

ABI RESEARCH COMPETITIVE RANKING

PASSIVE BASE STATION ANTENNA MARKET

PROSE



OVERALL: 76.6 | INNOVATION: 75.9 | IMPLEMENTATION: 77.4 | RANK: 3

OVERALL COMPETITIVE RANKINGS

LEADERS

 HUAWEI	1	88.1
COMMSCOPE®	2	80.7
PROSE	3	76.6
ERICSSON 	4	75.1

MAINSTREAM

 Amphenol ANTENNA SOLUTIONS	5	70.0
Comba	6	68.1
 RADIO FREQUENCY SYSTEMS	7	61.5
 ACE Technologies	8	60.0

FOLLOWERS

 TONGYU COMMUNICATION	9	57.0
MOBI 摩比	10	51.5
 DENRYO	11	48.4
 HENGXIN TECHNOLOGY 亨鑫科技	12	39.6

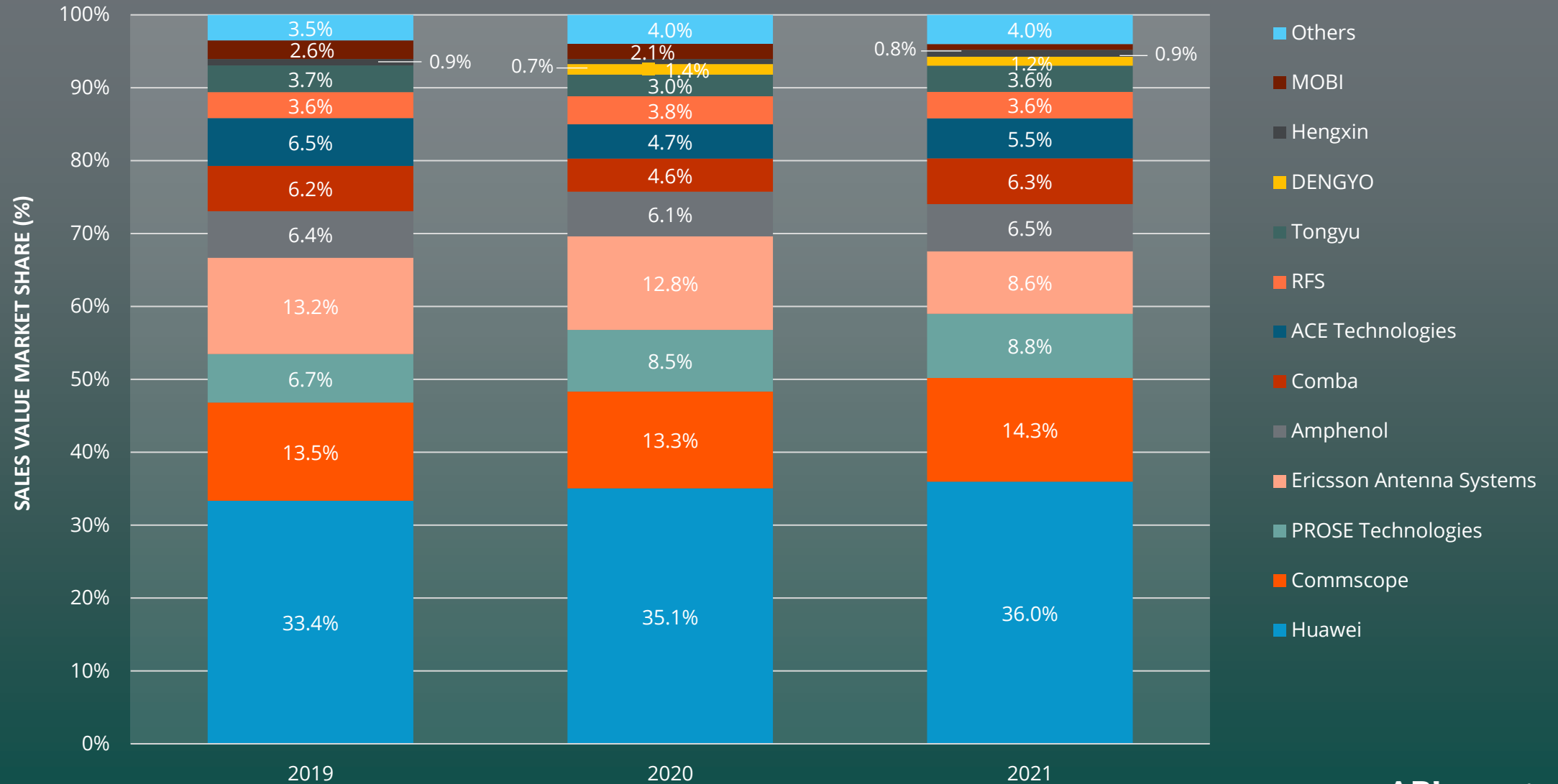
2021 MARKET SHARE & VENDOR RANKING

In terms of the market share in 2021, Huawei continues to rank in first with 36%, an increase of 0.9% from 2020. CommScope remains as the second largest vendor in the market with 14.3% market share. However, in 2021, the third position is occupied by PROSE Technologies (previously Rosenberger) and closely followed by Ericsson Antenna System in fourth position with 8.8% and 8.6%, respectively. Amphenol Antenna Solutions stayed in fifth position for 2021 with 6.5% market share. In sixth position is Comba Telecom, which has swapped position with ACE Technologies in seventh position. In eighth position is Radio Frequency Systems followed closely by Tongyu Communications. Radio Frequency Systems (RFS) inched out ahead of Tongyu Communications in market share. DENGYO USA, Hengxin, and MOBI lined up to finish the ranking for 2021.

For the 2021 vendor matrix, Huawei continues to pull itself away from the other vendors in the top right quadrant. This is underpinned by Huawei's continued innovative culture to be years ahead of the current market. CommScope remains in second position, next in line after Huawei. However, a key change for 2021 is in the third position where PROSE Technologies has moved up a rank inching out ahead of Ericsson Antenna System. PROSE Technologies and Ericsson Antenna System have also both made it into the leader category. Another key change for the 2021 vendor matrix is the rise of Comba Telecom to the sixth position and into the mainstream category. RFS has also crossed the line to enter into the mainstream category. ACE Technologies, DENGYO, MOBI, Tongyu, and Hengxin make up the remaining vendors ranked in order for the vendor matrix.

MARKET SHARE RANKING

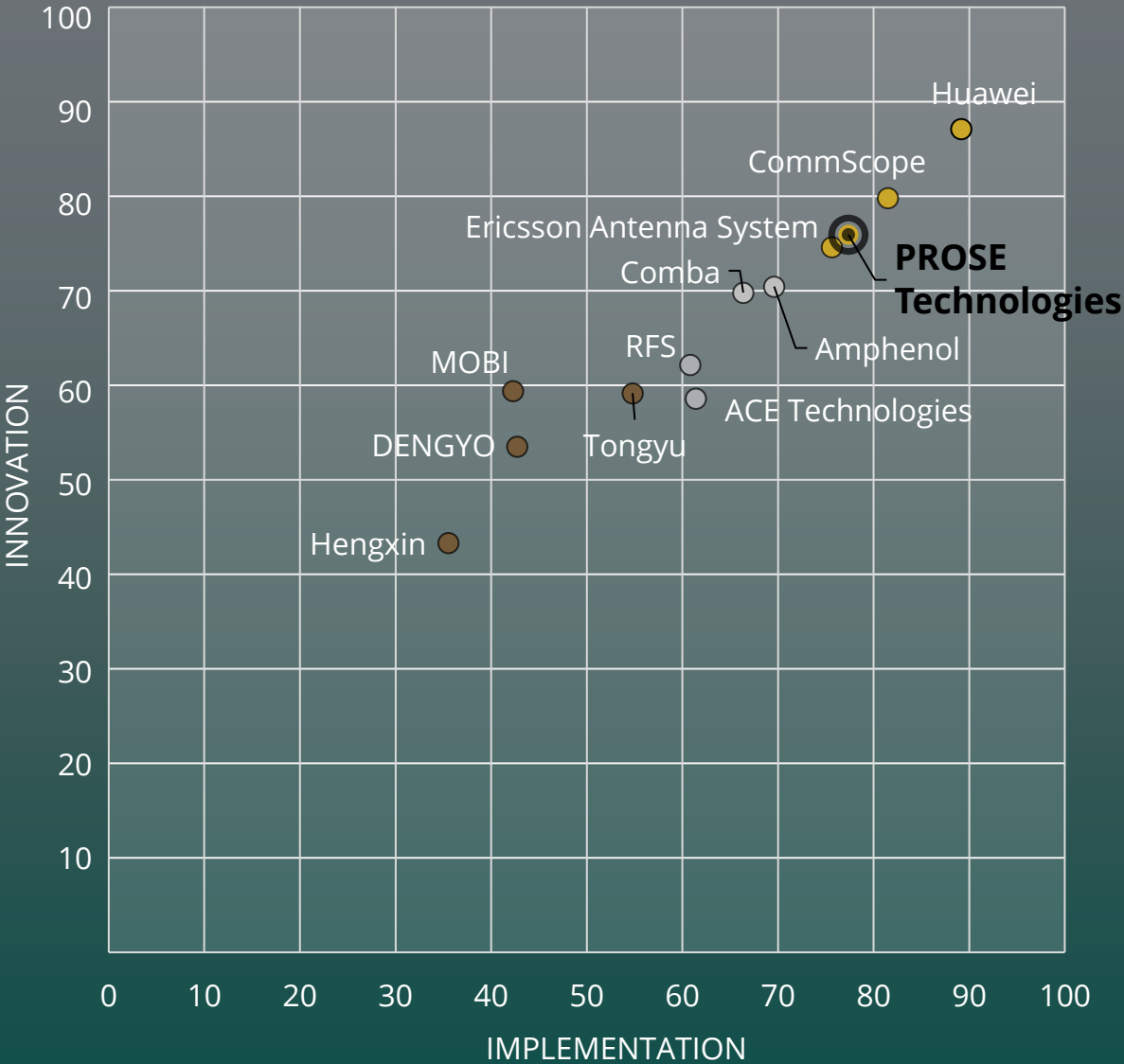
PASSIVE BASE STATION ANTENNA REVENUE, WORLD MARKETS, 2019 TO 2021





PROSE
TECHNOLOGIES
INNOVATION
VERSUS
IMPLEMENTATION
FOCUS

OVERALL: 76.6 | INNOVATION: 75.9 | IMPLEMENTATION: 77.4 | RANK: 3



INNOVATION

PROSE



**INNOVATION
SCORE: 75.9**

PROSE Technologies, previously Rosenberger, is now an independent entity after a successful spin-off from Rosenberger Group. PROSE Technologies is the Group's antenna and coverage solution unit and the spin-off seeks to provide PROSE with greater focus and autonomy to better realize value add for its customers. PROSE Technologies has more than 3,500 employees with 25 subsidiaries sales/service offices, 3 factories, and 4 R&D centers globally. PROSE Technologies services more than 100 CSPs globally with its wireless solutions.

PROSE Technologies is also a member of the 1.5°C Supply Chain Leaders working 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: 22.0/30

PROSE Technologies scored a good 22.0 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 600 MHz to 3,800 MHz. The 30 ports or 15 band antenna comes in at a width of 498 mm with 2.7 m and 1.6 m variations. PROSE Technologies is one of the few vendors with a 15-band antenna solution. PROSE's antennas are equipped with field-exchangeable RET systems, which allows CSPs to adjust the tilt angle of the antenna without requiring maintenance staff up the tower.

To cater for the future, PROSE Technologies has included in its development roadmaps the relevant passive antennas variations to support CSPs in their rollouts and upgrades. This include both traditional multi-band FDD antennas and FDD+TDD antennas.

UWB Capabilities: 23.3/30

For the UWB capabilities, Rosenberger scored a high 23.3 points out of 30. Rosenberger's UWB antennas come in various hexa-bands and nona-bands covering, for example, the 1,427 – 2,690 MHz. In 2021, the company also realized its UWB capability in the low band (617 MHz – 960 MHz); for example, in the 18 ports/nona-band antennas. At the same time, PROSE Technologies also has antennas with UWB capabilities in the 2,300 MHz to 3,800 MHz frequency bands.

INNOVATION

PROSE



**INNOVATION
SCORE: 75.9**

Essential IP & R&D: 19.4/25

PROSE Technologies scored an excellent 19.4 points out of 25 for the essential IP & R&D category. In 2021, the company embarked on forming deeper cooperation with radio Original Equipment Manufacturers (OEMs) to support 5G rollouts aside from the passive antennas.

Additionally, PROSE has made significant R&D investments in better production automation and material science. This translates into PROSE's ability to compete where the pricing by CSPs is more sensitive. Other key innovations include the redesign of dipole arrays and components within the base station antennas and redesigning of peripheral products (e.g., mounting brackets). Globally, PROSE Technologies has four R&D centers and a sizable number of R&D engineers.

Antenna Configuration & Maintenance: 11.3/15

In the antenna configuration & maintenance category, PROSE Technologies scored an excellent 11.3 out of 15 points. For CSPs facing challenges in deployment cost, network sharing is one avenue to accelerate deployment. PROSE Technologies has worked on enabling single antenna support for multiple RUs.

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

PROSE Technologies has also worked on enabling antennas and the RUs to communicate and coordinate based on the Antenna Interface Standards Group (AISG) bus. This is important in helping ease the antenna configuration time, addressing details like which RET controls which antenna array and the frequency ranges.

IMPLEMENTATION

PROSE



**IMPLEMENTATION
SCORE: 77.2**

Overall Antenna Sales Market Share: 32.8/45

In 2021, PROSE Technologies made it across the line to take the third position in ABI Research's market share ranking with 8.8%. This is an increase of 0.3% compared to the previous year. PROSE Technologies cited expansion into new markets and growth in demand with some of its largest existing CSP customers.

Antenna Sales Regional Geographical Penetration: 16.7 /20

PROSE Technologies scored an excellent 16.7 points out of 20 for this criterion. The company is well established in the Asia-Pacific region and has footprints in the Middle East, Africa, Europe, and the Americas. PROSE has also been expanding its market to more emerging markets in 2021 compared to 2020. Major emerging markets have been cited by PROSE Technologies in which it made expansions and new entries. The CSPs in some of these markets work with a limited financial budget, so they are 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: 12.3/15

PROSE Technologies has managed to not only expand into new markets, but also obtain growth in demand from some of its key CSPs customers. Therefore, PROSE Technologies scored an excellent 12.3 points out of 15 for this criterion. These customers are in various regions, including Latin America, Europe, Asia-Pacific, and Africa. PROSE Technologies continue to leverage its unique business model to capture new and emerging market opportunities.

IMPLEMENTATION

PROSE



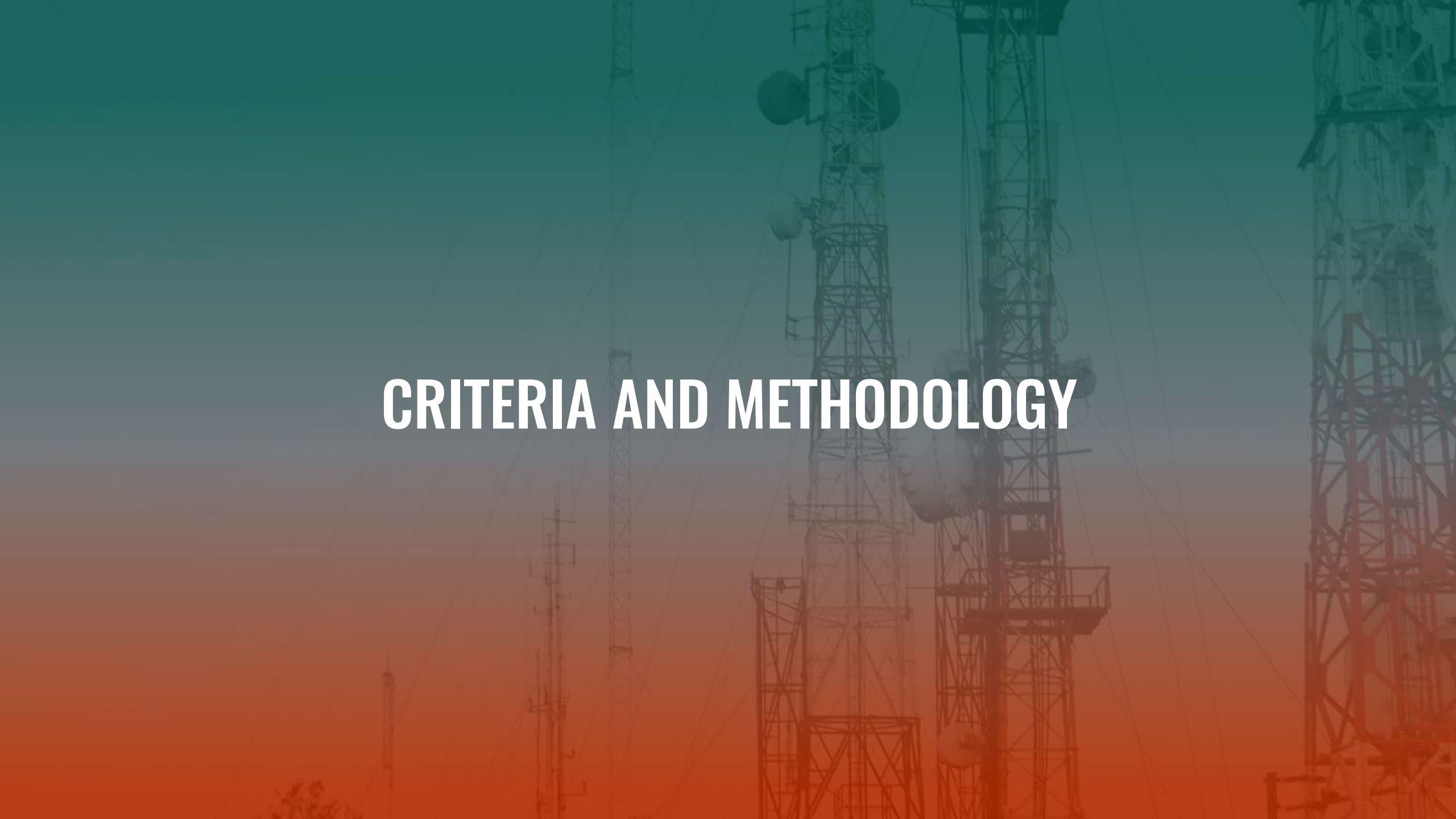
**IMPLEMENTATION
SCORE: 77.2**

Financial & Organizational Health: 3.8/5

PROSE Technologies scored 3.8 points out of 5 for this category in 2021. PROSE Technologies has seen its revenue increase in 2021 compared to 2020. At the same time, the company has a positive outlook moving into 2022 and, hence, 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-port, multi-band, multi-beam, TDD+FDD hybrid antennas. In addition, the company has continued to develop its capabilities in the active + passive platform 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 the filter units.

The background of the slide features a photograph of several tall, lattice-structured communication towers. The towers are silhouetted against a sky that transitions from a light blue at the top to a warm orange at the bottom. A semi-transparent gradient overlay, matching the sky's colors, is applied across the entire image. The text 'CRITERIA AND METHODOLOGY' is centered in a bold, white, sans-serif font.

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.

This competitive assessment is only for **passive macro base station antennas**.



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.

UWB 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, 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). This criterion is given a weighting of 15 out of 100 points.

IMPLEMENTATION CRITERIA

Overall Antenna Sales Market Share: The greater the market share in terms of revenue, the better 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 better 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.



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