

ABI RESEARCH COMPETITIVE RANKING

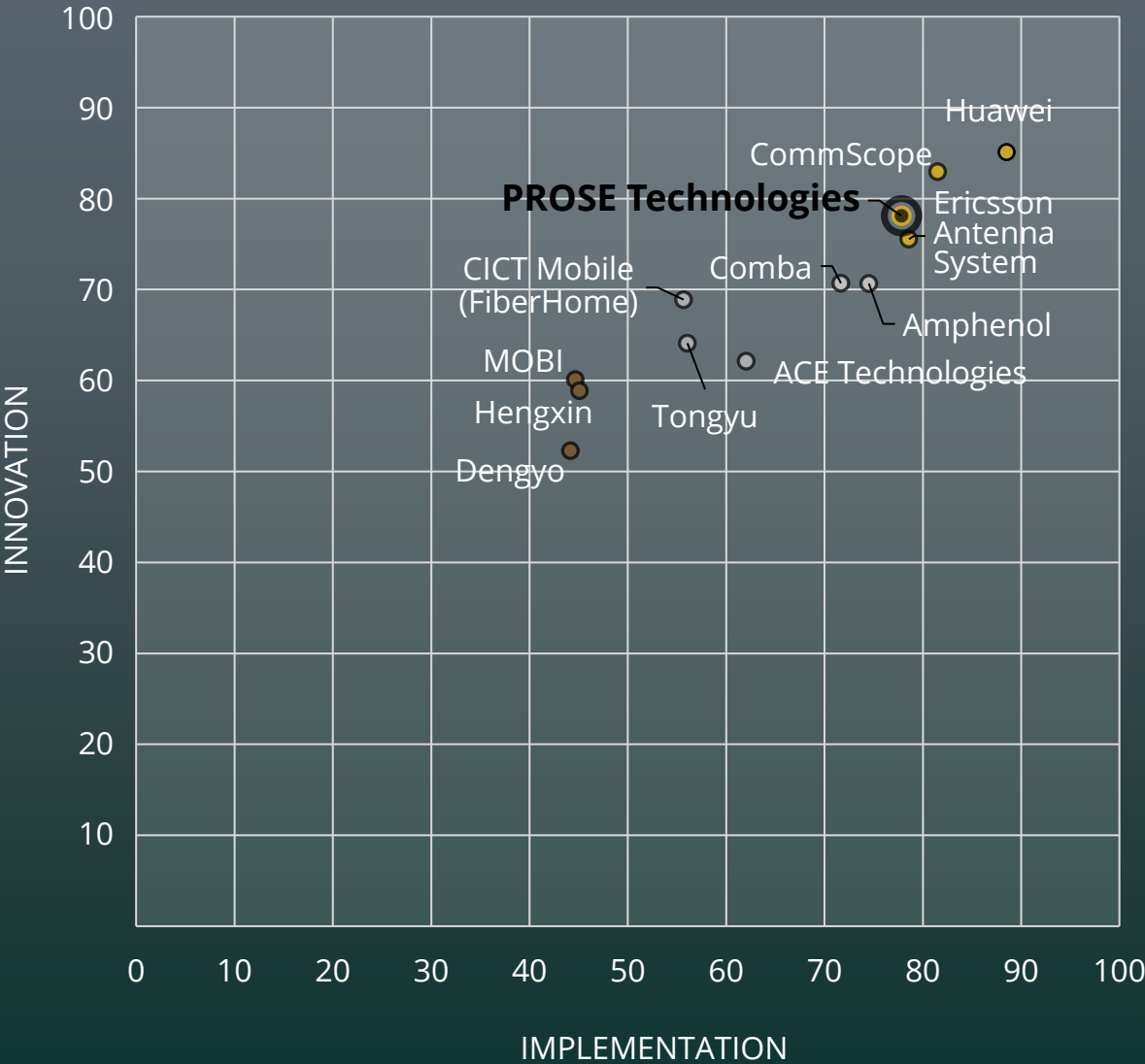
PASSIVE BASE STATION ANTENNAS

PROSE



OVERALL: 78.0 | INNOVATION: 78.1 | IMPLEMENTATION: 77.8 | RANK: 3

PROSE
TECHNOLOGIES
INNOVATION
VERSUS
IMPLEMENTATION
FOCUS



INNOVATION

PROSE



**INNOVATION
SCORE: 78.1**

Helping 100+ operators in 68 countries connect people to their work, life, and everything in between, PROSE Technologies, previously Rosenberger, is now an independent entity after a successful spin-out from Rosenberger Group. PROSE Technologies' areas of focus are on antenna and wireless coverage solutions. The main purpose of the spinout is to offer a stronger focus on those key areas of expertise to create better value to the market. PROSE Technologies has more than 3,500 employees with more than 40 subsidiaries, including sales and service offices, along with 4 factories, and 7 R&D centers worldwide. PROSE Technologies services more than 100 CSPs with its array of wireless solutions.

PROSE Technologies is also a member of the 1.5°C Supply Chain Leaders working together to drive climate action throughout the global supply chains and targeting to halve emissions before 2030 and achieve net zero emissions before 2050.

Multi-Band Capabilities: 22.6/30

PROSE Technologies scored a robust 22.6 points out of 30 for the multi-band capabilities category. PROSE Technologies' multi-band antenna ranges from single band up to 15 bands with support for frequency bands from 617 MHz to 5,925 MHz. The 30-port or 15-band antenna comes in at a width of 498 mm with 2.7 Meter (m) and 1.6 m variations. PROSE Technologies is one of the few vendors with a 15-band antenna solution.

To cater to the future, PROSE Technologies has included in its development roadmaps the relevant passive antenna variations to support CSPs in their rollout and upgrades. This includes both traditional multi-band FDD antennas, as well as FDD+TDD antennas. The company will be releasing a 32-port or 16-band antenna to support site-sharing deployments among different CSPs in the near-term.

Ultra-Wideband Capabilities: 24.5/30

For the UWB category, PROSE Technologies scored a high 24.5 points out of 30. PROSE Technologies' UWB antennas come in various FDD, TDD, multi-beam, and hybrid antenna solutions, including, for example, the 1,427–2,690 MHz platform. The company also offers UWB capability in the low-band (617–960 MHz). At the same time, PROSE Technologies also has antennas with UWB capabilities in the 3,300–4,200 MHz or 2,300–3,800 MHz frequency range.

INNOVATION

PROSE



**INNOVATION
SCORE: 78.1**

Essential IP & R&D: 19.4/25

PROSE Technologies scored a high 19.4 points out of 25 for the essential IP & R&D category. In 2022, the company focused on developing more innovative solutions together with radio OEMs and CSPs, such as building new and advanced multi-beam capabilities and multi-sector solutions. The company also holds several key antenna technology patents, covering areas such as the redesign of antenna dipole array configurations and redesigning of peripheral products (e.g., antenna shape, mounting brackets, etc.), thereby displaying its strong R&D capabilities in this field.

Additionally, PROSE continues to make significant R&D investments in better production automation and material science. As outlined by the company's commitment to sustainability, PROSE Technologies has embarked on key initiatives such as reducing material usage, switching to recyclable and renewable materials, cable-free antenna designs, and adopting a platform-based and modular design for its antennas. Globally, PROSE Technologies has 7 R&D centers and a sizable number of R&D engineers.

Antenna Configuration & Maintenance: 11.6/15

In the Antenna Configuration & Maintenance category, PROSE Technologies scored an excellent 11.6 out of 15 points. For CSPs facing challenges in deployment cost, network sharing is one avenue to accelerate deployment. PROSE Technologies has worked on and continues to develop more advanced solutions that support site sharing among multiple operators (i.e., a single antenna support for multiple Radio Units (RUs)).

Wind load is a constant challenge and factor that CSPs look at. To help CSPs reduce the wind load and ensure a safe and stable deployment, PROSE Technologies has incorporated patented design into their passive base station antennas to reduce wind load.

Additionally, PROSE's antennas are equipped with field-exchangeable RET systems (AISG 3.0 ready) that allow CSPs to adjust the tilt angle of the antenna without requiring on-site maintenance staff. PROSE Technologies has also worked on enabling antennas and RUs to communicate and coordinate based on the AISG bus, which helps CSPs reduce the time required for antenna configuration.

IMPLEMENTATION

PROSE



**IMPLEMENTATION
SCORE: 77.8**

Overall Antenna Sales Market Share: 33.8/45

In 2022, PROSE Technologies maintained its 3rd place position in ABI Research's market share ranking with 8.5%. This is facilitated by PROSE Technologies' continued expansion into new markets and growth in demand with some of its largest existing CSPs customers.

Antenna Sales Regional Geographical Penetration: 16.3/20

PROSE Technologies scored an excellent 16.3 points out of 20 for this criterion. The company is well established in the Asia-Pacific region and has a footprint in the Middle East, Africa, Europe, and the Americas. PROSE has been expanding its presence in key markets such as India, being awarded the Airtel Value Leader award from Bharti Airtel in August 2022. Beyond India, PROSE Technologies reported that it has also continued to make expansion and new entries into major emerging markets, such as Southeast Asia and other regions, supported by agreements with key global operators and OEMs with significant global footprints. The CSPs in some of these markets work with a limited financial budget and tend to be more price sensitive. The successful entry into these markets highlights the company's capabilities to be flexible and meet heterogeneous demands.

Major Antenna Customer Contract Wins: 12.5/15

As mentioned in the previous paragraph, PROSE Technologies has managed to not only expand into new markets, but also obtain growth in demand from some of its key CSP customers. The company is also able to meet the requirements for unique project conditions. For example, working with Hong Kong Telecom in March 2022, the vendor was able to support the deployment of more than 1,000 base station antennas at a large COVID-19 quarantine facility in Tsing Yi within 7 days. PROSE Technologies continues to leverage its strong business model to capture new and emerging market opportunities. Therefore, PROSE Technologies scored a strong 12.5 points out of 15 on this criterion.

IMPLEMENTATION

PROSE



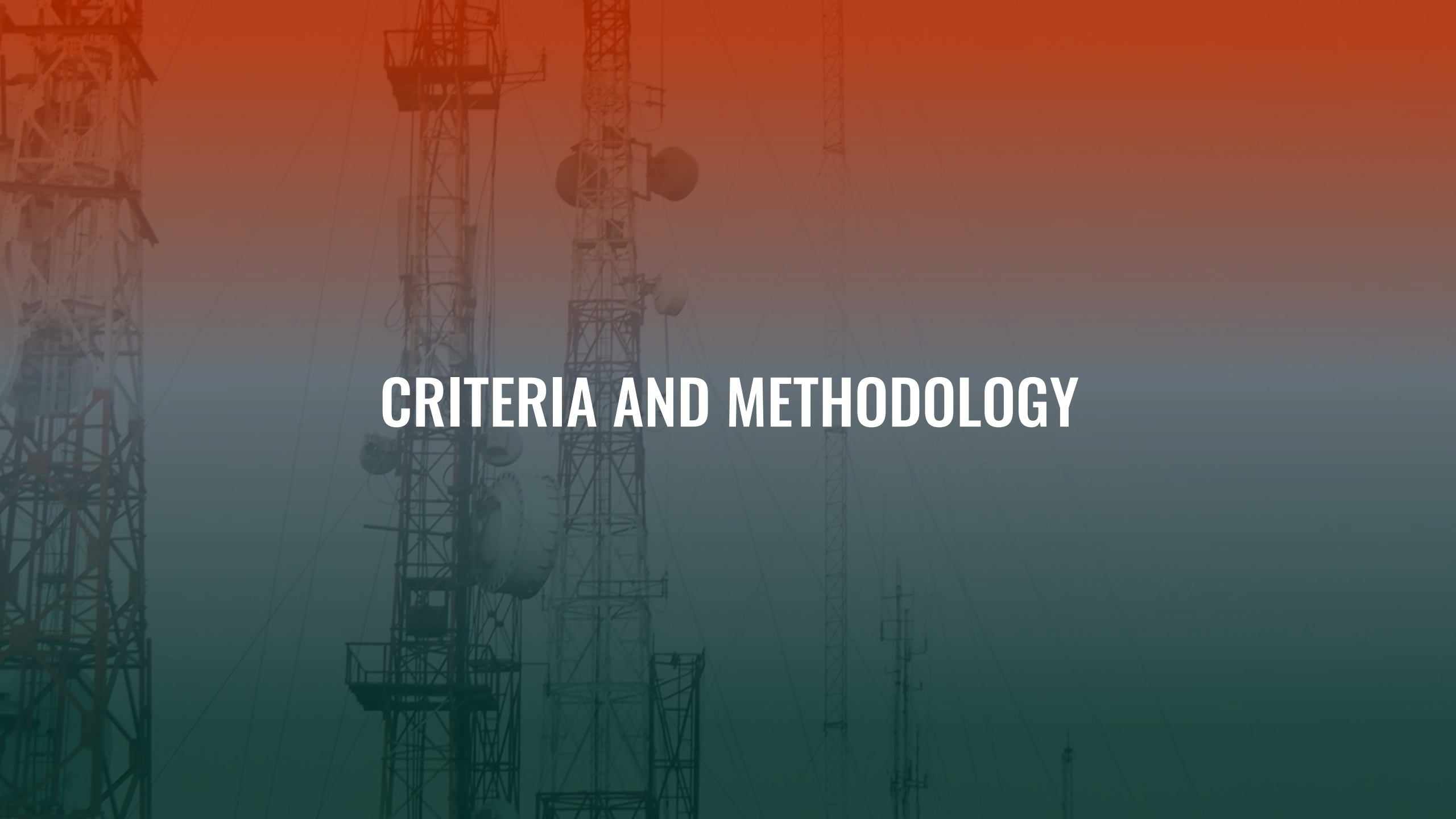
**IMPLEMENTATION
SCORE: 77.8**

Financial & Organizational Health: 3.4/5

PROSE Technologies scored 3.4 points out of 5 for this category in 2022. The company set lofty expectations for the Asia-Pacific region moving forward and committed US\$20 million to its India-based Pune facility to double its manufacturing capacity. Along with a series of strong existing and new partnerships announced by PROSE Technologies, the company continues to have a positive outlook moving forward and is expected to be in a financially sound position.

Vendor's Antenna Portfolio: 11.9/15

PROSE Technologies scored an excellent 11.9 points out of 15 for the antenna portfolio category. The company has an extensive product portfolio for base station antennas, which includes multi-band, multi-beam, FDD+TDD hybrid, and beamforming antennas. In addition, the company has continued to develop its capabilities in the Active + Passive platform category to meet CSPs' need to overcome deployment challenges. To cater to the future of 5G, PROSE Technologies also has 5G active antenna-related solutions. These include the antenna array units, as well as filter units.



CRITERIA AND METHODOLOGY

VENDOR MATRIX

Methodology: After individual scores are established for innovation and implementation, an overall company score is established using the Root Mean Square (RMS) method:

$$\text{Score} = \sqrt{\frac{\text{innovation}^2 + \text{implementation}^2}{2}}$$

The resulting overall scores are then ranked and used for percentile comparisons.

The RMS method, in comparison with a straight summation or average of individual innovation and implementation values, rewards companies for standout performances.

For example, using this method, a company with an innovation score of nine and an implementation score of one would score considerably higher than a company with a score of five in both areas, despite the mean score being the same. ABI Research believes that this is appropriate as the goal of these matrices is to highlight those companies that stand out from the others.

RANKING CRITERIA

Leader: A company that receives a score of **75 or above** for their overall ranking

Mainstream: A company that receives scores **between 60 and 75** for their overall ranking

Follower: A company that receives a score of **60 or below** for their overall ranking

Innovation Leader: A company that receives a score of **75 or above** for their innovation ranking.

Implementation Leader: A company that receives a score of **75 or above** for their implementation ranking.

INNOVATION CRITERIA

Multi-Band Capabilities: Degree of support for multi-band capabilities,* but also needs to deliver high gain and coverage. This criterion is given a weighting of 30 out of 100 points.

Ultra-Wideband Capabilities: How extensive is the vendor's antenna support for UWB capabilities, while also supporting high gain and coverage? This criterion is given a weighting of 30 out of 100 points.

Essential Intellectual Property and R&D: Level of Intellectual Property (IP), also factors in collaborative partnerships, and quality of the antenna design and manufacturing process. This also encapsulates innovations that the company released to improve on product performance. This segment can also include any other innovations that are relevant to the passive base station antenna market undertaken by the vendors. This criterion is given a weighting of 25 out of 100 points.

Antenna Configurability and Maintenance: Degree of maintenance, quality of materials and components to resist downtime of antenna, and simplicity of configuration, Self-Organizing Network (SON) and Remote Electrical Tilt (RET). Conformance to the Antenna Interface Standards Group (AISG) requirements, which develops and sets out the standards for the control and monitoring interface between base stations and tower-top equipment, including antennas with RET, will also be considered. This criterion is given a weighting of 15 out of 100 points.

For this report, **low bands are defined as frequencies below 1 GHz, **lower mid-bands** as frequencies between 1 GHz and 2.6 GHz, and **upper mid-bands** as frequencies between 3.5 GHz and 6 GHz.*

IMPLEMENTATION CRITERIA

Overall Antenna Sales Market Share: The greater the market share in terms of revenue, the higher the ranking.* This criterion is given a weighting of 45 out of 100 points.

Antenna Sales Regional Geographical Penetration: Partly based on sales presence in each global region. Also, the more regions the vendor's clients are in, the higher the ranking. This criterion is given a weighting of 20 out of 100 points.

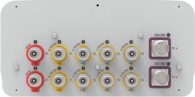
Financial and Organizational Health: Based on the size of overall firm sales and operating margin. Tries to assess how robust the vendor is to shocks and to fund internal needs, such as R&D, regional distribution, channel expansion, etc. This criterion is given a weighting of 5 out of 100 points.

Major Antenna Customer Contract Wins: Weights based on significant clients. Major player decisions often reassure/guide small operators. Operators have a herding instinct. This criterion is given a weighting of 15 out of 100 points.

Vendor's Antenna Portfolio: Range of portfolio. Does the portfolio support all the protocols, have a wide range of spectrum bands, and competitive pricing? This criterion is given a weighting of 15 out of 100 points.

**Vendors are requested to fill out a questionnaire and requested to participate in an interview. If confidential data provided under a Non-Disclosure Agreement are presented to ABI Research, they are evaluated, but not fully presented in this report.*

ANTENNA DEFINITIONS

Antenna Type	Multi-Band	Ultra-Wideband	Active + Passive	FDD	TDD	FDD+TDD
Description	An antenna designed to operate in multiple bands of frequencies.	Antennas that support wider frequency channels for higher data throughput.	Consist of both active and passive antenna elements.	Supports Frequency Division Duplex (FDD) frequencies (separated by a guard band).	Supports Time Division Duplex (TDD) frequencies. Transmissions use the same channel but transmit in different time slices.	Supports both FDD and TDD frequencies.
Examples	 6 ports (3 bands) 22 ports (11 bands)	 690-960 Megahertz (MHz) (2 ports) & 1427-2690 MHz (4 ports)		 690-960 MHz (2 ports) & 1695-2690 MHz (8 ports)	 2300-2690 MHz (2 ports) & 3300-3800 MHz (2 ports)	 690-960 MHz (2 ports) & 1695-2690 MHz (8 ports) & 3300-3800 MHz (2 ports)

Source: COMBA Telecom

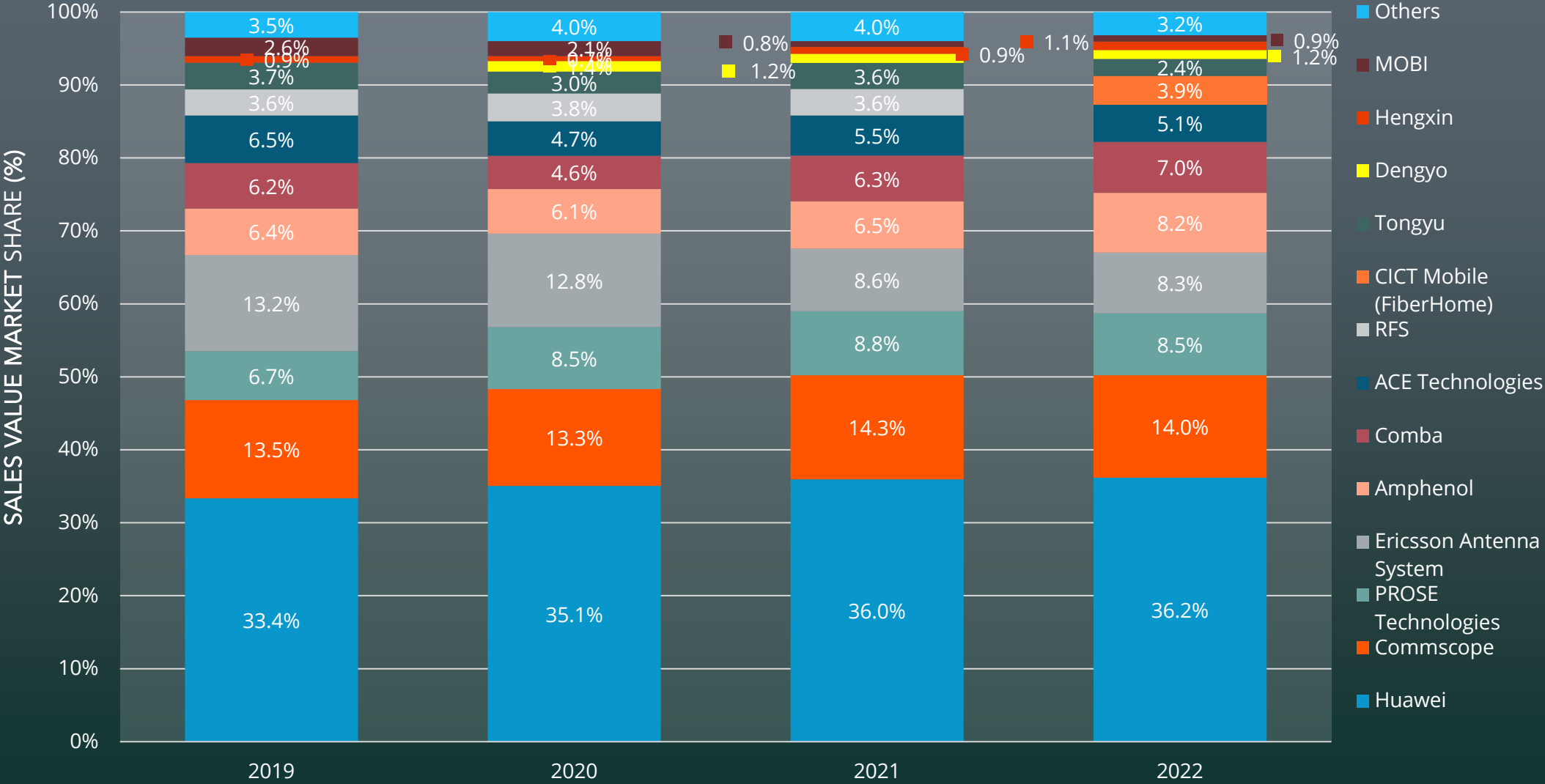
2022 MARKET SHARE & VENDOR RANKING

In terms of the market share in 2022, Huawei continues to rank in 1st place with 36.2%, consistent with its performance in 2021. CommScope remains as the 2nd largest vendor in the market with 14.0% market share. The 3rd position is occupied by PROSE Technologies and closely followed by Ericsson Antenna System in 4th position with 8.5% and 8.3%, respectively. Amphenol Antenna Solutions, having acquired RFS, stayed in the 5th position with 8.2% market share. In 6th position is Combat Telecom, followed by ACE Technologies (7th), CICT Mobile (FiberHome) (8th), Tongyu Communications (9th), Dengyo USA (10th), Hengxin (11th), and MOBI (12th).

For the 2022 Vendor Matrix, Huawei continues to pull itself away from the other vendors in the top right quadrant. This is underpinned by Huawei's strong and consistent innovative culture. CommScope remains in 2nd position, the next in line after Huawei. PROSE Technologies and Ericsson Antenna System remain at 3rd and 4th position, respectively.

A key change for the 2022 Vendor Matrix is the increase in Amphenol's scoring, which was boosted by its acquisition of RFS. Comba Telecom also saw impressive growth and made noticeable upward progress in the Vendor Matrix. Lastly, Hengxin was observed to post strong results and innovations in 2022, thereby helping the company climb to the 11th position.

2022 MARKET SHARE





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New York, NY 11771 USA
Tel: +1 516-624-2500
www.abiresearch.com

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