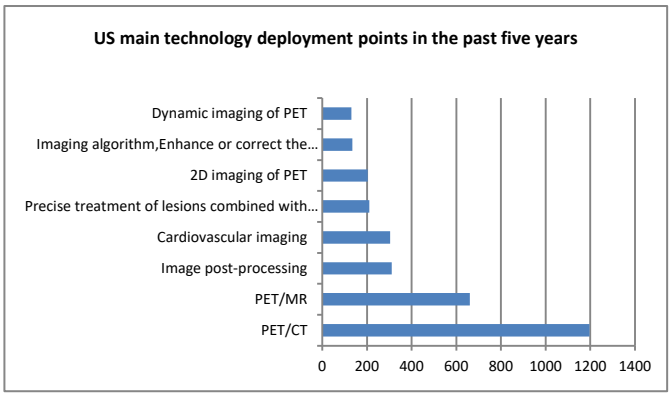


As shown in the figure above, the companies that hold patent technology holdings in the PET field in China in the past ten years include United Imaging, Siemens, Philips, Neusoft and GE. In the Chinese market, in addition to the traditional GPS head companies, United Imaging and Neusoft have also joined the competition in the commercial market of this field. However, China has significantly fewer patents in the PET field than the United States, and the vertical depth of China's PET technical reserves need to be further strengthened and precipitated.

4. Comparison and analysis of major innovations in the PET field between China and US in the past five years

As important commercial application markets, China and the United States have deposited a

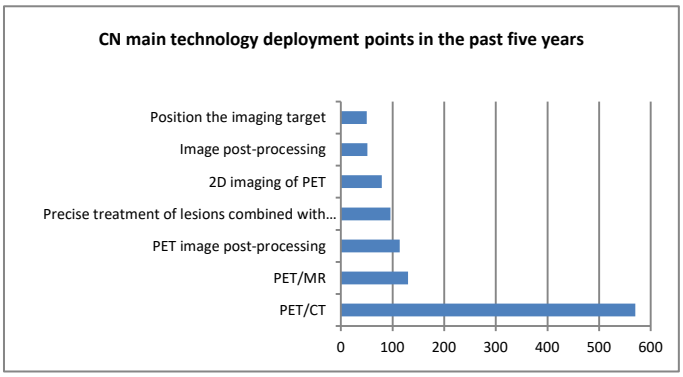
large number of patents of multinational giants, such as GPS's patents. This not only reflects the technological advantages, but also builds a firewall in the commercial market that is in line with the giants' commercial interests. The firewall (technical threshold) settings between each other should be analyzed to know yourself and understand others.



Cluster analysis is performed on patent data to reflect the category of patent technology innovation points. The abscissa indicates the number of patents owned in the category (the same below).

As can be seen from the above figure, in the past five years, the United States' key technical content for improvement is specifically reflected in the integration of PET/CT and PCT/MR technologies, and both of them have related commercial products. Comparing and analyzing from the perspective of absolute number of patents, the number of PET/CT commercial applications is relatively high, which can be judged from the number and trend of patented technological innovations.

In addition, in the technical field of PET, the United States has advantages in cardiovascular imaging, which also cooperates with new imaging sequences/algorithms and image post-processing technologies. At the same time, precise treatment of lesions is achieved with the help of PET technology.

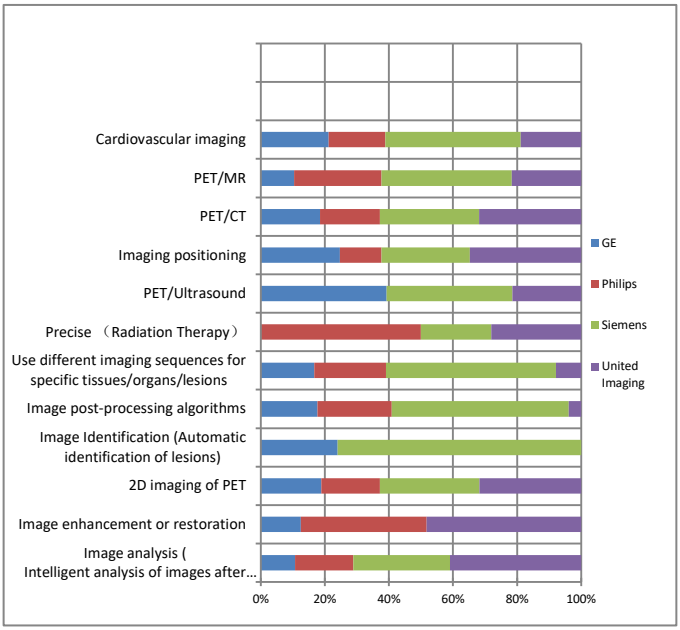


As can be seen from the above figure, in the past five years, in terms of China's key technical content for improvement, the mainstream technology direction is consistent with the US technology direction, but the number of patents deposited in China's PET technology is relatively small. In addition, Chinese companies have seized the demands of the market demand side, starting from the software field that is easy to achieve, and cutting into the high-end imaging track. For example, in the imaging field, rapid positioning can shorten imaging time and improve imaging efficiency, so as to solve the imaging needs of a large number of hospitals and patients in China.

The focus of technological development in China and the United States in the last five years is the combination of PET/CT, but China's investment in PET/CT research is more prominent, and PET/MR is also one of the key research and layout directions in the United States. In addition, the US research in the two fields of PET/CT and PET/MR, comparing and analyzing from the absolute number of patents, the United States surpasses China, reflecting the United States' leadership in this field from the side.

Furthermore, in the imaging and post-processing of images, especially for tumor, cardiovascular and other imaging are the core of imaging, and there are more optimizations at the algorithm level, combined with radiation and other methods for precise treatment of lesions, the United States has advantages. In addition to investing more in PET/CT, China has a certain research accumulation in image post-processing, imaging target positioning, and precision treatment combined with radiotherapy.

5. Comparison and analysis of the main innovations of GPS and United Imaging in the PET field in the past five years



Combining the above figure, select the most active companies in the global PET field in the past five years, take Siemens, United Imaging, Philips, and GE as the analysis objects, and grab some key technical fields to analyze the commonalities and differences of each company. See the technical characteristics that reflect the development of the PET field as following:

a. The product direction of GPS and United Imaging, namely PET/CT, is the commonality of all parties.

b. Siemens has the most prominent research layout in PET/MR, especially in using different sequence imaging which has specific characteristics for specific tissues/organs or lesions. Although the other three companies have some research, they are obviously weaker than Siemens.

c. GPS has obvious advantages in image enhancement or correction, that is, image post-processing algorithms, and the research output of United Imaging in this direction is weak.

d. In image analysis, especially the intelligent analysis of images after image segmentation, United Imaging has certain advantages over GPS. Siemens follows closely behind in this field, and Philips and GE are weaker.

Based on the above analysis, it can be seen that the technical focus of GPS research is almost the same, but at different levels. In addition, Siemens has obvious advantages, while Philips and GE are weaker. Although United Imaging lags behind GPS in many technical directions, it also has its own characteristics, that is, in the field of image segmentation, analyzing images to achieve accurate image recognition, improving the recognition rate of lesions, and enhancing the advantages of medical equipment in intelligence.

6. The attractiveness of China's capital market to high-end medical imaging

In the past three years, Chinese medical companies have grown rapidly in the field of medical imaging. At present, there are more than 6,000 medical equipment-related companies from Round A to Pre-IPO, more than 1,000 companies involved in the imaging field, and about RMB 80 billion of funds involved. Among them, 14 companies have raised more than RMB 1.5 billion in financing, such as MGI, WeDoctor Group, United Imaging Medical, and Yitu Medical.

Among them, United Imaging Medical is competitive in the segment of high-end imaging, its PET/CT products, and products in different high-end imaging fields such as PET/MR or MR. Patented technology information also reflects the advantages and characteristics of United Imaging Medical's independent innovation, and at the same time has been affirmed by the capital market and pursued by capital.

In the track of high-end medical imaging companies, capital favors emerging innovative companies, especially those with advantages in software and accumulation in hardware, but they are conservative with traditional Chinese medical device companies.

7. Value matrix of capital layout and patent layout

	safe and stable	treatment (Precise)	Fast	Price
TEC – PET				
TEC – CT				
TEC – MR				
Imaging – Image segmentation				
Imaging – AI				
Imaging – Big data				
Organ - Heart				
Organ - Blood vessel				
Organ - Lungs				
Organ - Brain				

In the above table, the cross node of the horizontal and vertical coordinates will fall into patent data, capital data, policy data, etc., and the model is constructed through related weighted analysis calculations and different business demands is indicated in different colors, which provides quantitative data for the development of enterprise technology and the investment direction of the capital side.

Specifically, combined with the above table (for reference only) and patent intelligence analysis, how will the capital be deployed in the face of the new subdivision track? In the face of technological development, how can enterprises build a technological firewall to gain market share and increase valuation?

The table only shows the new subdivision track from a certain perspective. For example: the advantages formed by the integration of imaging cross-technology, such as PET/CT, PET/MR, and even PET/ultrasound, etc.; the advantages formed by the integration of imaging and interventional equipment technologies, such as PET+radiotherapy, PET+interventional surgery, PET+focus positioning, etc.; imaging recognition improves the accuracy and efficiency of doctors' image reading, such as image post-processing + AI intelligent recognition, image post-processing + big data analysis of lesion prediction, image post-processing + data comparison adaptive judgment, etc.; imaging recognition is specifically aimed at the imaging of major organs, such as the heart, blood vessels, etc.; and designing special imaging sequences and imaging algorithms, etc.

Companies will choose the best subdivision of the track, and the capital will accurately invest resources on the corresponding track to bring value to the society and all parties involved.

8. Summary

Patent intelligence data can serve the technological innovation of enterprises and open up new innovation tracks; it can also build a market firewall for enterprises and maintain the value of the commercial market; meanwhile, it can also help enterprises attract capital and increase valuation. At the same time, the capital intelligence analysis of comprehensive patent intelligence data can find the best investment track and investment target for the capital side, so that the capital can get the best return.

In order to realize the above-mentioned value, high-quality patent layout, analysis and application of patent information, operation of patent public opinion and value, etc., are all important content and means to bring added value to enterprises and capital. Providing high-quality services across the entire industrial chain of intellectual property rights is not only intellectual property legal services, but also the integration of technological innovation, commercial markets, and capital investment and financing, providing support for the realization of the value of enterprises and capital, and achieving a win-win situation.

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