UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF TEXAS
MARSHALL DIVISION

THE RESEARCH FOUNDATION FOR THE STATE UNIVERSITY OF NEW YORK and UNIVERSITY OF CONNECTICUT and WORCESTER POLYTECHNIC INSTITUTE, Plaintiffs, v. XIAOMI CORPORATION, XIAOMI H.K. LTD., XIAOMI COMMUNICATIONS CO., LTD., XIAOMI INC., AND ZEPP HEALTH CORPORATION Defendants.	Case No. 2:23-cv-00353 Jury Trial Demanded

FIRST AMENDED COMPLAINT FOR PATENT INFRINGEMENT

Plaintiffs The Research Foundation for The State University of New York, University of Connecticut, and Worcester Polytechnic Institute (collectively, "Plaintiffs" and/or "the Universities"), by and through their counsel, file this Complaint against Xiaomi Corporation, Xiaomi H.K. Ltd., Xiaomi Communications Co., Ltd., Xiaomi, Inc., and Zepp Health Corporation (collectively, "Defendants") for infringement of United States patent nos. 8,417,326 ("the '326 patent"), 9,408,576 ("the '576 patent"), 9,713,428 ("the '428 patent"), 9,986,921 ("the '921 patent"), 10,278,647 ("the '647 patent"), 10,285,601 ("the '601 patent"), and 10,653,362 ("the '362 patent") (collectively, the "patents-in-suit"), and allege as follows:

NATURE OF THE ACTION

1. This is an action for infringement of the patents-in-suit arising under the patent laws of the United States, 35 U.S.C. §§ 100, *et seq.* Specifically, this action relates

Exhibit 2002
IPR2025-00522

to patents directed to the monitoring and/or detection of smartwatch wearers' physiological functions.

PARTIES

2. Plaintiff The Research Foundation for The State University of New York (the "Research Foundation") is a non-profit educational corporation duly organized and existing under the laws of the State of New York, having a principal place of business at 35 State Street, Albany, New York 12207.

3. Plaintiff University of Connecticut ("UConn") is a constituent unit of the State of Connecticut, having a business address at 352 Mansfield Road, Storrs, Connecticut 06269.

4. Plaintiff Worcester Polytechnic Institute ("WPI") is a charitable corporation organized and existing under the laws of Massachusetts, having a principal place of business at 100 Institution Road, Worchester, Massachusetts 01609.

5. On information and belief, Defendant Xiaomi Corporation is a corporation organized and existing under the laws of the Cayman Islands, with a place of business at Maples Corporate Services Limited, P.O. Box 309, Ugland House, Grand Cayman, KY1-1104, Cayman Islands. On information and belief, Xiaomi Corporation makes and sells smartwatches in the world and the United States. On information and belief, Xiaomi Corporation does business in Texas and in the Eastern District of Texas, directly or through its subsidiaries.

6. On information and belief, Defendant Xiaomi Communications Co., Ltd. is a corporation organized and existing under the laws of the People's Republic of China,

with its principal place of business at Xiaomi Office Building, 68 Qinghe Middle Street, Haidian District, Beijing, China 100085. On information and belief, Xiaomi Communications makes and sells smartwatches in the world and the United States. On information and belief, Xiaomi Communications does business in Texas and in the Eastern District of Texas, directly or through its subsidiaries.

7. On information and belief, Xiaomi H.K., Ltd. is a corporation organized and existing under the laws of Hong Kong SAR, China, with its principal place of business at Unit 806, Tower 2 8/F, Cheung Sha Wan Plaza, 833 Cheung Sha Wan Road, Kowloon City, Hong Kong SAR, China. Xiaomi H.K. makes and sells smartwatches in the world and the United States. On information and belief, Xiaomi H.K. does business in Texas and in the Eastern District of Texas, directly or through its subsidiaries.

8. On information and belief, Xiaomi, Inc. is a corporation organized under the laws of the People's Republic of China, with its principal place of business at Xiaomi Office Building, 68 Qinghe Middle Street, Haidian District, Beijing, China 100085. Xiaomi, Inc. makes and sells smartwatches in the world and the United States. On information and belief, Xiaomi Inc. does business in Texas and in the Eastern District of Texas, directly or through its subsidiaries.

9. Xiaomi Corporation, Xiaomi H.K., Ltd., Xiaomi Communications Co., Ltd., and Xiaomi, Inc., are referred to collectively hereinafter as "Xiaomi."

10. On information and belief, Defendant Zepp Health ("Zepp") is a corporation organized and existing under the laws of the People's Republic of China, with its principal place of business at Huami Global Innovation Center, Building B2,

Zhing'an Chuanggu Technology Park, No. 900 Wangjiang West Road, Hefei, 230088, People's Republic of China. Zepp is a leading manufacturer and seller of smartwatches in the world and in the United States. Upon information and belief, Zepp does business in Texas, directly or through its subsidiaries, and offers its products and/or services, including those accused herein of infringement, to customers and potential customers located in Texas, including in the Judicial District of the Eastern District of Texas.

11. Zepp's United States Securities and Exchange Commission Form 20-F ("the Form") demonstrates the relationship between Zepp and Xiaomi. Zepp manufactures Xiaomi products for distribution by Xiaomi in the United States. Zepp has a "strategic cooperation agreement with Xiaomi" that "grants [Zepp] the most-preferred-partner status globally to develop future Xiaomi Wearable Products." And "[h]istorically, [Zepp] derived a substantial majority of [its] revenues from the sales of Xiaomi Wearable Products. For the years ended December 31, 2020, 2021 and 2022, revenues from our Xiaomi Wearable Products segment represented 69.0%, 53.5% and 41.0% of our total revenues, respectively. In February 2023, we entered into a new business cooperation agreement with Xiaomi for the next two years, which will end in January 2025. The sales of smart band category across the world decreased throughout 2022. For future product collaborations, we will continue following a disciplined approach and focusing on the profitability and return on investment." *See* https://app.quotemedia.com/data/downloadFiling?webmasterId=101533&ref=317422664&type=HTML&symbol=ZEPP&cdn=0a230683c09fa66cecb10fad1311a2ef&company

Name=Zepp+Health+Corporation+American+Depositary+Shares&formType=20-F&dateFiled=2023-04-24#ITEM5OPERATINGANDFINANCIALREVIEWANDPROSP

12. Zepp and Xiaomi's manufacturing are intertwined. Zepp represents that it offers wearables under its own brands, Amazfit and Zepp, as well as designing and manufacturing the Mi Band series for Xiaomi. Zepp and Xiaomi "work together to determine the quantity to be produced, the final selling price, the distribution channel and promotional events." *Id.*

13. Lastly, the Form illustrates how Zepp and Xiaomi's manufacturing are intertwined by stating, for example, "We have developed a wide range of smart wearables that offers robust features at competitive pricing, primarily under our own brands, Amazfit and Zepp. Mi Band series is our smart band series that is designed and manufactured for Xiaomi." *Id.* "For Xiaomi Wearable Products, Xiaomi provides us with production forecasts on a rolling basis, which serves as the primary indicator for our component procurement effort." *Id.* "[W]e and Xiaomi work together to determine the quantity to be produced, the final selling price, the distribution channel and promotional events." *Id.*

14. Xiaomi, globally recognized as a leading company in smartwatch sales, is Zepp's principal customer. Zepp generates a significant portion of its revenue from the sale of Xiaomi Wearable Products, fully cognizant of their eventual distribution in the U.S. market. This understanding is underpinned by Xiaomi's prominent presence in the U.S., where it has previously outperformed other leading companies in smartwatch

sales during certain fiscal years. It is evident that Zepp, through its sales to Xiaomi, is directly engaged in the U.S. market.

15. On information and belief, Zepp's contribution to Xiaomi extends beyond simply supplying smartwatches for its product line. Zepp also imparts design and operations guidance/instructions, along with preparing some or all of the essential documentation, which includes guides, manuals, and specifications. These resources are specifically furnished to equip Xiaomi to effortlessly integrate them into its product packaging, marketing endeavors, and/or sales tactics intended for the U.S. market and customers in the E.D of Texas.

16. On information and belief, Defendants are engaged in making, using, offering for sale, selling, importing, or otherwise providing, within the United States and this Judicial District, directly or indirectly, physiological monitoring devices utilizing protected corresponding algorithms and/or related products and services, with features and functionalities that infringe the patents-in-suit. These acts of infringement include inducing and/or contributing to infringement in the U.S. of the patents-in-suits' claims.

JURISDICTION AND VENUE

17. This Court has subject matter jurisdiction under 28 U.S.C. §§ 1331 and 1338(a) because this action arises under the patent laws of the United States, 35 U.S.C. § 1 *et seq*., including 35 U.S.C. § 271.

18. Each Defendant is subject to this Court's personal jurisdiction consistent with the principles of due process and the Texas Long Arm Statute. Tex. Civ. Prac. & Rem. Code §§ 17.041, *et seq.*

19. Jurisdiction and venue for this action are proper in this Judicial District.

20. This Court has personal jurisdiction over Defendants at least because, through each and/or all of a respective Defendants' own acts and/or through the acts of each other Defendant acting as its agent, representative, or alter ego, they each (i) have a presence and/or a regular and established place of business in the State of Texas and this Judicial District; (ii) have purposefully availed themselves of the rights and benefits of the laws of the State of Texas and this Judicial District; (iii) have done and are doing substantial business in the State of Texas and this Judicial District, directly or through intermediaries, both generally and, on information and belief, with respect to the allegations in this Complaint, including their one or more acts of infringement in the State of Texas and this Judicial District; (iv) maintain continuous and systematic contacts in the State of Texas and this Judicial District; and/or (v) place products alleged to be infringing in this Complaint in the stream of commerce, directly or through intermediaries, with awareness that those products are likely destined for use, offered for sale, sold, and/or imported, in the State of Texas and this Judicial District.

21. For example, Defendants have authorized retailers and distributors in the State of Texas and this Judicial District for the products alleged to be infringing in this Complaint, and Defendants have derived substantial revenues from their infringing acts occurring within the State of Texas and this Judicial District.

22. Defendants have established sufficient minimum contacts with the State of Texas and this Judicial District such that they should reasonably and fairly anticipate being brought into court in the State of Texas and this Judicial District without offending traditional notions of fair play and substantial justice, and Defendants have purposefully directed activities at residents of the State of Texas and this Judicial District. Moreover, the patent infringement claims alleged herein arise out of or are related to one or more of the foregoing activities. On information and belief, a substantial part of the events giving rise to Plaintiffs' claims, including acts of patent infringement, have occurred in the State of Texas and this Judicial District.

23. Venue is proper in this Court under 28 U.S.C. §§ 1391 and 1400(b) because each Defendant is subject to personal jurisdiction in this Judicial District and has committed acts of infringement in this Judicial District. Each Defendant, through its own acts and/or through the acts of each other Defendant acting as its agent, representative, or alter ego, makes, uses, sells, offers to sell, and/or imports infringing products within this Judicial District, has a continuing presence within this Judicial District, and has the requisite minimum contacts with this Judicial District such that venue is proper.

24. Venue is proper as to each Defendant because each defendant is a foreign corporation and suits against foreign entities are proper in any judicial district under 28 U.S.C. § 1391(c)(3).

JOINDER

25. Plaintiff incorporates each of the preceding paragraphs as if fully set forth here.

26. Joinder is proper under at least Fed. R. Civ. P. 20 and 35 U.S.C. § 299 at least because Defendants' infringing conduct alleged herein arises out of the same transaction, occurrence, or series of transactions or occurrences relating to the making, using, importing into the United States, offering for sale, or selling of the same accused product or process, or portions thereof, and questions of fact common to all Defendants will arise in this action.

27. Zepp's relationship with Xiaomi involving not only distribution but also manufacturing, sufficiently fulfills the criteria for induced infringement. This partnership enables and encourages the unauthorized use of the patented technology that is the subject of the patents-in-suit. Zepp's knowledge of Xiaomi's presence in the U.S. market, coupled with its contribution to Xiaomi's product design, documentation and operational guidance, indicates an active role in facilitating patent infringement. Zepp encourages the acts accused of to be direct infringement of the patents-in-suit and has specific intent to encourage and thereby induce the direct infringement of the patents in the U.S., where it knew its accused manufactured products for Xiaomi would be sold and used.

28. On information and belief, Xiaomi and Zepp both make, use, import, offer for sale, and/or sell accused products. On information and belief, Xiaomi and Zepp infringes the patents-in-suit by, for example, making, using, importing, offering for sale,

and selling products incorporating the Plaintiffs' patents-in-suit. Thus, on information and belief, the common accused products are a defining characteristic for Xiaomi's and Zepp's infringement, and the factual question of infringement will thus substantially overlap for Xiaomi and Zepp.

BACKGROUND

The Patents-in-Suit

29. Since their introduction to the mass-consumer market, smartwatch usage has grown tremendously. By the end of 2021, more than 200 million people were smartwatch users and the revenue generated by such devices is nearly $40 billion, with growth expected to continue rising in upcoming years.[1]

30. A primary reason for owning and wearing smartwatches is the ability to obtain physiological information and health parameters from the watch. For example, at least one study showed that 42% of smartwatch users have discussed such health information with their doctors, and 92% of smartwatch users reported that they use smartwatches to maintain and manage their health.[2]

31. To compete in this growing market, companies such as Defendants have worked to ensure that their products offer the cutting edge health-related features their consumers desire.

[1] https://www.statista.com/forecasts/1314339/worldwide-users-of-smartwatches
[2] https://www.valuepenguin.com/fitness-tracker-smartwatch-health-survey

Exhibit 2002
IPR2025-00522

Dr. Chon's Research

32. From 2002 through 2010, Dr. Ki Chon worked as a faculty member at The State University of New York at Stony Brook ("Stony Brook University") in the Department of Biomedical Engineering. During his time at Stony Brook University, Dr. Chon, along with members of his research team, developed and co-invented, *inter alia*, algorithms and devices for the detection of physiological functions that do not suffer from the drawbacks of the prior art devices. Pursuant to The State University of New York ("SUNY") patent policy, these patents are owned or co-owned by the Research Foundation.

33. From 2010 through 2014, Dr. Chon was a professor and, subsequently, the Department Head of Biomedical Engineering at WPI. During his time as a faculty member at WPI, Dr. Chon worked with members of his research team to develop and co-invent a multitude of algorithms and systems for the detection of physiological functions that do not suffer from the drawbacks of the prior art devices. These patents are owned and co-owned by WPI.

34. Dr. Chon is currently a professor of biomedical engineering at UConn with previous appointments at SUNY and WPI.

35. Dr. Chon's and his team's research produced technology that could detect atrial fibrillation, atrial flutter, and atrial tachycardia in real time. Among other things, Dr. Chon and his team were exploring whether the technology could be brought to the mass-consumer market through new devices and sensors such as smartwatches, mobile phones, and even clothing.

36. After many years of work at Stony Brook University, WPI, and UConn, and with the help of public funding, the Universities filed for and obtained patents to protect Dr. Chon's and his team's proprietary developments.

37. The Universities now commence this patent infringement action on the patents-in-suit to address Defendants' infringement, to recognize Dr. Chon and his co-inventors' hard work and achievements, and to deter the future theft of publicly funded academic work for corporate profit.

United States Patent No. 8,417,326

38. U.S. Patent No. 8,417,326, entitled "RR Interval Monitoring Method and Blood Pressure Cuff Utilizing Same," (attached as Exhibit 1), was duly and legally issued on April 9, 2013.

39. The '326 patent will expire on August 4, 2028.

40. The inventors named on the '326 patent are Ki H. Chon and Ernst A. Raeder.

41. The '326 patent is directed to an apparatus and method for ambulatory, real-time detection of Atrial Fibrillation (AF) providing an overall accuracy that refers to the detection of AF, irrespective of the duration of AF and beat-to-beat classification.

42. The claims of the '326 patent are valid, enforceable, and not expired.

43. The '326 patent ultimately claims priority to U.S. Provisional Patent Application No. 60/953,508, filed on August 2, 2007, and U.S. Provisional Patent Application No. 61/084,389, filed on July 29, 2008.

44. The '326 patent solved multiple problems in the prior art and provided specific technical advancements, including as further described below.

45. In addition to the innovations set forth, the '326 patent overcame the limitation of having to obtain large databases of training data for AF detection and instead, provides for combining statistical techniques without the need for training data, allowing for higher accuracy in AF detection.

46. For the reasons set forth, the '326 patent claims are patent eligible because, *inter alia*, they provide specific technological benefits. *See* Exhibit 1.

47. All rights, title, and interest, including the right to sue for past infringement in the '326 patent are owned by and assigned to The Research Foundation for The State University of New York.

United States Patent No. 9,408,576

48. U.S. Patent No. 9,408,576, entitled "Detection and Monitoring of Atrial Fibrillation," (attached as Exhibit 2), was duly and legally issued on August 9, 2016.

49. The '576 patent will expire on May 12, 2034.

50. The inventors named on the '576 patent are Ki. H. Chon and Jowoon Chong.

51. The '576 patent is directed to an enhanced real-time realizable AF algorithm for the accurate detection of, and discrimination between, NSR, AF, PVC, and PAC.

52. The '576 patent ultimately claims priority to U.S. Provisional Patent Application No. 61/818,207, filed on May 1, 2013.

53. The ’576 patent solved multiple problems in the prior art and provided specific technical advancements, including as further described below.

54. In addition to the innovations set forth, the ’576 patent overcame the limitation of inaccurate AF algorithm methods that typically result in distortions, which can lead to the incorrect classification of the presence or absence of AF, and instead, an algorithm for the detection of PAC/PVC from a pulse interval signal derived from a smartphone is used as a real-time realizable and more efficient method for AF detection.

55. For the reasons set forth, the ’576 patent claims are patent eligible because, *inter alia*, they provide specific technological benefits. *See* Exhibit 2.

56. All rights, title, and interest, including the right to sue for past infringement in the ’576 patent are owned by and assigned to Worcester Polytechnic Institute.

United States Patent No. 9,713,428

57. U.S. Patent No. 9,713,428, entitled “Physiological Parameter Monitoring with a Mobile Communication Device,” (attached as Exhibit 3), was duly and legally issued on July 25, 2017.

58. The ‘428 patent will expire on April 23, 2032.

59. The inventors named on the ’428 patent are Ki. H. Chon, Jinseok Lee and Nandakumar Selvaraj.

60. The ’428 patent is directed to systems and methods that enable physiological health monitoring with a mobile communication device and further

allows the detection of motion artifacts in a manner such that results reported are of acceptable quality.

61. The ’428 patent ultimately claims priority to U.S. Provisional Patent Application No. 61/434,862, filed on January 21, 2011, U.S. Provisional Patent Application No. 61/512,199, filed on July 27, 2011, U.S. Provisional Patent Application No. 61/434,856, filed on January 21, 2011, and U.S. Provisional Patent Application No. 61/566,329, filed on December 2, 2011.

62. The ’428 patent solved multiple problems in the prior art and provided specific technical advancements, including as further described below.

63. In addition to the innovations set forth, the ’428 patent overcame the limitation of inaccurate AF algorithm methods that typically result in distortions, which can lead to the incorrect classification of the presence or absence of AF, and instead, an algorithm and system are used to enable physiological monitoring with a mobile communication device that allows detection of motion artifacts so that the results reported are of acceptable quality.

64. For the reasons set forth, the ’428 patent claims are patent eligible because, *inter alia*, they provide specific technological benefits. *See* Exhibit 3.

65. All rights, title, and interest, including the right to sue for past infringement in the ’428 patent are co-owned by Worcester Polytechnic Institute and the Research Foundation for The State University of New York and assigned to Worcester Polytechnic Institute.

United States Patent No. 9,986,921

66. U.S. Patent No. 9,986,921, entitled "Detection and Monitoring of Atrial Fibrillation," (attached as Exhibit 4), was duly and legally issued on June 5, 2018.

67. The '921 patent will expire on May 1, 2035.

68. The inventors named on the '921 patent are Ki. H. Chon and Jowoon Chong.

69. The '921 patent is directed to a real-time arrhythmia discrimination method for use in smartphones, which can discriminate between NSR, AF, PACs, and PVCs by utilizing pulsatile time series collected from a smartphone's camera.

70. The '921 patent ultimately claims priority to U.S. Provisional Patent Application No. 61/987,057, filed on May 1, 2014.

71. The '921 patent solved multiple problems in the prior art and provided specific technical advancements, including as further described below.

72. In addition to the innovations set forth, the '921 patent overcame the limitation of inaccurate detection of AF in the presence of many PAC/PVC episodes interspersed with NSR because the presence of many PAC/PVC episodes interspersed with NSR can mimic the random dynamics of the AF. Instead, an enhanced real-time realizable AF algorithm is used for accurate detection of, and discrimination between, NSR, AF, PVC, and PAC.

73. For the reasons set forth, the '921 patent claims are patent eligible because, *inter alia*, they provide specific technological benefits. *See* Exhibit 4.

74. All rights, title, and interest, including the right to sue for past infringement in the '921 patent are owned by and assigned to Worcester Polytechnic Institute.

United States Patent No. 10,278,647

75. U.S. Patent No. 10,278,647, entitled "Method and Apparatus for Removing Motion Artifacts from Biomedical Signals," (attached as Exhibit 5), was duly and legally issued on May 7, 2019.

76. The '647 patent will expire on January 24, 2037.

77. The inventors named on the '647 patent are Ki. H. Chon, Seyed M. A. Salehizadeh, and Yeonsik Noh.

78. The '647 patent is directed to a method and corresponding apparatus employing a time-varying spectral analysis approach for reconstructing a heart-related signal that includes motion artifacts.

79. The '647 patent ultimately claims priority to U.S. Provisional Patent Application No. 62/299,944, filed on February 25, 2016, and U.S. Provisional Patent Application No. 62/172,862, filed on June 9, 2015.

80. The '647 patent solved multiple problems in the prior art and provided specific technical advancements, including as further described below.

81. In addition to the innovations set forth, the '647 patent overcame the limitation of inaccurate estimation of a heart rate and changing arterial oxygen saturation from a heart-related signal, such as a PPG signal during intense physical activity resulting in inaccurate heart rate and oxygen rate estimation due to motion

artifacts from strenuous and high intensity exercise and instead, a method and corresponding apparatus is used to employ a time-varying spectral analysis approach for reconstructing a heart-related signal that includes motion artifacts.

82. For the reasons set forth, the '647 patent claims are patent eligible because, *inter alia*, they provide specific technological benefits. *See* Exhibit 5.

83. All rights, title, and interest, including the right to sue for past infringement in the '647 patent are owned by and assigned to the University of Connecticut.

United States Patent No. 10,285,601

84. U.S. Patent No. 10,285,601, entitled "Detection and Monitoring of Atrial Fibrillation," (attached as Exhibit 6), was duly and legally issued on May 14, 2019.

85. The '601 patent will expire on May 1, 2035.

86. The inventors named on the '601 patent are Ki. H. Chon and Jowoon Chong.

87. The '601 patent is directed to a real-time arrhythmia discrimination method for use in smartphones, which can discriminate between NSR, AF, PACs, and PVCs using pulsatile time series collected from a smartphone's camera.

88. The '601 patent ultimately claims priority to U.S. Provisional Patent Application No. 61/987,057, filed on May 1, 2014.

89. The '601 patent solved multiple problems in the prior art and provided specific technical advancements, including as further described below.

90. In addition to the innovations set forth, the '601 patent overcame the limitation of inaccurate detection of AF in the presence of many PAC/PVC episodes interspersed with NSR because the presence of many PAC/PVC episodes interspersed with NSR can mimic the random dynamics of AF and instead, a real-time realizable AF algorithm is used for accurate detection of, and discrimination between NSR, AF, PVC, and PAC.

91. For the reasons set forth, the '601 patent claims are patent eligible because, *inter alia*, they provide specific technological benefits. *See* Exhibit 6.

92. All rights, title, and interest, including the right to sue for past infringement in the '601 patent are owned by and assigned to Worcester Polytechnic Institute.

United States Patent No. 10,653,362

93. U.S. Patent No. 10,653,362, entitled "Motion and Noise Artifact Detection and Reconstruction Algorithms for Photoplethysmogram and Equivalent Signals," (attached as Exhibit 7), was duly and legally issued on May 19, 2020.

94. The '362 patent will expire on November 28, 2037.

95. The inventors named on the '362 patent are Ki. H. Chon, Jo Woon Chong, Duy Dao, and Hamed Salehizadeh.

96. The '362 patent is directed to a pulse oximeter embedded with a motion and noise artifact (MNA) detection algorithm based on extraction of time-varying spectral features that are unique to the clean and corrupted components.

97. The '362 patent ultimately claims priority to U.S. Provisional Patent Application No. 62/109,183, filed on January 29, 2015.

98. The '362 patent solved multiple problems in the prior art and provided specific technical advancements, including as further described below.

99. In addition to the innovations set forth, the '362 patent overcame the limitation of inaccurate detection of heart rates and oxygen saturation values during body movements and instead, a pulse oximeter embedded with a motion and noise artifact detection algorithm is used to extract time-varying spectral features that are unique to the clean and corrupted components for accurate heart rate and oxygen saturation detection.

100. For the reasons set forth, the '362 patent claims are patent eligible because, *inter alia*, they provide specific technological benefits. *See* Exhibit 7.

101. All rights, title, and interest, including the right to sue for past infringement in the '362 patent are owned by and assigned to Worcester Polytechnic Institute.

Xiaomi Watches

102. On information and belief, Xiaomi manufactures and sells multiple models and/or versions of the Xiaomi Smartwatches. *See* https://www.mi.com/global/product-list/wearables attached as Exhibit 8.

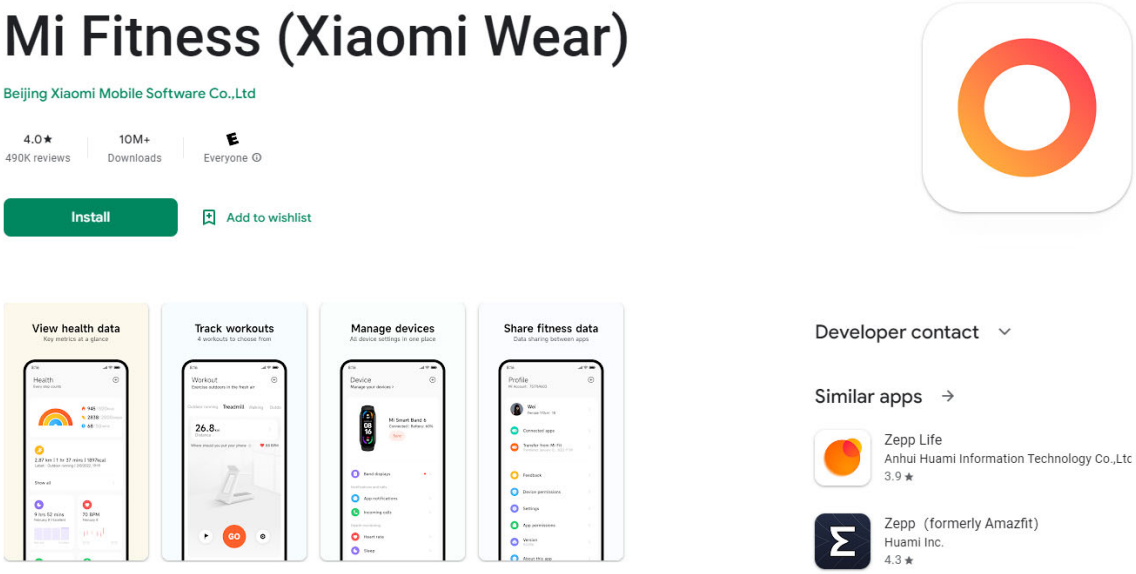
103. On information and belief and as stated above, the Mi Band watch series is manufactured and sold by Zepp. *See* https://app.quotemedia.com/data/downloadFiling?webmasterId=101533&ref=317422

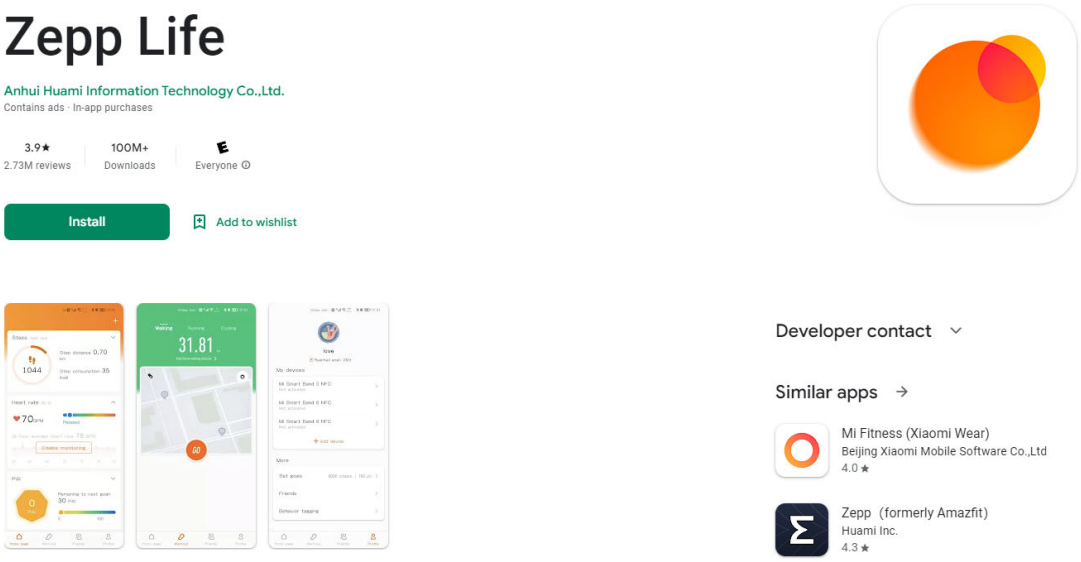
664&type=HTML&symbol=ZEPP&cdn=0a230683c09fa66cecb10fad1311a2ef&companyName=Zepp+Health+Corporation+American+Depositary+Shares&formType=20-F&dateFiled=2023-04-24#ITEM5OPERATINGANDFINANCIALREVIEWANDPROSP

104. Xiaomi offers one mobile app called "Mi Fitness" mobile app. However, the Mi Band watch series connects to both Zepp's "Zepp Life" app and Xiaomi's "Mi Fitness" app. This dual app connectivity for the Mi Band series is shown below.

FAQs:
How to set the language:
Zepp Life App: My -> Mi Band -> Band Settings -> Band Language.
Mi Fitness App: Device->System Settings->Bracelet Language.

105. The Mi Band series uses both the Xiaomi "Mi Fitness" mobile app and Zepp's "Zepp Life" mobile app as shown below.





106. As stated on Xiaomi's website, the Xiaomi Smartwatches provide "Real time heart rate all day long and delivers precise reviews in easy-to-read graphs. The band will vibrate to alert when your heart rates fall out of the safe zone." *See* https://www.mi.com/global/product/xiaomi-smart-band-7-nfc/

107. Xiaomi's website also lists, generally, the Xiaomi watches' main features, noting their ability to answer "daily exercise concerns" *Id.*

108. The Professional Workout analysis features include at least the following: "VO2 Max analysis, Training load analysis and an overall rating of your hardwork." *Id.*

109. The Xiaomi Watch S1 Active Model is shown in the image below. The watch is featured in the Xiaomi Watch S1 Active User Manual as an example of the various models and/or versions of the Xiaomi Smartwatches that Xiaomi manufactures, uses, sells, offer to sell, and/or imports into the United States. *See* https://manuals.plus/xiaomi/watch-s1-active-global-version-smartwatch-manual#axzz83svIdY8q



Zepp Watches

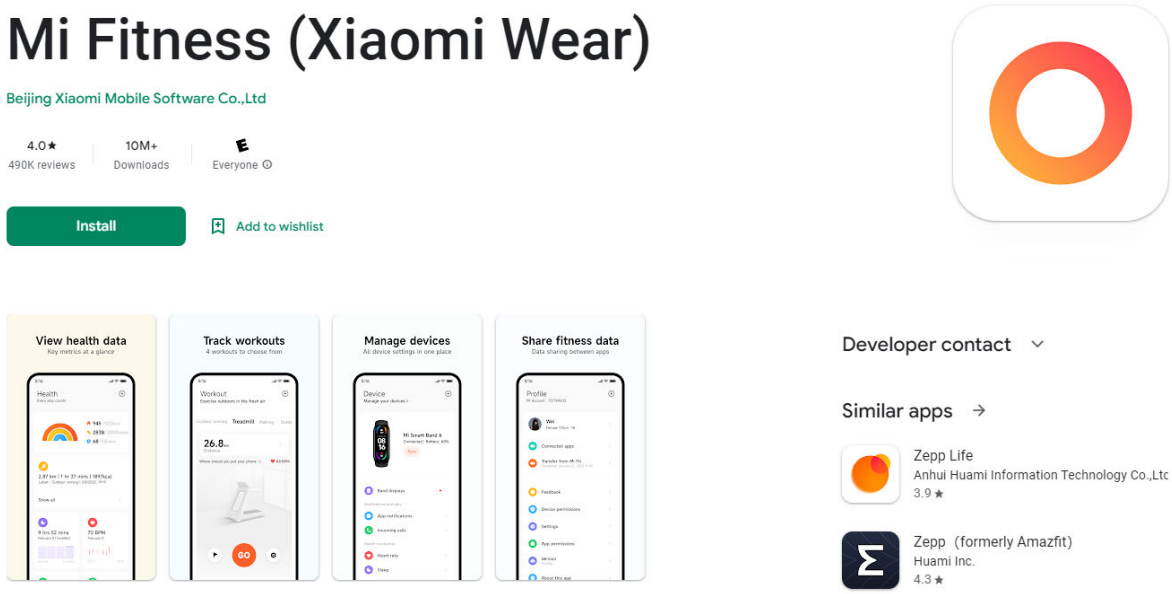
110. On information and belief, Zepp manufactures and sells multiple models and/or versions of the Zepp Smartwatches. *See* https://www.amazfit.com/pages/watch-classify attached as Exhibit 9.

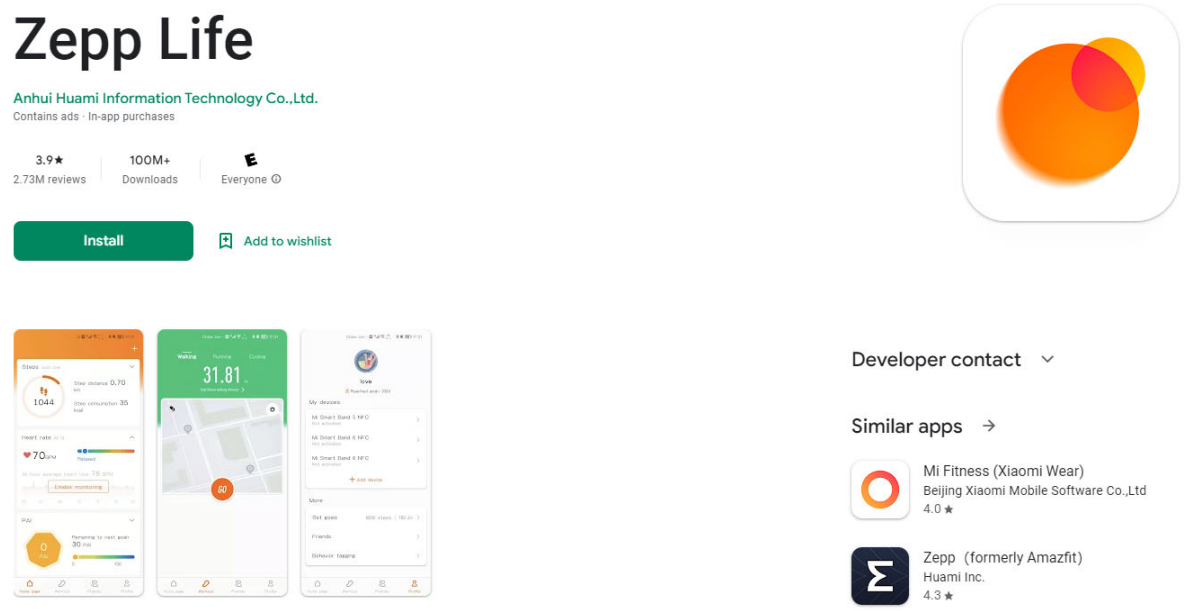
111. On information and belief, the Mi Band watch series is manufactured and sold by Zepp and Xiaomi. *See* https://app.quotemedia.com/data/downloadFiling?webmasterId=101533&ref=317422664&type=HTML&symbol=ZEPP&cdn=0a230683c09fa66cecb10fad1311a2ef&companyName=Zepp+Health+Corporation+American+Depositary+Shares&formType=20-F&dateFiled=2023-04-24#ITEM5OPERATINGANDFINANCIALREVIEWANDPROSP

112. Zepp offers two mobile apps. One app is "Zepp Life," formerly known as the "Mi Fit" mobile app. The second app is "Zepp" app, formerly known as the "Amazfit" mobile app. The Mi Band series connects to both Zepp's "Zepp Life" app and Xiaomi's "Mi Fitness" app. *Id.* This dual app connectivity for the Mi Band series is shown below.

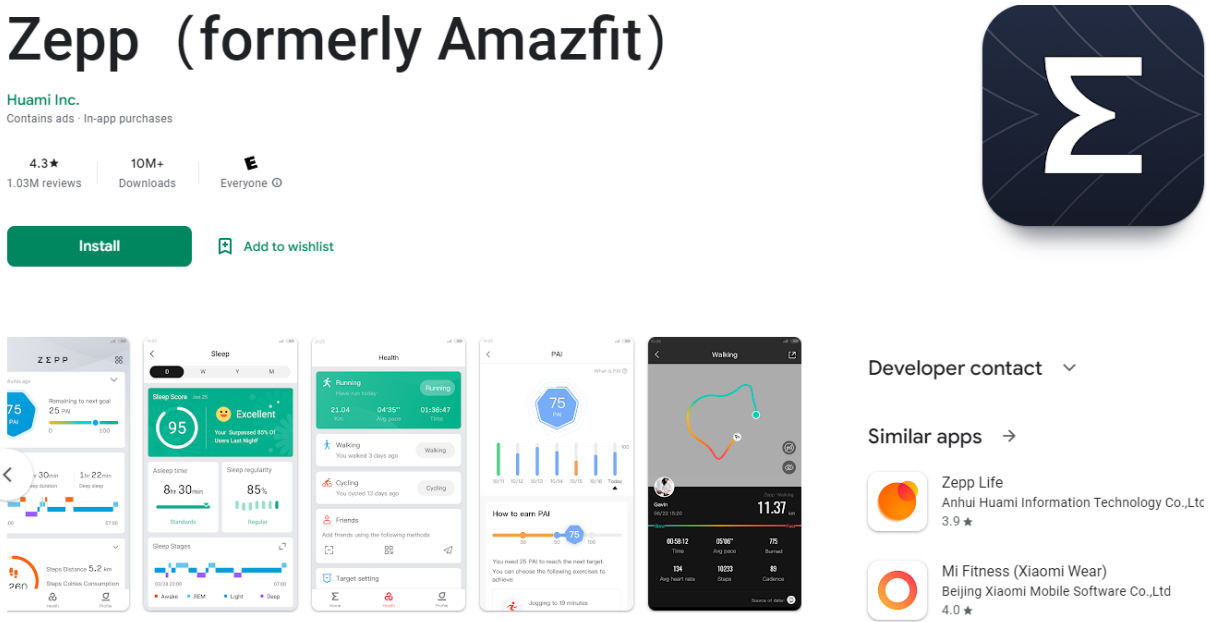
FAQs:
How to set the language:
Zepp Life App: My -> Mi Band -> Band Settings -> Band Language.
Mi Fitness App: Device->System Settings->Bracelet Language.

113. The Mi Band series uses both the Xiaomi "Mi Fitness" mobile app and the Zepp "Zepp Life" mobile app as shown below.





114. Zepp's own line of Amazfit watches uses their "Zepp" app as shown below.



115. As stated on Zepp's website, the Amazfit Smartwatches provide "Easy 24H Monitoring of Heart Rate, Blood-oxygen Saturation, and Stress Level(s)." *See* https://us.amazfit.com/products/amazfit-falcon

116. Zepp's website also lists, generally, the Amazfit watches' main features, noting their ability to be a "gym partner you can rely on." *Id.*

117. The gym partner features include at least "reminders for abnormally high or low heart rates," among others, in conjunction with recognizing movement. *Id.*

118. The Zepp Amazfit Falcon Model is shown in the image below. The watch is featured in the Amazfit Falcon User Manual as an example of the various models and/or versions of the Zepp Smartwatches that Zepp manufactures, uses, sells, offers to sell, and/or imports into the United States. *See* https://manual-cdn.zepp.com/uploads/doc/20221014/166571140628.pdf



PATENT INFRINGEMENT

Count I: Infringement of United States Patent No. 8,417,326 by Xiaomi

119. Plaintiffs incorporate each of the preceding paragraphs as if fully set forth herein.

120. On information and belief, Xiaomi's products, including at least the, Mi Smart Band 6, Mi Watch Lite, Mi Watch, Mi Smart Band 5, Mi Smart Band 4C, Mi Smart Band 6, Redmi Watch 3, Redmi Smart Band 2, Redmi Smart Band Pro, Redmi Watch 2, Redmi Watch 2 Lite, Xiaomi Watch S1 Pro, Xiaomi Watch S1 Active, Xiaomi Smart Band 7 Pro, and Xiaomi Smart Band 7 infringe at least Claim 1 of the '326 patent under 35 U.S.C. §271.

121. On information and belief, Xiaomi has directly infringed one or more claims of the '326 patent through the manufacture, use, sale, offer for sale, and/or importation into the United States of physiological monitors, including at least the, Mi Watch Lite, Mi Watch, Mi Smart Band 4C, Mi Smart Band 5, Mi Smart Band 6, Mi Smart Band 6, Redmi Watch 3, Redmi Smart Band 2, Redmi Smart Band Pro, Redmi Watch 2, Redmi Watch 2 Lite, Xiaomi Watch S1 Pro, Xiaomi Watch S1 Active, Xiaomi Smart Band 7 Pro, and Xiaomi Smart Band 7 ("the Accused Xiaomi Watches").

122. The above-listed watches are non-limiting. Additional products of Xiaomi may infringe the '326 patent, and the above-listed watches may infringe additional patents.

123. On information and belief, at least the Accused Xiaomi Watches listed above are sold with the Mi Fitness app and Zepp Life app infringing technology/algorithms. Each patent listed in this Complaint includes at least method claims, system claims and/or apparatus claims.

124. For example, Claim 1 covers:

> An Atrial Fibrillation (AF) analysis method comprising:
> obtaining an output that includes a heart beat;
> deriving a heart beat interval;
> analyzing a number (N) of heart beat intervals from the output; and
> detecting a likelihood of AF by:
> calculating a Turning Points Ratio (TPR) of the N heart beat intervals;
> calculating a root mean square of successive (RMSSD) heart beat intervals;
> and calculating Shannon Entropy (SE) of the N heart beat intervals.

125. On information and belief, the algorithm used by the Accused Xiaomi Watches does AF analysis, including as shown below.

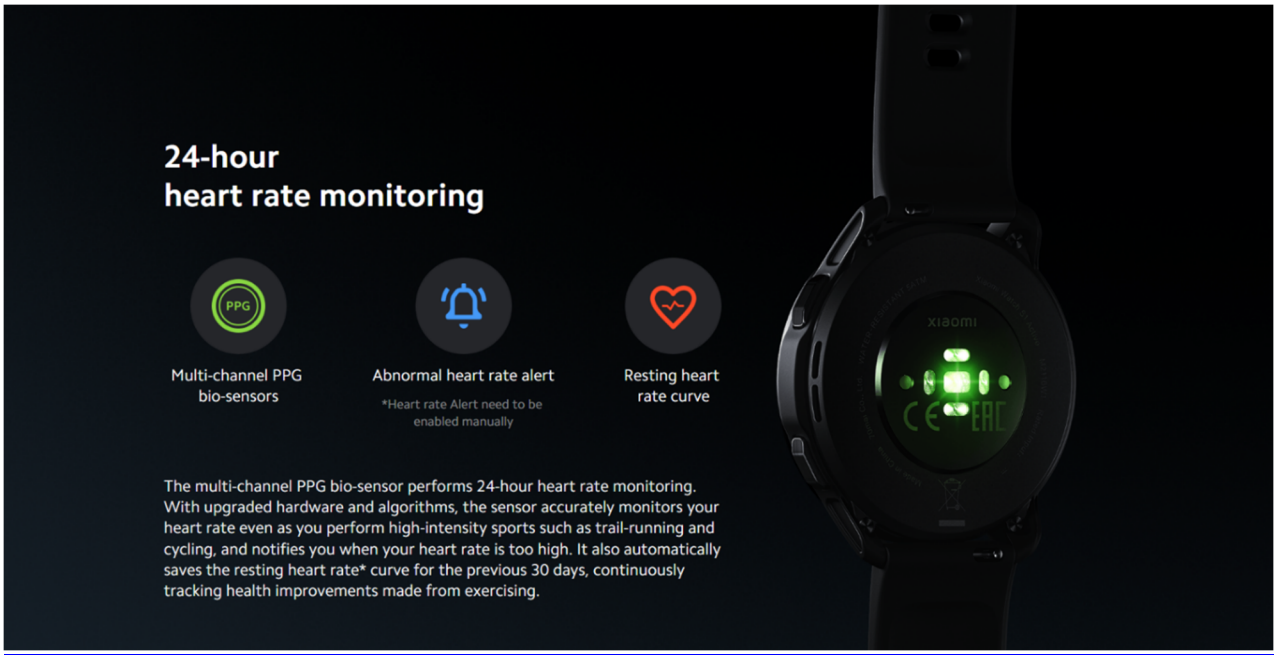
https://www.mi.com/global/product/xiaomi-smart-band-7-nfc/,

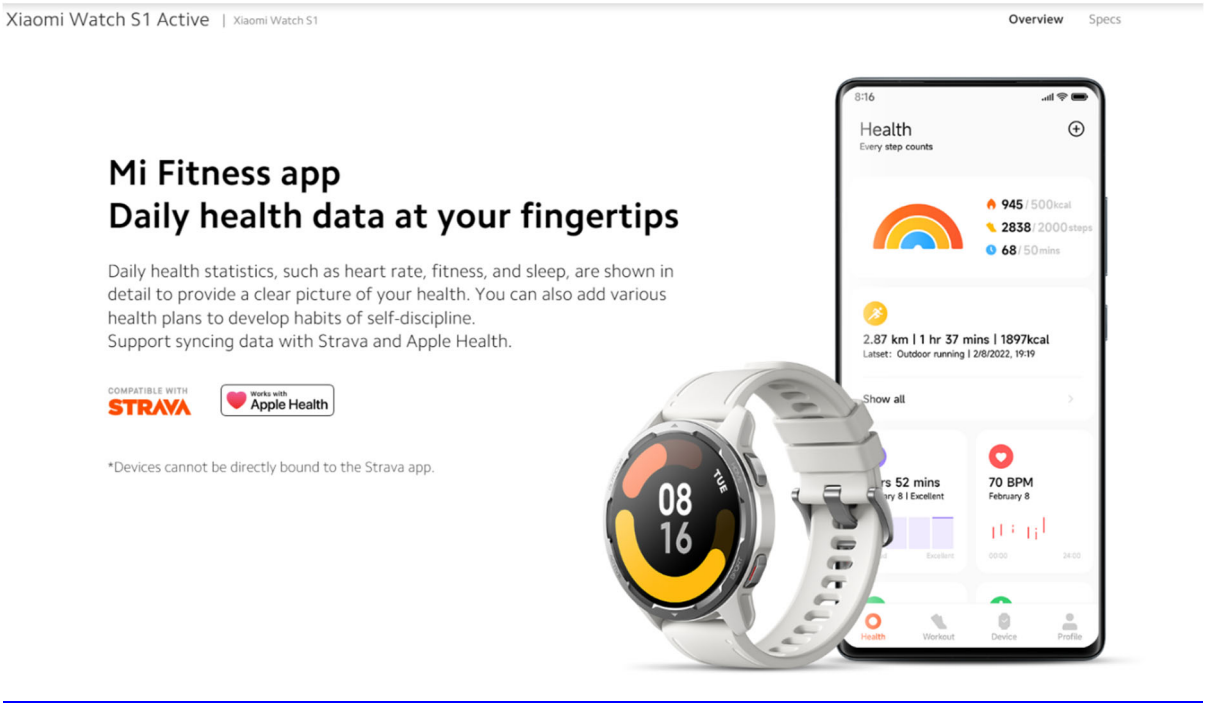
https://www.mi.com/global/product/xiaomi-watch-s1-active/

All-day heart rate monitoring

Xiaomi Smart Band 7 tracks your real time heart rate all day long and delivers precise reviews in easy-to-read graphs. The band will vibrate to alert when your heart rates fall out of the safe zone.*







126. The algorithm used by the Accused Xiaomi Watches obtains an output that includes a heart beat, including as shown below.

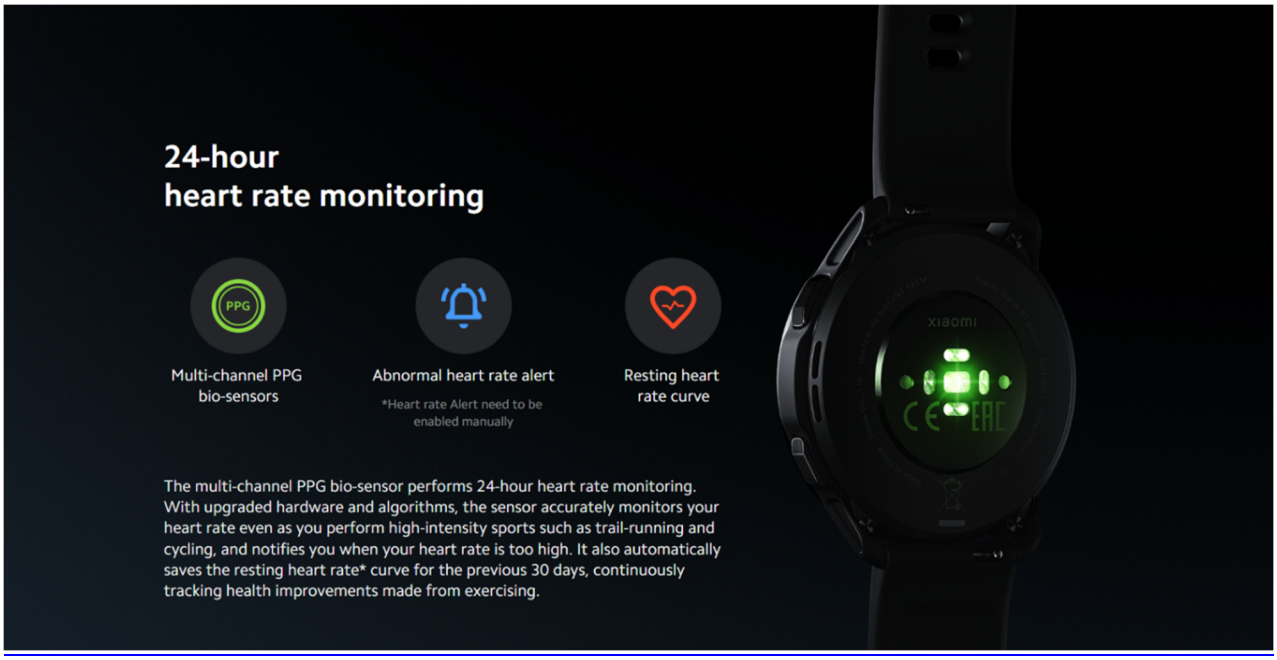
https://www.mi.com/global/product/xiaomi-smart-band-7-nfc/,

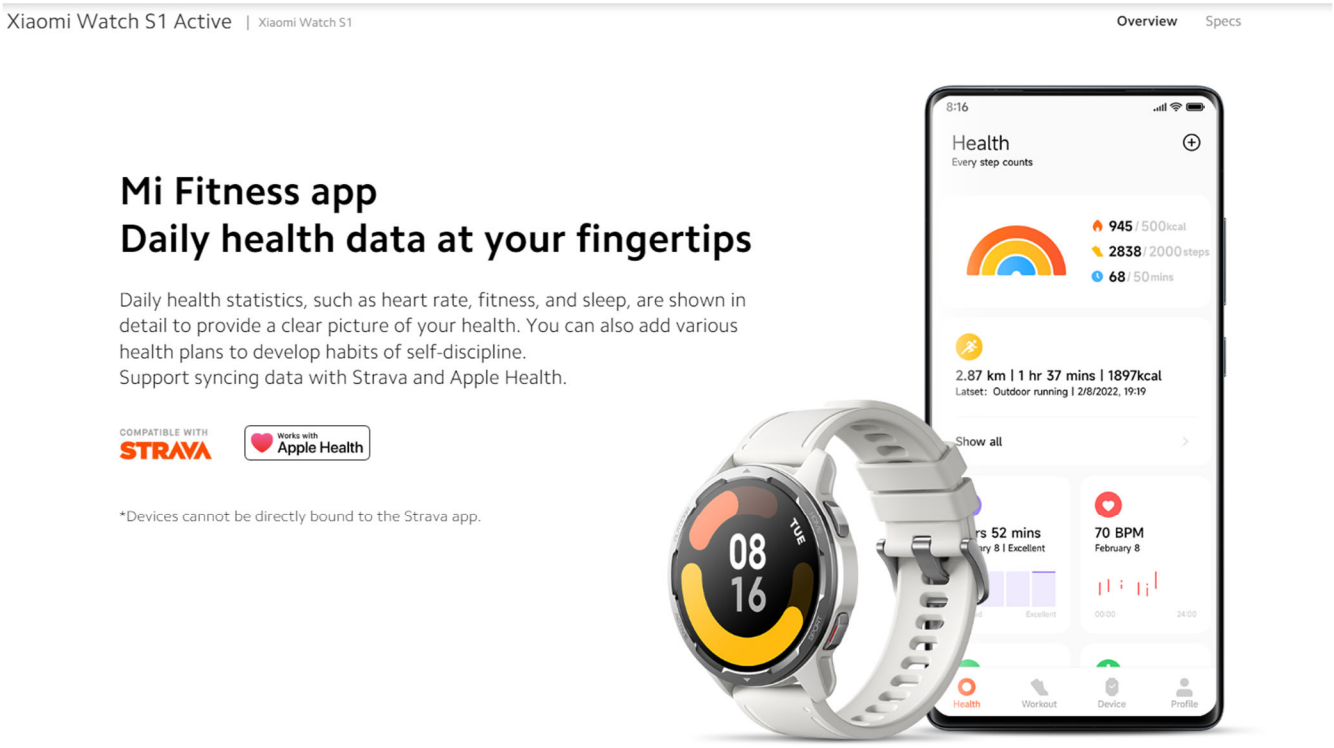
https://www.mi.com/global/product/xiaomi-watch-s1-active/

All-day heart rate monitoring

Xiaomi Smart Band 7 tracks your real time heart rate all day long and delivers precise reviews in easy-to-read graphs. The band will vibrate to alert when your heart rates fall out of the safe zone.*







127. The algorithm used by the Accused Xiaomi Watches derives a heart beat interval, including as shown below.

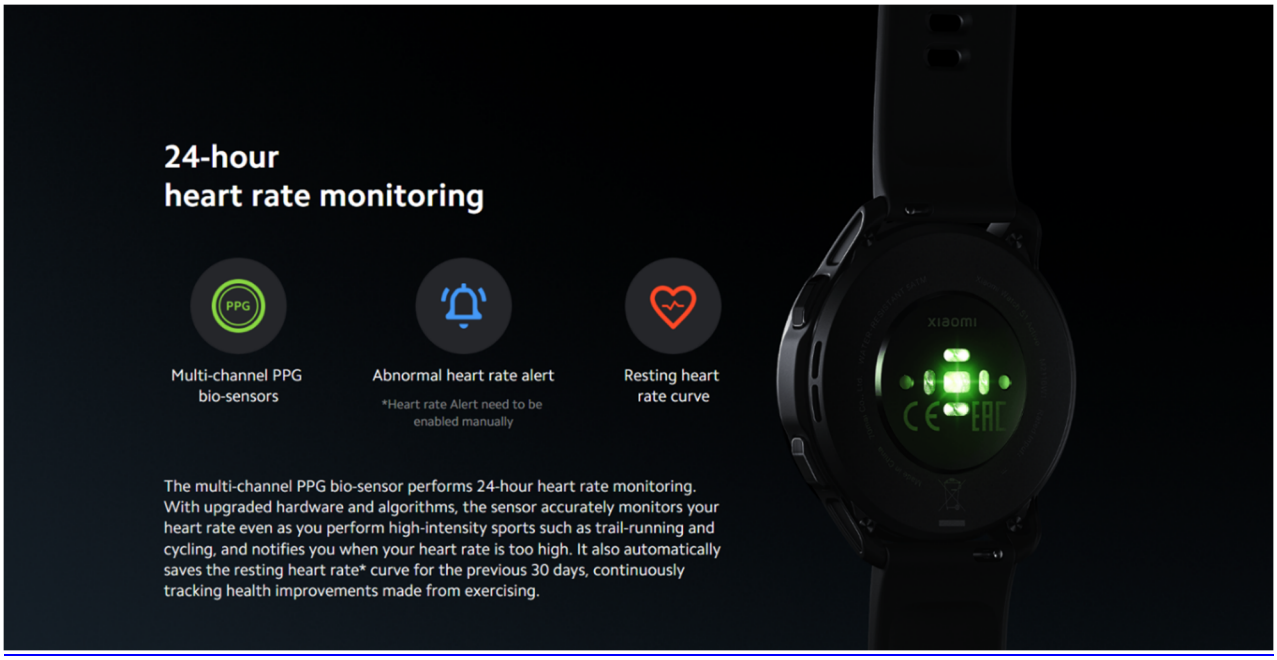
https://www.mi.com/global/product/xiaomi-smart-band-7-nfc/,

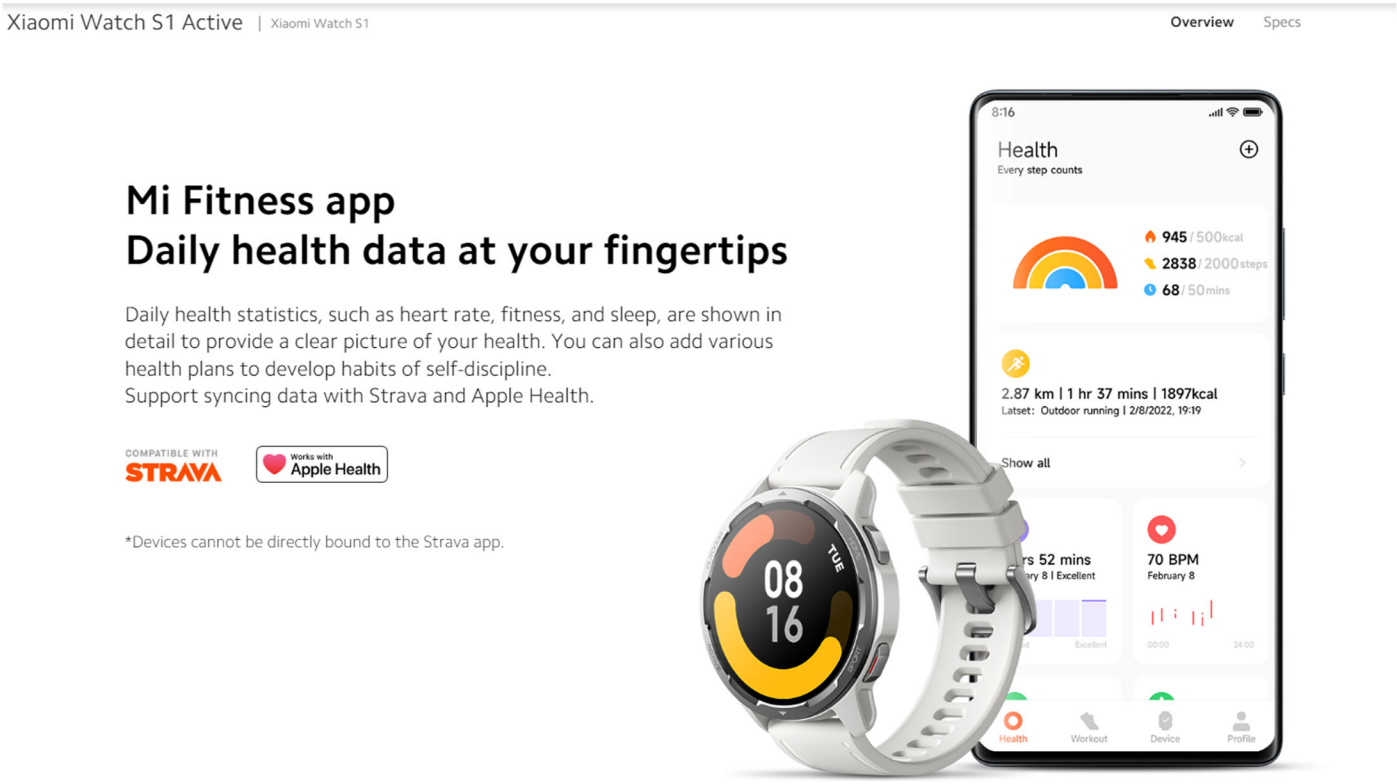
https://www.mi.com/global/product/xiaomi-watch-s1-active/

All-day heart rate monitoring

Xiaomi Smart Band 7 tracks your real time heart rate all day long and delivers precise reviews in easy-to-read graphs. The band will vibrate to alert when your heart rates fall out of the safe zone.*







128. The algorithm used by the Accused Xiaomi Watches analyzes a number (N) of heart beat intervals from the output, including as shown below.

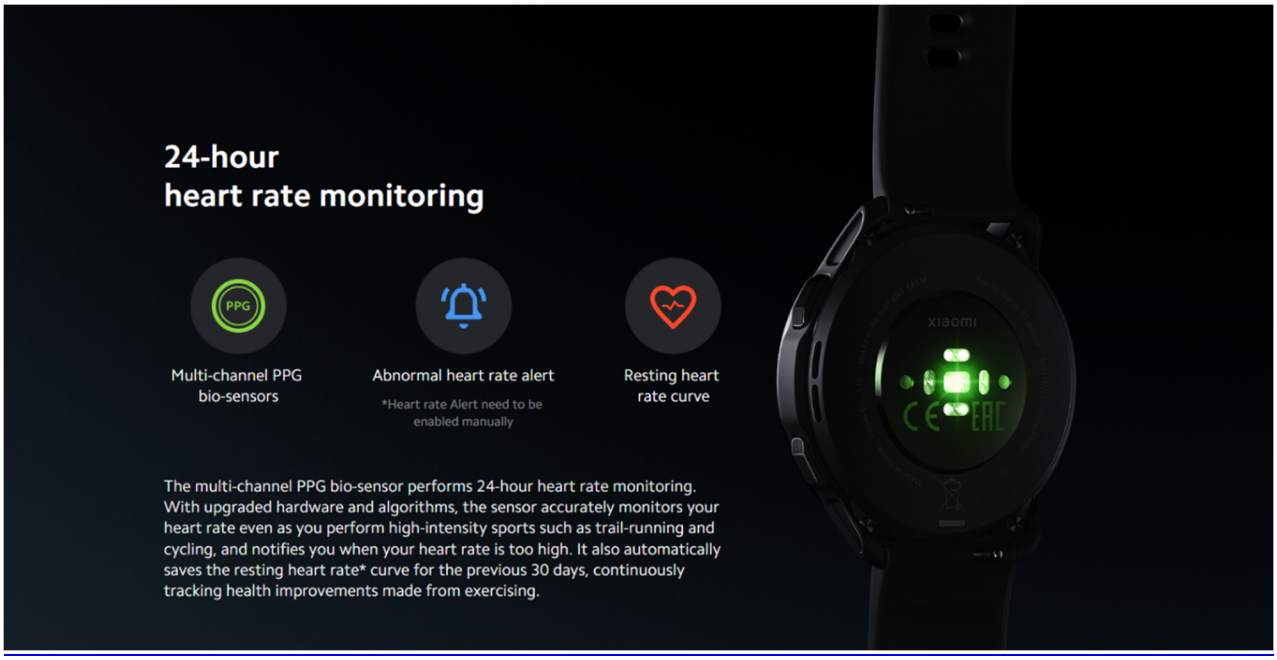
https://www.mi.com/global/product/xiaomi-smart-band-7-nfc/,

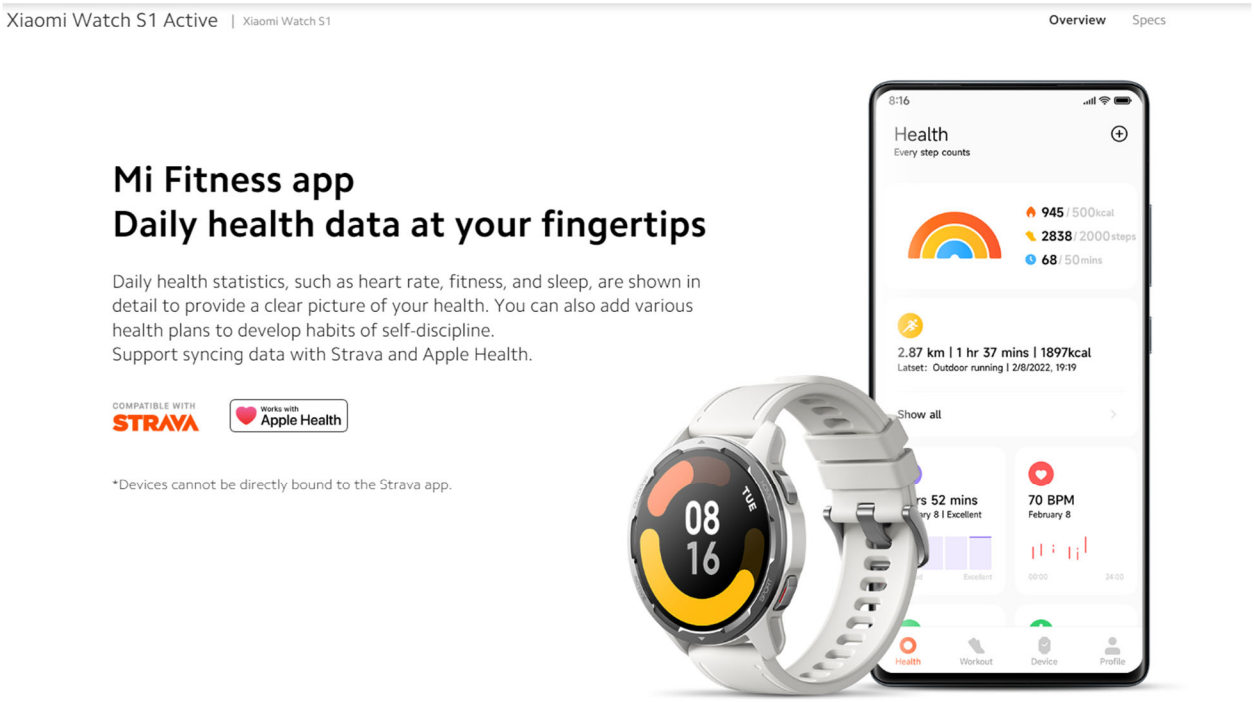
https://www.mi.com/global/product/xiaomi-watch-s1-active/

All-day heart rate monitoring

Xiaomi Smart Band 7 tracks your real time heart rate all day long and delivers precise reviews in easy-to-read graphs. The band will vibrate to alert when your heart rates fall out of the safe zone.*







129. On information and belief, the algorithm used by the Accused Xiaomi Watches detects a likelihood of AF by calculating a Turning Points Ratio (TPR) of the N heart beat intervals, calculating a root mean square of successive (RMSSD) heart beat intervals, and calculating Shannon Entropy (SE) of the N heart beat intervals.

130. On information and belief, Xiaomi had knowledge of Plaintiffs' algorithm and systems as claimed in Claim 1 from the publication of the '326 patent claims by the United States Patent and Trademark Office, but in any event at least as of the filing of this lawsuit.

131. Xiaomi's infringement of the '326 patent is willful, deliberate, and intentional. On information and belief, Xiaomi has known of the '326 patent and its infringement of that patent since at least the filing of this complaint.

132. Because of Xiaomi's infringement of the '326 patent, Plaintiffs have suffered and will continue to suffer irreparable harm and injury, including monetary damages in an amount to be determined at trial.

133. On information and belief, Xiaomi has acted with full knowledge or at least willful blindness of the '326 patent and without a reasonable basis for believing that they would not be liable for direct infringement of the '326 patent and active inducement of infringement of the '326 patent.

134. Xiaomi has infringed and continues to infringe the '326 patent by making, using, selling, offering to sell, and/or importing, without license or authority, the Accused Xiaomi Watches, as alleged herein, which embody or use the inventions claimed in the '326 patent literally or under the doctrine of equivalents.

135. Xiaomi has induced infringement and continues to induce infringement of the '326 patent by actively and knowingly inducing others to make, use, sell, offer to sell, and/or import, without license or authority, the Accused Xiaomi Watches, as alleged herein, which embody or use the inventions claimed in the '326 patent literally or under the doctrine of equivalents.

136. Xiaomi markets, advertises, offers for sale, and/or otherwise promotes the Accused Xiaomi Watches and, on information and belief, does so to actively and knowingly induce, encourage, instruct, and aid one or more persons in the United

States to make, use, sell, offer to sell and/or import the Accused Xiaomi Watches. For example, Xiaomi knowingly and intentionally induces retailers to advertise, offer for sale, and/or otherwise promote the Accused Xiaomi Watches on their websites and in stores. Additionally, Xiaomi, or one or more related entities, induces end users by, for example, instructing users of the Accused Xiaomi Watches in its manual to use its Mi Fitness app to monitor physiological parameters. Therein, on information and belief, Xiaomi describes and touts the use of the subject matter claimed in the '326 patent, as described and alleged herein.

137. Plaintiffs reserve the right to assert additional claims of the '326 patent that Xiaomi infringes.

138. On information and belief, Xiaomi has known of the existence of the '326 patent and its applicability to the Accused Xiaomi Watches since at least the filing of this complaint, and committed acts of infringement that were willful, demonstrated willful blindness, and disregard for the '326 patent, without any reasonable basis for believing that it had a right to engage in the infringing conduct. Plaintiffs are entitled to increased damages of three times the damages assessed pursuant to 35 U.S.C. § 284, as well as an award of attorney's fees pursuant to 35 U.S.C. § 285.

Count II: Infringement of United States Patent No. 9,408,576 by Xiaomi

139. Plaintiffs incorporate each of the preceding paragraphs as if fully set forth herein.

140. On information and belief, Xiaomi's products, including at least the Accused Xiaomi Watches, infringe at least Claim 1 of the '576 patent under at least 35 U.S.C. § 271.

141. On information and belief, Xiaomi has directly infringed one or more claims of the '576 patent through the manufacture, use, sale, offer for sale, and/or importation into the United States of physiological monitors, including at least the Accused Xiaomi Watches.

142. The above-listed watches are non-limiting. Additional products of Xiaomi may infringe the '576 patent, and the above-listed watches may infringe additional patents.

143. On information and belief, at least the Accused Xiaomi Watches listed above are sold with the Mi Fitness app and Zepp Life app infringing technology/algorithms.

144. For example, Claim 1 covers:

> A computer implemented method for discriminating between atrial fibrillation and premature ventricular contractions (PVC) and premature atrial contractions (PACs), the method comprising:
>
> demarcating boundaries in a Poincare plot space, the boundaries being obtained from data from a test set of test subjects; the Poincare plot space being a space of time interval between consecutive pulses obtained by sensing variability in heart rate signal;
>
> constructing a Poincare plot of time interval data from a subject under test; the time interval being a time interval between consecutive pulses obtained by sensing variability in heart rate signal from the subject under test;
>
> identifying data in patterns in the Poincare plot, the patterns including patterns corresponding to combinations of at least one of bigeminy, trigemini, and quadragemini indicating one of PAC or PVC;

obtaining updated data by subtracting the data in the patterns corresponding to combinations of at least one of bigeminy, trigemini, quadragemini indicating one of PAC or PVC from the time interval data from the subject under test;

obtaining a root mean squared of successive differences, a Shannon entropy and a turning point ratio for the updated data;

comparing the root mean square of successive differences to a first predetermined threshold; comparing the Shannon entropy to a second predetermined threshold;

comparing the turning point ratio to a third predetermined threshold;

determining, if each of the root mean square of successive differences, the Shannon entropy, and the turning point ratio is not less than a corresponding predetermined threshold, that the subject under test has atrial fibrillation; and

determining, if each of the root mean square of successive differences, the Shannon entropy, and the turning point ratio is less than a corresponding predetermined threshold, that the subject under test has normal sinus rhythm (NSR) with PVC or PAC;

wherein demarcating boundaries in a Poincare plot space, constructing a Poincare plot, identifying data in patterns in the Poincare plot, obtain updated data, obtaining root mean squared of successive differences, Shannon entropy and turning point ratio for the updated data, comparing to predetermined thresholds, and determining whether the subject under test has atrial fibrillation or the subject under test has normal sinus rhythm (NSR) with PVC or PAC are performed by one or more processors executing computer readable code embodied in non-transitory computer usable media.

145. On information and belief, the algorithm used by the Accused Xiaomi Watches uses a computer implemented method for discriminating between atrial fibrillation and premature ventricular contractions (PVC) and premature atrial contractions (PACs), including as shown below.

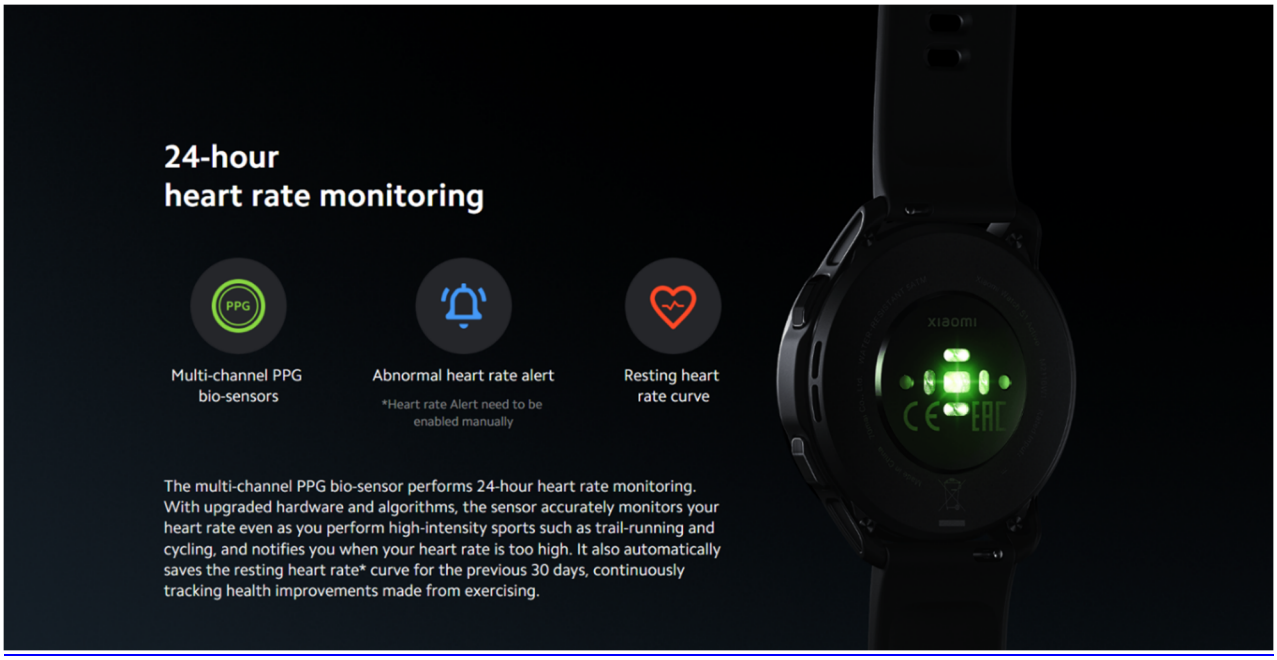
https://www.mi.com/global/product/xiaomi-smart-band-7-nfc/,

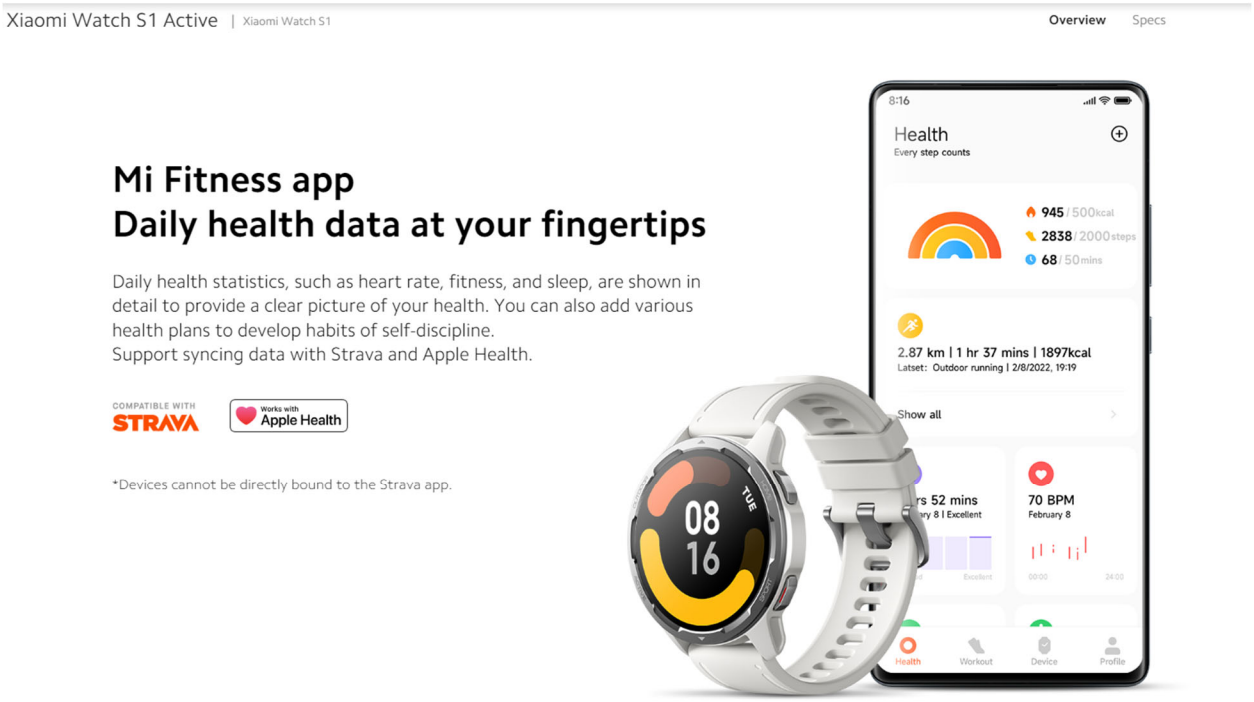
https://www.mi.com/global/product/xiaomi-watch-s1-active/

All-day heart rate monitoring

Xiaomi Smart Band 7 tracks your real time heart rate all day long and delivers precise reviews in easy-to-read graphs. The band will vibrate to alert when your heart rates fall out of the safe zone.*







146. On information and belief, the algorithm used by the Accused Xiaomi Watches demarcates boundaries in a Poincare plot space, the boundaries being obtained from data from a test set of test subjects.

147. On information and belief, the algorithm used by the Accused Xiaomi Watches demonstrates the Poincare plot space being a space of time interval between consecutive pulses obtained by sensing variability in heart rate signal.

148. On information and belief, the algorithm used by the Accused Xiaomi Watches constructs a Poincare plot of time interval data from a subject under test, the

time interval being a time interval between consecutive pulses obtained by sensing variability in heart rate signal from the subject under test.

149. On information and belief, the algorithm used by the Accused Xiaomi Watches identifies data in patterns in the Poincare plot, the patterns including patterns corresponding to combinations of at least one of bigeminy, trigemini, and quadragemini indicating one of PAC or PVC.

150. On information and belief, the algorithm used by the Accused Xiaomi Watches obtains updated data by subtracting the data in the patterns corresponding to combinations of at least one of bigeminy, trigemini, quadragemini indicating one of PAC or PVC from the time interval data from the subject under test.

151. On information and belief, the algorithm used by the Accused Xiaomi Watches obtains a root mean square of successive differences, a Shannon entropy, and a turning point ratio for the updated data.

152. On information and belief, the algorithm used by the Accused Xiaomi Watches compares the root mean square of successive differences to a first predetermined threshold, comparing the Shannon entropy to a second predetermined threshold, and comparing the turning point ratio to a third predetermined threshold.

153. On information and belief, the algorithm used by the Accused Xiaomi Watches determines if each of the root mean square of successive differences, the Shannon entropy, and the turning point ratio is not less than a corresponding predetermined threshold, that the subject under test has atrial fibrillation.

154. On information and belief, the algorithm used by the Accused Xiaomi Watches determines if each of the root mean square of successive differences, the Shannon entropy, and the turning point ratio is less than a corresponding predetermined threshold that the subject under test has normal sinus rhythm (NSR) with PVC or PAC.

155. On information and belief, the algorithm used by the Accused Xiaomi Watches constructs a Poincare plot, identifies data in patterns in the Poincare plot, obtains updated data, obtains root mean squared of successive differences, Shannon entropy, and turning point ratio for the updated data, compares to predetermined thresholds, and determines whether the subject under test has atrial fibrillation or the subject under test has normal sinus rhythm (NSR) with PVC or PAC, which are performed by one or more processors executing computer readable code embodied in non-transitory computer usable media.

156. On information and belief, the Accused Xiaomi Watches utilize Plaintiffs' algorithm capable of reducing the number of false positives in AF detection by differentiating various patterns of premature atrial contractions ("PAC") and premature ventricle contractions ("PVC") from normal sinus rhythm ("NSR") and AF.

157. On information and belief, Xiaomi had knowledge of Plaintiffs' algorithm as claimed in Claim 1 from the publication of the '576 patent claims the United States Patent and Trademark Office, but in any event at least as of the filing of this lawsuit.

158. Xiaomi's infringement of the '576 patent is willful, deliberate, and intentional. On information and belief, Xiaomi has known of the '576 patent and its infringement of that patent since at least the filing of this complaint.

159. Because of Xiaomi's infringement of the '576 patent, Plaintiffs have suffered and will continue to suffer irreparable harm and injury, including monetary damages in an amount to be determined at trial.

160. On information and belief, Xiaomi has acted with full knowledge or at least willful blindness of the '576 patent and without a reasonable basis for believing that they would not be liable for direct infringement of the '576 patent and active inducement of infringement of the '576 patent.

161. Xiaomi has infringed and continues to infringe the '576 patent by making, using, selling, offering to sell, and/or importing, without license or authority, the Accused Xiaomi Watches, as alleged herein, which embody or use the inventions claimed in the '576 patent literally or under the doctrine of equivalents.

162. Xiaomi has induced infringement and continues to induce infringement of the '576 patent by actively and knowingly inducing others to make, use, sell, offer to sell, and/or import, without license or authority, the Accused Xiaomi Watches, as alleged herein, which embody or use the inventions claimed in the '576 patent literally or under the doctrine of equivalents.

163. Xiaomi markets, advertises, offers for sale, and/or otherwise promotes the Accused Xiaomi Watches and, on information and belief, does so to actively and knowingly induce, encourage, instruct, and aid one or more persons in the United

States to make, use, sell, offer to sell and/or import the Accused Xiaomi Watches. For example, Xiaomi knowingly and intentionally induces retailers to advertise, offer for sale, and/or otherwise promote the Accused Xiaomi Watches on their websites and in stores. Additionally, Xiaomi, or one or more related entities, induces end users by, for example, instructing users of the Accused Xiaomi Watches in its manual to use its Mi Fitness app to monitor physiological parameters. Therein, on information and belief, Xiaomi describes and touts the use of the subject matter claimed in the '576 patent, as described and alleged herein.

164. Plaintiffs reserve the right to assert additional claims of the '576 patent that Xiaomi infringes.

165. On information and belief, Xiaomi has known of the existence of the '576 patent and its applicability to the Accused Xiaomi Watches since at least the filing of this lawsuit, and committed acts of infringement that were willful, demonstrated willful blindness, and disregard for the '576 patent, without any reasonable basis for believing that it had a right to engage in the infringing conduct. Plaintiffs are entitled to increased damages of three times the damages assessed pursuant to 35 U.S.C. § 284, as well as an award of attorney's fees pursuant to 35 U.S.C. § 285.

Count III: Infringement of United States Patent No. 9,713,428 by Xiaomi

166. Plaintiffs incorporate each of the preceding paragraphs as if fully set forth herein.

167. On information and belief, Xiaomi's products, including at least the Accused Xiaomi Watches, infringe at least Claim 1 of the '428 patent under at least 35 U.S.C. §271.

168. On information and belief, Xiaomi has directly infringed one or more claims of the '428 patent through the manufacture, use, sale, offer for sale, and/or importation into the United States of physiological monitors, including at least the Accused Xiaomi Watches.

169. The above-listed watches are non-limiting. Additional products of Xiaomi may infringe the '428 patent, and the above-listed watches may infringe additional patents.

170. On information and belief, at least the Accused Xiaomi Watches listed above are sold with the Mi Fitness app and Zepp Life app infringing technology/algorithms.

171. For example, Claim 1 covers:

> A method for physiological parameter monitoring, the method comprising:
>
> providing a physiological indicator signal to a handheld mobile communication device; the physiological indicator signal being obtained from one of an image acquisition component, a photoplethysmographic (PPG) sensor and an electrocardiogram sensor;
>
> analyzing, using the handheld mobile communication device, the physiological indicator signal;
>
> obtaining, from said analyzing, measurements of one or more physiological parameters; and
>
> detecting, using the handheld mobile communication device and using only the measurements of one or more physiological parameters, effects of motion artifacts in the measurements of the one or more physiological parameters and deciding whether to retain the measurements based on detected effects of motion artifacts;

wherein detecting effects of motion artifacts in the measurements comprises:

a. bandpass filtering and detrending a segment from the measurement of one physiological parameter; wherein a bandpass filtered and detrended segment is hereinafter referred to as a preprocessed segment;

b. obtaining a value of at least one indicator of volatility, used in determining whether motion artifacts are present, for the preprocessed segment; the at least one indicator of volatility being at least Shannon entropy (SE) for the preprocessed segment; where

$$SE = -\sum_{i=1}^{k} \frac{p(i) * \log\left(p(i)\right)}{\log\left(\frac{1}{k}\right)}$$

and where i represents the bin number and, p(i) is the probability distribution of the preprocessed segment;

c. including the segment in analyses of physiological measurements, when comparison of the value of the at least one indicator of volatility with a predetermined threshold indicates noise/motion artifacts are not present; and

d. selecting another segment of the signal from the physiological measurement and proceeding to step (a) when the value of the at least one indicator of volatility is less than a predetermined threshold and when another segment is available.

172. The algorithm used by the Accused Xiaomi Watches does physiological parameter monitoring, including as shown below.

https://www.mi.com/global/product/xiaomi-smart-band-7-nfc/,

https://www.mi.com/global/product/xiaomi-watch-s1-active/

All-day heart rate monitoring

Xiaomi Smart Band 7 tracks your real time heart rate all day long and delivers precise reviews in easy-to-read graphs.
The band will vibrate to alert when your heart rates fall out of the safe zone.*



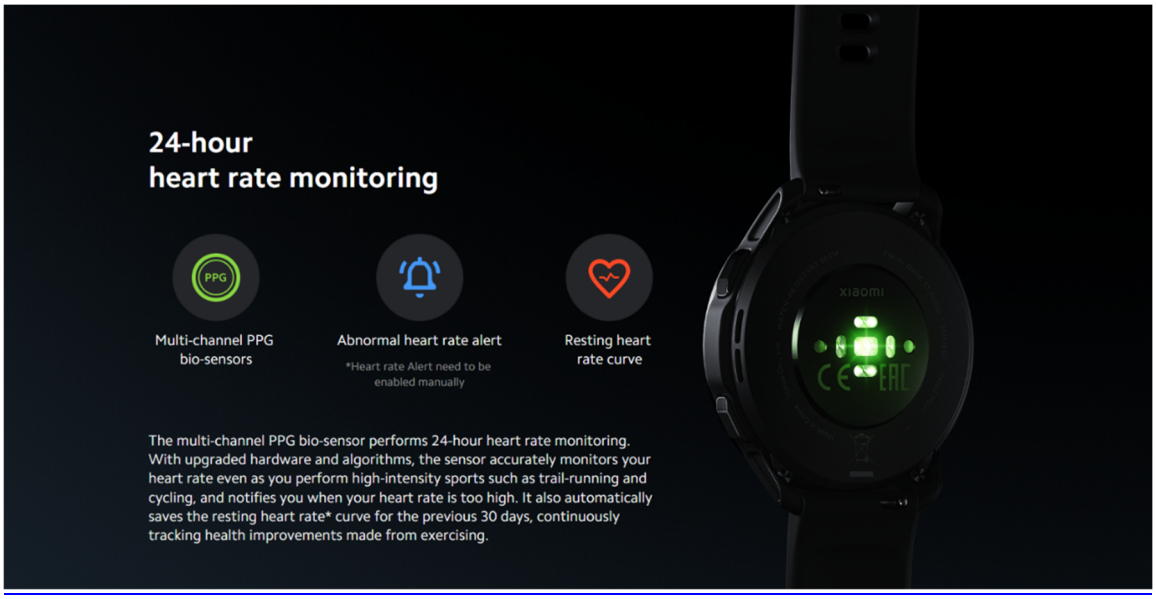
Advanced sleep monitoring
Sleep well to perform well

The sleep monitoring function has also been upgraded with a 35%* increase in accuracy and support monitoring night-time long sleeps and daytime sporadic naps.
Record your sleep patterns through different stages and help to improve your habits for a better sleep.



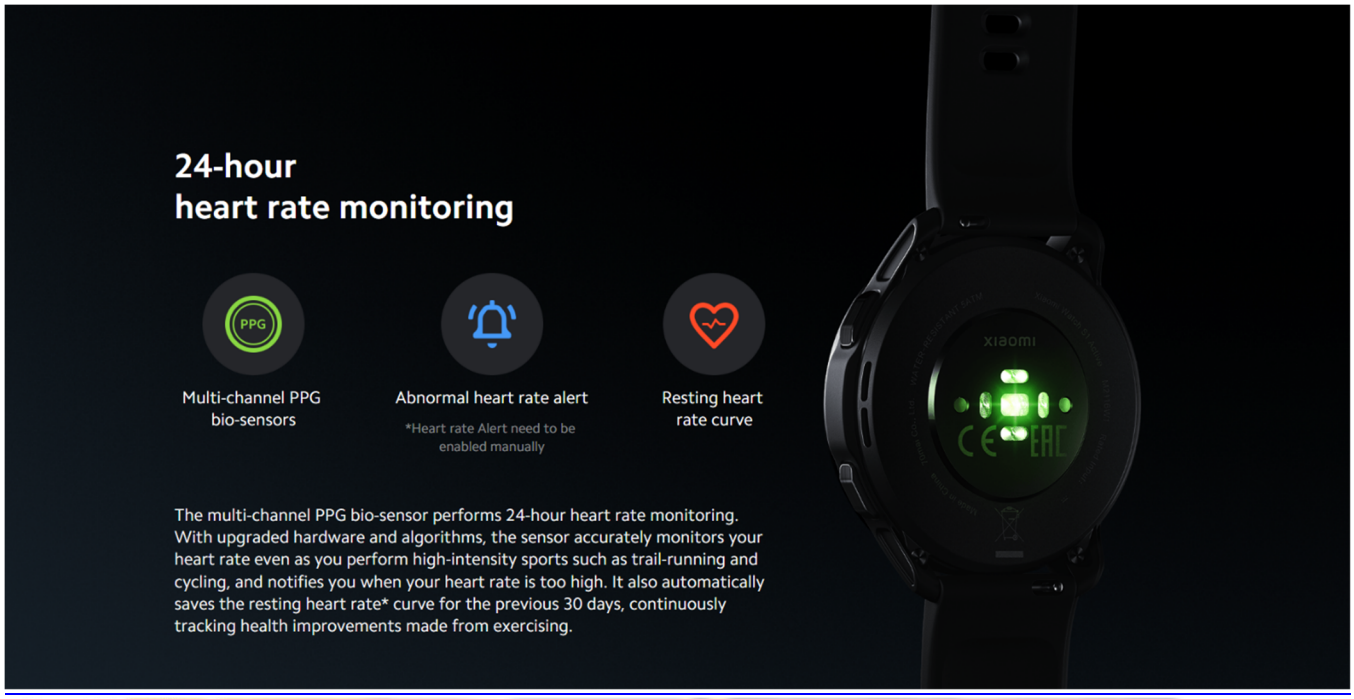
*Sleep stage, average heart rate, and blood oxygen data will not display for sporadic naps less than three hours. The duration for sporadic nap detection is 20 minutes to 3 hours.

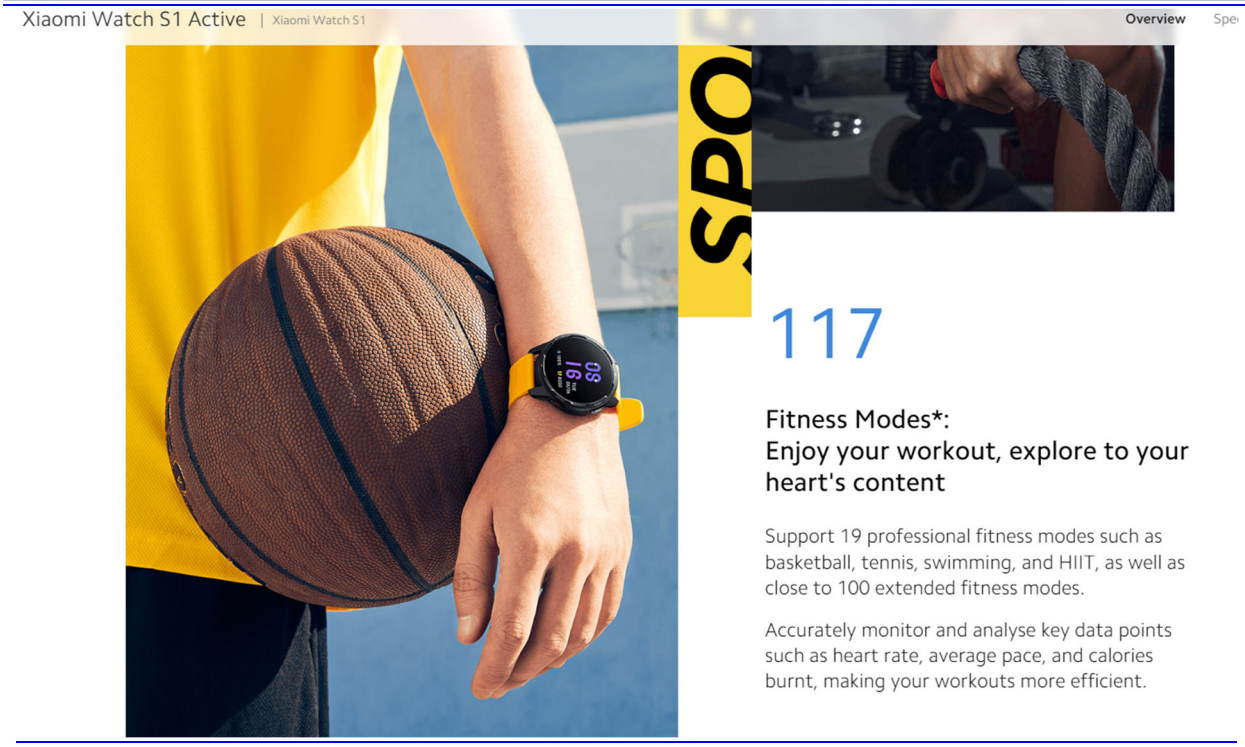

All-day blood oxygen monitoring*
Get an SpO₂ measurement for a peace of mind. Newly upgraded to support all-day continuous SpO₂ monitoring. Measurement interval can be set up according to your need.
Tips:
*All-day blood oxygen monitoring mode needs to be manually enabled. Default monitoring is set to once every 30 minutes and can be adjusted to once every 10 minutes.
SpO₂
95%
30 mins ago
00:00
24:00
Measure

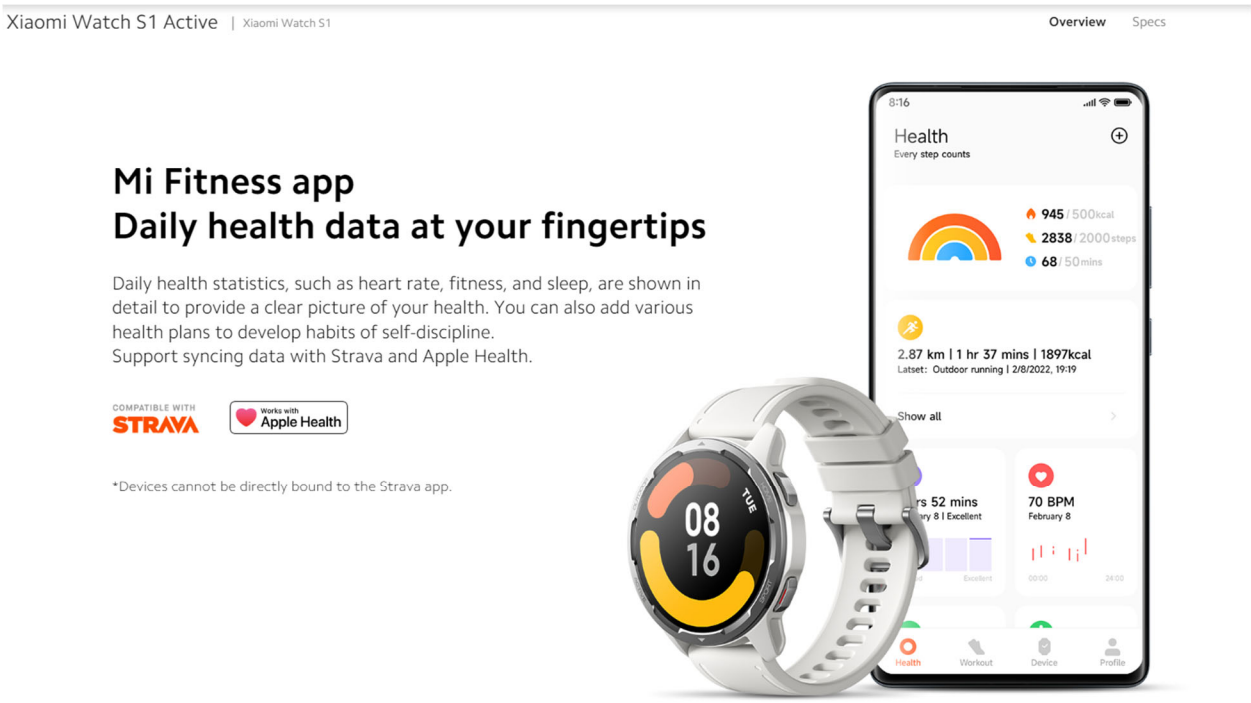

24-hour
heart rate monitoring
PPG
Multi-channel PPG bio-sensors
Abnormal heart rate alert
*Heart rate Alert need to be enabled manually
Resting heart rate curve
The multi-channel PPG bio-sensor performs 24-hour heart rate monitoring. With upgraded hardware and algorithms, the sensor accurately monitors your heart rate even as you perform high-intensity sports such as trail-running and cycling, and notifies you when your heart rate is too high. It also automatically saves the resting heart rate* curve for the previous 30 days, continuously tracking health improvements made from exercising.
xiaomi


Advanced sleep monitoring
Sleep well to perform well
The sleep monitoring function has also been upgraded with a 35%* increase in accuracy and support monitoring night-time long sleeps and daytime sporadic naps.
Record your sleep patterns through different stages and help to improve your habits for a better sleep.
Details
23:20-06:56
7h36m
Avg
62 BPM
Avg
98%
*Sleep stage, average heart rate, and blood oxygen data will not display for sporadic naps less than three hours. The duration for sporadic nap detection is 20 minutes to 3 hours.


All-day blood oxygen monitoring*
Get an SpO2 measurement for a peace of mind. Newly upgraded to support all-day continuous SpO2 monitoring. Measurement interval can be set up according to your need.
Tips:
*All-day blood oxygen monitoring mode needs to be manually enabled. Default monitoring is set to once every 30 minutes and can be adjusted to once every 10 minutes.
SpO2
95%
30 mins ago
00:00
24:00
Measure


24-hour
heart rate monitoring
PPG
Multi-channel PPG bio-sensors
Abnormal heart rate alert
*Heart rate Alert need to be enabled manually
Resting heart rate curve
The multi-channel PPG bio-sensor performs 24-hour heart rate monitoring. With upgraded hardware and algorithms, the sensor accurately monitors your heart rate even as you perform high-intensity sports such as trail-running and cycling, and notifies you when your heart rate is too high. It also automatically saves the resting heart rate* curve for the previous 30 days, continuously tracking health improvements made from exercising.
xiaomi


Xiaomi Watch S1 Active | Xiaomi Watch S1
Overview
117
Fitness Modes*:
Enjoy your workout, explore to your heart's content
Support 19 professional fitness modes such as basketball, tennis, swimming, and HIIT, as well as close to 100 extended fitness modes.
Accurately monitor and analyse key data points such as heart rate, average pace, and calories burnt, making your workouts more efficient.

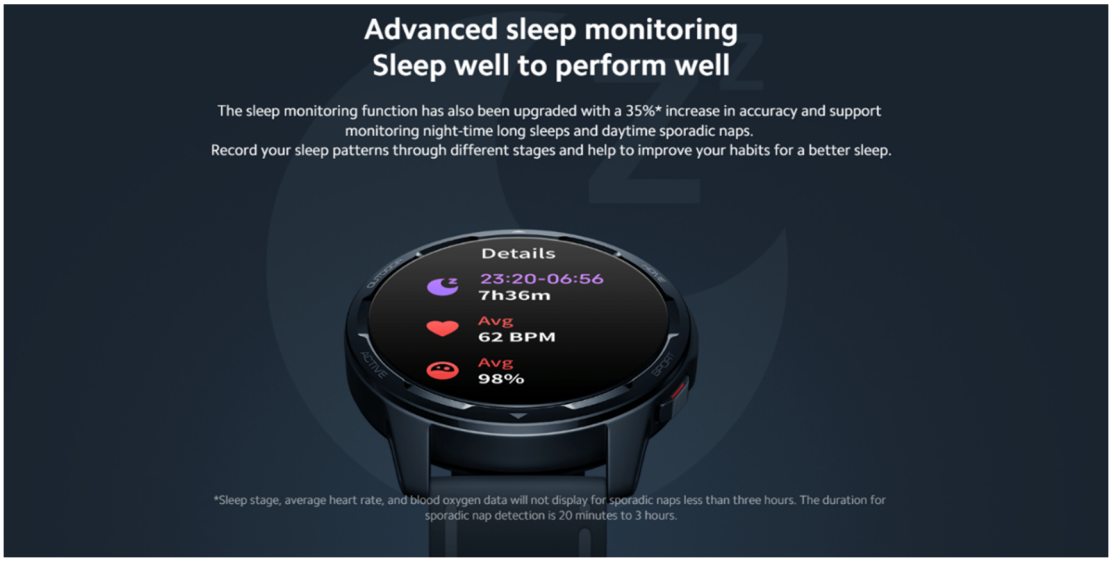


173. The algorithm used by the Accused Xiaomi Watches provides a physiological indicator signal to a handheld mobile communication device, the physiological indicator signal being obtained from one of an image acquisition component, a photoplethysmographic (PPG) sensor and an electrocardiogram sensor, including as shown below. https://www.mi.com/global/product/xiaomi-smart-band-7-nfc/, https://www.mi.com/global/product/xiaomi-watch-s1-active/

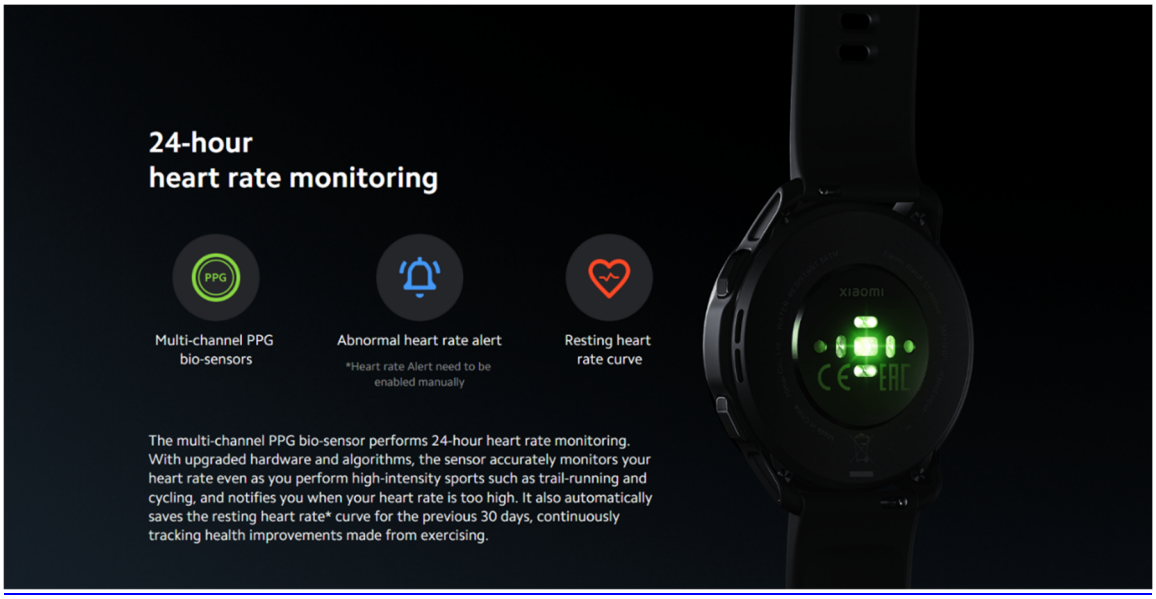
All-day heart rate monitoring

Xiaomi Smart Band 7 tracks your real time heart rate all day long and delivers precise reviews in easy-to-read graphs.
The band will vibrate to alert when your heart rates fall out of the safe zone.*



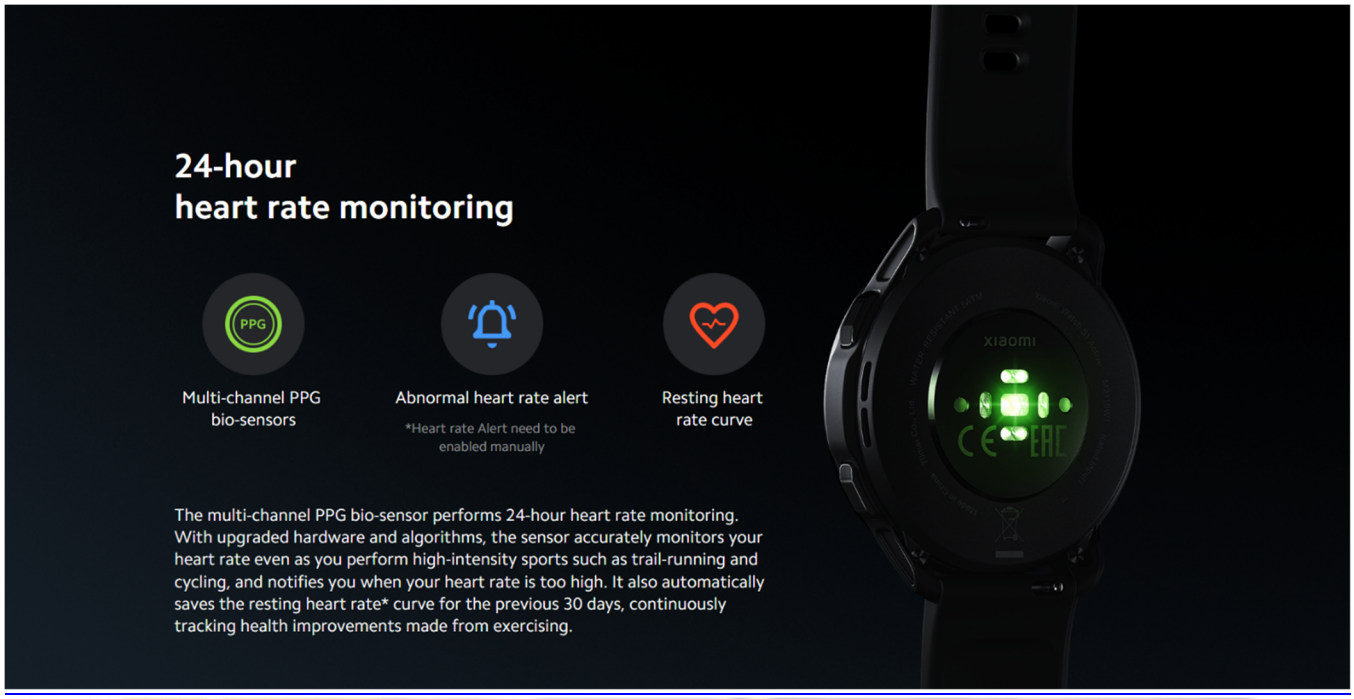


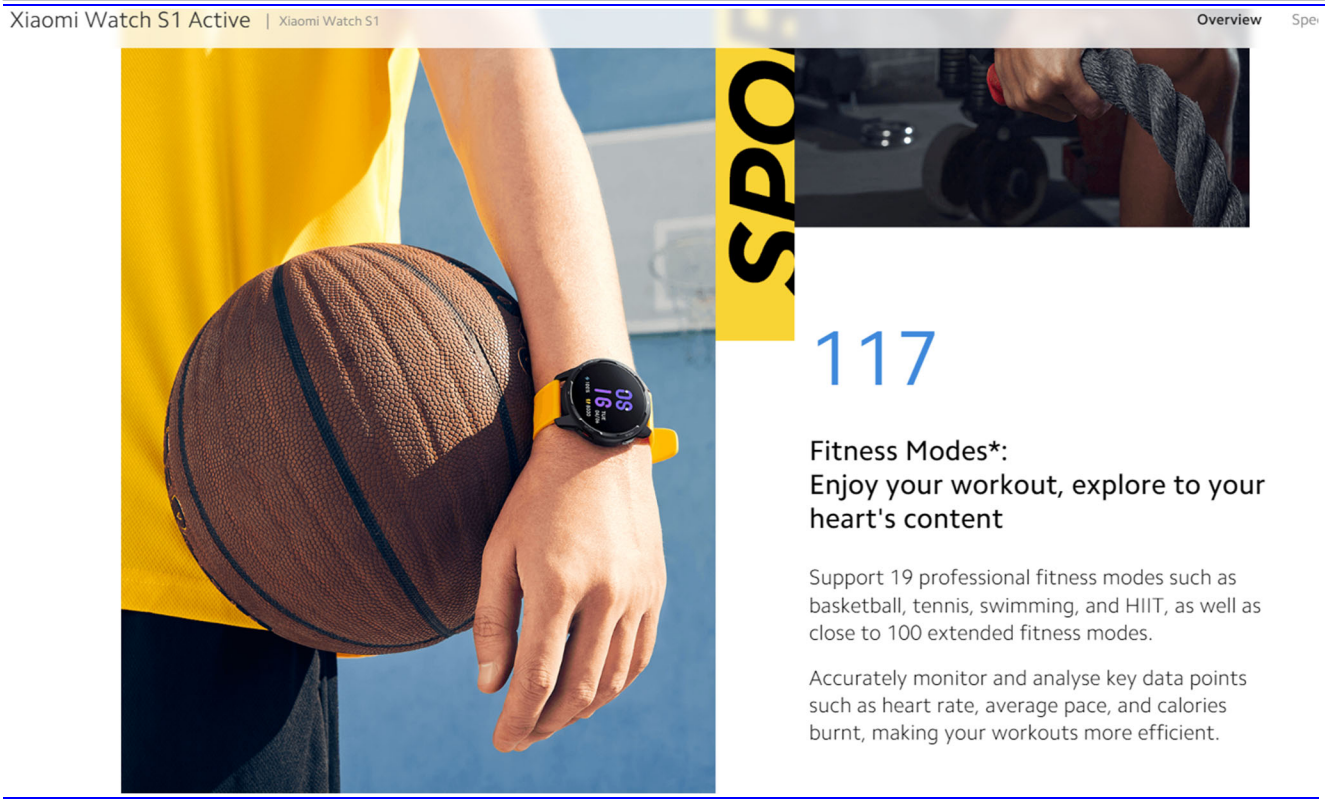

All-day blood oxygen monitoring*
Get an SpO₂ measurement for a peace of mind. Newly upgraded to support all-day continuous SpO₂ monitoring. Measurement interval can be set up according to your need.
Tips:
*All-day blood oxygen monitoring mode needs to be manually enabled. Default monitoring is set to once every 30 minutes and can be adjusted to once every 10 minutes.
SpO₂
95%
30 mins ago
00:00
24:00
Measure

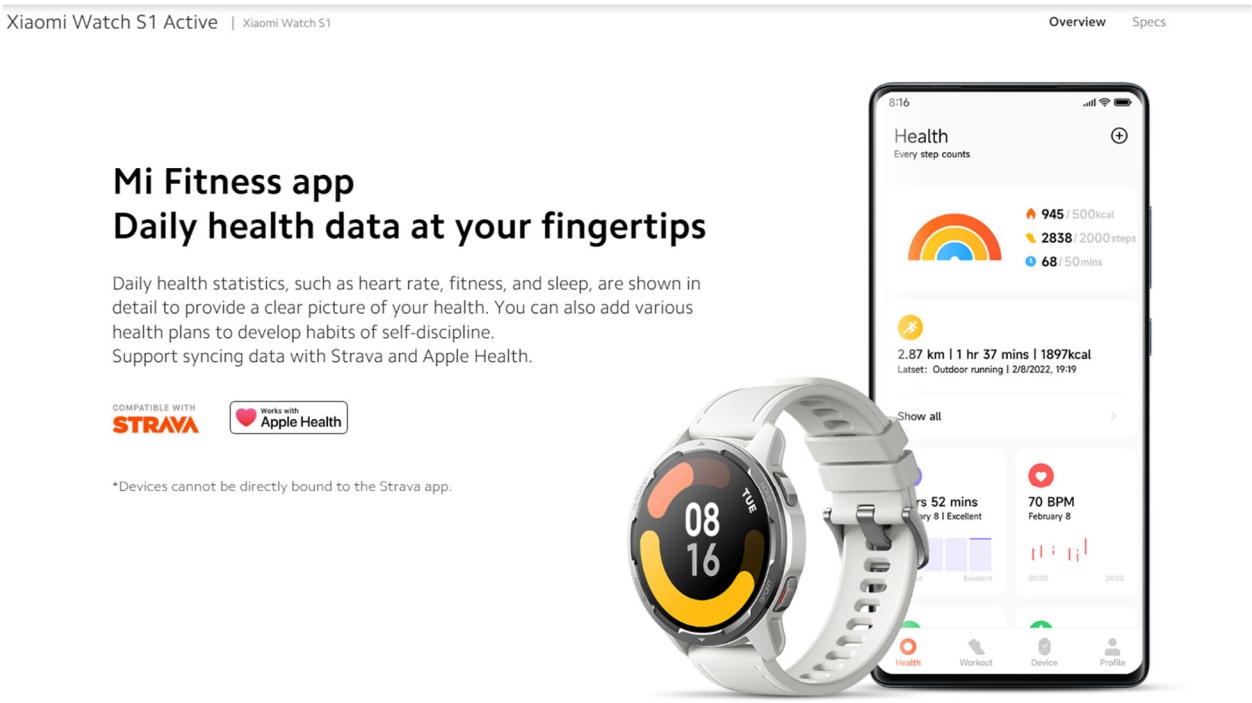

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xiaomi


Advanced sleep monitoring
Sleep well to perform well
The sleep monitoring function has also been upgraded with a 35%* increase in accuracy and support monitoring night-time long sleeps and daytime sporadic naps.
Record your sleep patterns through different stages and help to improve your habits for a better sleep.
Details
23:20-06:56
7h36m
Avg
62 BPM
Avg
98%
*Sleep stage, average heart rate, and blood oxygen data will not display for sporadic naps less than three hours. The duration for sporadic nap detection is 20 minutes to 3 hours.


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95%
30 mins ago
00:00
24:00
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xiaomi


Xiaomi Watch S1 Active | Xiaomi Watch S1
Overview
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Support 19 professional fitness modes such as basketball, tennis, swimming, and HIIT, as well as close to 100 extended fitness modes.
Accurately monitor and analyse key data points such as heart rate, average pace, and calories burnt, making your workouts more efficient.



174. The algorithm used by the Accused Xiaomi Watches analyzes, using the handheld mobile communication device, the physiological indicator signal and obtains, from said analyzing, measurements of one or more physiological parameters, including as shown below. https://www.mi.com/global/product/xiaomi-smart-band-7-nfc/, https://www.mi.com/global/product/xiaomi-watch-s1-active/

All-day heart rate monitoring

Xiaomi Smart Band 7 tracks your real time heart rate all day long and delivers precise reviews in easy-to-read graphs.
The band will vibrate to alert when your heart rates fall out of the safe zone.*



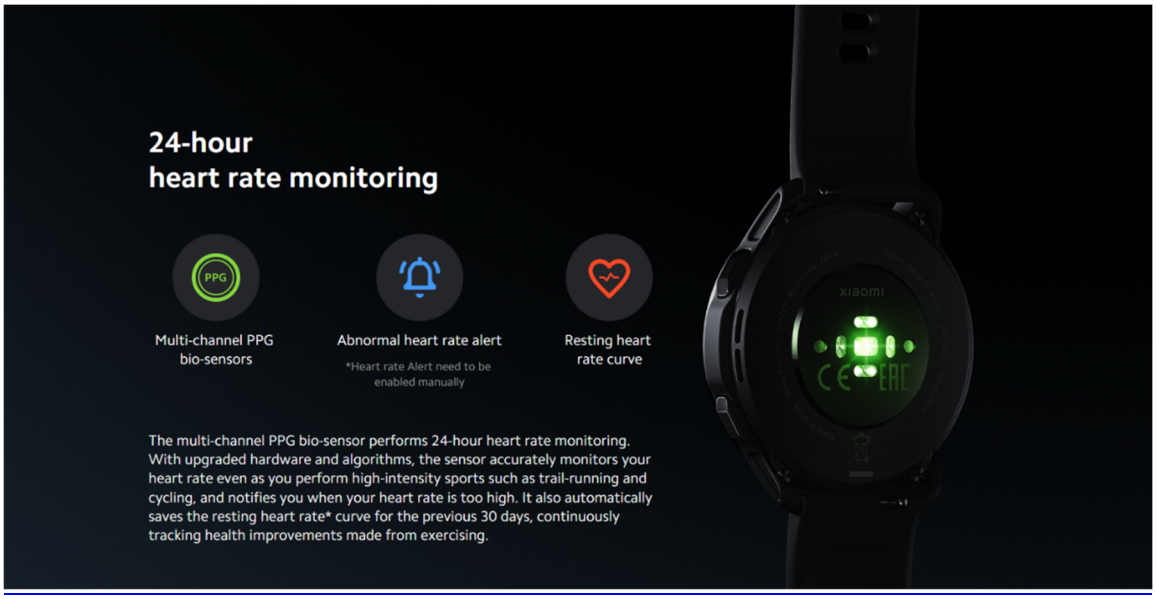
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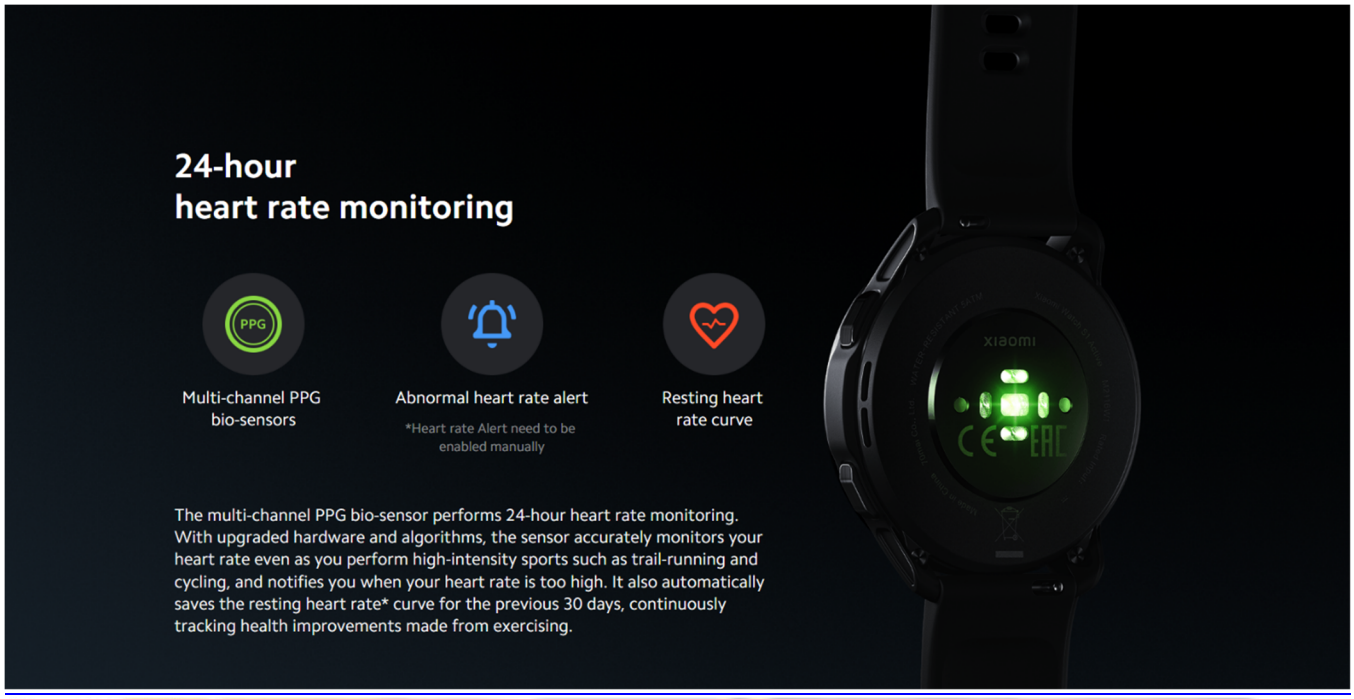
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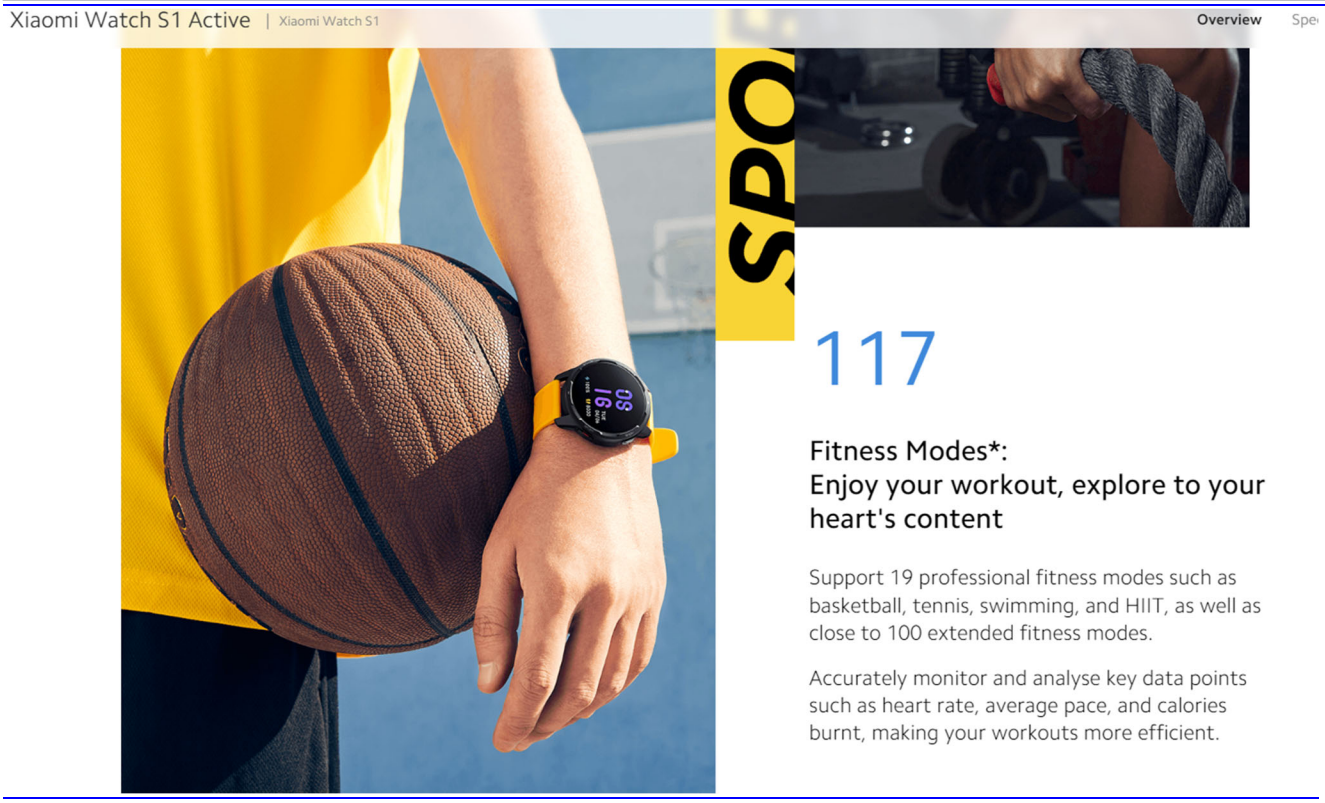

All-day blood oxygen monitoring*
Get an SpO₂ measurement for a peace of mind. Newly upgraded to support all-day continuous SpO₂ monitoring. Measurement interval can be set up according to your need.
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00:00
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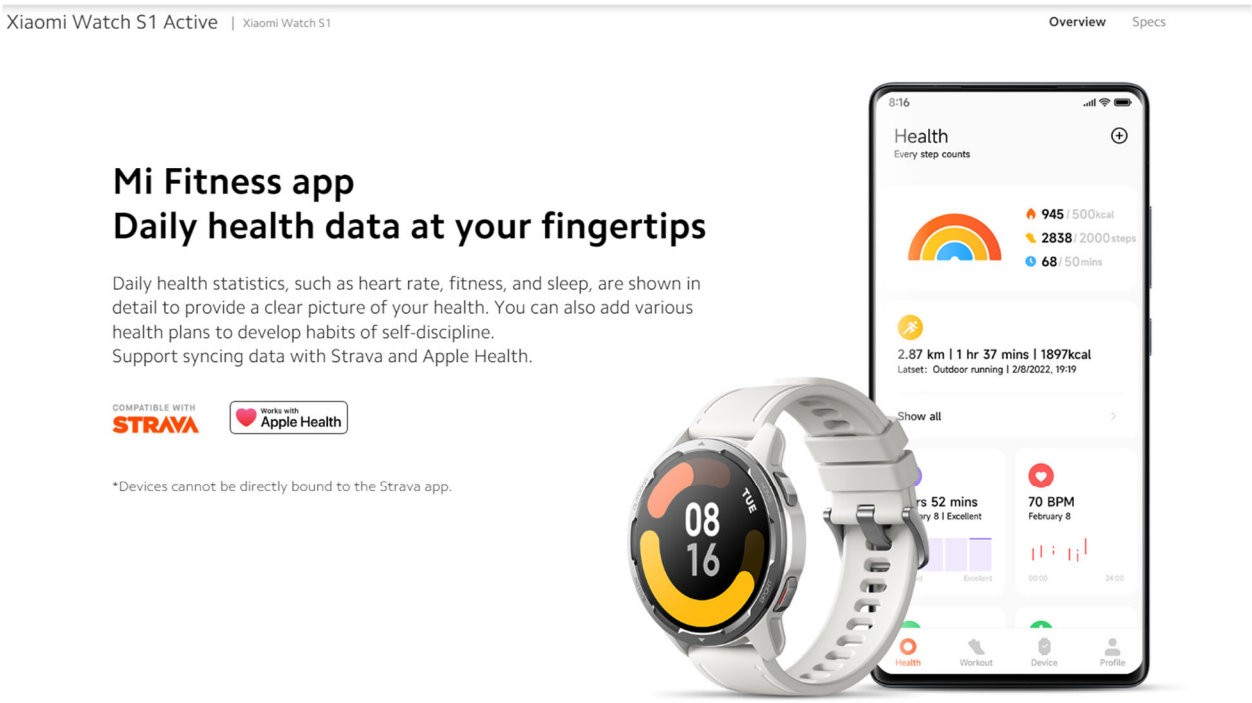

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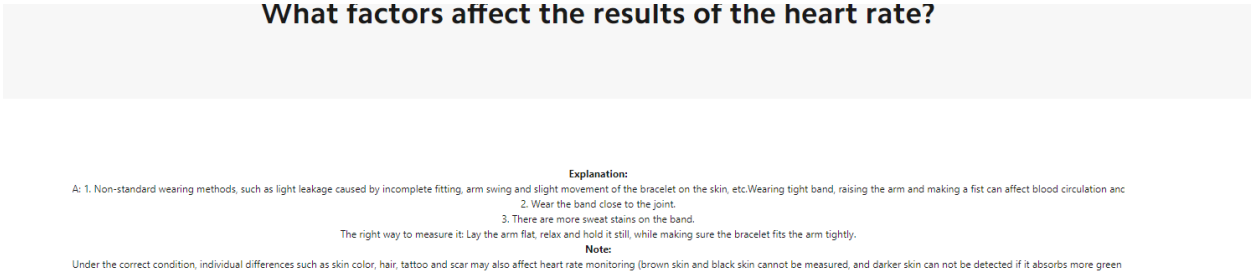

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xiaomi


Xiaomi Watch S1 Active | Xiaomi Watch S1
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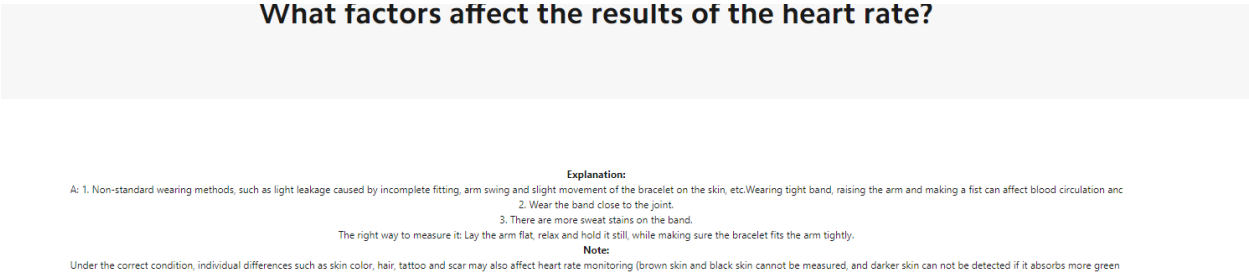


175. On information and belief, the algorithm used by the Accused Xiaomi Watches detects, using the handheld mobile communication device and using only the measurements of one or more physiological parameters, effects of motion artifacts in the measurements of the one or more physiological parameters and deciding whether to retain the measurements based on detected effects of motion artifacts, including as shown below. https://www.mi.com/global/support/article/KA-07154



176. The algorithm used by the Accused Xiaomi Watches detects effects of motion artifacts in the measurements, including as shown below.

https://www.mi.com/global/support/article/KA-07154



177. On information and belief, the algorithm used by the Accused Xiaomi Watches uses bandpass filtering and detrending a segment from the measurement of one physiological parameter, wherein a bandpass filtered and detrended segment is hereinafter referred to as a preprocessed segment, as claimed in independent claim 1(a).

178. On information and belief, the algorithm used by the Accused Xiaomi Watches obtains a value of at least one indicator of volatility, used in determining whether motion artifacts are present, for the preprocessed segment, the at least one indicator of volatility being at least Shannon entropy (SE) for the preprocessed segment, where $SE = -\sum_{i=1}^{k} \frac{p(i) * \log(p(i))}{\log\left(\frac{1}{k}\right)}$ and where i represents the bin number and, p(i) is the probability distribution of the preprocessed segment including the segment in analyses of physiological measurements, when comparison of the value of the at least one indicator of volatility with a predetermined threshold indicates noise/motion artifacts are not present; and selecting another segment of the signal from the physiological

measurement and proceeding to step (a) when the value of the at least one indicator of volatility is less than a predetermined threshold and when another segment is available.

179. On information and belief, the Accused Xiaomi Watches utilize Plaintiffs' algorithm and system claims to enable physiological monitoring with a mobile communication device using PPG to allow for the detection of motion artifacts so that the results reported are of acceptable quality.

180. On information and belief, Xiaomi had knowledge of Plaintiffs' algorithm and systems as claimed in Claim 1 from the publication of the '428 patent claims the United States Patent and Trademark Office, but in any event at least as of the filing of this lawsuit.

181. Xiaomi's infringement of the '428 patent is willful, deliberate, and intentional. On information and belief, Xiaomi has known of the '428 patent and its infringement of that patent since at least the filing of this complaint.

182. Because of Xiaomi's infringement of the '428 patent, Plaintiffs have suffered and will continue to suffer irreparable harm and injury, including monetary damages in an amount to be determined at trial.

183. On information and belief, Xiaomi has acted with full knowledge or at least willful blindness of the '428 patent and without a reasonable basis for believing that they would not be liable for direct infringement of the '428 patent and active inducement of infringement of the '428 patent.

184. Xiaomi has infringed and continues to infringe the '428 patent by making, using, selling, offering to sell, and/or importing, without license or authority, the

Accused Xiaomi Watches, as alleged herein, which embody or use the inventions claimed in the '428 patent literally or under the doctrine of equivalents.

185. Xiaomi has induced infringement and continues to induce infringement of the '428 patent by actively and knowingly inducing others to make, use, sell, offer to sell, and/or import, without license or authority, the Accused Xiaomi Watches, as alleged herein, which embody or use the inventions claimed in the '428 patent literally or under the doctrine of equivalents.

186. Xiaomi markets, advertises, offers for sale, and/or otherwise promotes the Accused Xiaomi Watches and, on information and belief, does so to actively and knowingly induce, encourage, instruct, and aid one or more persons in the United States to make, use, sell, offer to sell and/or import the Accused Xiaomi Watches. For example, Xiaomi, or an entity under Xiaomi's direction or control, advertises, offers for sale, and/or otherwise promotes the Accused Xiaomi Watches on its website. Xiaomi, or one or more related entities, induces retailers and end users. For example, Xiaomi knowingly and intentionally induces retailers to advertise, offer for sale, and/or otherwise promote the Accused Xiaomi Watches on their websites and in stores. Additionally, Xiaomi, or one or more related entities, induces end users by, for example, users of the Accused Xiaomi Watches in its manual to use its Mi Fitness app to monitor physiological parameters. Therein, on information and belief, Xiaomi describes and touts the use of the subject matter claimed in the '428 patent, as described and alleged herein.

187. Plaintiffs reserve the right to assert additional claims of the '428 patent that Xiaomi infringes.

188. On information and belief, Xiaomi has known of the existence of the '428 patent and its applicability to the Accused Xiaomi Watches since at least the filing of this complaint, and committed acts of infringement that were willful, demonstrated willful blindness, and disregard for the '428 patent, without any reasonable basis for believing that it had a right to engage in the infringing conduct. Plaintiffs are entitled to increased damages of three times the damages assessed pursuant to 35 U.S.C. § 284, as well as an award of attorney's fees pursuant to 35 U.S.C. § 285.

Count IV: Infringement of United States Patent No. 9,986,921 by Xiaomi

189. Plaintiffs incorporate each of the preceding paragraphs as if fully set forth herein.

190. On information and belief, Xiaomi's products, including at least the Accused Xiaomi Watches, infringe at least Claim 1 of the '921 patent under at least 35 U.S.C. §271.

191. On information and belief, Xiaomi has directly infringed one or more claims of the '921 patent through the manufacture, use, sale, offer for sale, and/or importation into the United States of physiological monitors, including at least the Accused Xiaomi Watches.

192. The above-listed watches are non-limiting. Additional products of Xiaomi may infringe the '921 patent, and the above-listed watches may infringe additional patents.

193. On information and belief, at least the Accused Xiaomi Watches listed above are sold with the Mi Fitness app and Zepp Life app infringing technology/algorithms.

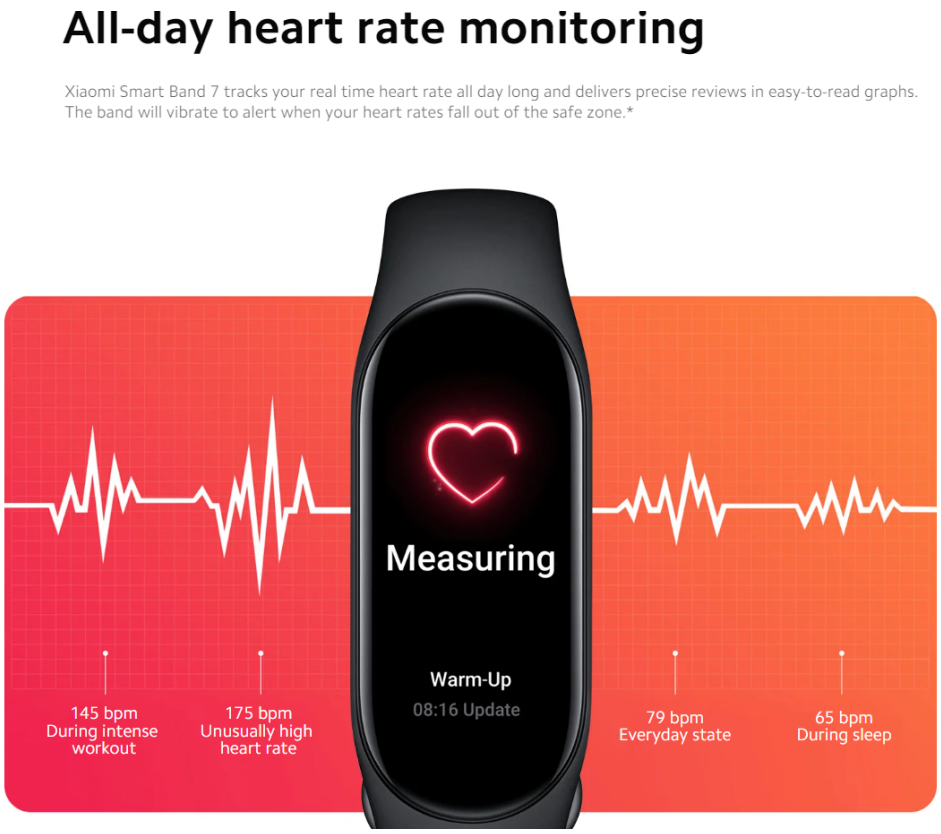
194. For example, Claim 1 covers:

> A computer implemented method for discriminating between normal sinus rhythm without premature ventricular contractions (PVC) or premature atrial contractions (PAC) and atrial fibrillation and premature ventricular contractions (PVC) and premature atrial contractions (PACs), the method comprising:
> obtaining root mean squared of successive differences, Shannon entropy and turning point ratio for peak-to-peak (PPI) interval data;
> comparing the root mean square of successive differences to a first predetermined threshold; comparing the Shannon entropy to a second predetermined threshold;
> comparing the turning point ratio to a third predetermined threshold; and
> determining, when each of the root mean square of successive differences, the Shannon entropy, and the turning point ratio is less than a corresponding predetermined threshold, a subject under test has normal sinus rhythm without PAC or PVC.

195. On information and belief, the algorithm used by the Accused Xiaomi Watches implemented a computer method for discriminating between normal sinus rhythm without premature ventricular contractions (PVC) or premature atrial contractions (PAC) and atrial fibrillation and premature ventricular contractions (PVC) and premature atrial contractions (PACs), including as shown below.

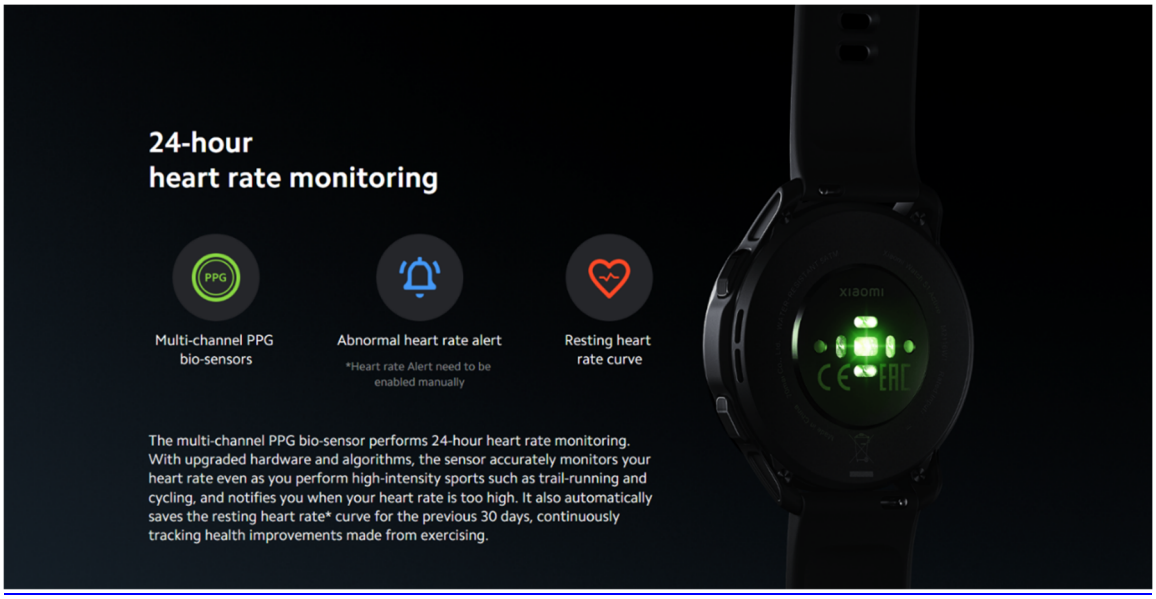
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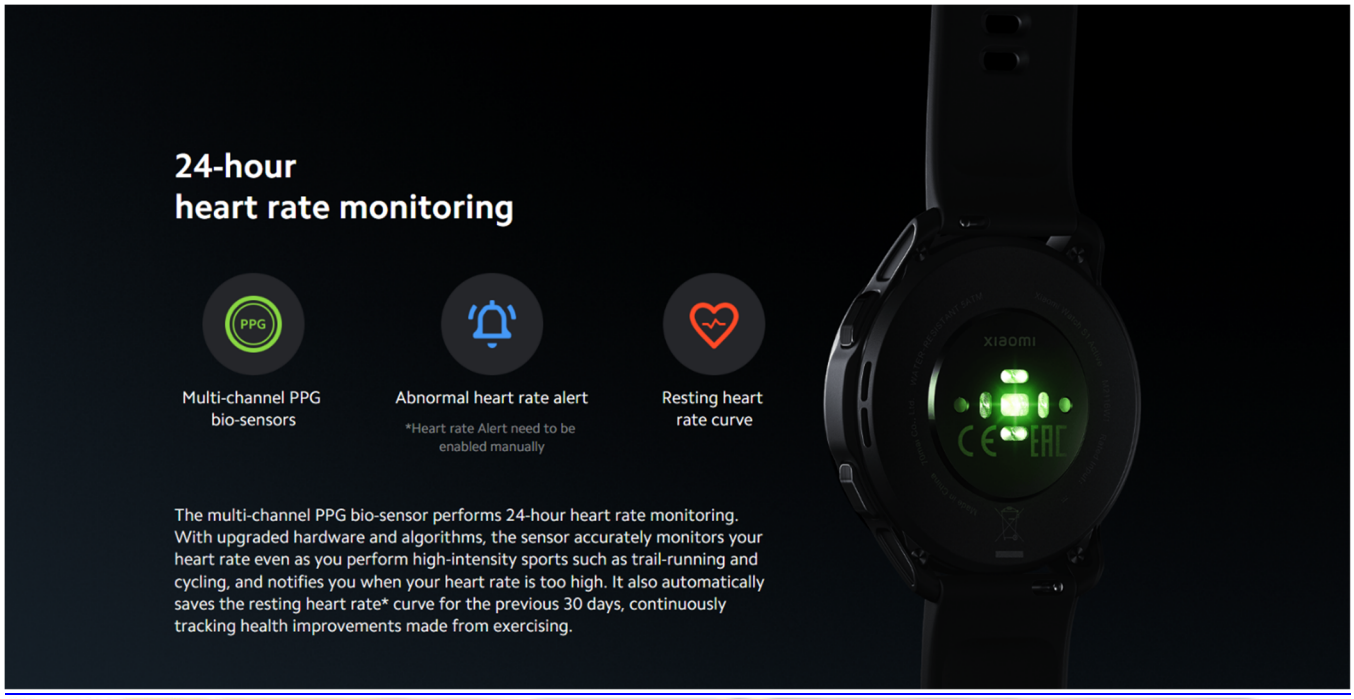


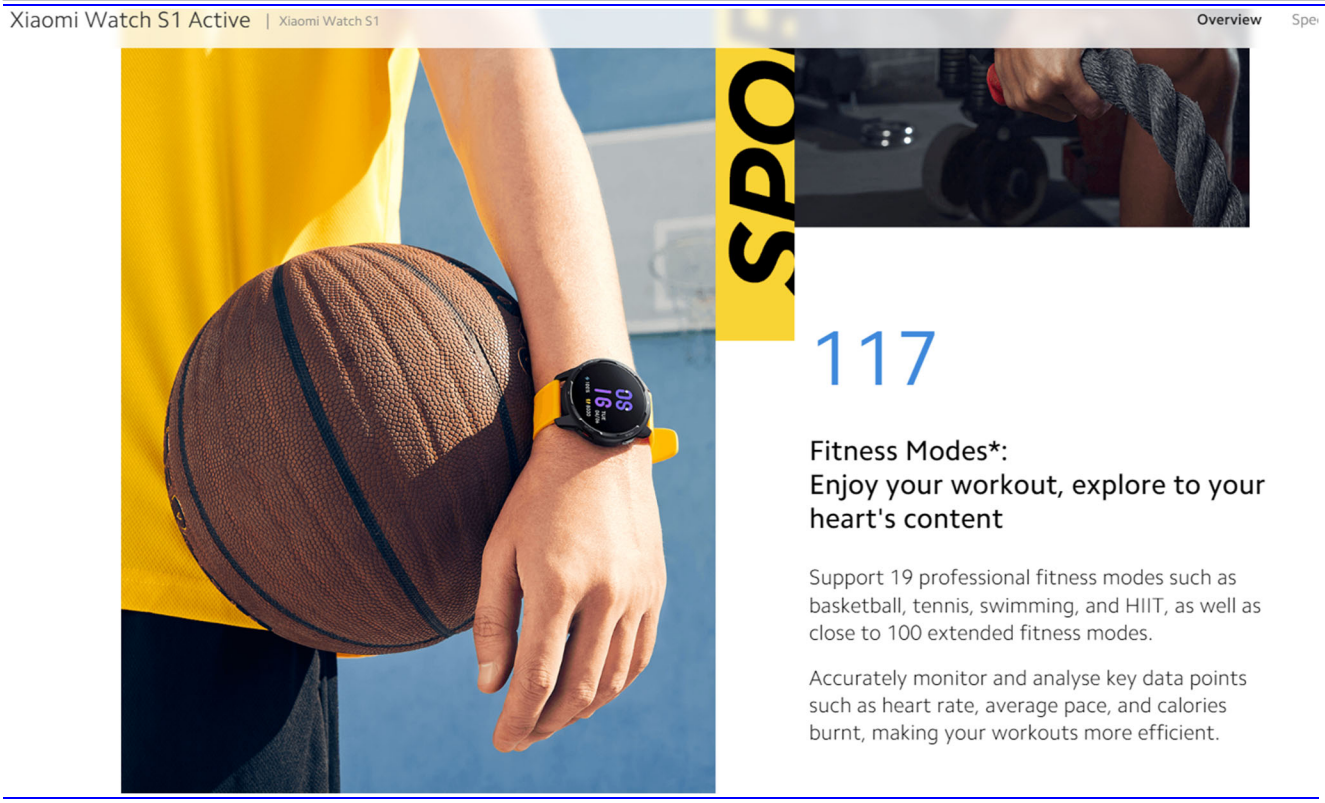

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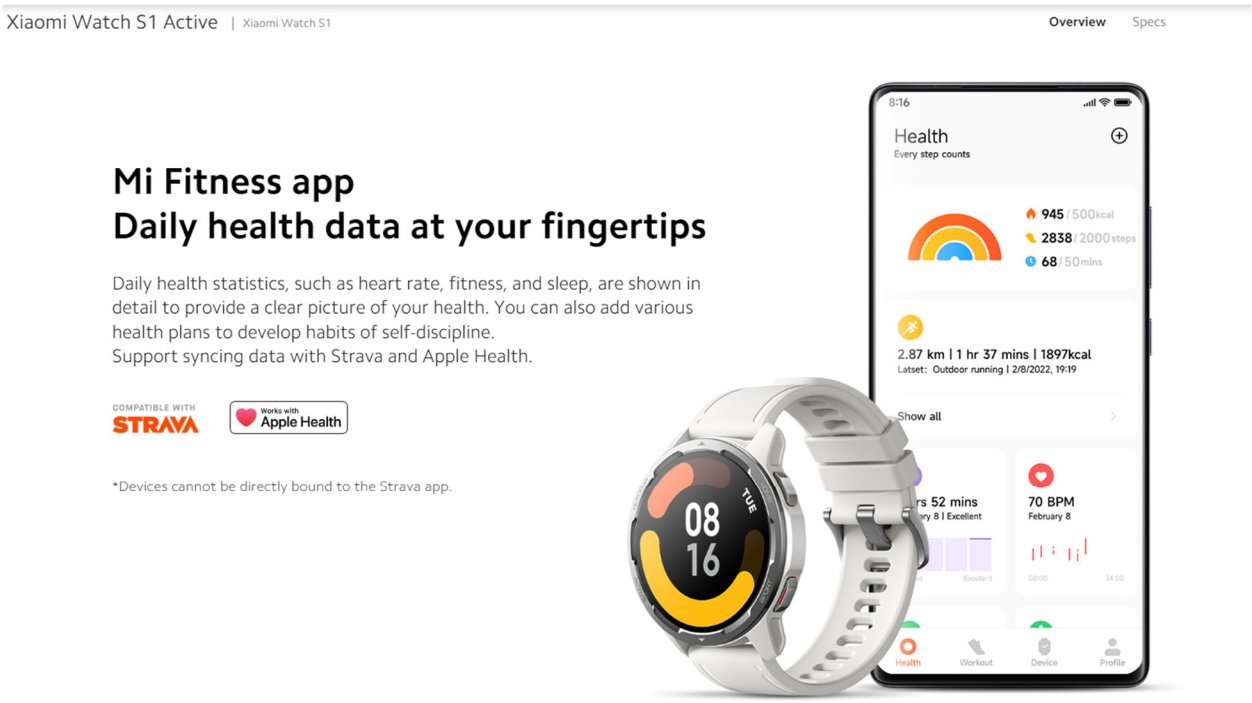

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xiaomi


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196. On information and belief, the algorithm used by the Accused Xiaomi Watches obtains root mean squared of successive differences, Shannon entropy and turning point ratio for peak-to-peak (PPI) interval data.

197. On information and belief, the algorithm used by the Accused Xiaomi Watches compares the root mean square of successive differences to a first predetermined threshold, compares the Shannon entropy to a second predetermined threshold, compares the turning point ratio to a third predetermined threshold, and determines when each of the root mean square of successive differences, the Shannon entropy, and the turning point ratio is less than a corresponding predetermined threshold, a subject under test has normal sinus rhythm without PAC or PVC.

198. On information and belief, the Accused Xiaomi Watches utilize Plaintiffs' algorithm capable of real-time arrhythmia discrimination, which can discriminate between NSR, AF, PACs, and PVCs using pulsatile time series.

199. On information and belief, Xiaomi had knowledge of Plaintiffs' algorithm as claimed in Claim 1 from the publication of the '921 patent claims the United States Patent and Trademark Office, but in any event at least as of the filing of this lawsuit.

200. Xiaomi's infringement of the '921 patent is willful, deliberate, and intentional. On information and belief, Xiaomi has known of the '921 patent and its infringement of the '921 patent since at least the filing of this complaint.

201. Because of Xiaomi's infringement of the '921 patent, Plaintiffs have suffered and will continue to suffer irreparable harm and injury, including monetary damages in an amount to be determined at trial.

202. On information and belief, Xiaomi has acted with full knowledge or at least willful blindness of the '921 patent and without a reasonable basis for believing that they would not be liable for direct infringement of the '921 patent and active inducement of infringement of the '921 patent.

203. Xiaomi has infringed and continues to infringe the '921 patent by making, using, selling, offering to sell, and/or importing, without license or authority, the Accused Xiaomi Watches, as alleged herein, which embody or use the inventions claimed in the '921 patent literally or under the doctrine of equivalents.

204. Xiaomi has induced infringement and continues to induce infringement of the '921 patent by actively and knowingly inducing others to make, use, sell, offer to

sell, and/or import, without license or authority, the Accused Xiaomi Watches, as alleged herein, which embody or use the inventions claimed in the '921 patent literally or under the doctrine of equivalents.

205. Xiaomi markets, advertises, offers for sale, and/or otherwise promotes the Accused Xiaomi Watches and, on information and belief, does so to actively and knowingly induce, encourage, instruct, and aid one or more persons in the United States to make, use, sell, offer to sell and/or import the Accused Xiaomi Watches. For example, Xiaomi knowingly and intentionally induces retailers to advertise, offer for sale, and/or otherwise promote the Accused Xiaomi Watches on their websites and in stores. Additionally, Xiaomi, or one or more related entities, induces end users by, for example, users of the Accused Xiaomi Watches in its manual to use its Mi Fitness app to monitor physiological parameters. Therein, on information and belief, Xiaomi describes and touts the use of the subject matter claimed in the '921 patent, as described and alleged herein.

206. Plaintiffs reserve the right to assert additional claims of the '921 patent that Xiaomi infringes.

207. On information and belief, Xiaomi has known of the existence of the '921 patent and its applicability to the Accused Xiaomi Watches since at least the filing of this complaint, and committed acts of infringement that were willful, demonstrated willful blindness, and disregard for the '921 patent, without any reasonable basis for believing that it had a right to engage in the infringing conduct. Plaintiffs are entitled to

increased damages of three times the damages assessed pursuant to 35 U.S.C. § 284, as well as an award of attorney's fees pursuant to 35 U.S.C. § 285.

Count V: Infringement of United States Patent No. 10,278,647 by Xiaomi

208. Plaintiffs incorporate each of the preceding paragraphs as if fully set forth herein.

209. On information and belief, Xiaomi's products, including at least the Accused Xiaomi Watches, infringe at least Claim 1 of the '647 patent under at least 35 U.S.C. § 271.

210. On information and belief, Xiaomi has directly infringed one or more claims of the '647 patent through the manufacture, use, sale, offer for sale, and/or importation into the United States of physiological monitors, including at least the Accused Xiaomi Watches.

211. The above-listed watches are non-limiting. Additional products of Xiaomi may infringe the '647 patent, and the above-listed watches may infringe additional patents.

212. On information and belief, at least the Accused Xiaomi Watches listed above are sold with the Mi Fitness app and Zepp Life app infringing technology/algorithms.

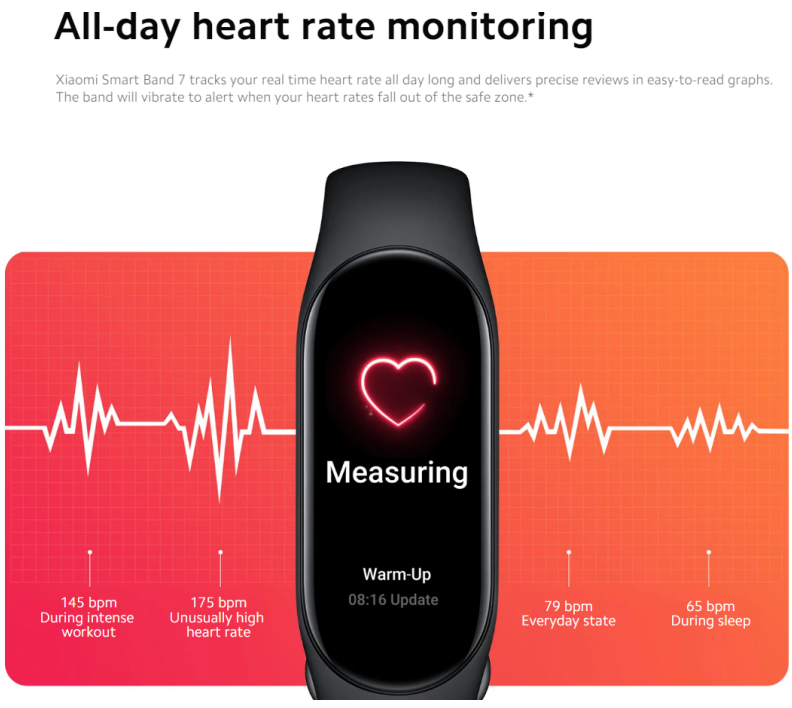
213. For example, Claim 1 covers:

> A method for reconstructing a heart-related signal output by a biomedical sensor, the method comprising:
>
> reconstructing a representation of the heart-related signal to produce a reconstructed representation of the heart-related signal, the

reconstructing based on (i) a time-varying spectral analysis of the heart-related signal and a motion signal, the motion signal output by a motion sensor and representative of motion artifacts in the heart-related signal, the motion artifacts being signal artifacts produced by movement of the biomedical sensor relative to a sensing location, and (ii) a classification of the movement, wherein the time-varying spectral analysis includes pre-processing the heart-related signal to produce a pre-processed heart-related signal, pre-processing the motion signal to produce a pre-processed motion signal, and computing a first time-frequency spectrum (TFS) of the heart-related signal using the pre-processed heart-related signal and a second TFS of the motion signal using the pre-processed motion signal; and

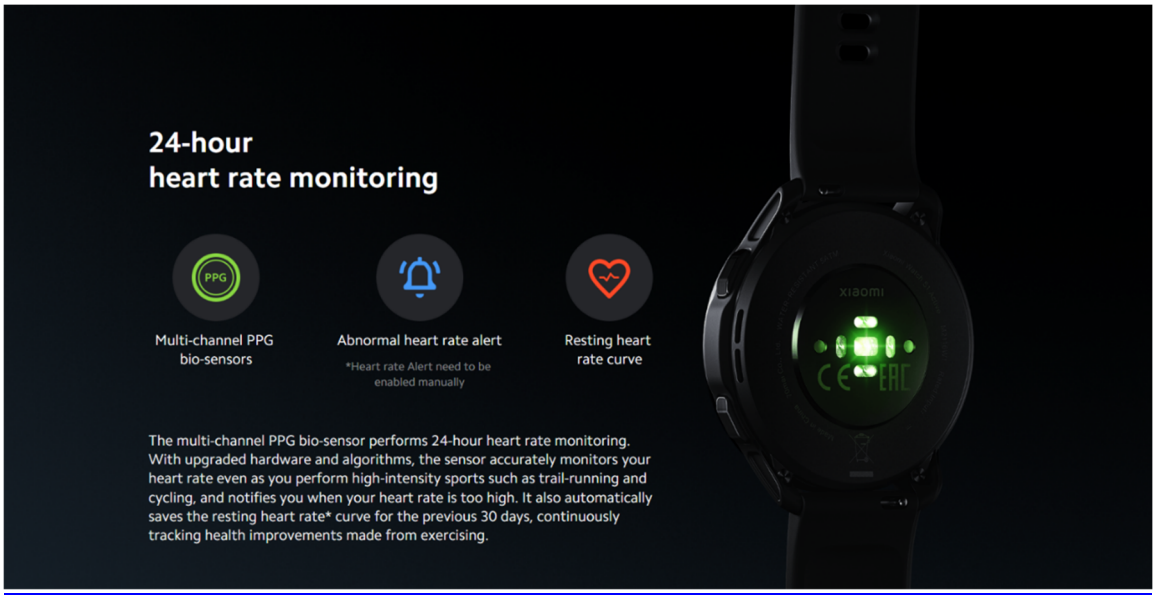
outputting the reconstructed representation of the heart-related signal.

214. On information and belief, the algorithm used by the Accused Xiaomi Watches reconstructs a heart-related signal output by a biomedical sensor, including as shown below. https://www.mi.com/global/product/xiaomi-smart-band-7-nfc/, https://www.mi.com/global/product/xiaomi-watch-s1-active/



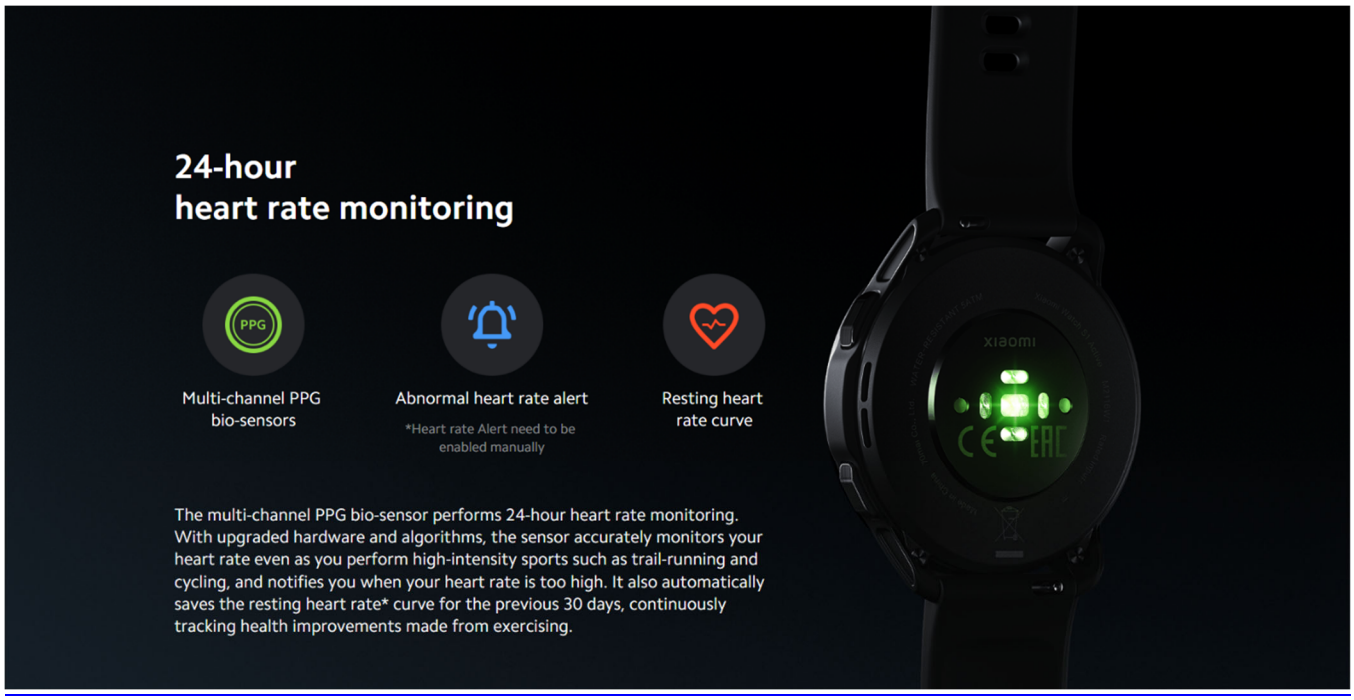

Advanced sleep monitoring
Sleep well to perform well
The sleep monitoring function has also been upgraded with a 35%* increase in accuracy and support monitoring night-time long sleeps and daytime sporadic naps.
Record your sleep patterns through different stages and help to improve your habits for a better sleep.
Details
23:20-06:56
7h36m
Avg
62 BPM
Avg
98%
*Sleep stage, average heart rate, and blood oxygen data will not display for sporadic naps less than three hours. The duration for sporadic nap detection is 20 minutes to 3 hours.

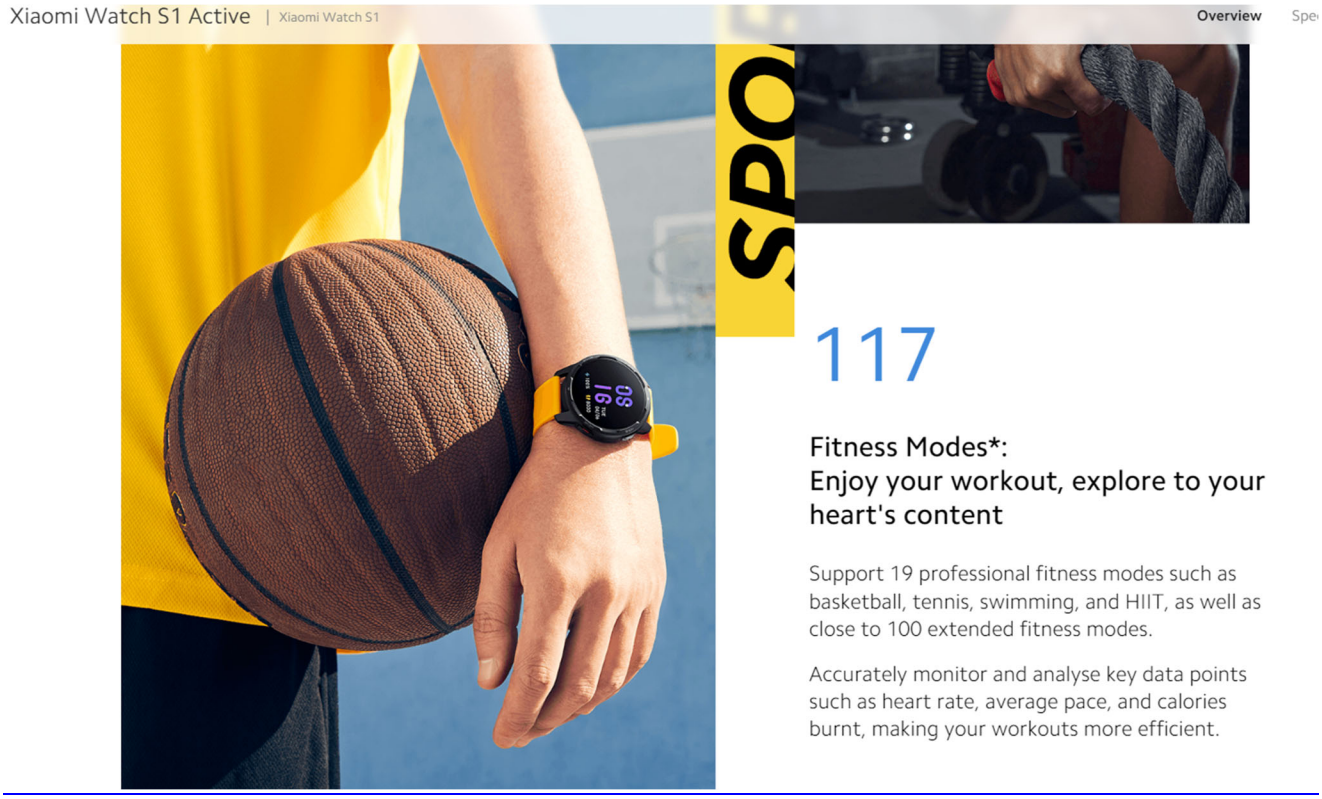

All-day blood oxygen monitoring*
Get an SpO2 measurement for a peace of mind. Newly upgraded to support all-day continuous SpO2 monitoring. Measurement interval can be set up according to your need.
Tips:
*All-day blood oxygen monitoring mode needs to be manually enabled. Default monitoring is set to once every 30 minutes and can be adjusted to once every 10 minutes.
SpO2
95%
30 mins ago
00:00
24:00
Measure

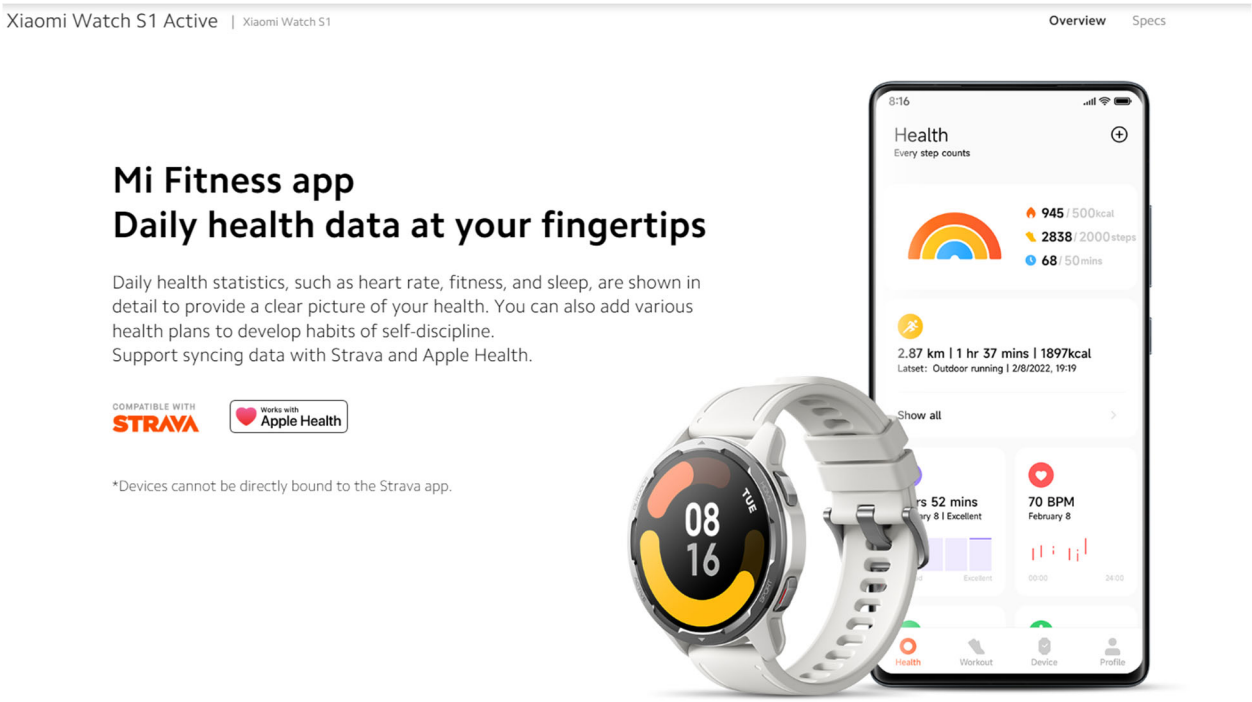

24-hour
heart rate monitoring
PPG
Multi-channel PPG bio-sensors
Abnormal heart rate alert
*Heart rate Alert need to be enabled manually
Resting heart rate curve
The multi-channel PPG bio-sensor performs 24-hour heart rate monitoring. With upgraded hardware and algorithms, the sensor accurately monitors your heart rate even as you perform high-intensity sports such as trail-running and cycling, and notifies you when your heart rate is too high. It also automatically saves the resting heart rate* curve for the previous 30 days, continuously tracking health improvements made from exercising.
xiaomi


Advanced sleep monitoring
Sleep well to perform well
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Record your sleep patterns through different stages and help to improve your habits for a better sleep.
Details
23:20-06:56
7h36m
Avg
62 BPM
Avg
98%
*Sleep stage, average heart rate, and blood oxygen data will not display for sporadic naps less than three hours. The duration for sporadic nap detection is 20 minutes to 3 hours.


All-day blood oxygen monitoring*
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Tips:
*All-day blood oxygen monitoring mode needs to be manually enabled. Default monitoring is set to once every 30 minutes and can be adjusted to once every 10 minutes.
SpO₂
95%
30 mins ago
00:00
24:00
Measure
MOVE
SPORT


24-hour
heart rate monitoring
PPG
Multi-channel PPG bio-sensors
Abnormal heart rate alert
*Heart rate Alert need to be enabled manually
Resting heart rate curve
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xiaomi


Xiaomi Watch S1 Active | Xiaomi Watch S1
Overview
117
Fitness Modes*:
Enjoy your workout, explore to your heart's content
Support 19 professional fitness modes such as basketball, tennis, swimming, and HIIT, as well as close to 100 extended fitness modes.
Accurately monitor and analyse key data points such as heart rate, average pace, and calories burnt, making your workouts more efficient.


Xiaomi Watch S1 Active | Xiaomi Watch S1
Overview
Specs
Mi Fitness app
Daily health data at your fingertips
Daily health statistics, such as heart rate, fitness, and sleep, are shown in detail to provide a clear picture of your health. You can also add various health plans to develop habits of self-discipline.
Support syncing data with Strava and Apple Health.
COMPATIBLE WITH STRAVA
Works with Apple Health
*Devices cannot be directly bound to the Strava app.
Health
Every step counts
945/500kcal
2838/2000steps
68/50mins
2.87 km | 1 hr 37 mins | 1897kcal
Latset: Outdoor running | 2/8/2022, 19:19
Show all
70 BPM
February 8
Health
Workout
Device
Profile

215. On information and belief, the algorithm used by the Accused Xiaomi Watches reconstructs a representation of the heart-related signal to produce a reconstructed representation of the heart-related signal, the reconstructing based on (i) a time-varying spectral analysis of the heart-related signal and a motion signal, the motion signal output by a motion sensor and representative of motion artifacts in the heart-related signal, the motion artifacts being signal artifacts produced by movement of the biomedical sensor relative to a sensing location, and (ii) a classification of the movement, wherein the time-varying spectral analysis includes pre-processing the heart-related signal to produce a pre-processed heart-related signal, pre-processing the motion signal to produce a pre-processed motion signal, and computing a first time-frequency spectrum (TFS) of the heart-related signal using the pre-processed heart-related signal and a second TFS of the motion signal using the pre-processed motion signal.

216. On information and belief, the algorithm used by the Accused Xiaomi Watches outputs the reconstructed representation of the heart-related signal, including as shown below. https://www.mi.com/global/product/xiaomi-smart-band-7-nfc/, https://www.mi.com/global/product/xiaomi-watch-s1-active/

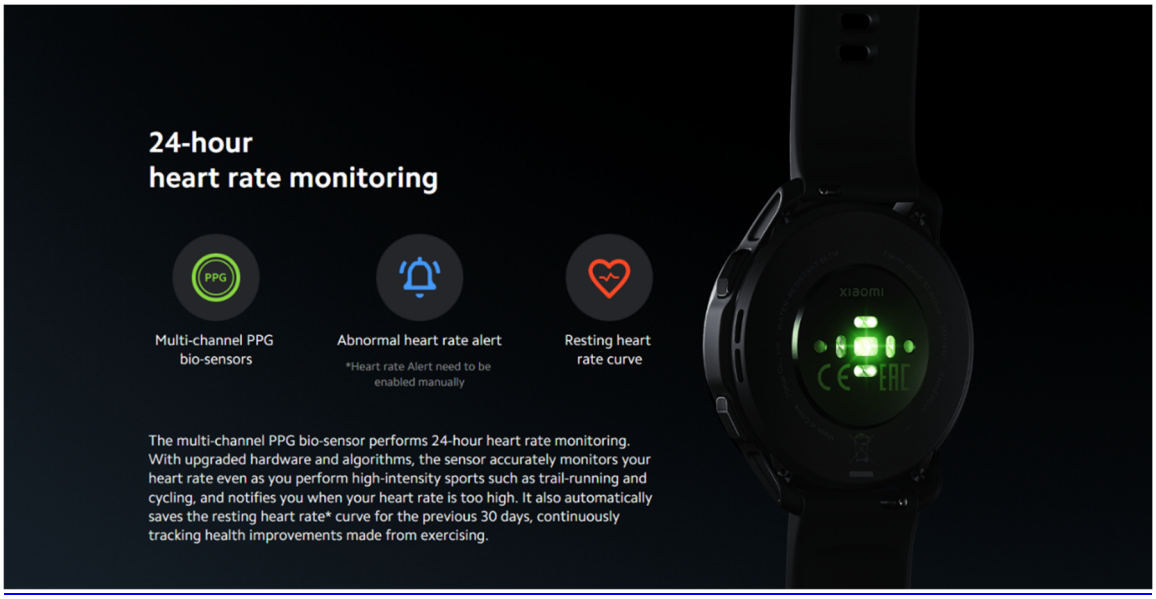
All-day heart rate monitoring

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The band will vibrate to alert when your heart rates fall out of the safe zone.*



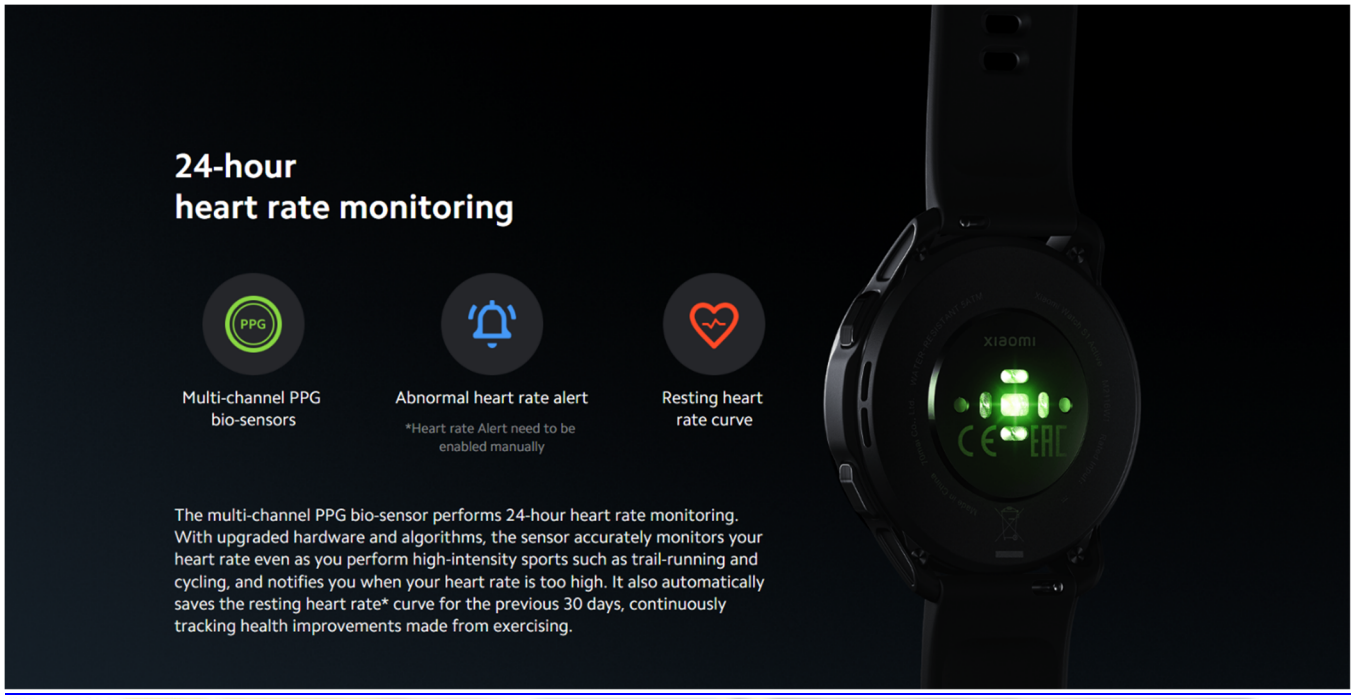


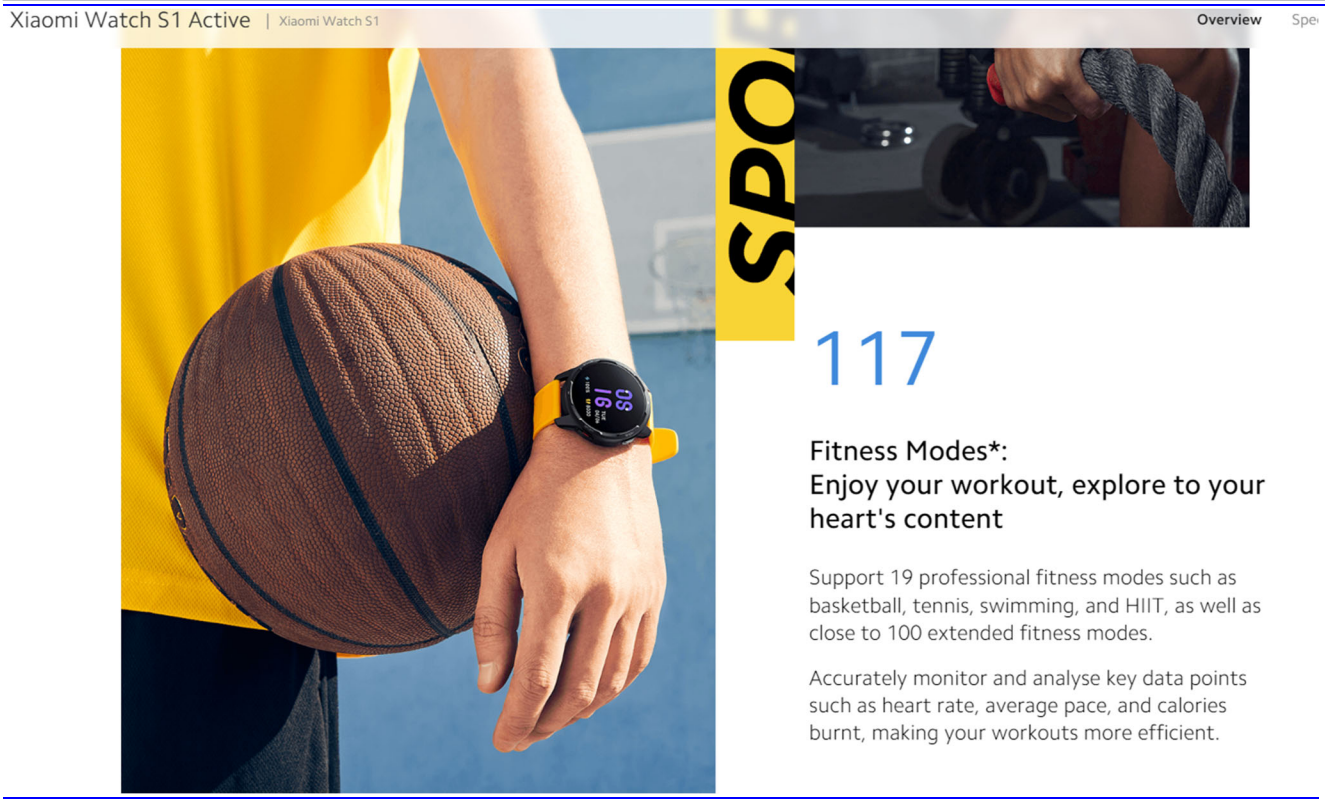

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Tips:
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SpO₂
95%
30 mins ago
00:00
24:00
Measure

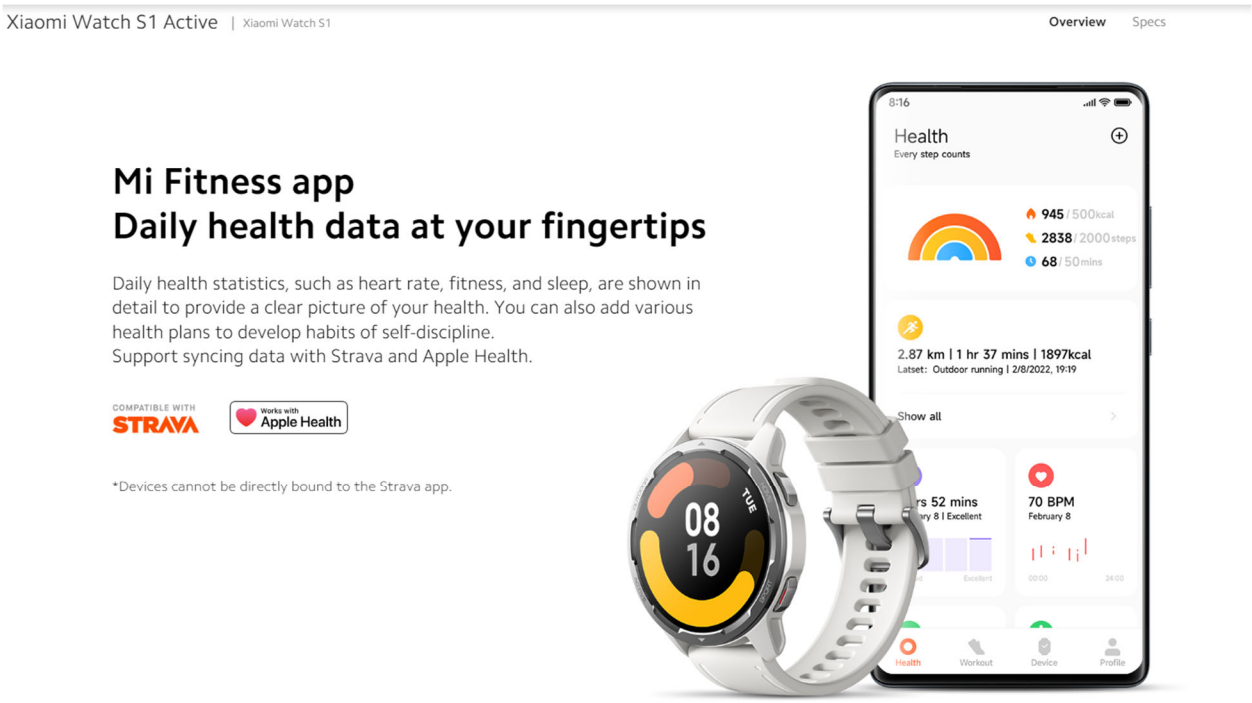

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*Heart rate Alert need to be enabled manually
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xiaomi


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SpO2
95%
30 mins ago
00:00
24:00
Measure

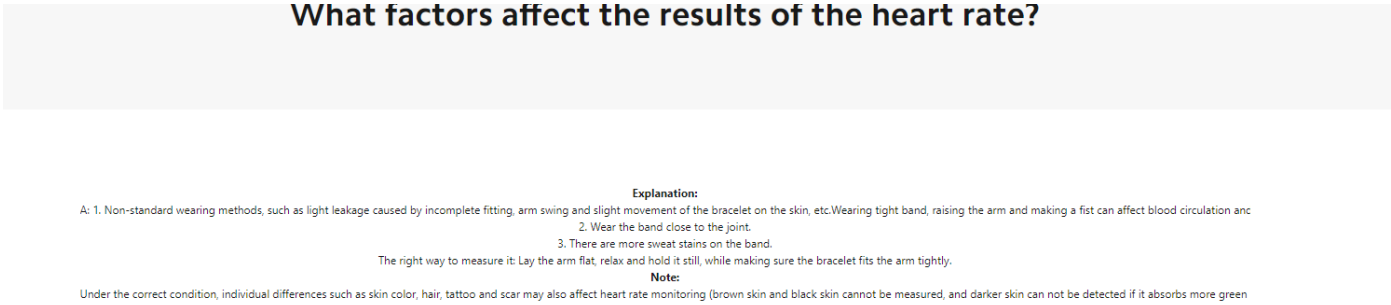

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xiaomi


Xiaomi Watch S1 Active | Xiaomi Watch S1
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117
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Enjoy your workout, explore to your heart's content
Support 19 professional fitness modes such as basketball, tennis, swimming, and HIIT, as well as close to 100 extended fitness modes.
Accurately monitor and analyse key data points such as heart rate, average pace, and calories burnt, making your workouts more efficient.



217. On information and belief, the Accused Xiaomi Watches utilize Plaintiffs' algorithm and method claims to employ a time-varying spectral approach for reconstructing a heart-related signal that includes motion artifacts using at least of a PPG sensor, piezoelectric sensor, LED based sensor, camera sensor, and a pulse oximeter sensor.

218. On information and belief, the method and apparatus for heart-related signal monitoring that includes motion artifacts is shown in the images below found on the Xiaomi's website at: https://www.mi.com/global/support/article/KA-07154



219. On information and belief, Xiaomi had knowledge of Plaintiffs' algorithm as claimed in Claim 1 from the publication of the '647 patent claims the United States Patent and Trademark Office, but in any event at least as of the filing of this lawsuit.

220. Xiaomi's infringement of the '647 patent is willful, deliberate, and intentional. On information and belief, Xiaomi has known of the '647 patent and its infringement of that patent since at least the filing of this complaint.

221. Because of Xiaomi's infringement of the '647 patent, Plaintiffs have suffered and will continue to suffer irreparable harm and injury, including monetary damages in an amount to be determined at trial.

222. On information and belief, Xiaomi has acted with full knowledge or at least willful blindness of the '647 patent and without a reasonable basis for believing that they would not be liable for direct infringement of the '647 patent and active inducement of infringement of the '647 patent.

223. Xiaomi has infringed and continues to infringe the '647 patent by making, using, selling, offering to sell, and/or importing, without license or authority, the Accused Xiaomi Watches, as alleged herein, which embody or use the inventions claimed in the '647 patent literally or under the doctrine of equivalents.

224. Xiaomi has induced infringement and continues to induce infringement of the '647 patent by actively and knowingly inducing others to make, use, sell, offer to sell, and/or import, without license or authority, the Accused Xiaomi Watches, as alleged herein, which embody or use the inventions claimed in the '647 patent literally or under the doctrine of equivalents.

225. Xiaomi markets, advertises, offers for sale, and/or otherwise promotes the Accused Xiaomi Watches and, on information and belief, does so to actively and knowingly induce, encourage, instruct, and aid one or more persons in the United States to make, use, sell, offer to sell and/or import the Accused Xiaomi Watches. For example, Xiaomi knowingly and intentionally induces retailers to advertise, offer for sale, and/or otherwise promote the Accused Xiaomi Watches on their websites and in stores. Additionally, Xiaomi, or one or more related entities, induces end users by, for example, users of the Accused Xiaomi Watches in its manual to use its Mi Fitness app to monitor physiological parameters. Therein, on information and belief, Xiaomi describes and touts the use of the subject matter claimed in the '647 patent, as described and alleged herein.

226. Plaintiffs reserve the right to assert additional claims of the '647 patent that Xiaomi infringes.

227. On information and belief, Xiaomi has known of the existence of the '647 patent and its applicability to the Accused Xiaomi Watches since at least the filing of this complaint, and committed acts of infringement that were willful, demonstrated willful blindness, and disregard for the '647 patent, without any reasonable basis for believing that it had a right to engage in the infringing conduct. Plaintiffs are entitled to increased damages of three times the damages assessed pursuant to 35 U.S.C. § 284, as well as an award of attorney's fees pursuant to 35 U.S.C. § 285.

Count VI: Infringement of United States Patent No. 10,285,601 by Xiaomi

228. Plaintiffs incorporate each of the preceding paragraphs as if fully set forth herein.

229. On information and belief, Xiaomi's products, including at least the Accused Xiaomi Watches, infringe at least Claim 1 of the '601 patent under at least 35 U.S.C. § 271.

230. On information and belief, Xiaomi has directly infringed one or more claims of the '601 patent through the manufacture, use, sale, offer for sale, and/or importation into the United States of physiological monitors, including at least the Accused Xiaomi Watches.

231. The above-listed watches are non-limiting. Additional products of Xiaomi may infringe the '601 patent, and the above-listed watches may infringe additional patents.

232. On information and belief, at least the Accused Xiaomi Watches listed above are sold with the Mi Fitness app and Zepp Life app infringing technology/algorithms.

233. For example, Claim 1 covers:

> A system for discriminating between normal sinus rhythm without premature ventricular contractions or premature atrial contractions and atrial fibrillation and premature ventricular contractions (PVC) and premature atrial contractions (PACs), the system comprising:
>
> one or more processors; the one or more processors being configured to:

obtain root mean squared of successive differences, Shannon entropy and turning point ratio for peak-to-peak (PPI) interval data;

compare the root mean square of successive differences to a first predetermined threshold;

compare the Shannon entropy to a second predetermined threshold;

compare the turning point ratio to a third predetermined threshold; and

determine, when each of the root mean square of successive differences, the Shannon entropy, and the turning point ratio is less than a corresponding predetermined threshold, a subject under test has normal sinus rhythm without PAC or PVC.

234. On information and belief, the algorithm used by the Accused Xiaomi Watches discriminates between normal sinus rhythm without premature ventricular contractions or premature atrial contractions and atrial fibrillation and premature ventricular contractions (PVC) and premature atrial contractions (PACs), including as shown below. https://www.mi.com/global/product/xiaomi-smart-band-7-nfc/, https://www.mi.com/global/product/xiaomi-watch-s1-active/

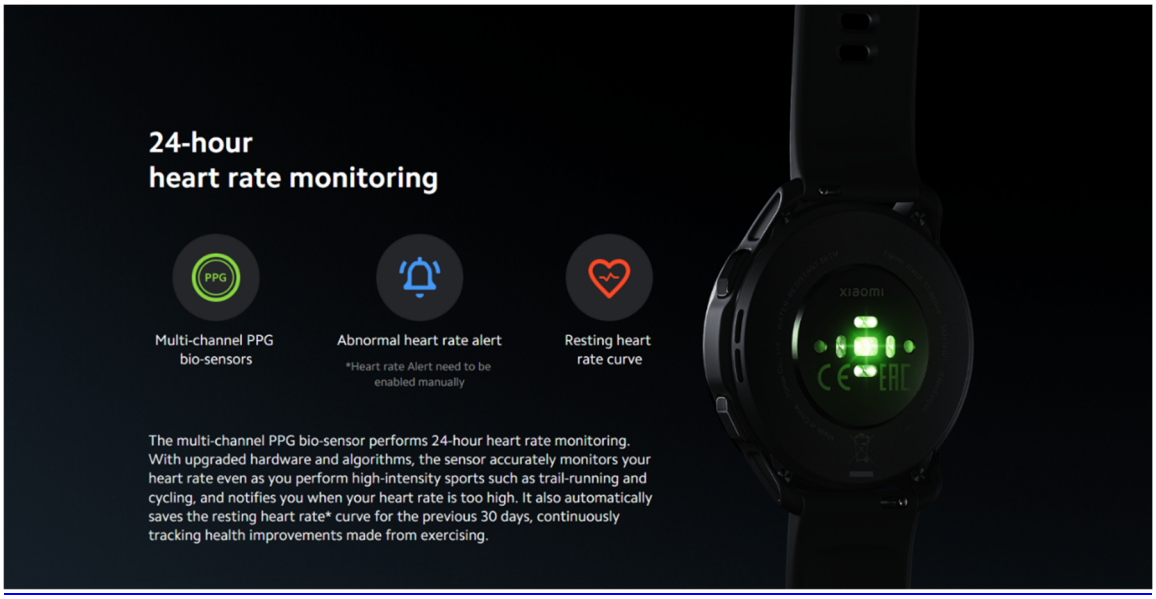
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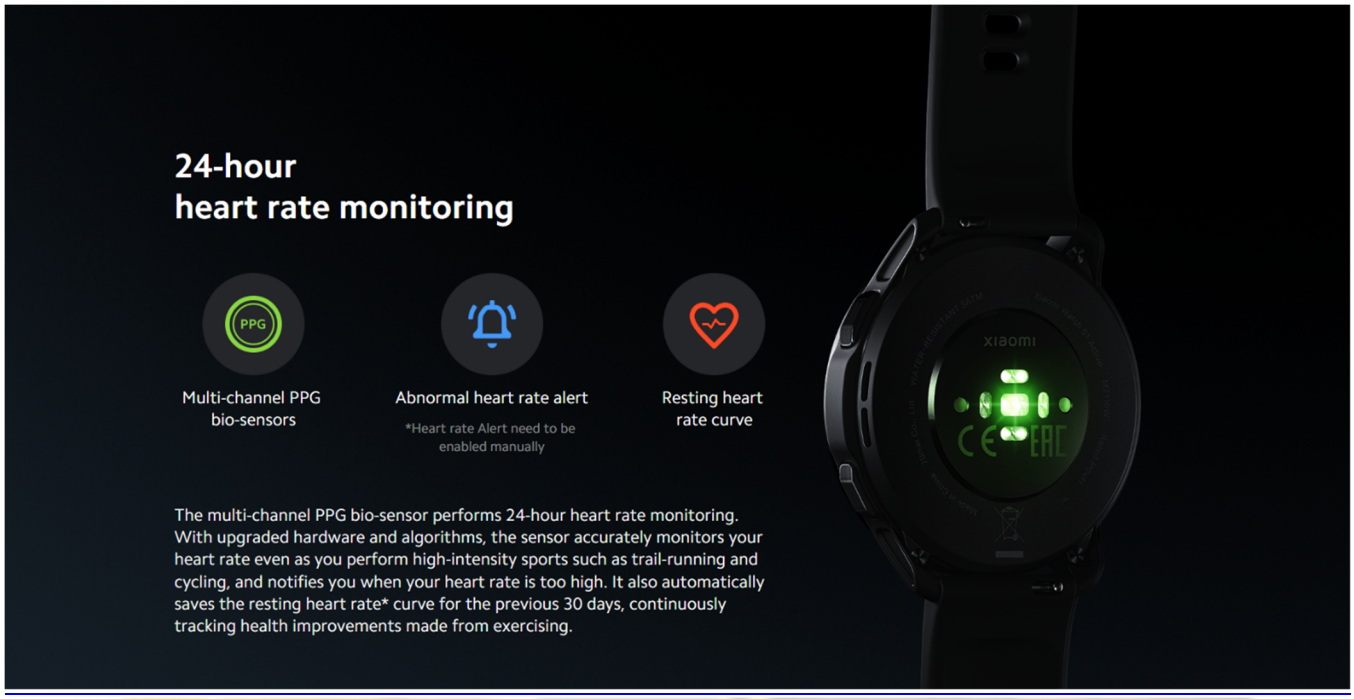


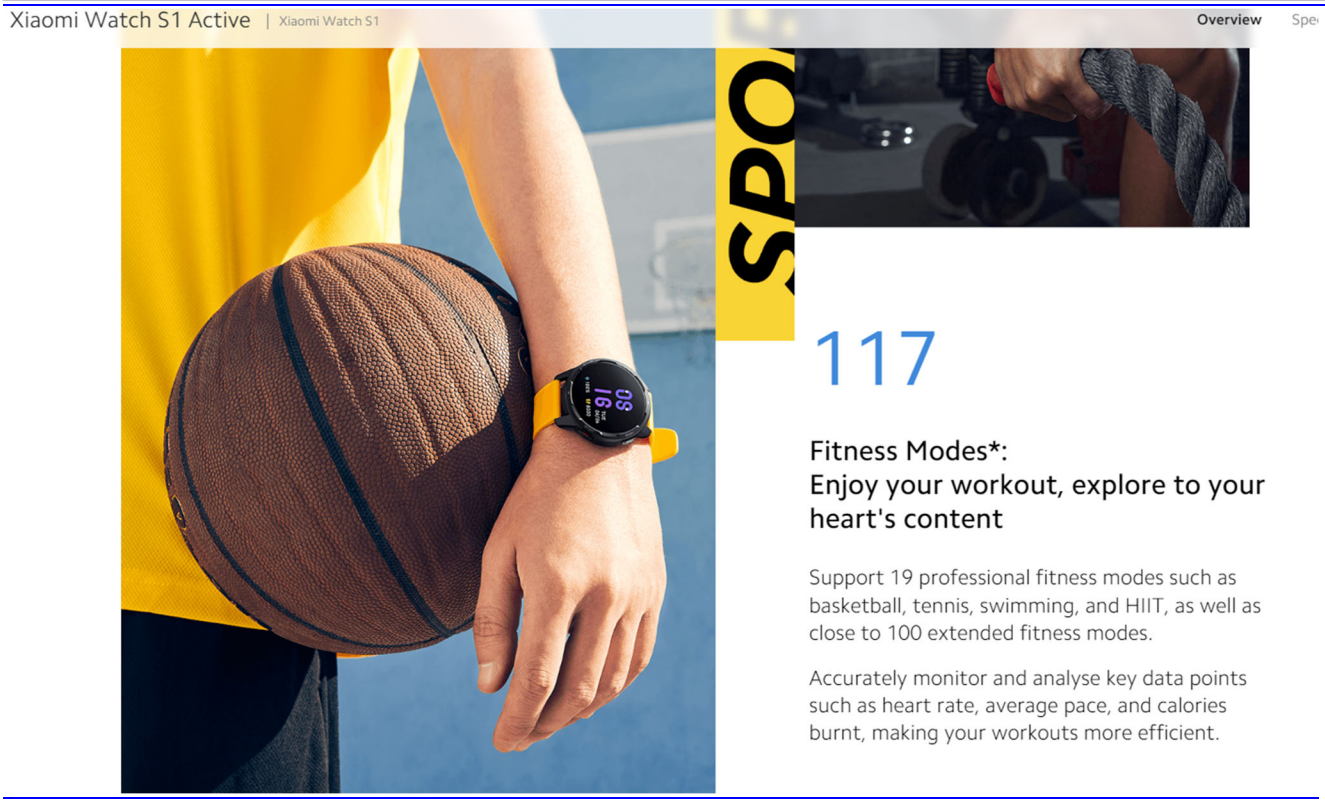

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SpO₂
95%
30 mins ago
00:00
24:00
Measure

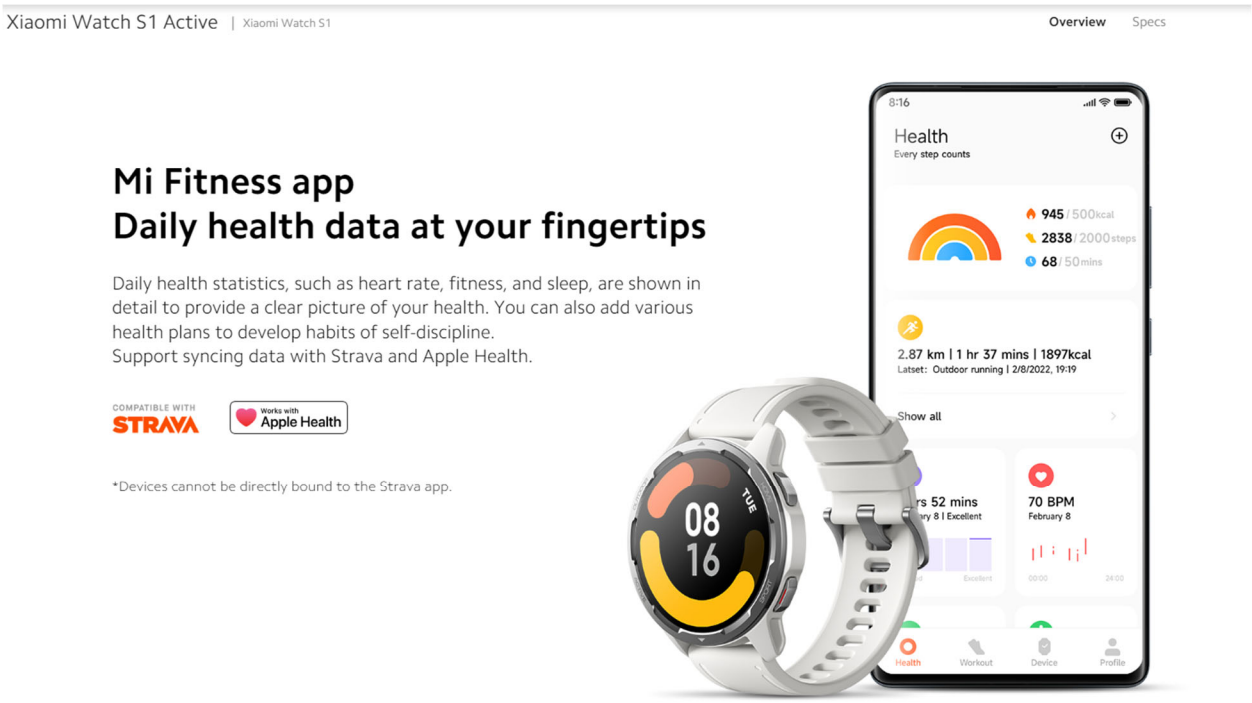

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Avg
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30 mins ago
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24:00
Measure


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xiaomi


Xiaomi Watch S1 Active | Xiaomi Watch S1
Overview
117
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Support 19 professional fitness modes such as basketball, tennis, swimming, and HIIT, as well as close to 100 extended fitness modes.
Accurately monitor and analyse key data points such as heart rate, average pace, and calories burnt, making your workouts more efficient.



235. The algorithm and technology used by the Accused Xiaomi Watches have one or more processors.

236. On information and belief, the algorithm used by the Accused Xiaomi Watches obtains root mean squared of successive differences, Shannon entropy and turning point ratio for peak-to-peak (PPI) interval data.

237. On information and belief, the algorithm used by the Accused Xiaomi Watches compares the root mean square of successive differences to a first predetermined threshold.

238. On information and belief, the algorithm used by the Accused Xiaomi Watches compares the Shannon entropy to a second predetermined threshold.

239. On information and belief, the algorithm used by the Accused Xiaomi Watches compares the turning point ratio to a third predetermined threshold.

240. On information and belief, the algorithm used by the Accused Xiaomi Watches determines, when each of the root mean square of successive differences, the Shannon entropy, and the turning point ratio is less than a corresponding predetermined threshold, a subject under test has normal sinus rhythm without PAC or PVC.

241. On information and belief, the Accused Xiaomi Watches utilize Plaintiffs' algorithm capable of real-time arrhythmia discrimination, which can discriminate between NSR, AF, PACs, and PVCs using pulsatile time series.

242. On information and belief, Xiaomi had knowledge of Plaintiffs' algorithm and systems as claimed in Claim 1 from the publication of the '601 patent claims the United States Patent and Trademark Office, but in any event at least as of the filing of this lawsuit.

243. Xiaomi's infringement of the '601 patent is willful, deliberate, and intentional. On information and belief, Xiaomi has known of the '601 patent and its infringement of that patent since at least the filing of this complaint.

244. Because of Xiaomi's infringement of the '601 patent, Plaintiffs have suffered and will continue to suffer irreparable harm and injury, including monetary damages in an amount to be determined at trial.

245. On information and belief, Xiaomi has acted with full knowledge or at least willful blindness of the '601 patent and without a reasonable basis for believing that they would not be liable for direct infringement of the '601 patent and active inducement of infringement of the '601 patent.

246. Xiaomi has infringed and continues to infringe the '601 patent by making, using, selling, offering to sell, and/or importing, without license or authority, the Accused Xiaomi Watches, as alleged herein, which embody or use the inventions claimed in the '601 patent literally or under the doctrine of equivalents.

247. Xiaomi has induced infringement and continues to induce infringement of the '601 patent by actively and knowingly inducing others to make, use, sell, offer to sell, and/or import, without license or authority, the Accused Xiaomi Watches, as alleged herein, which embody or use the inventions claimed in the '601 patent literally or under the doctrine of equivalents.

248. Xiaomi markets, advertises, offers for sale, and/or otherwise promotes the Accused Xiaomi Watches and, on information and belief, does so to actively and knowingly induce, encourage, instruct, and aid one or more persons in the United States to make, use, sell, offer to sell and/or import the Accused Xiaomi Watches. For example, Xiaomi knowingly and intentionally induces retailers to advertise, offer for sale, and/or otherwise promote the Accused Xiaomi Watches on their websites and in stores. Additionally, Xiaomi, or one or more related entities, induces end users by, for example, users of the Accused Xiaomi Watches in its manual to use its Mi Fitness app to monitor physiological parameters. Therein, on information and belief, Xiaomi describes

and touts the use of the subject matter claimed in the '601 patent, as described and alleged herein.

249. Plaintiffs reserve the right to assert additional claims of the '601 patent that Xiaomi infringes.

250. On information and belief, Xiaomi has known of the existence of the '601 patent and its applicability to the Accused Xiaomi Watches since at least the filing of the complaint, and committed acts of infringement that were willful, demonstrated willful blindness, and disregard for the '601 patent, without any reasonable basis for believing that it had a right to engage in the infringing conduct. Plaintiffs are entitled to increased damages of three times the damages assessed pursuant to 35 U.S.C. § 284, as well as an award of attorney's fees pursuant to 35 U.S.C. § 285.

Count VII: Infringement of United States Patent No. 10,653,362 by Xiaomi

251. Plaintiffs incorporate each of the preceding paragraphs as if fully set forth here.

252. On information and belief, Xiaomi's products, including at least the Accused Xiaomi Watches, infringe at least Claim 1 of the '362 patent under at least 35 U.S.C. § 271.

253. On information and belief, Xiaomi has directly infringed one or more claims of the '362 patent through the manufacture, use, sale, offer for sale, and/or importation into the United States of physiological monitors, including at least the Accused Xiaomi Watches.

254. The above-listed watches are non-limiting. Additional products of Xiaomi may infringe the '362 patent, and the above-listed watches may infringe additional patents.

255. On information and belief, at least the Accused Xiaomi Watches listed above are sold with the Mi Fitness app and Zepp Life app infringing technology/algorithms.

256. For example, Claim 1 covers:

> A computer implemented method for physiological parameter monitoring using a signal used as a Photoplethysmogram (PPG) signal, the computer implemented method comprising:
>
> obtaining a time frequency spectrum of a segment of the signal used as the PPG signal;
>
> obtaining, from the time frequency spectrum, a noise quality index for the segment; the noise quality index being used to determine whether the segment is corrupted by motion and noise artifacts;
>
> wherein obtaining a noise quality index comprises:
>
> determining a dominant frequency in the time frequency spectrum of the segment;
>
> normalizing the time frequency spectrum to a total power in a narrow band centered at the dominant frequency;
>
> determining a first trace of amplitudes in the narrow band spectrum of the time frequency spectrum centered at the dominant frequency;
>
> determining a second trace of amplitudes in a narrow band spectrum of the time frequency spectrum centered at twice the dominant frequency;
>
> determining a third trace of amplitudes in a narrow band spectrum of the time frequency spectrum centered at three times the dominant frequency;
>
> subtracting the first, second and third traces of amplitudes from the time frequency spectrum;
>
> obtaining, after subtracting, a total power remaining in the time frequency spectrum, said total power remaining referred to as a residual noise power;

determining a difference in frequency between the first trace and the second and third traces, the difference in frequency referred to as a projected difference;

the noise quality index being a weighted sum of factors including the residual noise power and the projected difference; weights being selected such that each weighted factor represents less than a predetermined percentage of power in an uncorrupted segment;

applying a statistical learning method, using the noise quality index, to determine whether the segment is corrupted by motion and noise artifacts or not corrupted by motion and noise artifacts;

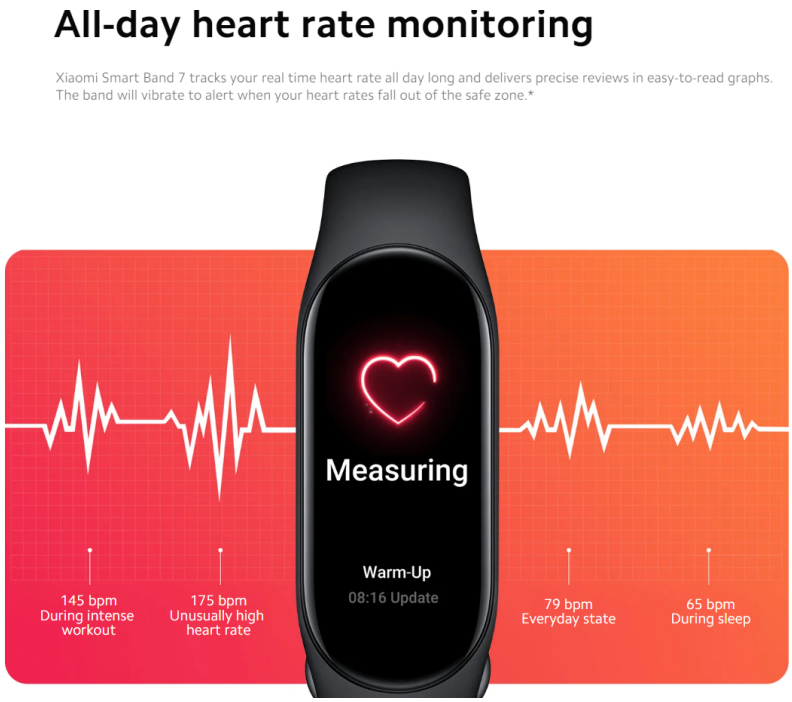
and,

if motion and noise artifacts are not present, including the segment in determination of a physiological parameter.

257. The algorithm used by the Accused Xiaomi Watches implement a computer method for physiological parameter monitoring using a signal used as a Photoplethysmogram (PPG) signal, including as shown below.

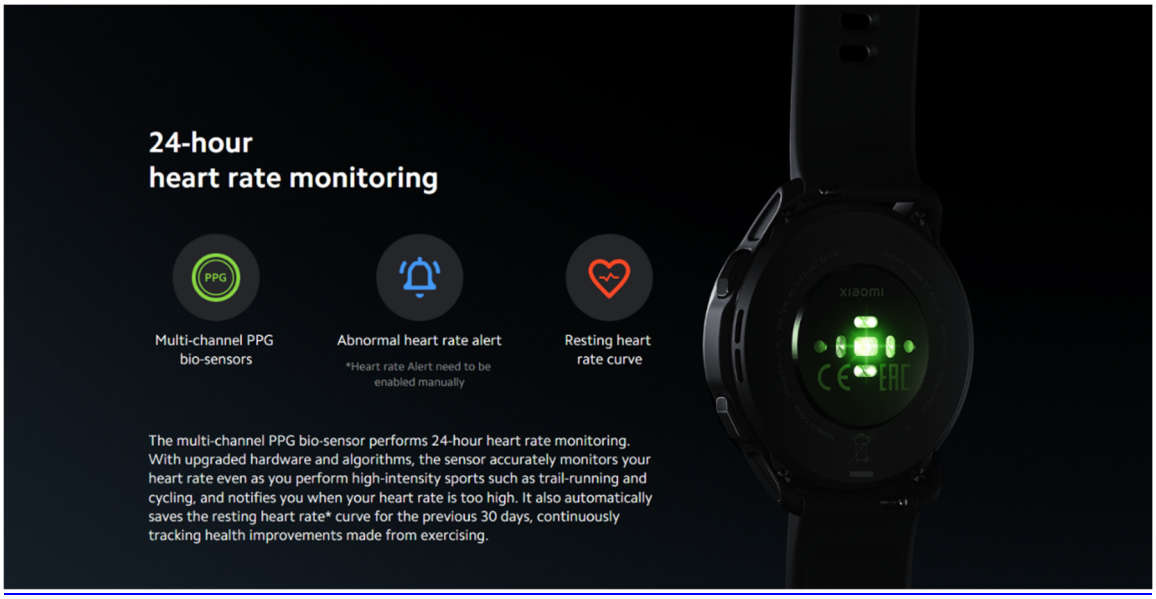
https://www.mi.com/global/product/xiaomi-smart-band-7-nfc/,

https://www.mi.com/global/product/xiaomi-watch-s1-active/



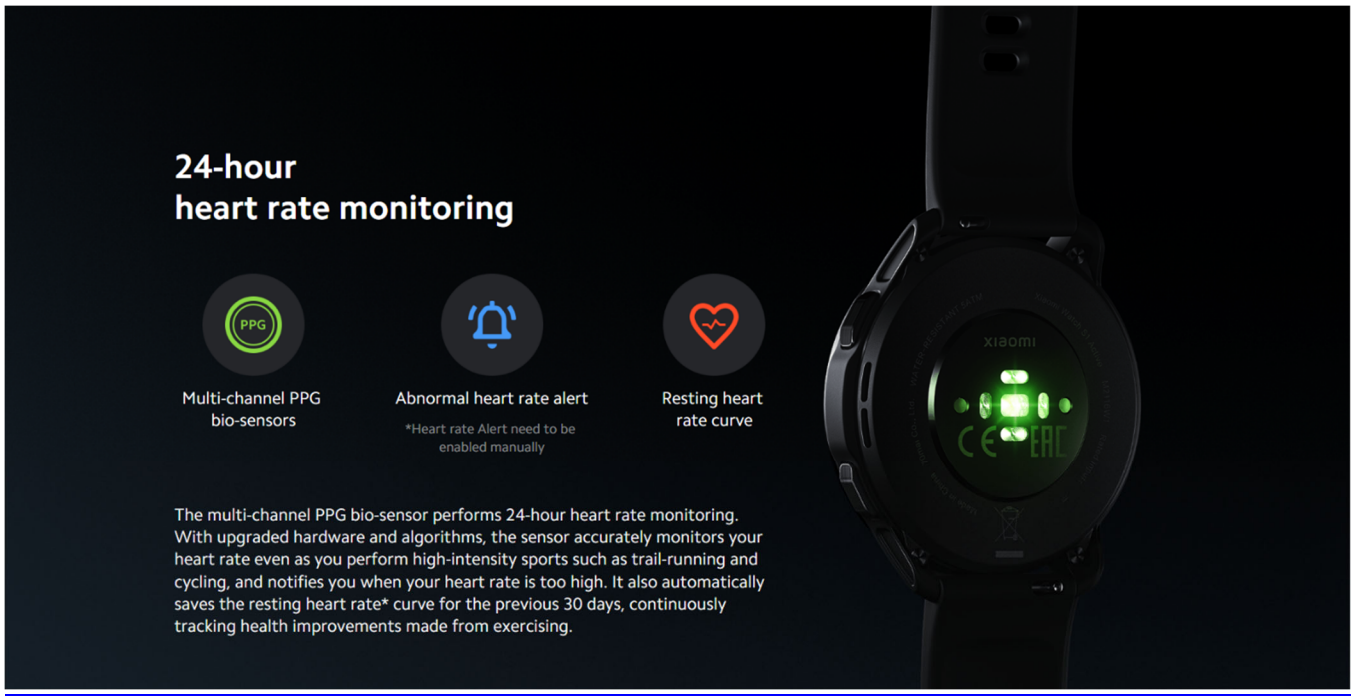

Advanced sleep monitoring
Sleep well to perform well
The sleep monitoring function has also been upgraded with a 35%* increase in accuracy and support monitoring night-time long sleeps and daytime sporadic naps.
Record your sleep patterns through different stages and help to improve your habits for a better sleep.
Details
23:20-06:56
7h36m
Avg
62 BPM
Avg
98%
*Sleep stage, average heart rate, and blood oxygen data will not display for sporadic naps less than three hours. The duration for sporadic nap detection is 20 minutes to 3 hours.

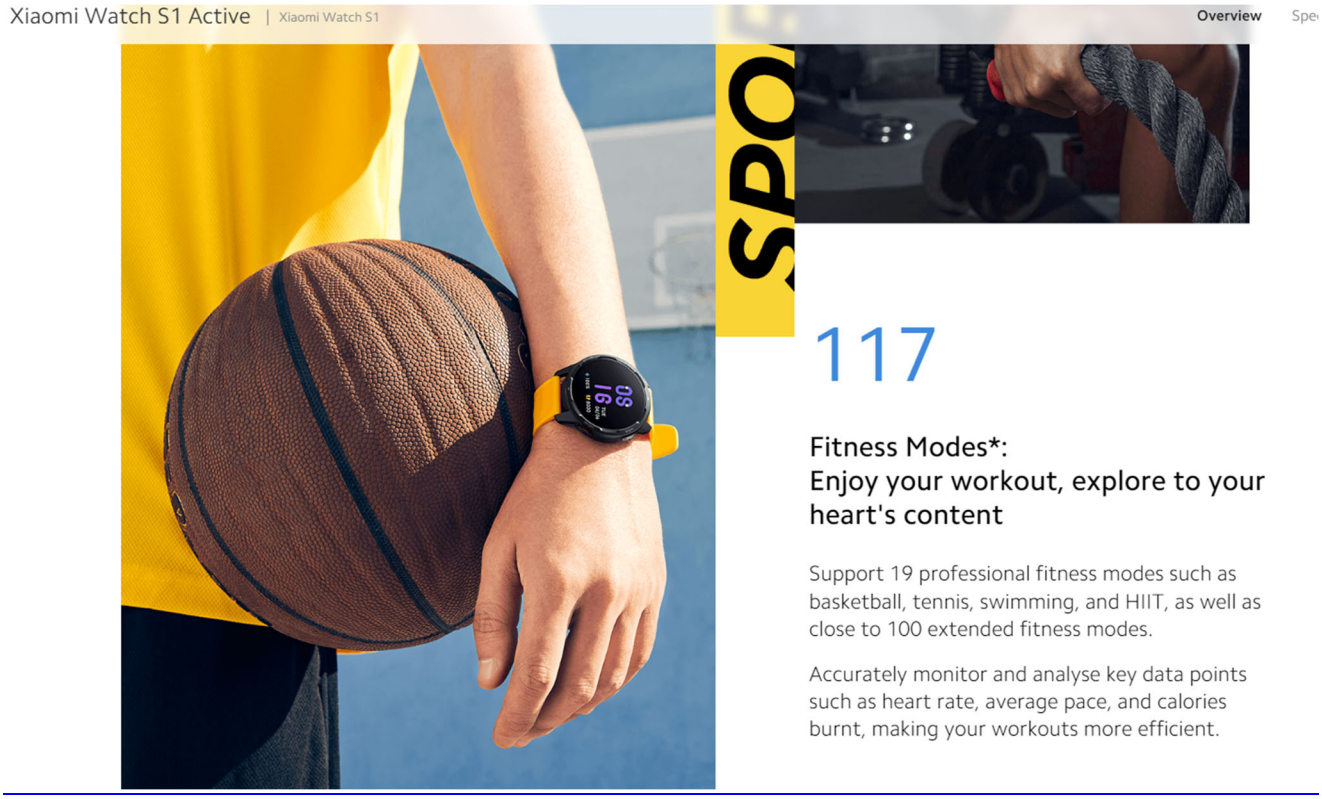

All-day blood oxygen monitoring*
Get an SpO2 measurement for a peace of mind. Newly upgraded to support all-day continuous SpO2 monitoring. Measurement interval can be set up according to your need.
Tips:
*All-day blood oxygen monitoring mode needs to be manually enabled. Default monitoring is set to once every 30 minutes and can be adjusted to once every 10 minutes.
SpO2
95%
30 mins ago
00:00
24:00
Measure

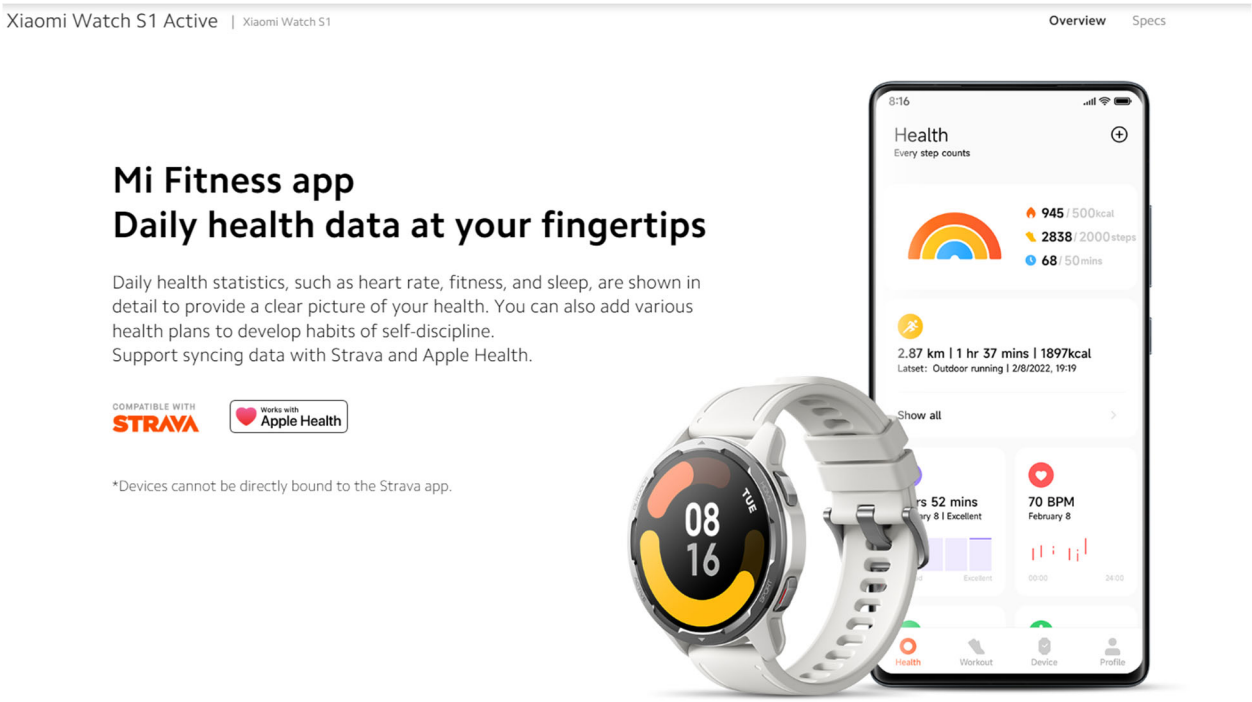

24-hour
heart rate monitoring
PPG
Multi-channel PPG bio-sensors
Abnormal heart rate alert
*Heart rate Alert need to be enabled manually
Resting heart rate curve
The multi-channel PPG bio-sensor performs 24-hour heart rate monitoring. With upgraded hardware and algorithms, the sensor accurately monitors your heart rate even as you perform high-intensity sports such as trail-running and cycling, and notifies you when your heart rate is too high. It also automatically saves the resting heart rate* curve for the previous 30 days, continuously tracking health improvements made from exercising.
xiaomi


Advanced sleep monitoring
Sleep well to perform well
The sleep monitoring function has also been upgraded with a 35%* increase in accuracy and support monitoring night-time long sleeps and daytime sporadic naps.
Record your sleep patterns through different stages and help to improve your habits for a better sleep.
Details
23:20-06:56
7h36m
Avg
62 BPM
Avg
98%
*Sleep stage, average heart rate, and blood oxygen data will not display for sporadic naps less than three hours. The duration for sporadic nap detection is 20 minutes to 3 hours.


All-day blood oxygen monitoring*
Get an SpO₂ measurement for a peace of mind. Newly upgraded to support all-day continuous SpO₂ monitoring. Measurement interval can be set up according to your need.
Tips:
*All-day blood oxygen monitoring mode needs to be manually enabled. Default monitoring is set to once every 30 minutes and can be adjusted to once every 10 minutes.
SpO₂
95%
30 mins ago
00:00
24:00
Measure


24-hour
heart rate monitoring
PPG
Multi-channel PPG bio-sensors
Abnormal heart rate alert
*Heart rate Alert need to be enabled manually
Resting heart rate curve
The multi-channel PPG bio-sensor performs 24-hour heart rate monitoring. With upgraded hardware and algorithms, the sensor accurately monitors your heart rate even as you perform high-intensity sports such as trail-running and cycling, and notifies you when your heart rate is too high. It also automatically saves the resting heart rate* curve for the previous 30 days, continuously tracking health improvements made from exercising.
xiaomi


Xiaomi Watch S1 Active | Xiaomi Watch S1
Overview
117
Fitness Modes*:
Enjoy your workout, explore to your heart's content
Support 19 professional fitness modes such as basketball, tennis, swimming, and HIIT, as well as close to 100 extended fitness modes.
Accurately monitor and analyse key data points such as heart rate, average pace, and calories burnt, making your workouts more efficient.


Xiaomi Watch S1 Active | Xiaomi Watch S1
Overview
Specs
Mi Fitness app
Daily health data at your fingertips
Daily health statistics, such as heart rate, fitness, and sleep, are shown in detail to provide a clear picture of your health. You can also add various health plans to develop habits of self-discipline.
Support syncing data with Strava and Apple Health.
COMPATIBLE WITH STRAVA
Works with Apple Health
*Devices cannot be directly bound to the Strava app.
Health
Every step counts
945/500kcal
2838/2000steps
68/50mins
2.87 km | 1 hr 37 mins | 1897kcal
Latset: Outdoor running | 2/8/2022, 19:19
Show all
70 BPM
February 8
Health
Workout
Device
Profile

258. On information and belief, the algorithm used by the Accused Xiaomi Watches obtains a time frequency spectrum of a segment of the signal used as the PPG signal.

259. On information and belief, the algorithm used by the Accused Xiaomi Watches obtains, from the time frequency spectrum, a noise quality index for the segment, the noise quality index being used to determine whether the segment is corrupted by motion and noise artifacts.

260. On information and belief, the algorithm used by the Accused Xiaomi Watches obtains a noise quality index.

261. On information and belief, the algorithm used by the Accused Xiaomi Watches determines a dominant frequency in the time frequency spectrum of the segment.

262. On information and belief, the algorithm used by the Accused Xiaomi Watches normalizes the time frequency spectrum to a total power in a narrow band centered at the dominant frequency.

263. On information and belief, the algorithm used by the Accused Xiaomi Watches determines a first trace of amplitudes in the narrow band spectrum of the time frequency spectrum centered at the dominant frequency.

264. On information and belief, the algorithm used by the Accused Xiaomi Watches determines a second trace of amplitudes in a narrow band spectrum of the time frequency spectrum centered at twice the dominant frequency.

265. On information and belief, the algorithm used by the Accused Xiaomi Watches determines a third trace of amplitudes in a narrow band spectrum of the time frequency spectrum centered at three times the dominant frequency.

266. On information and belief, the algorithm used by the Accused Xiaomi Watches subtracts the first, second and third traces of amplitudes from the time frequency spectrum.

267. On information and belief, the algorithm used by the Accused Xiaomi Watches obtains, after subtracting, a total power remaining in the time frequency spectrum, said total power remaining referred to as a residual noise power.

268. On information and belief, the algorithm used by the Accused Xiaomi Watches determines a difference in frequency between the first trace and the second and third traces, the difference in frequency referred to as a projected difference, the noise quality index being a weighted sum of factors including the residual noise power and the projected difference, weights being selected such that each weighted factor represents less than a predetermined percentage of power in an uncorrupted segment.

269. On information and belief, the algorithm used by the Accused Xiaomi Watches applies a statistical learning method, using the noise quality index, to determine whether the segment is corrupted by motion and noise artifacts or not corrupted by motion and noise artifacts, if motion and noise artifacts are not present, including the segment in determination of a physiological parameter.

270. On information and belief, the Accused Xiaomi Watches utilize Plaintiffs' algorithm and system claims to detect motion and noise artifact and reconstruct

algorithms for PPG and equivalent signals. Additionally, the algorithm covers a pulse oximeter embedded with a motion and noise artifact detection algorithm based on extraction of time-varying spectral features that are unique to the clean and corrupted components.

271. On information and belief, Xiaomi had knowledge of Plaintiffs' algorithm and apparatus as claimed in Claim 1 from the publication of the '362 patent claims the United States Patent and Trademark Office, but in any event at least as of the filing of this lawsuit.

272. Xiaomi's infringement of the '362 patent is willful, deliberate, and intentional. On information and belief, Xiaomi has known about the '362 patent and its infringement of that patent since at least the filing of the complaint.

273. Because of Xiaomi's infringement of the '362 patent, Plaintiffs have suffered and will continue to suffer irreparable harm and injury, including monetary damages in an amount to be determined at trial.

274. On information and belief, Xiaomi has acted with full knowledge or at least willful blindness of the '362 patent and without a reasonable basis for believing that they would not be liable for direct infringement of the '362 patent and active inducement of infringement of the '362 patent.

275. Xiaomi has infringed and continues to infringe the '362 patent by making, using, selling, offering to sell, and/or importing, without license or authority, the Accused Xiaomi Watches, as alleged herein, which embody or use the inventions claimed in the '362 patent literally or under the doctrine of equivalents.

276. Xiaomi has induced infringement and continues to induce infringement of the '362 patent by actively and knowingly inducing others to make, use, sell, offer to sell, and/or import, without license or authority, the Accused Xiaomi Watches, as alleged herein, which embody or use the inventions claimed in the '362 patent literally or under the doctrine of equivalents.

277. Xiaomi markets, advertises, offers for sale, and/or otherwise promotes the Accused Xiaomi Watches and, on information and belief, does so to actively and knowingly induce, encourage, instruct, and aid one or more persons in the United States to make, use, sell, offer to sell and/or import the Accused Xiaomi Watches. For example, Xiaomi knowingly and intentionally induces retailers to advertise, offer for sale, and/or otherwise promote the Accused Xiaomi Watches on their websites and in stores. Additionally, Xiaomi, or one or more related entities, induces end users by, for example, instructing in its manual users of the Accused Xiaomi Watches to use its Mi Fitness app to monitor physiological parameters. Therein, on information and belief, Xiaomi describes and touts the use of the subject matter claimed in the '362 patent, as described and alleged herein.

278. Plaintiffs reserve the right to assert additional claims of the '362 patent that Xiaomi infringes.

279. On information and belief, Xiaomi has known of the existence of the '362 patent and its applicability to the Accused Xiaomi Watches since at least the filing of the complaint, and committed acts of infringement that were willful, demonstrated willful blindness, and disregard for the '362 patent, without any reasonable basis for believing

that it had a right to engage in the infringing conduct. Plaintiffs are entitled to increased damages of three times the damages assessed pursuant to 35 U.S.C. § 284, as well as an award of attorney's fees pursuant to 35 U.S.C. § 285.

Count I: Infringement of United States Patent No. 8,417,326 by Zepp

280. Plaintiffs incorporate each of the preceding paragraphs as if fully set forth herein.

281. On information and belief, Zepp's products, including at least the Amazfit Falcon, T-Rex Ultra, T-Rex 2, T-Rex Pro, GTR Mini, GTR 4 Limited Edition, GTR 4, GTS 4, GTS 4 Mini, GTR 3 Pro, GTR 3 Pro Limited Edition, and all Mi Band series watches infringe at least Claim 1 of the '326 patent under 35 U.S.C. §271.

282. On information and belief, Zepp has directly infringed one or more claims of the '326 patent through the manufacture, use, sale, offer for sale, and/or importation into the United States of physiological monitors, including at least the Amazfit Falcon, T-Rex Ultra, T-Rex 2, T-Rex Pro, GTR Mini, GTR 4 Limited Edition, GTR 4, GTS 4, GTS 4 Mini, GTR 3 Pro, GTR 3 Pro Limited Edition devices, and all Mi Band series watches ("the Accused Zepp Watches").

283. The above-listed watches are non-limiting. Additional products of Zepp may infringe the '326 patent, and the above-listed watches may infringe additional patents.

284. On information and belief, at least the Accused Zepp Watches listed above are sold with the Zepp app and Zepp Life app infringing technology/algorithms. Each

patent listed in this Complaint includes at least method claims, system claims and/or apparatus claims.

285. For example, Claim 1 covers:

> An Atrial Fibrillation (AF) analysis method comprising:
> obtaining an output that includes a heart beat;
> deriving a heart beat interval;
> analyzing a number (N) of heart beat intervals from the output; and
> detecting a likelihood of AF by:
> calculating a Turning Points Ratio (TPR) of the N heart beat intervals;
> calculating a root mean square of successive (RMSSD) heart beat intervals;
> and calculating Shannon Entropy (SE) of the N heart beat intervals.

286. On information and believe, the algorithm used by the Accused Zepp Watches does AF analysis, including as shown below.

https://www.zepp.com/press-release/huami-announces-launch-of-new-amazfit-health-band, https://www.amazfit.com/products/amazfit-gts-4

ZEPP

Huami Announces Launch of New Amazfit Health Band 1S and Introduces Groundbreaking Smart Wearable AI Chip, Huangshan-1

BEIJING, China September 18, 2018 PRNewswire

Huami Corporation ("Huami" or the "Company") (NYSE: HMI), a biometric and activity data-driven company with significant expertise in smart wearable technology, today announced the launch of the new generation health band, Amazfit Health Band 1S, which delivers new features and benefits powered by AI technologies and brings advanced heart health monitoring capabilities to the smart wearables industry. The Company also introduced its groundbreaking self-developed smart wearable AI chip, Huangshan-1.

Utilizing an embedded AI algorithm, the new Amazfit Health Band 1S serves as a convenient extension of established heart health monitoring techniques and offers a battery life of up to 7 days. For the first time, the new band features self-developed optical modules that provide highly accurate photoplethysmography (PPG) and deliver continuous, real-time heart rate and heart rhythm monitoring. The Amazfit Health Band 1S is capable of screening the user's heart rhythm in the background and sending an alert if an arrhythmia including atrial fibrillation is detected. Once an arrhythmia is detected, the user is instructed to put a finger on top of the band to start a 30 to 120 second ECG recording process to capture detailed heart health data in real time.

Get reminders* for:

Abnormally High or Low Heart Rates

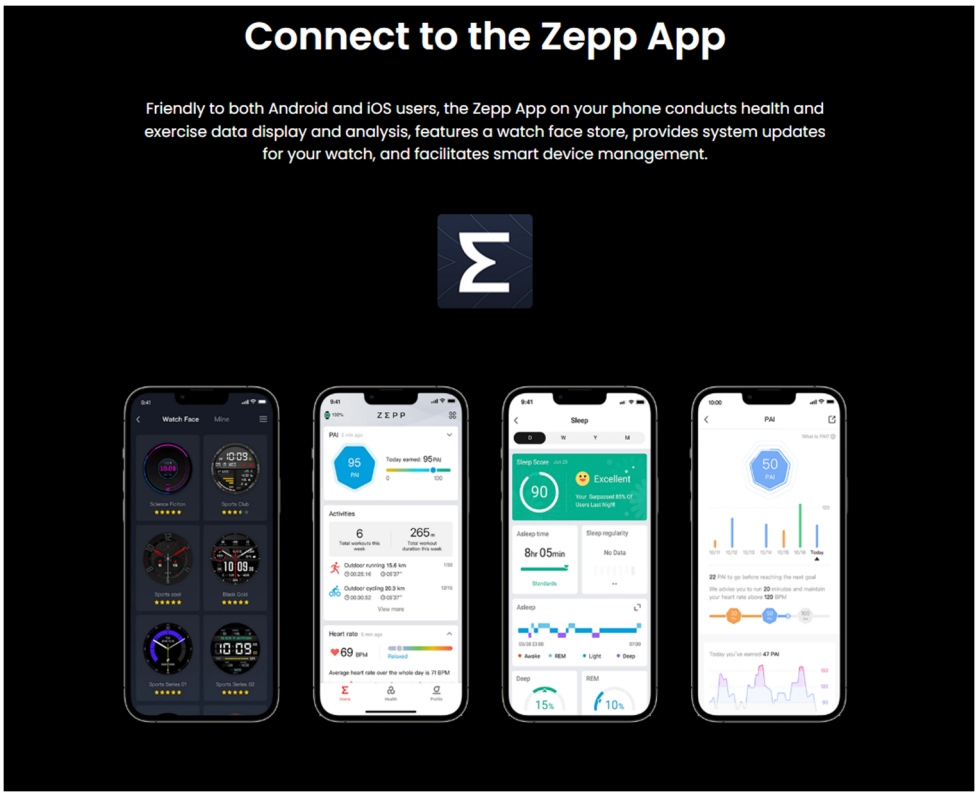
Abnormally Low SpO_2 Levels

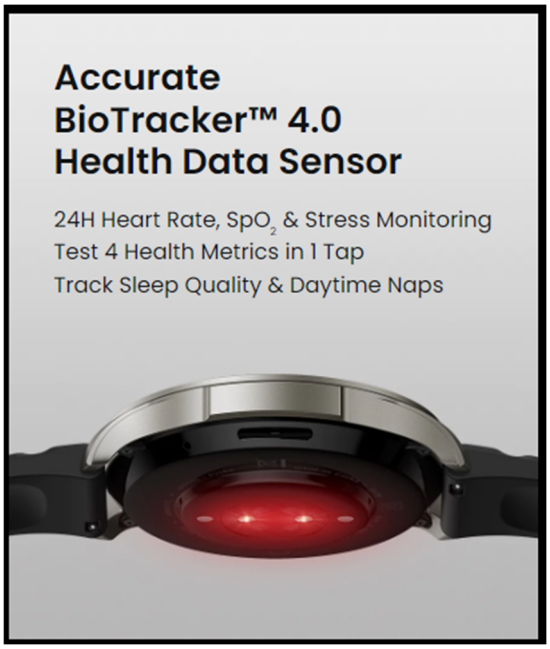
Abnormally High Stress Levels

Stress-reducing Breathing Exercise

287. The algorithm used by the Accused Zepp Watches obtains an output that includes a heart beat, including as shown below.

https://us.amazfit.com/products/amazfit-gtr-mini

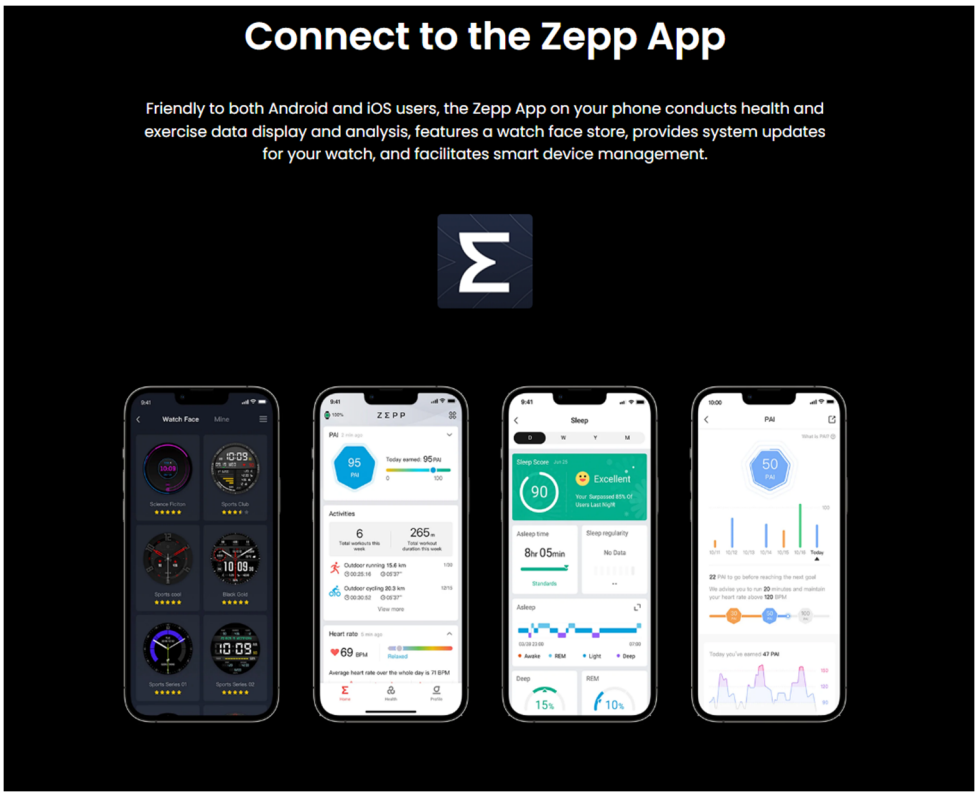

Connect to the Zepp App
Friendly to both Android and iOS users, the Zepp App on your phone conducts health and exercise data display and analysis, features a watch face store, provides system updates for your watch, and facilitates smart device management.


Accurate
BioTracker™ 4.0
Health Data Sensor
24H Heart Rate, SpO2 & Stress Monitoring
Test 4 Health Metrics in 1 Tap
Track Sleep Quality & Daytime Naps



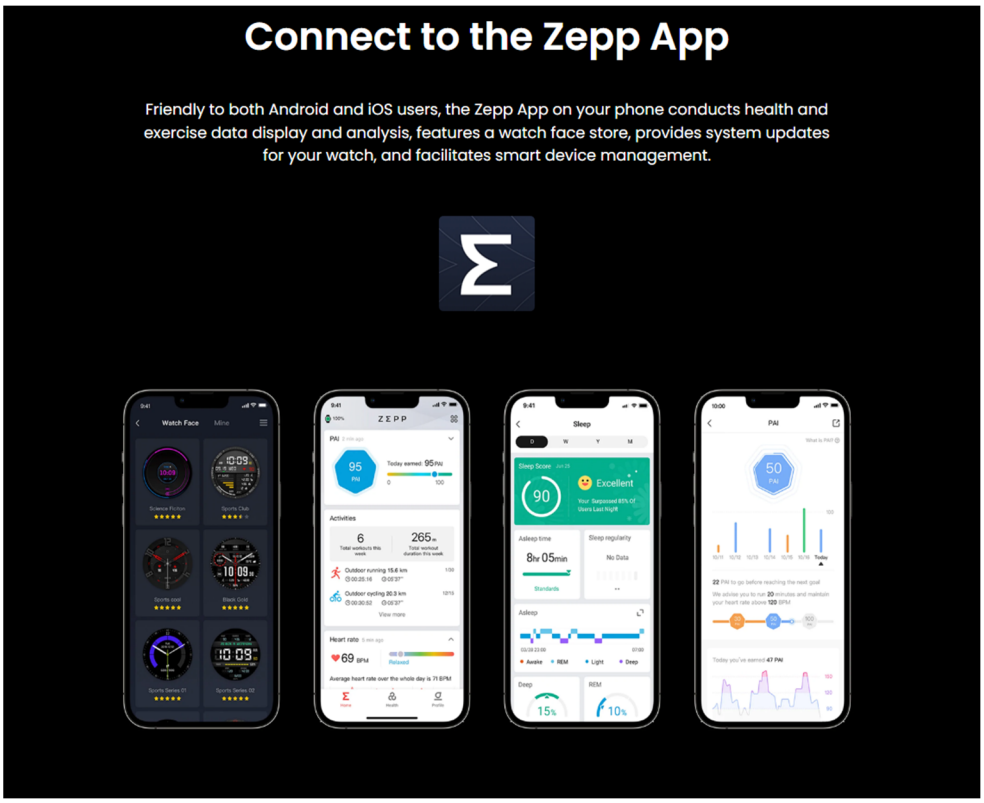
288. The algorithm used by the Accused Zepp Watches derives a heart beat interval, including as shown below.

https://us.amazfit.com/products/amazfit-gtr-mini



289. The algorithm used by the Accused Zepp Watches analyzes a number (N) of heart beat intervals from the output, including as shown below.

https://us.amazfit.com/products/amazfit-gtr-mini



290. On information and belief, the algorithm used by the Accused Zepp Watches in detecting a likelihood of AF by calculating a Turning Points Ratio (TPR) of the N heart beat intervals, calculating a root mean square of successive (RMSSD) heart beat intervals, and calculating Shannon Entropy (SE) of the N heart beat intervals.

291. On information and belief, Zepp had knowledge of Plaintiffs' algorithm and systems as claimed in Claim 1 by Plaintiffs' disclosure through the United States Patent and Trademark Office by obtaining the patent, but in any event at least as of the filing of this lawsuit.

292. Zepp's infringement of the '326 patent is willful, deliberate, and intentional by Zepp. On information and belief, Zepp has known of the '326 patent and its infringement of that patent since at least the filing of this complaint.

293. Because of Zepp's infringement of the '326 patent, Plaintiffs have suffered and will continue to suffer irreparable harm and injury, including monetary damages in an amount to be determined at trial.

294. On information and belief, Zepp has acted with full knowledge or at least willful blindness of the '326 patent and without a reasonable basis for believing that they would not be liable for direct infringement of the '326 patent and active inducement of infringement of the '326 patent.

295. Zepp has infringed and continues to infringe the '326 patent by making, using, selling, offering to sell, and/or importing, without license or authority, the Accused Zepp Watches, as alleged herein, which embody or use the inventions claimed in the '326 patent literally or under the doctrine of equivalents.

296. Zepp has induced infringement and continues to induce infringement of the '326 patent by actively and knowingly inducing others to make, use, sell, offer to sell, and/or import, without license or authority, the Accused Zepp Watches, as alleged herein, which embody or use the inventions claimed in the '326 patent literally or under the doctrine of equivalents.

297. Zepp markets, advertises, offers for sale, and/or otherwise promotes the Accused Zepp Watches and, on information and belief, does so to actively and knowingly induce, encourage, instruct, and aid one or more persons in the United States to make, use, sell, offer to sell and/or import the Accused Zepp Watches. For example, Zepp knowingly and intentionally induces retailers to advertise, offer for sale, and/or otherwise promote the Accused Zepp Watches on their websites and in stores.

Additionally, Zepp, or one or more related entities, induces end users by, for example, instructing in its manual users of the Accused Zepp Watches to use its Zepp app to monitor physiological parameters. Therein, on information and belief, Zepp describes and touts the use of the subject matter claimed in the '326 patent, as described and alleged herein.

298. Plaintiffs reserve the right to assert additional claims of the '326 patent that Zepp infringes.

299. On information and belief, Zepp has known of the existence of the '326 patent and its applicability to the Accused Zepp Watches since at least the filing of this complaint, and committed acts of infringement that were willful, demonstrated willful blindness, and disregard for the '326 patent, without any reasonable basis for believing that it had a right to engage in the infringing conduct. Plaintiffs are entitled to increased damages of three times the damages assessed pursuant to 35 U.S.C. § 284, as well as an award of attorney's fees pursuant to 35 U.S.C. § 285.

Count II: Infringement of United States Patent No. 9,408,576 by Zepp

300. Plaintiffs incorporate each of the preceding paragraphs as if fully set forth herein.

301. On information and belief, Zepp's products, including at least the Accused Zepp Watches, infringe at least Claim 1 of the '576 patent under at least 35 U.S.C. § 271.

302. On information and belief, Zepp has directly infringed one or more claims of the '576 patent through the manufacture, use, sale, offer for sale, and/or importation into the United States of physiological monitors, including at least the Accused Zepp Watches.

303. The above-listed watches are non-limiting. Additional products of Zepp may infringe the '576 patent, and the above-listed watches may infringe additional patents.

304. On information and belief, at least the Accused Zepp Watches listed above are sold with the Zepp app and Zepp Life app infringing technology/algorithms.

305. For example, Claim 1 covers:

> A computer implemented method for discriminating between atrial fibrillation and premature ventricular contractions (PVC) and premature atrial contractions (PACs), the method comprising:
>
> demarcating boundaries in a Poincare plot space, the boundaries being obtained from data from a test set of test subjects; the Poincare plot space being a space of time interval between consecutive pulses obtained by sensing variability in heart rate signal;
>
> constructing a Poincare plot of time interval data from a subject under test; the time interval being a time interval between consecutive pulses obtained by sensing variability in heart rate signal from the subject under test;
>
> identifying data in patterns in the Poincare plot, the patterns including patterns corresponding to combinations of at least one of bigeminy, trigemini, and quadragemini indicating one of PAC or PVC;
>
> obtaining updated data by subtracting the data in the patterns corresponding to combinations of at least one of bigeminy, trigemini, quadragemini indicating one of PAC or PVC from the time interval data from the subject under test;
>
> obtaining a root mean squared of successive differences, a Shannon entropy and a turning point ratio for the updated data;
>
> comparing the root mean square of successive differences to a first predetermined threshold; comparing the Shannon entropy to a second predetermined threshold;

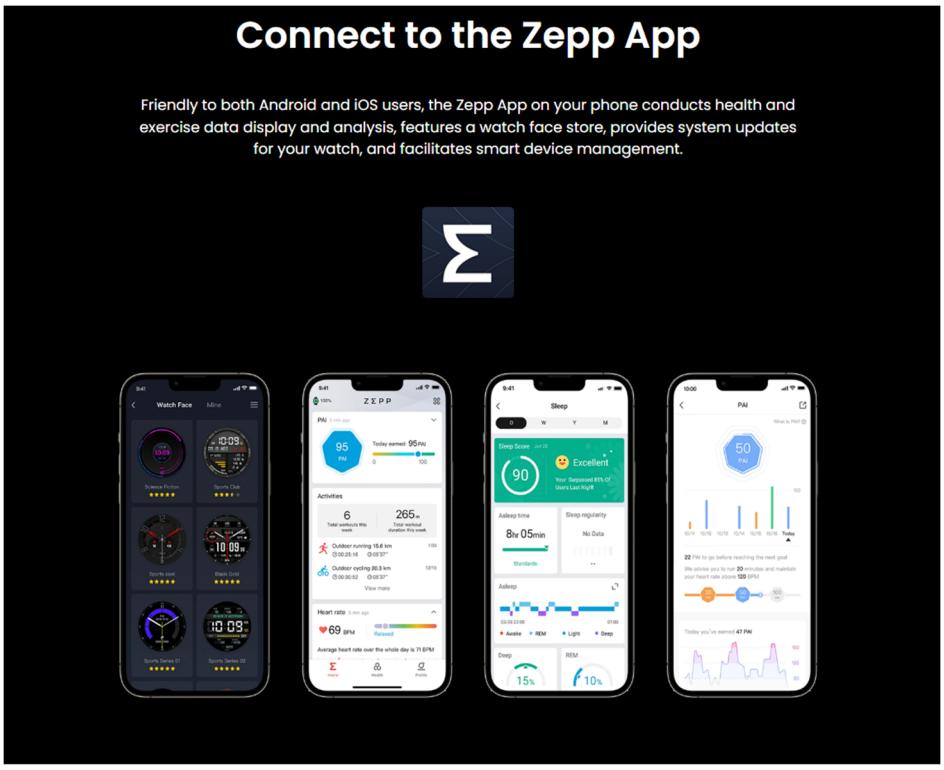
comparing the turning point ratio to a third predetermined threshold;

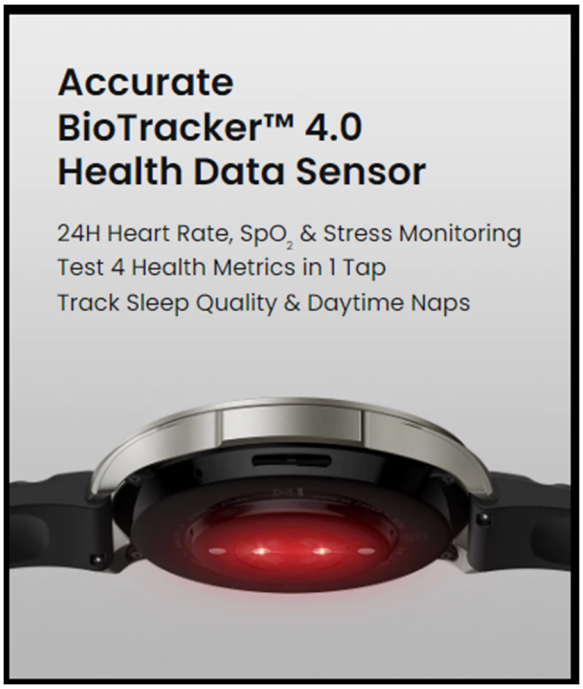
determining, if each of the root mean square of successive differences, the Shannon entropy, and the turning point ratio is not less than a corresponding predetermined threshold, that the subject under test has atrial fibrillation; and

determining, if each of the root mean square of successive differences, the Shannon entropy, and the turning point ratio is less than a corresponding predetermined threshold, that the subject under test has normal sinus rhythm (NSR) with PVC or PAC;

wherein demarcating boundaries in a Poincare plot space, constructing a Poincare plot, identifying data in patterns in the Poincare plot, obtain updated data, obtaining root mean squared of successive differences, Shannon entropy and turning point ratio for the updated data, comparing to predetermined thresholds, and determining whether the subject under test has atrial fibrillation or the subject under test has normal sinus rhythm (NSR) with PVC or PAC are performed by one or more processors executing computer readable code embodied in non-transitory computer usable media.

306. The algorithm used by the Accused Zepp Watches uses a computer implemented method for discriminating between atrial fibrillation and premature ventricular contractions (PVC) and premature atrial contractions (PACs), including as shown below. https://us.amazfit.com/products/amazfit-gtr-mini


Connect to the Zepp App
Friendly to both Android and iOS users, the Zepp App on your phone conducts health and exercise data display and analysis, features a watch face store, provides system updates for your watch, and facilitates smart device management.


Accurate
BioTracker™ 4.0
Health Data Sensor
24H Heart Rate, SpO2 & Stress Monitoring
Test 4 Health Metrics in 1 Tap
Track Sleep Quality & Daytime Naps



307. On information and belief, the algorithm used by the Accused Zepp Watches demarcates boundaries in a Poincare plot space, the boundaries being obtained from data from a test set of test subjects.

308. On information and belief, the algorithm used by the Accused Zepp Watches demonstrates the Poincare plot space being a space of time interval between consecutive pulses obtained by sensing variability in heart rate signal.

309. On information and belief, the algorithm used by the Accused Zepp Watches constructs a Poincare plot of time interval data from a subject under test, the time interval being a time interval between consecutive pulses obtained by sensing variability in heart rate signal from the subject under test.

310. On information and belief, the algorithm used by the Accused Zepp Watches identifies data in patterns in the Poincare plot, the patterns including patterns

corresponding to combinations of at least one of bigeminy, trigemini, and quadragemini indicating one of PAC or PVC.

311. On information and belief, the algorithm used by the Accused Zepp Watches obtains updated data by subtracting the data in the patterns corresponding to combinations of at least one of bigeminy, trigemini, quadragemini indicating one of PAC or PVC from the time interval data from the subject under test.

312. On information and belief, the algorithm used by the Accused Zepp Watches obtains a root mean square of successive differences, a Shannon entropy, and a turning point ratio for the updated data.

313. On information and belief, the algorithm used by the Accused Zepp Watches compares the root mean square of successive differences to a first predetermined threshold, comparing the Shannon entropy to a second predetermined threshold, and comparing the turning point ratio to a third predetermined threshold.

314. On information and belief, the algorithm used by the Accused Zepp Watches determines if each of the root mean square of successive differences, the Shannon entropy, and the turning point ratio is not less than a corresponding predetermined threshold, that the subject under test has atrial fibrillation.

315. On information and belief, the algorithm used by the Accused Zepp Watches determines if each of the root mean square of successive differences, the Shannon entropy, and the turning point ratio is less than a corresponding predetermined threshold that the subject under test has normal sinus rhythm (NSR) with PVC or PAC.

316. On information and belief, the algorithm used by the Accused Zepp Watches constructs a Poincare plot, identifies data in patterns in the Poincare plot, obtains updated data, obtains root mean squared of successive differences, Shannon entropy, and turning point ratio for the updated data, compares to predetermined thresholds, and determines whether the subject under test has atrial fibrillation or the subject under test has normal sinus rhythm (NSR) with PVC or PAC, which are performed by one or more processors executing computer readable code embodied in non-transitory computer usable media.

317. On information and belief, the Accused Zepp Watches utilize Plaintiffs' algorithm capable of reducing the number of false positives in AF detection by differentiating various patterns of premature atrial contractions ("PAC") and premature ventricle contractions ("PVC") from normal sinus rhythm ("NSR") and AF.

318. On information and belief, Zepp had knowledge of Plaintiffs' algorithm as claimed in Claim 1 from the publication of the '576 patent claims the United States Patent and Trademark Office, but in any event at least as of the filing of this lawsuit.

319. Zepp's infringement of the '576 patent is willful, deliberate, and intentional by Zepp. On information and belief, Zepp has known of the '576 patent and its infringement of that patent since at least the filing of this complaint.

320. Because of Zepp's infringement of the '576 patent, Plaintiffs have suffered and will continue to suffer irreparable harm and injury, including monetary damages in an amount to be determined at trial.

321. On information and belief, Zepp has acted with full knowledge or at least willful blindness of the '576 patent and without a reasonable basis for believing that they would not be liable for direct infringement of the '576 patent and active inducement of infringement of the '576 patent.

322. Zepp has infringed and continues to infringe the '576 patent by making, using, selling, offering to sell, and/or importing, without license or authority, the Accused Zepp Watches, as alleged herein, which embody or use the inventions claimed in the '576 patent literally or under the doctrine of equivalents.

323. Zepp has induced infringement and continues to induce infringement of the '576 patent by actively and knowingly inducing others to make, use, sell, offer to sell, and/or import, without license or authority, the Accused Zepp Watches, as alleged herein, which embody or use the inventions claimed in the '576 patent literally or under the doctrine of equivalents.

324. Zepp markets, advertises, offers for sale, and/or otherwise promotes the Accused Zepp Watches and, on information and belief, does so to actively and knowingly induce, encourage, instruct, and aid one or more persons in the United States to make, use, sell, offer to sell and/or import the Accused Zepp Watches. For example, Zepp knowingly and intentionally induces retailers to advertise, offer for sale, and/or otherwise promote the Accused Zepp Watches on their websites and in stores. Additionally, Zepp, or one or more related entities, induces end users by, for example, instructing in its manual users of the Accused Zepp Watches to use its Zepp app to monitor physiological parameters. Therein, on information and belief, Zepp describes

and touts the use of the subject matter claimed in the '576 patent, as described and alleged herein.

325. Plaintiffs reserve the right to assert additional claims of the '576 patent that Zepp infringes.

326. On information and belief, Zepp has known of the existence of the '576 patent and its applicability to the Accused Zepp Watches since at least the filing of this lawsuit, and committed acts of infringement that were willful, demonstrated willful blindness, and disregard for the '576 patent, without any reasonable basis for believing that it had a right to engage in the infringing conduct. Plaintiffs are entitled to increased damages of three times the damages assessed pursuant to 35 U.S.C. § 284, as well as an award of attorney's fees pursuant to 35 U.S.C. § 285.

Count III: Infringement of United States Patent No. 9,713,428 by Zepp

327. Plaintiffs incorporate each of the preceding paragraphs as if fully set forth herein.

328. On information and belief, Zepp's products, including at least the Accused Zepp Watches, infringe at least Claim 1 of the '428 patent under at least 35 U.S.C. §271.

329. On information and belief, Zepp has directly infringed one or more claims of the '428 patent through the manufacture, use, sale, offer for sale, and/or importation into the United States of physiological monitors, including at least the Accused Zepp Watches.

330. The above-listed watches are non-limiting. Additional products of Zepp may infringe the '428 patent, and the above-listed watches may infringe additional patents.

331. On information and belief, at least the Accused Zepp Watches listed above are sold with the Zepp app and Zepp Life app infringing technology/algorithms.

332. For example, Claim 1 covers:

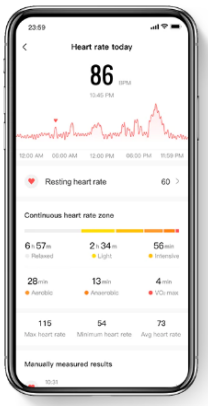
> A method for physiological parameter monitoring, the method comprising:
>
> providing a physiological indicator signal to a handheld mobile communication device; the physiological indicator signal being obtained from one of an image acquisition component, a photoplethysmographic (PPG) sensor and an electrocardiogram sensor;
>
> analyzing, using the handheld mobile communication device, the physiological indicator signal;
>
> obtaining, from said analyzing, measurements of one or more physiological parameters; and
>
> detecting, using the handheld mobile communication device and using only the measurements of one or more physiological parameters, effects of motion artifacts in the measurements of the one or more physiological parameters and deciding whether to retain the measurements based on detected effects of motion artifacts;
>
> wherein detecting effects of motion artifacts in the measurements comprises:
>
> a. bandpass filtering and detrending a segment from the measurement of one physiological parameter; wherein a bandpass filtered and detrended segment is hereinafter referred to as a preprocessed segment;
>
> b. obtaining a value of at least one indicator of volatility, used in determining whether motion artifacts are present, for the preprocessed segment; the at least one indicator of volatility being at least Shannon entropy (SE) for the preprocessed segment; where
>
> $$SE = -\sum_{i=1}^{k} \frac{p(i) * \log\left(p(i)\right)}{\log\left(\frac{1}{k}\right)}$$
>
> and where i represents the bin number and, p(i) is the probability distribution of the preprocessed segment;

c. including the segment in analyses of physiological measurements, when comparison of the value of the at least one indicator of volatility with a predetermined threshold indicates noise/motion artifacts are not present; and

d. selecting another segment of the signal from the physiological measurement and proceeding to step (a) when the value of the at least one indicator of volatility is less than a predetermined threshold and when another segment is available.

333. The algorithm used by the Accused Zepp Watches does physiological parameter monitoring, including as shown below.

https://us.amazfit.com/products/amazfit-gtr-mini

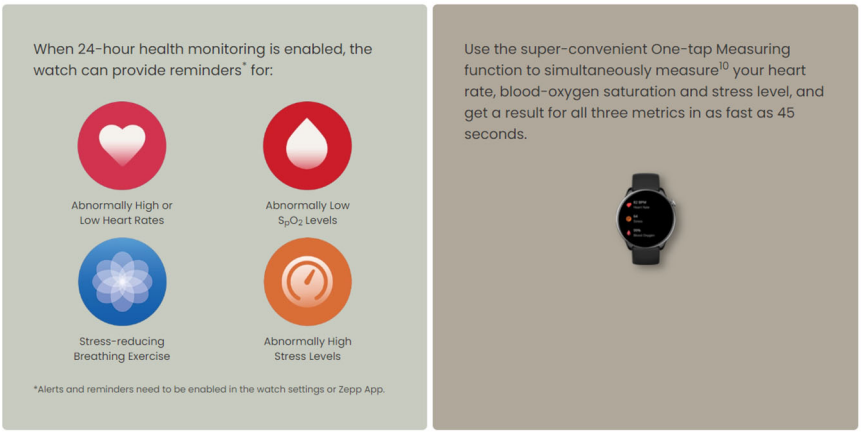


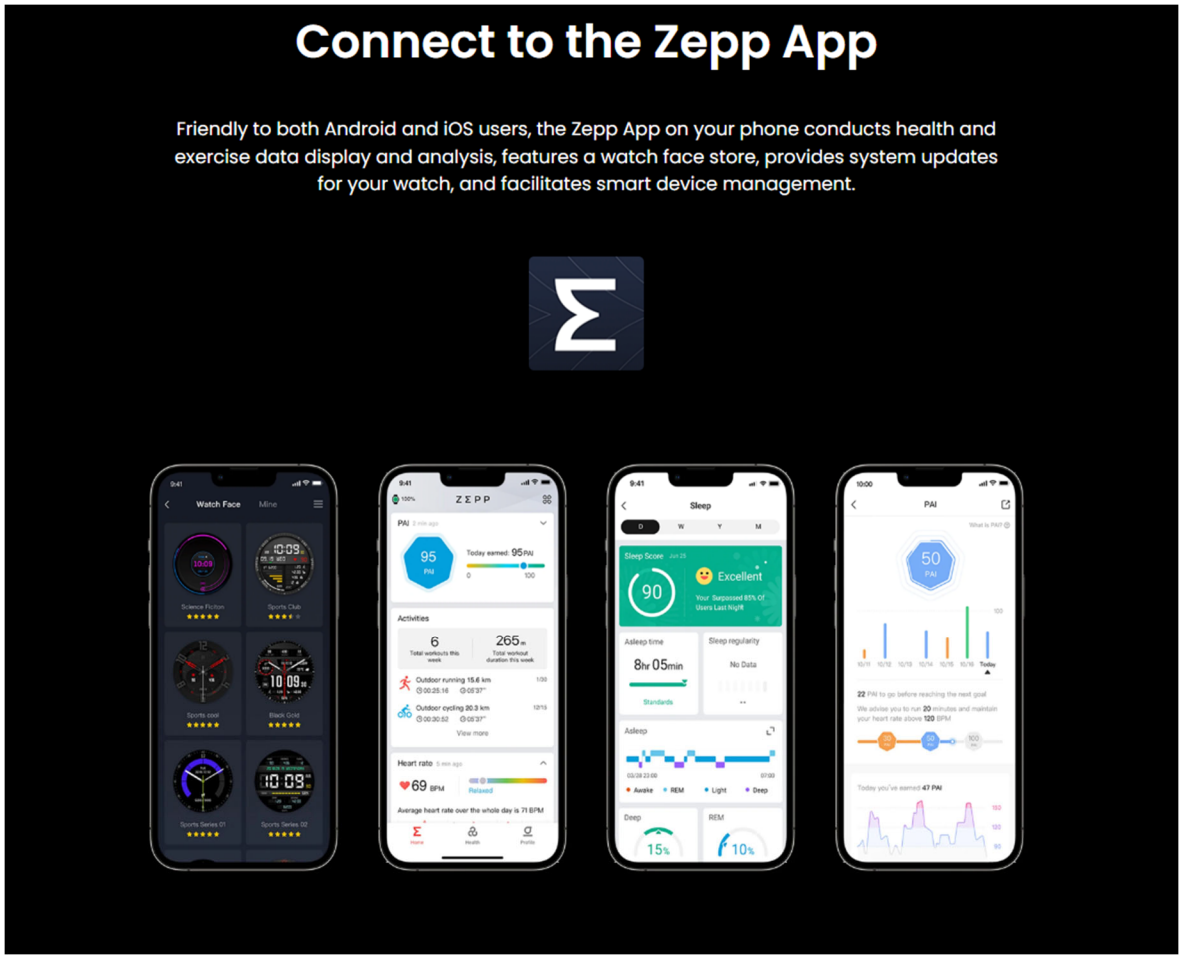
Your Personal Sports and Health Companion - Zepp App

(formerly known as the Amazfit App)

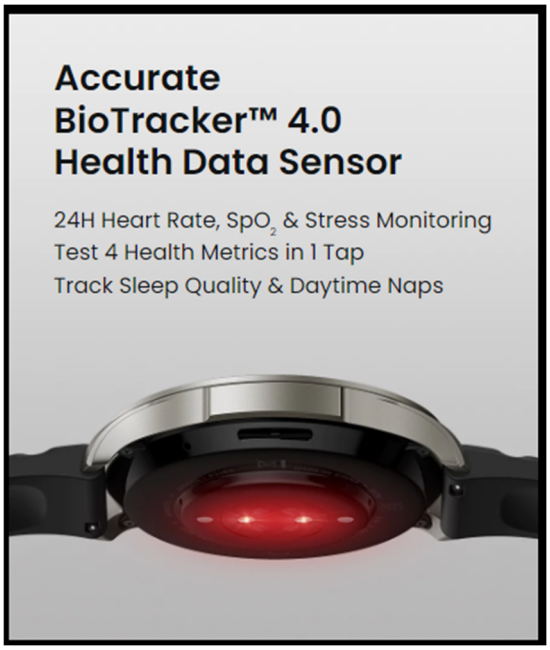
- All-day fitness tracking
- **24/7 heart rate monitoring**
- Health assessment system
- Sleep quality monitoring
- Blood-oxygen saturation measurement
- Online watch face downloading

Download on the App Store | GET IT ON Google Play

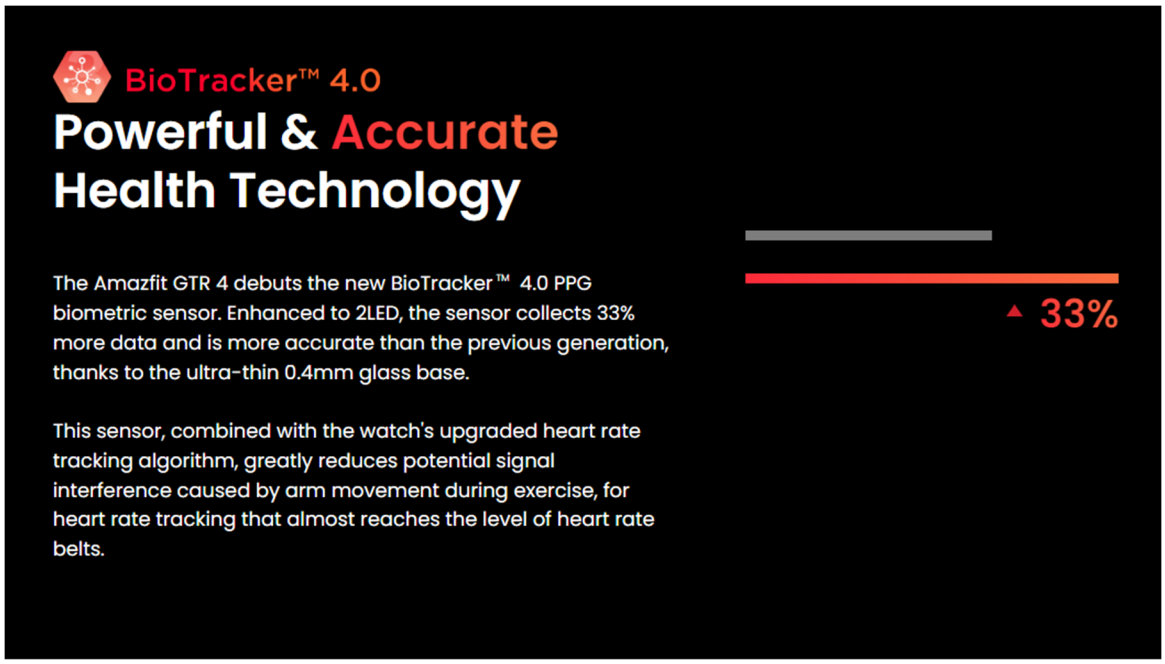



Connect to the Zepp App
Friendly to both Android and iOS users, the Zepp App on your phone conducts health and exercise data display and analysis, features a watch face store, provides system updates for your watch, and facilitates smart device management.


Quality Sleep,
Quality Progress
Put your Amazfit GTR 4 into the new Sleep Mode when you head to bed, and enjoy a peaceful night thanks to reduced display brightness and temporarily disabled notifications. This mode can be set to intelligently engage based on your Sleep Schedule or sleep state.
In-depth Monitoring[15] of:
Sleep Quality & Daytime Naps
Light, Deep & REM Sleep Stages
Sleep Breathing Quality
Sleep Phases
Awake 0 min
REM 113 min
Light Sleep 264 min
Deep Sleep 69 min

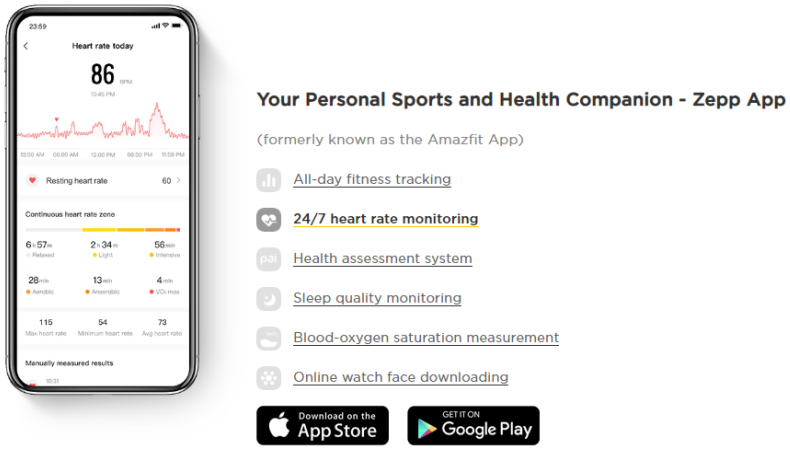

Accurate
BioTracker™ 4.0
Health Data Sensor
24H Heart Rate, SpO2 & Stress Monitoring
Test 4 Health Metrics in 1 Tap
Track Sleep Quality & Daytime Naps


82 BPM
Heart Rate
64
Stress
99%
Blood Oxygen
Easy 24/7 Health Management
Enjoy highly accurate 24-hour monitoring[12] of heart rate, blood-oxygen saturation and stress levels. The watch can also detect your breathing rate, and is able to quickly measure these four important health[14] metrics in one easy tap[15].
24-hour Monitoring of:
Heart Rate
Blood-oxygen Saturation
Stress Level



334. The algorithm used by the Accused Zepp Watches provides a physiological indicator signal to a handheld mobile communication device, the physiological indicator signal being obtained from one of an image acquisition component, a photoplethysmographic (PPG) sensor, including as shown below.

https://us.amazfit.com/products/amazfit-gtr-mini



When 24-hour health monitoring is enabled, the watch can provide reminders* for:

Abnormally High or Low Heart Rates

Abnormally Low SpO_2 Levels

Stress-reducing Breathing Exercise

Abnormally High Stress Levels

*Alerts and reminders need to be enabled in the watch settings or Zepp App.

Use the super-convenient One-tap Measuring function to simultaneously measure[10] your heart rate, blood-oxygen saturation and stress level, and get a result for all three metrics in as fast as 45 seconds.

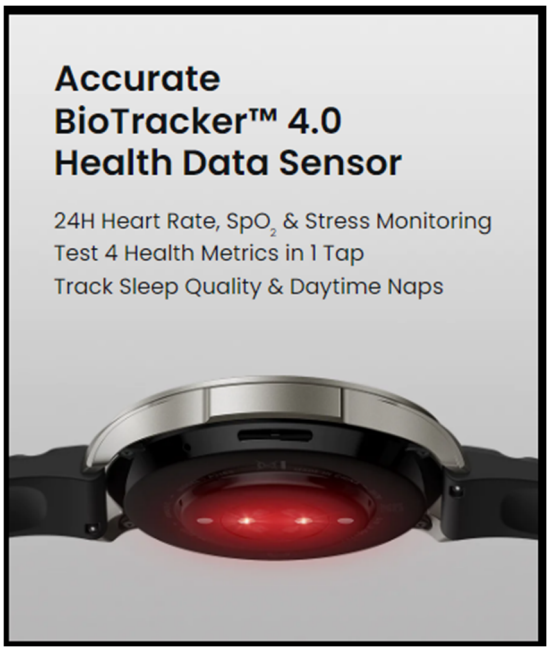


Connect to the Zepp App

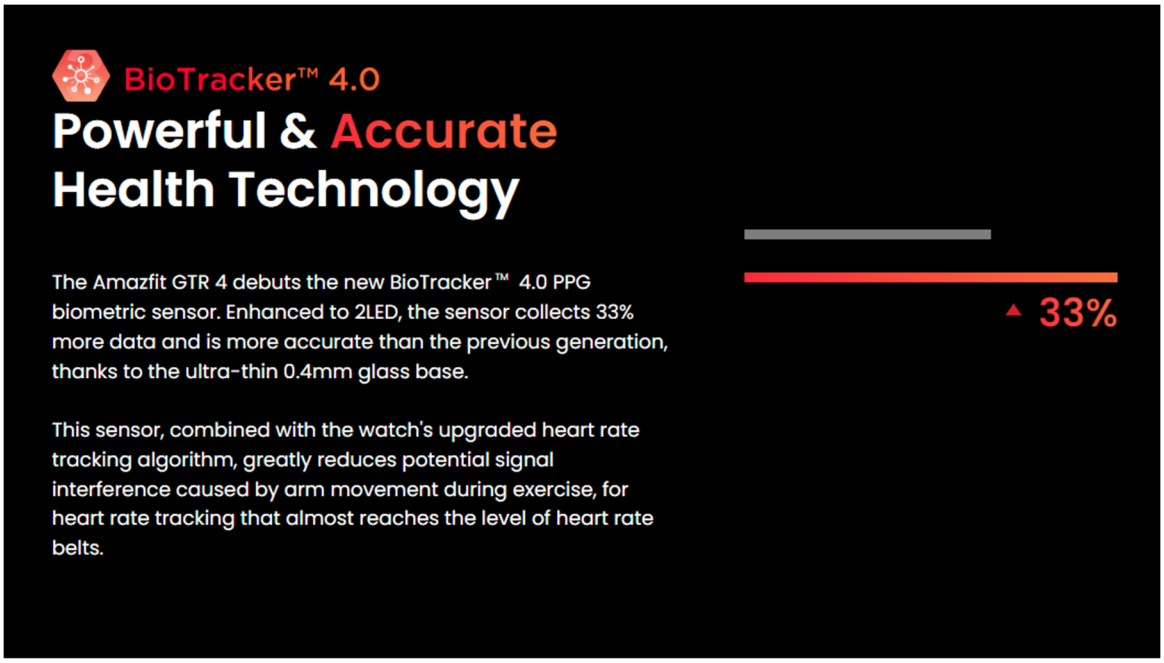
Friendly to both Android and iOS users, the Zepp App on your phone conducts health and exercise data display and analysis, features a watch face store, provides system updates for your watch, and facilitates smart device management.



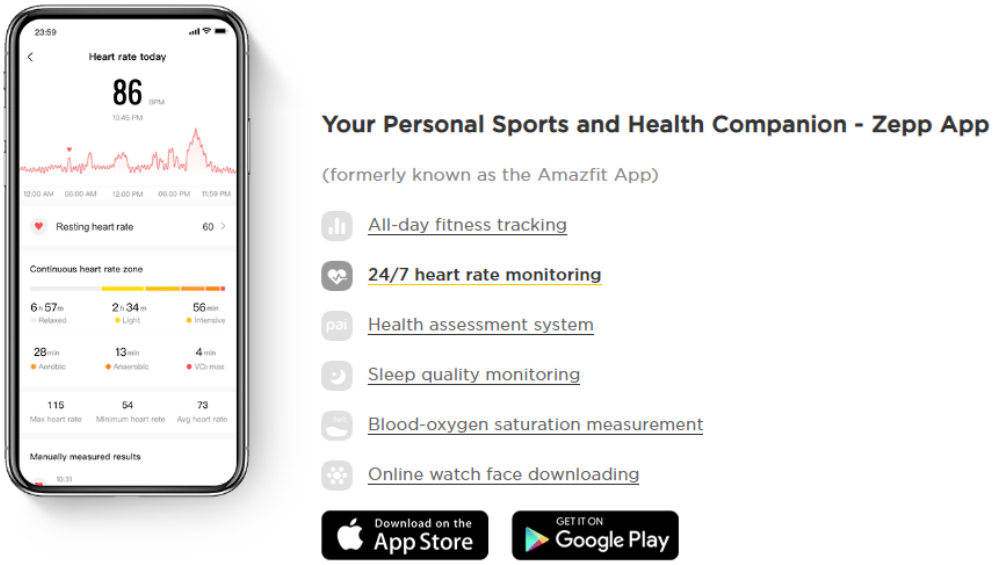

Quality Sleep,
Quality Progress
Put your Amazfit GTR 4 into the new Sleep Mode when you head to bed, and enjoy a peaceful night thanks to reduced display brightness and temporarily disabled notifications. This mode can be set to intelligently engage based on your Sleep Schedule or sleep state.
In-depth Monitoring[15] of:
Sleep Quality & Daytime Naps
Light, Deep & REM Sleep Stages
Sleep Breathing Quality
Sleep Phases
Awake 0 min
REM 113 min
Light Sleep 264 min
Deep Sleep 69 min


Accurate
BioTracker™ 4.0
Health Data Sensor
24H Heart Rate, SpO2 & Stress Monitoring
Test 4 Health Metrics in 1 Tap
Track Sleep Quality & Daytime Naps

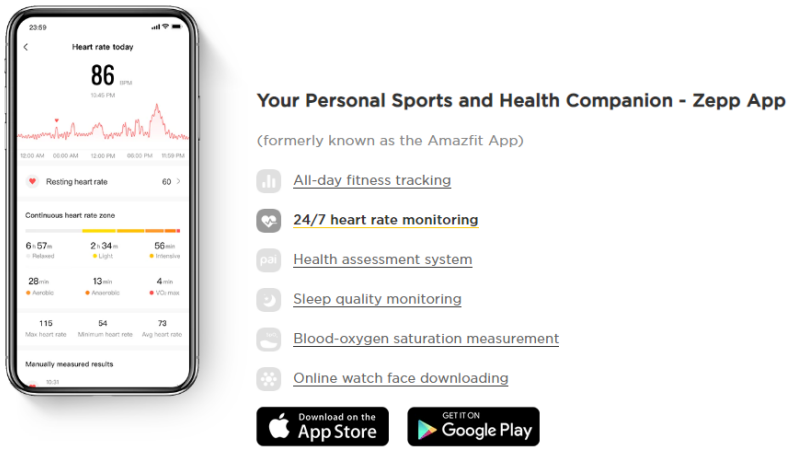




335. The algorithm used by the Accused Zepp Watches analyzes, using the handheld mobile communication device, the physiological indicator signal and obtains, from said analyzing, measurements of one or more physiological parameters, including as shown below. https://www.amazfit.com/



336. On information and belief, the algorithm used by the Accused Zepp Watches detects, using the handheld mobile communication device and using only the measurements of one or more physiological parameters, effects of motion artifacts in the measurements of the one or more physiological parameters and deciding whether to retain the measurements based on detected effects of motion artifacts, including as shown below. https://us.amazfit.com/products/amazfit-gtr-mini



When 24-hour health monitoring is enabled, the watch can provide reminders* for:

Abnormally High or Low Heart Rates

Abnormally Low SpO_2 Levels

Stress-reducing Breathing Exercise

Abnormally High Stress Levels

*Alerts and reminders need to be enabled in the watch settings or Zepp App.

Use the super-convenient One-tap Measuring function to simultaneously measure[10] your heart rate, blood-oxygen saturation and stress level, and get a result for all three metrics in as fast as 45 seconds.

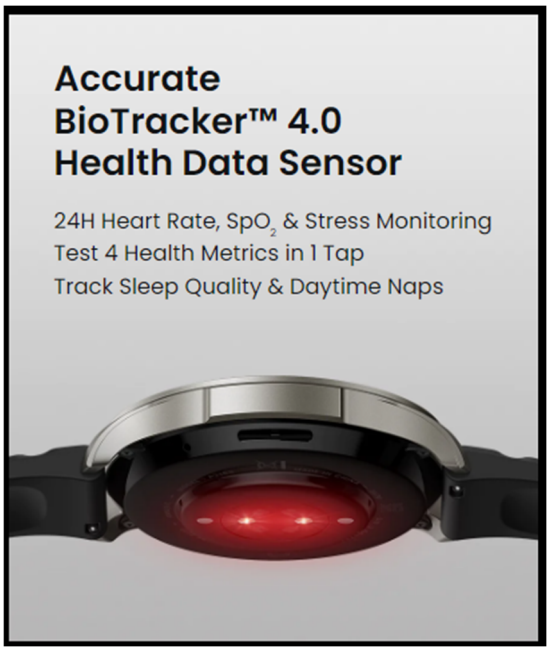


Connect to the Zepp App

Friendly to both Android and iOS users, the Zepp App on your phone conducts health and exercise data display and analysis, features a watch face store, provides system updates for your watch, and facilitates smart device management.



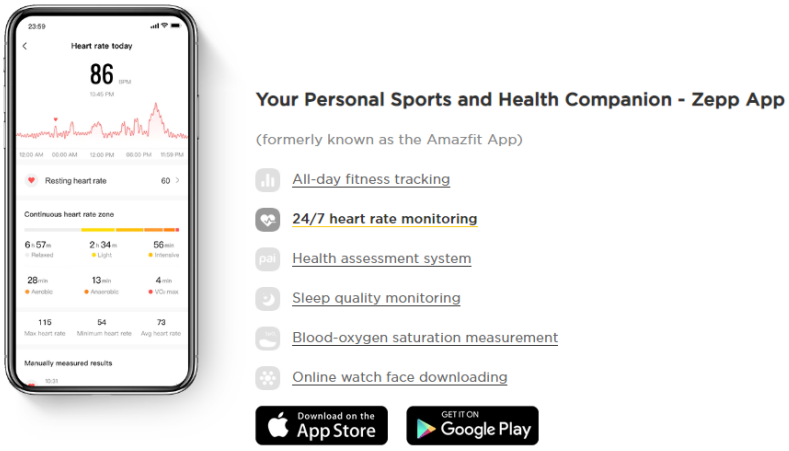

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Quality Progress
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Light, Deep & REM Sleep Stages
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Awake 0 min
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Light Sleep 264 min
Deep Sleep 69 min


Accurate
BioTracker™ 4.0
Health Data Sensor
24H Heart Rate, SpO2 & Stress Monitoring
Test 4 Health Metrics in 1 Tap
Track Sleep Quality & Daytime Naps



337. The algorithm used by the Accused Zepp Watches detects effects of motion artifacts in the measurements, including as shown below.

https://us.amazfit.com/products/amazfit-gtr-mini



When 24-hour health monitoring is enabled, the watch can provide reminders* for:

Abnormally High or Low Heart Rates

Abnormally Low SpO_2 Levels

Stress-reducing Breathing Exercise

Abnormally High Stress Levels

*Alerts and reminders need to be enabled in the watch settings or Zepp App.

Use the super-convenient One-tap Measuring function to simultaneously measure[10] your heart rate, blood-oxygen saturation and stress level, and get a result for all three metrics in as fast as 45 seconds.

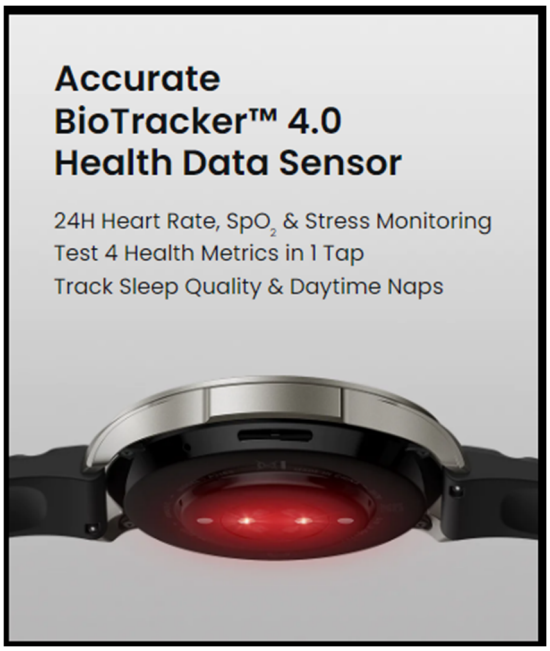


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Friendly to both Android and iOS users, the Zepp App on your phone conducts health and exercise data display and analysis, features a watch face store, provides system updates for your watch, and facilitates smart device management.




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In-depth Monitoring[15] of:
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Deep Sleep 69 min


Accurate
BioTracker™ 4.0
Health Data Sensor
24H Heart Rate, SpO2 & Stress Monitoring
Test 4 Health Metrics in 1 Tap
Track Sleep Quality & Daytime Naps



338. On information and belief, the algorithm used by the Accused Zepp Watches uses bandpass filtering and detrending a segment from the measurement of one physiological parameter, wherein a bandpass filtered and detrended segment is hereinafter referred to as a preprocessed segment, as claimed in independent claim 1(a).

339. On information and belief, the algorithm used by the Accused Zepp Watches obtains a value of at least one indicator of volatility, used in determining whether motion artifacts are present, for the preprocessed segment, the at least one indicator of volatility being at least Shannon entropy (SE) for the preprocessed segment,

where $SE = -\sum_{i=1}^{k} \frac{p(i) * \log(p(i))}{\log\left(\frac{1}{k}\right)}$ and where i represents the bin number and, p(i) is the probability distribution of the preprocessed segment including the segment in analyses of physiological measurements, when comparison of the value of the at least one indicator of volatility with a predetermined threshold indicates noise/motion artifacts

are not present; and selecting another segment of the signal from the physiological measurement and proceeding to step (a) when the value of the at least one indicator of volatility is less than a predetermined threshold and when another segment is available.

340. On information and belief, the Accused Zepp Watches utilize Plaintiffs' algorithm and system claims to enable physiological monitoring with a mobile communication device using PPG to allow for the detection of motion artifacts so that the results reported are of acceptable quality.

341. On information and belief, Zepp had knowledge of Plaintiffs' algorithm and systems as claimed in Claim 1 from the publication of the '428 patent claims the United States Patent and Trademark Office, but in any event at least as of the filing of this lawsuit.

342. Zepp's infringement of the '428 patent is willful, deliberate, and intentional by Zepp. On information and belief, Zepp has known of the '428 patent and its infringement of that patent since at least the filing of this complaint.

343. Because of Zepp's infringement of the '428 patent, Plaintiffs have suffered and will continue to suffer irreparable harm and injury, including monetary damages in an amount to be determined at trial.

344. On information and belief, Zepp has acted with full knowledge or at least willful blindness of the '428 patent and without a reasonable basis for believing that they would not be liable for direct infringement of the '428 patent and active inducement of infringement of the '428 patent.

345. Zepp has infringed and continues to infringe the '428 patent by making, using, selling, offering to sell, and/or importing, without license or authority, the Accused Zepp Watches, as alleged herein, which embody or use the inventions claimed in the '428 patent literally or under the doctrine of equivalents.

346. Zepp has induced infringement and continues to induce infringement of the '428 patent by actively and knowingly inducing others to make, use, sell, offer to sell, and/or import, without license or authority, the Accused Zepp Watches, as alleged herein, which embody or use the inventions claimed in the '428 patent literally or under the doctrine of equivalents.

347. Zepp markets, advertises, offers for sale, and/or otherwise promotes the Accused Zepp Watches and, on information and belief, does so to actively and knowingly induce, encourage, instruct, and aid one or more persons in the United States to make, use, sell, offer to sell and/or import the Accused Zepp Watches. For example, Zepp, or an entity under Zepp's direction or control, advertises, offers for sale, and/or otherwise promotes the Accused Zepp Watches on its website. Zepp, or one or more related entities, induces retailers and end users. For example, Zepp knowingly and intentionally induces retailers to advertise, offer for sale, and/or otherwise promote the Accused Zepp Watches on their websites and in stores. Additionally, Zepp, or one or more related entities, induces end users by, for example, instructing in its manual users of the Accused Zepp Watches to use its Zepp app to monitor physiological parameters. Therein, on information and belief, Zepp describes and touts the use of the subject matter claimed in the '428 patent, as described and alleged herein.

348. Plaintiffs reserve the right to assert additional claims of the '428 patent that Zepp infringes.

349. On information and belief, Zepp has known of the existence of the '428 patent and its applicability to the Accused Zepp Watches since at least the filing of this complaint, and committed acts of infringement that were willful, demonstrated willful blindness, and disregard for the '428 patent, without any reasonable basis for believing that it had a right to engage in the infringing conduct. Plaintiffs are entitled to increased damages of three times the damages assessed pursuant to 35 U.S.C. § 284, as well as an award of attorney's fees pursuant to 35 U.S.C. § 285.

Count IV: Infringement of United States Patent No. 9,986,921 by Zepp

350. Plaintiffs incorporate each of the preceding paragraphs as if fully set forth herein.

351. On information and belief, Zepp's products, including at least the Accused Zepp Watches, infringe at least Claim 1 of the '921 patent under at least 35 U.S.C. §271.

352. On information and belief, Zepp has directly infringed one or more claims of the '921 patent through the manufacture, use, sale, offer for sale, and/or importation into the United States of physiological monitors, including at least the Accused Zepp Watches.

353. The above-listed watches are non-limiting. Additional products of Zepp may infringe the '921 patent, and the above-listed watches may infringe additional patents.

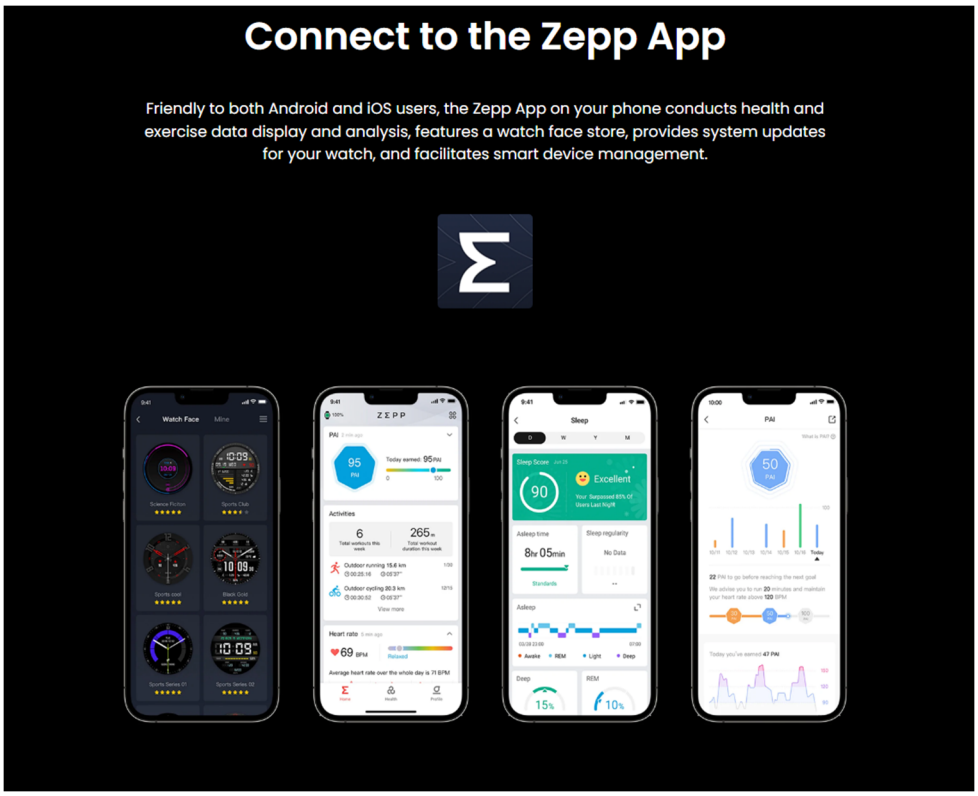
354. On information and belief, at least the Accused Zepp Watches listed above are sold with the Zepp app and Zepp Life app infringing technology/algorithms.

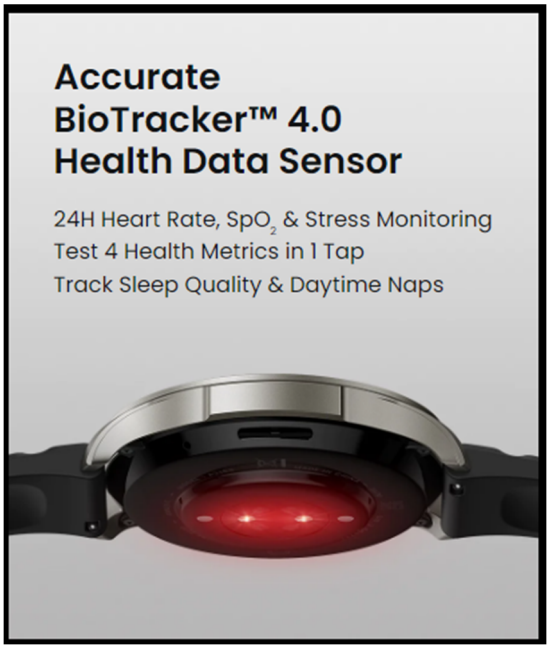
355. For example, Claim 1 covers:

> A computer implemented method for discriminating between normal sinus rhythm without premature ventricular contractions (PVC) or premature atrial contractions (PAC) and atrial fibrillation and premature ventricular contractions (PVC) and premature atrial contractions (PACs), the method comprising:
> obtaining root mean squared of successive differences, Shannon entropy and turning point ratio for peak-to-peak (PPI) interval data;
> comparing the root mean square of successive differences to a first predetermined threshold; comparing the Shannon entropy to a second predetermined threshold;
> comparing the turning point ratio to a third predetermined threshold; and
> determining, when each of the root mean square of successive differences, the Shannon entropy, and the turning point ratio is less than a corresponding predetermined threshold, a subject under test has normal sinus rhythm without PAC or PVC.

356. On information and belief, the algorithm used by the Accused Zepp Watches implemented a computer method for discriminating between normal sinus rhythm without premature ventricular contractions (PVC) or premature atrial contractions (PAC) and atrial fibrillation and premature ventricular contractions (PVC) and premature atrial contractions (PACs), including as shown below.

https://us.amazfit.com/products/amazfit-gtr-mini


Connect to the Zepp App
Friendly to both Android and iOS users, the Zepp App on your phone conducts health and exercise data display and analysis, features a watch face store, provides system updates for your watch, and facilitates smart device management.


Accurate
BioTracker™ 4.0
Health Data Sensor
24H Heart Rate, SpO2 & Stress Monitoring
Test 4 Health Metrics in 1 Tap
Track Sleep Quality & Daytime Naps



357. On information and belief, the algorithm used by the Accused Zepp Watches obtains root mean squared of successive differences, Shannon entropy and turning point ratio for peak-to-peak (PPI) interval data.

358. On information and belief, the algorithm used by the Accused Zepp Watches compares the root mean square of successive differences to a first predetermined threshold, compares the Shannon entropy to a second predetermined threshold, compares the turning point ratio to a third predetermined threshold, and determines when each of the root mean square of successive differences, the Shannon entropy, and the turning point ratio is less than a corresponding predetermined threshold, a subject under test has normal sinus rhythm without PAC or PVC.

359. On information and belief, the Accused Zepp Watches utilize Plaintiffs' algorithm capable of real-time arrhythmia discrimination, which can discriminate between NSR, AF, PACs, and PVCs using pulsatile time series.

360. On information and belief, Zepp had knowledge of Plaintiffs' algorithm as claimed in Claim 1 from the publication of the '921 patent claims the United States Patent and Trademark Office, but in any event at least as of the filing of this lawsuit.

361. Zepp's infringement of the '921 patent is willful, deliberate, and intentional by Zepp. On information and belief, Zepp has known of the '921 patent and its infringement of the '921 patent since at least the filing of this complaint.

362. Because of Zepp's infringement of the '921 patent, Plaintiffs have suffered and will continue to suffer irreparable harm and injury, including monetary damages in an amount to be determined at trial.

363. On information and belief, Zepp has acted with full knowledge or at least willful blindness of the '921 patent and without a reasonable basis for believing that they would not be liable for direct infringement of the '921 patent and active inducement of infringement of the '921 patent.

364. Zepp has infringed and continues to infringe the '921 patent by making, using, selling, offering to sell, and/or importing, without license or authority, the Accused Zepp Watches, as alleged herein, which embody or use the inventions claimed in the '921 patent literally or under the doctrine of equivalents.

365. Zepp has induced infringement and continues to induce infringement of the '921 patent by actively and knowingly inducing others to make, use, sell, offer to sell, and/or import, without license or authority, the Accused Zepp Watches, as alleged herein, which embody or use the inventions claimed in the '921 patent literally or under the doctrine of equivalents.

366. Zepp markets, advertises, offers for sale, and/or otherwise promotes the Accused Zepp Watches and, on information and belief, does so to actively and knowingly induce, encourage, instruct, and aid one or more persons in the United States to make, use, sell, offer to sell and/or import the Accused Zepp Watches. For example, Zepp knowingly and intentionally induces retailers to advertise, offer for sale, and/or otherwise promote the Accused Zepp Watches on their websites and in stores. Additionally, Zepp, or one or more related entities, induces end users by, for example, instructing in its manual users of the Accused Zepp Watches to use its Zepp app to monitor physiological parameters. Therein, on information and belief, Zepp describes and touts the use of the subject matter claimed in the '921 patent, as described and alleged herein.

367. Plaintiffs reserve the right to assert additional claims of the '921 patent that Zepp infringes.

368. On information and belief, Zepp has known of the existence of the '921 patent and its applicability to the Accused Zepp Watches since at least the filing of this complaint, and committed acts of infringement that were willful, demonstrated willful blindness, and disregard for the '921 patent, without any reasonable basis for believing that it had a right to engage in the infringing conduct. Plaintiffs are entitled to increased damages of three times the damages assessed pursuant to 35 U.S.C. § 284, as well as an award of attorney's fees pursuant to 35 U.S.C. § 285.

Count V: Infringement of United States Patent No. 10,278,647 by Zepp

369. Plaintiffs incorporate each of the preceding paragraphs as if fully set forth herein.

370. On information and belief, Zepp's products, including at least the Accused Zepp Watches, infringe at least Claim 1 of the '647 patent under at least 35 U.S.C. § 271.

371. On information and belief, Zepp has directly infringed one or more claims of the '647 patent through the manufacture, use, sale, offer for sale, and/or importation into the United States of physiological monitors, including at least the Accused Zepp Watches.

372. The above-listed watches are non-limiting. Additional products of Zepp may infringe the '647 patent, and the above-listed watches may infringe additional patents.

373. On information and belief, at least the Accused Zepp Watches listed above are sold with the Zepp app and Zepp Life app infringing technology/algorithms.

374. For example, Claim 1 covers:

> A method for reconstructing a heart-related signal output by a biomedical sensor, the method comprising:
>
> reconstructing a representation of the heart-related signal to produce a reconstructed representation of the heart-related signal, the reconstructing based on (i) a time-varying spectral analysis of the heart-related signal and a motion signal, the motion signal output by a motion sensor and representative of motion artifacts in the heart-related signal, the motion artifacts being signal artifacts produced by movement of the biomedical sensor relative to a sensing location, and (ii) a classification of the movement, wherein the time-varying spectral analysis includes pre-

processing the heart-related signal to produce a pre-processed heart-related signal, pre-processing the motion signal to produce a pre-processed motion signal, and computing a first time-frequency spectrum (TFS) of the heart-related signal using the pre-processed heart-related signal and a second TFS of the motion signal using the pre-processed motion signal; and

outputting the reconstructed representation of the heart-related signal.

375. On information and belief, the algorithm used by the Accused Zepp Watches reconstructs a heart-related signal output by a biomedical sensor, including as shown below. https://www.zepp.com/press-release/huami-announces-launch-of-new-amazfit-health-band, https://www.amazfit.com/products/amazfit-gts-4

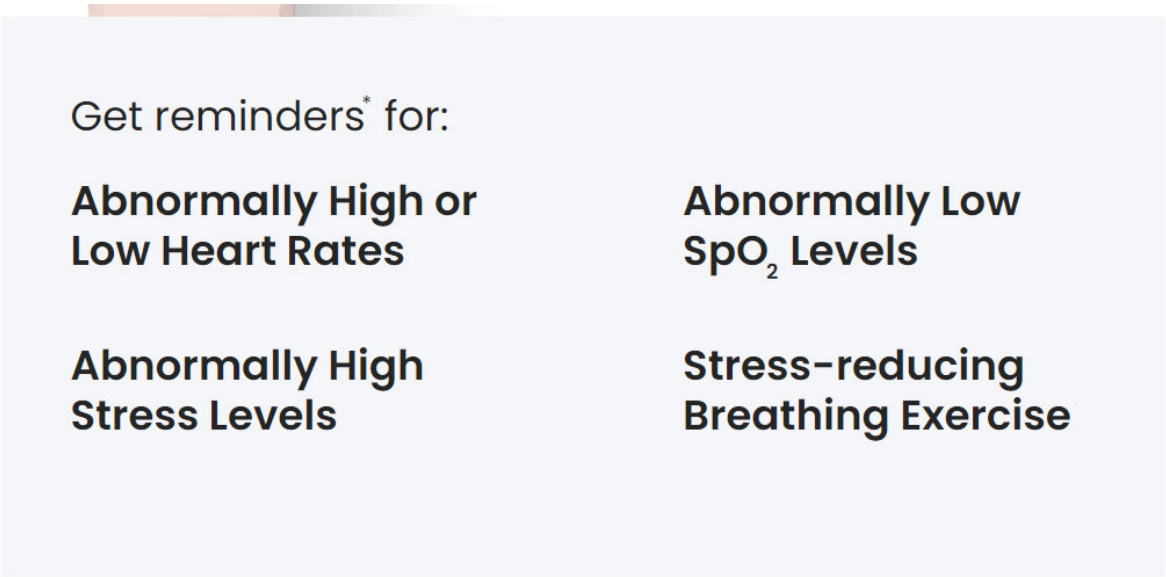
ZEPP

Huami Announces Launch of New Amazfit Health Band 1S and Introduces Groundbreaking Smart Wearable AI Chip, Huangshan-1

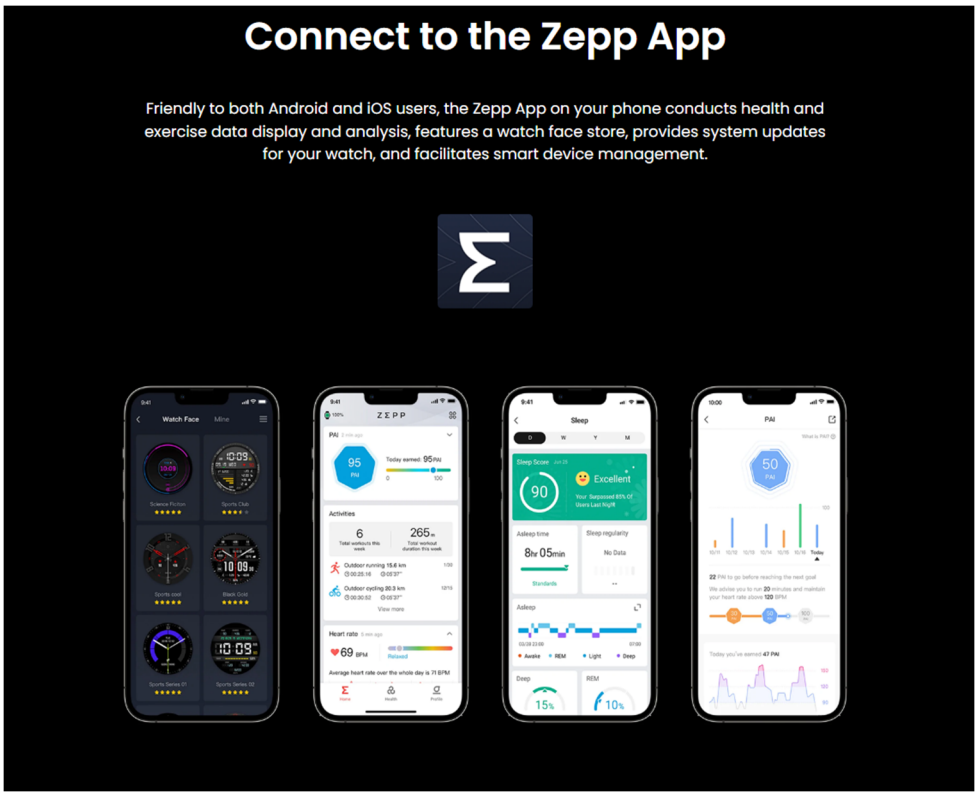
BEIJING, China September 18, 2018 PRNewswire

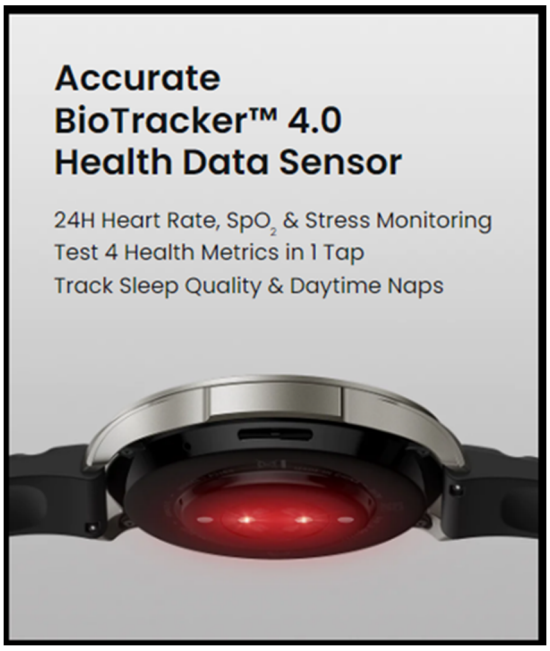
Huami Corporation ("Huami" or the "Company") (NYSE: HMI), a biometric and activity data-driven company with significant expertise in smart wearable technology, today announced the launch of the new generation health band, Amazfit Health Band 1S, which delivers new features and benefits powered by AI technologies and brings advanced heart health monitoring capabilities to the smart wearables industry. The Company also introduced its groundbreaking self-developed smart wearable AI chip, Huangshan-1.

Utilizing an embedded AI algorithm, the new Amazfit Health Band 1S serves as a convenient extension of established heart health monitoring techniques and offers a battery life of up to 7 days. For the first time, the new band features self-developed optical modules that provide highly accurate photoplethysmography (PPG) and deliver continuous, real-time heart rate and heart rhythm monitoring. The Amazfit Health Band 1S is capable of screening the user's heart rhythm in the background and sending an alert if an arrhythmia including atrial fibrillation is detected. Once an arrhythmia is detected, the user is instructed to put a finger on top of the band to start a 30 to 120 second ECG recording process to capture detailed heart health data in real time.

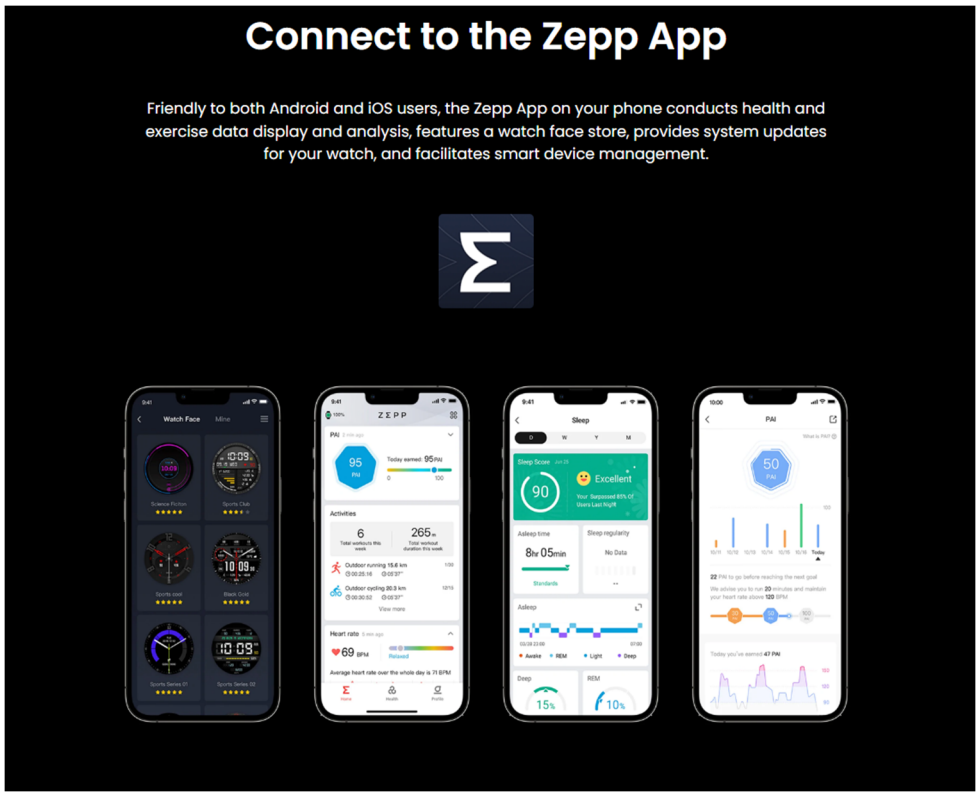


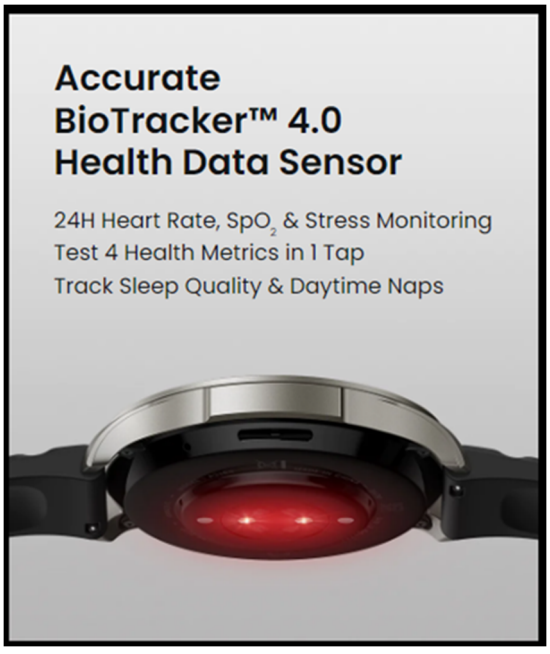
376. On information and belief, the algorithm used by the Accused Zepp Watches reconstructs a representation of the heart-related signal to produce a reconstructed representation of the heart-related signal, the reconstructing based on (i) a time-varying spectral analysis of the heart-related signal and a motion signal, the motion signal output by a motion sensor and representative of motion artifacts in the heart-related signal, the motion artifacts being signal artifacts produced by movement of the biomedical sensor relative to a sensing location, and (ii) a classification of the movement, wherein the time-varying spectral analysis includes pre-processing the heart-related signal to produce a pre-processed heart-related signal, pre-processing the motion signal to produce a pre-processed motion signal, and computing a first time-frequency spectrum (TFS) of the heart-related signal using the pre-processed heart-related signal and a second TFS of the motion signal using the pre-processed motion signal, including as shown below. https://www.amazfit.com/products/amazfit-gts-4


Connect to the Zepp App
Friendly to both Android and iOS users, the Zepp App on your phone conducts health and exercise data display and analysis, features a watch face store, provides system updates for your watch, and facilitates smart device management.


Accurate
BioTracker™ 4.0
Health Data Sensor
24H Heart Rate, SpO2 & Stress Monitoring
Test 4 Health Metrics in 1 Tap
Track Sleep Quality & Daytime Naps

377. On information and belief, the algorithm used by the Accused Zepp Watches outputs the reconstructed representation of the heart-related signal, including as shown below. https://www.amazfit.com/products/amazfit-gts-4

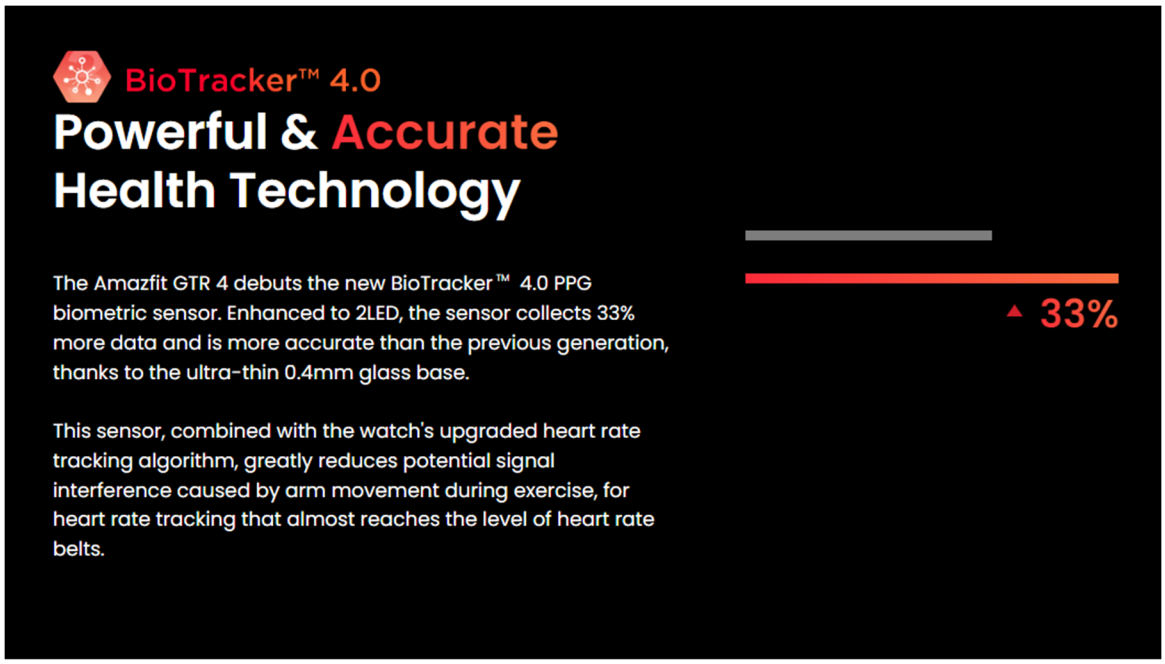






378. On information and belief, the Accused Zepp Watches utilize Plaintiffs' algorithm and method claims to employ a time-varying spectral approach for reconstructing a heart-related signal that includes motion artifacts using at least of a PPG sensor, piezoelectric sensor, LED based sensor, camera sensor, and a pulse oximeter sensor, including as shown below.

https://www.amazfit.com/products/amazfit-gts-4



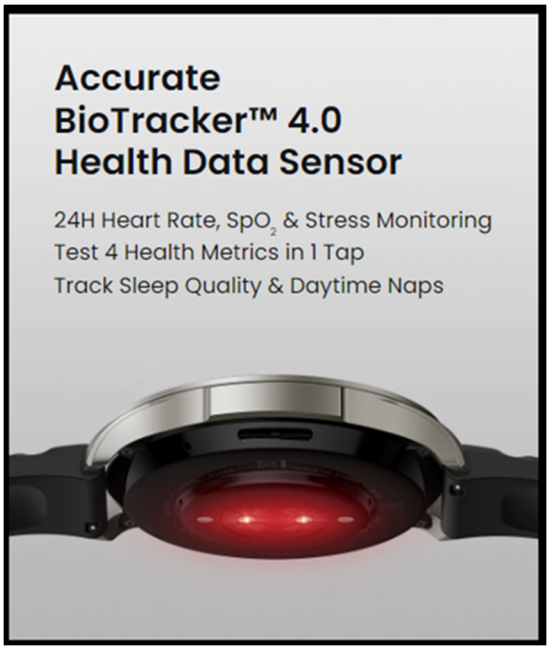
Technical Specifications

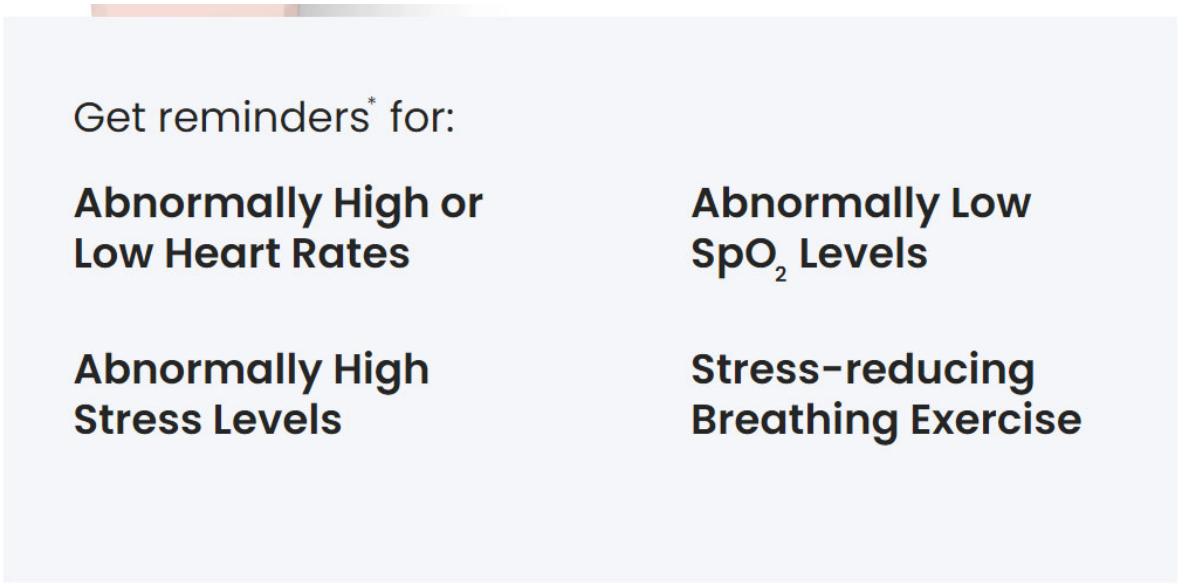
Design

Colors	Superspeed Black (Fluoroelastomer strap, Liquid silicone strap) Vintage Brown Leather (Leather strap) Racetrack Grey (Nylon strap)[22]
Dimensions (without heart rate base)	46x46x10.6mm
Weight (without strap)	34g
Body Material	Aluminum alloy middle frame + high-gloss sprayed PC bottom shell
Buttons	2

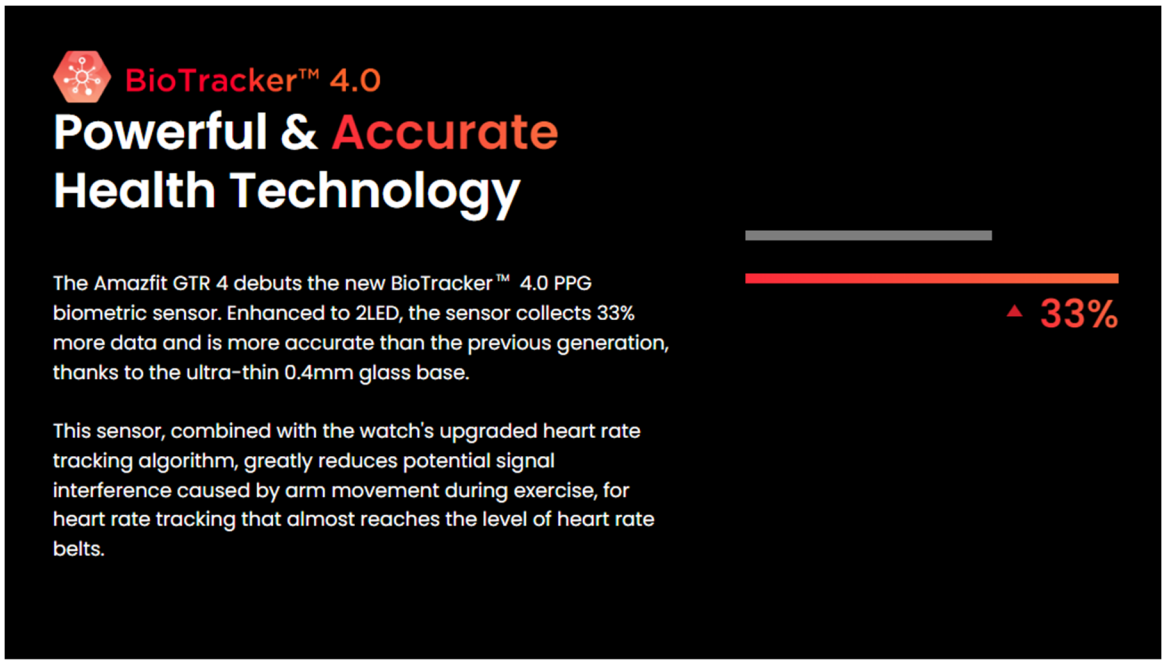
Sensors

Health	BioTracker™ 4.0 PPG biometric sensor (supports blood-oxygen, 4PD + 2LED)
Movement	Acceleration sensor Gyroscope sensor Geomagnetic sensor Barometric altimeter Ambient light sensor
Positioning	Dual-band & 6 satellite positioning systems
Connection	WLAN 2.4GHz, Bluetooth 5.0 & BLE





379. On information and belief, the method and apparatus for heart-related signal monitoring that includes motion artifacts is shown in the images below found on the Zepp's website at: https://www.amazfit.com/products/amazfit-gts-4



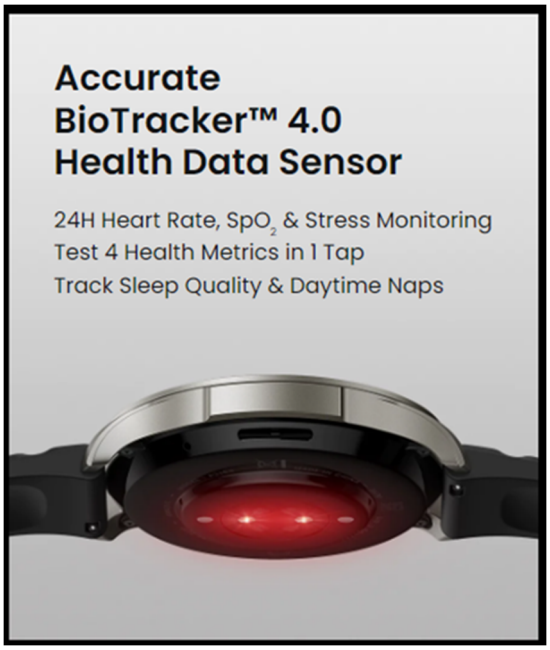
Technical Specifications

Design

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Dimensions (without heart rate base)	46x46x10.6mm
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Buttons	2

Sensors

Health	BioTracker™ 4.0 PPG biometric sensor (supports blood-oxygen, 4PD + 2LED)
Movement	Acceleration sensor Gyroscope sensor Geomagnetic sensor Barometric altimeter Ambient light sensor
Positioning	Dual-band & 6 satellite positioning systems
Connection	WLAN 2.4GHz, Bluetooth 5.0 & BLE



380. On information and belief, Zepp had knowledge of Plaintiffs' algorithm as claimed in Claim 1 from the publication of the '647 patent claims the United States Patent and Trademark Office, but in any event at least as of the filing of this lawsuit.

381. Zepp's infringement of the '647 patent is willful, deliberate, and intentional by Zepp. On information and belief, Zepp has known of the '647 patent and its infringement of that patent since at least the filing of this complaint.

382. Because of Zepp's infringement of the '647 patent, Plaintiffs have suffered and will continue to suffer irreparable harm and injury, including monetary damages in an amount to be determined at trial.

383. On information and belief, Zepp has acted with full knowledge or at least willful blindness of the '647 patent and without a reasonable basis for believing that they would not be liable for direct infringement of the '647 patent and active inducement of infringement of the '647 patent.

384. Zepp has infringed and continues to infringe the '647 patent by making, using, selling, offering to sell, and/or importing, without license or authority, the Accused Zepp Watches, as alleged herein, which embody or use the inventions claimed in the '647 patent literally or under the doctrine of equivalents.

385. Zepp has induced infringement and continues to induce infringement of the '647 patent by actively and knowingly inducing others to make, use, sell, offer to sell, and/or import, without license or authority, the Accused Zepp Watches, as alleged herein, which embody or use the inventions claimed in the '647 patent literally or under the doctrine of equivalents.

386. Zepp markets, advertises, offers for sale, and/or otherwise promotes the Accused Zepp Watches and, on information and belief, does so to actively and knowingly induce, encourage, instruct, and aid one or more persons in the United States to make, use, sell, offer to sell and/or import the Accused Zepp Watches. For example, Zepp knowingly and intentionally induces retailers to advertise, offer for sale, and/or otherwise promote the Accused Zepp Watches on their websites and in stores. Additionally, Zepp, or one or more related entities, induces end users by, for example, instructing in its manual users of the Accused Zepp Watches to use its Zepp app to monitor physiological parameters. Therein, on information and belief, Zepp describes and touts the use of the subject matter claimed in the '647 patent, as described and alleged herein.

387. Plaintiffs reserve the right to assert additional claims of the '647 patent that Zepp infringes.

388. On information and belief, Zepp has known of the existence of the '647 patent and its applicability to the Accused Zepp Watches since at least the filing of this complaint, and committed acts of infringement that were willful, demonstrated willful blindness, and disregard for the '647 patent, without any reasonable basis for believing that it had a right to engage in the infringing conduct. Plaintiffs are entitled to increased damages of three times the damages assessed pursuant to 35 U.S.C. § 284, as well as an award of attorney's fees pursuant to 35 U.S.C. § 285.

Count VI: Infringement of United States Patent No. 10,285,601 by Zepp

389. Plaintiffs incorporate each of the preceding paragraphs as if fully set forth herein.

390. On information and belief, Zepp's products, including at least the Accused Zepp Watches, infringe at least Claim 1 of the '601 patent under at least 35 U.S.C. § 271.

391. On information and belief, Zepp has directly infringed one or more claims of the '601 patent through the manufacture, use, sale, offer for sale, and/or importation into the United States of physiological monitors, including at least the Accused Zepp Watches.

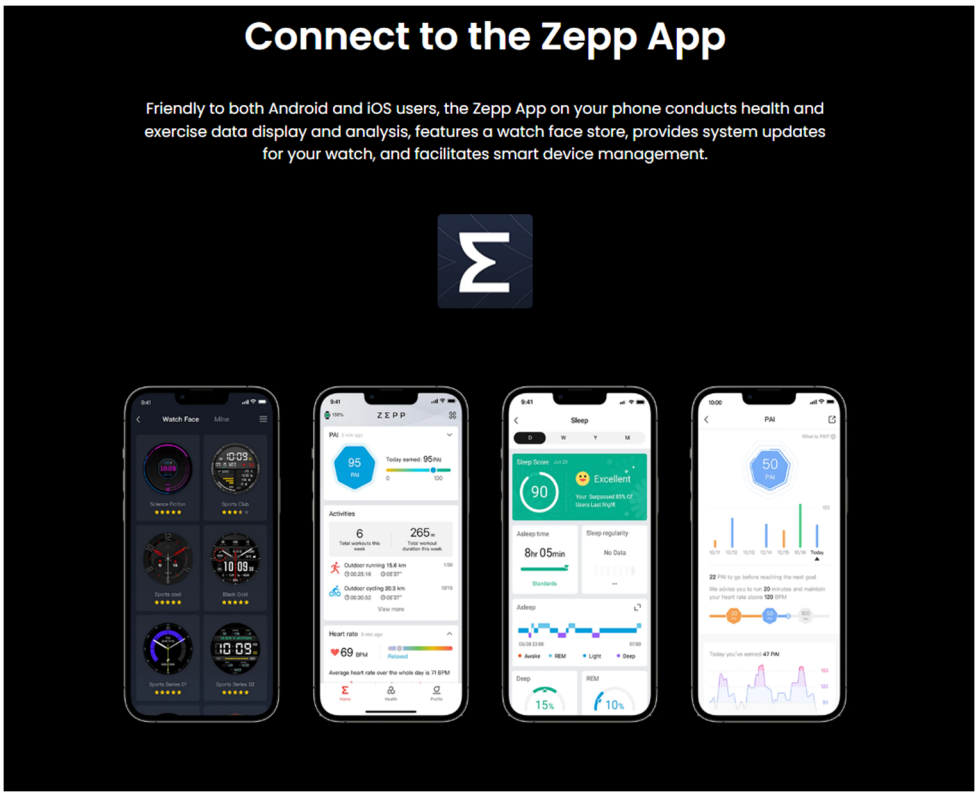
392. The above-listed watches are non-limiting. Additional products of Zepp may infringe the '601 patent, and the above-listed watches may infringe additional patents.

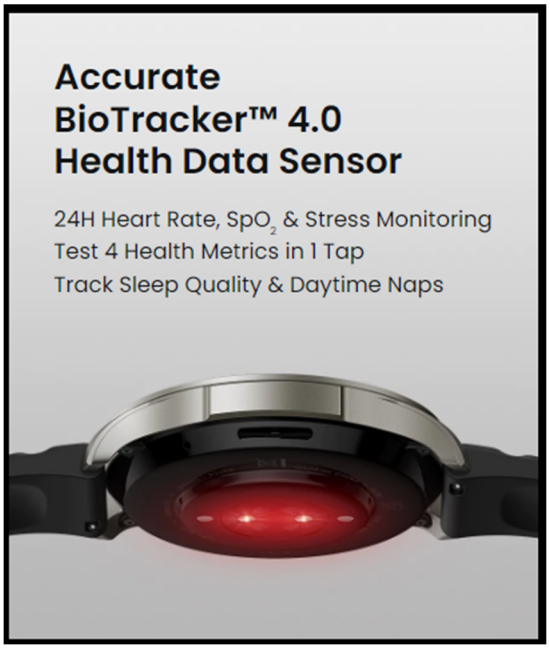
393. On information and belief, at least the Accused Zepp Watches listed above are sold with the Zepp app and Zepp Life app infringing technology/algorithms.

394. For example, Claim 1 covers:

> A system for discriminating between normal sinus rhythm without premature ventricular contractions or premature atrial contractions and atrial fibrillation and premature ventricular contractions (PVC) and premature atrial contractions (PACs), the system comprising:
>
> one or more processors; the one or more processors being configured to:
>
> obtain root mean squared of successive differences, Shannon entropy and turning point ratio for peak-to-peak (PPI) interval data;
>
> compare the root mean square of successive differences to a first predetermined threshold;
>
> compare the Shannon entropy to a second predetermined threshold;
>
> compare the turning point ratio to a third predetermined threshold; and
>
> determine, when each of the root mean square of successive differences, the Shannon entropy, and the turning point ratio is less than a corresponding predetermined threshold, a subject under test has normal sinus rhythm without PAC or PVC.

395. On information and belief, the algorithm used by the Accused Zepp Watches discriminates between normal sinus rhythm without premature ventricular contractions or premature atrial contractions and atrial fibrillation and premature ventricular contractions (PVC) and premature atrial contractions (PACs), including as shown below. https://us.amazfit.com/products/amazfit-gtr-mini


Connect to the Zepp App
Friendly to both Android and iOS users, the Zepp App on your phone conducts health and exercise data display and analysis, features a watch face store, provides system updates for your watch, and facilitates smart device management.


Accurate
BioTracker™ 4.0
Health Data Sensor
24H Heart Rate, SpO2 & Stress Monitoring
Test 4 Health Metrics in 1 Tap
Track Sleep Quality & Daytime Naps



396. The algorithm and technology used by the Accused Zepp Watches have one or more processors.

397. On information and belief, the algorithm used by the Accused Zepp Watches obtains root mean squared of successive differences, Shannon entropy and turning point ratio for peak-to-peak (PPI) interval data.

398. On information and belief, the algorithm used by the Accused Zepp Watches compares the root mean square of successive differences to a first predetermined threshold.

399. On information and belief, the algorithm used by the Accused Zepp Watches compares the Shannon entropy to a second predetermined threshold.

400. On information and belief, the algorithm used by the Accused Zepp Watches compares the turning point ratio to a third predetermined threshold.

401. On information and belief, the algorithm used by the Accused Zepp Watches determines, when each of the root mean square of successive differences, the Shannon entropy, and the turning point ratio is less than a corresponding predetermined threshold, a subject under test has normal sinus rhythm without PAC or PVC.

402. On information and belief, the Accused Zepp Watches utilize Plaintiffs' algorithm capable of real-time arrhythmia discrimination, which can discriminate between NSR, AF, PACs, and PVCs using pulsatile time series.

403. On information and belief, Zepp had knowledge of Plaintiffs' algorithm and systems as claimed in Claim 1 from the publication of the '601 patent claims the United States Patent and Trademark Office, but in any event at least as of the filing of this lawsuit.

404. Zepp's infringement of the '601 patent is willful, deliberate, and intentional by Zepp. On information and belief, Zepp has known of the '601 patent and its infringement of that patent since at least the filing of this complaint.

405. Because of Zepp's infringement of the '601 patent, Plaintiffs have suffered and will continue to suffer irreparable harm and injury, including monetary damages in an amount to be determined at trial.

406. On information and belief, Zepp has acted with full knowledge or at least willful blindness of the '601 patent and without a reasonable basis for believing that

they would not be liable for direct infringement of the '601 patent and active inducement of infringement of the '601 patent.

407. Zepp has infringed and continues to infringe the '601 patent by making, using, selling, offering to sell, and/or importing, without license or authority, the Accused Zepp Watches, as alleged herein, which embody or use the inventions claimed in the '601 patent literally or under the doctrine of equivalents.

408. Zepp has induced infringement and continues to induce infringement of the '601 patent by actively and knowingly inducing others to make, use, sell, offer to sell, and/or import, without license or authority, the Accused Zepp Watches, as alleged herein, which embody or use the inventions claimed in the '601 patent literally or under the doctrine of equivalents.

409. Zepp markets, advertises, offers for sale, and/or otherwise promotes the Accused Zepp Watches and, on information and belief, does so to actively and knowingly induce, encourage, instruct, and aid one or more persons in the United States to make, use, sell, offer to sell and/or import the Accused Zepp Watches. For example, Zepp knowingly and intentionally induces retailers to advertise, offer for sale, and/or otherwise promote the Accused Zepp Watches on their websites and in stores. Additionally, Zepp, or one or more related entities, induces end users by, for example, instructing in its manual users of the Accused Zepp Watches to use its Zepp app to monitor physiological parameters. Therein, on information and belief, Zepp describes and touts the use of the subject matter claimed in the '601 patent, as described and alleged herein.

410. Plaintiffs reserve the right to assert additional claims of the '601 patent that Zepp infringes.

411. On information and belief, Zepp has known of the existence of the '601 patent and its applicability to the Accused Zepp Watches since at least the filing of the complaint, and committed acts of infringement that were willful, demonstrated willful blindness, and disregard for the '601 patent, without any reasonable basis for believing that it had a right to engage in the infringing conduct. Plaintiffs are entitled to increased damages of three times the damages assessed pursuant to 35 U.S.C. § 284, as well as an award of attorney's fees pursuant to 35 U.S.C. § 285.

Count VII: Infringement of United States Patent No. 10,653,362 by Zepp

412. Plaintiffs incorporate each of the preceding paragraphs as if fully set forth here.

413. On information and belief, Zepp's products, including at least the Accused Zepp Watches, infringe at least Claim 1 of the '362 patent under at least 35 U.S.C. § 271.

414. On information and belief, Zepp has directly infringed one or more claims of the '362 patent through the manufacture, use, sale, offer for sale, and/or importation into the United States of physiological monitors, including at least the Accused Zepp Watches.

415. The above-listed watches are non-limiting. Additional products of Zepp may infringe the '362 patent, and the above-listed watches may infringe additional patents.

416. On information and belief, at least the Accused Zepp Watches listed above are sold with the Zepp app and Zepp Life app infringing technology/algorithms.

417. For example, Claim 1 covers:

> A computer implemented method for physiological parameter monitoring using a signal used as a Photoplethysmogram (PPG) signal, the computer implemented method comprising:
>
> obtaining a time frequency spectrum of a segment of the signal used as the PPG signal;
>
> obtaining, from the time frequency spectrum, a noise quality index for the segment; the noise quality index being used to determine whether the segment is corrupted by motion and noise artifacts;
>
> wherein obtaining a noise quality index comprises:
>
> determining a dominant frequency in the time frequency spectrum of the segment;
>
> normalizing the time frequency spectrum to a total power in a narrow band centered at the dominant frequency;
>
> determining a first trace of amplitudes in the narrow band spectrum of the time frequency spectrum centered at the dominant frequency;
>
> determining a second trace of amplitudes in a narrow band spectrum of the time frequency spectrum centered at twice the dominant frequency;
>
> determining a third trace of amplitudes in a narrow band spectrum of the time frequency spectrum centered at three times the dominant frequency;
>
> subtracting the first, second and third traces of amplitudes from the time frequency spectrum;
>
> obtaining, after subtracting, a total power remaining in the time frequency spectrum, said total power remaining referred to as a residual noise power;
>
> determining a difference in frequency between the first trace and the second and third traces, the difference in frequency referred to as a projected difference;

the noise quality index being a weighted sum of factors including the residual noise power and the projected difference; weights being selected such that each weighted factor represents less than a predetermined percentage of power in an uncorrupted segment;

applying a statistical learning method, using the noise quality index, to determine whether the segment is corrupted by motion and noise artifacts or not corrupted by motion and noise artifacts;

and,

if motion and noise artifacts are not present, including the segment in determination of a physiological parameter.

418. The algorithm used by the Accused Zepp Watches implement a computer method for physiological parameter monitoring using a signal used as a Photoplethysmogram (PPG) signal, including as shown below.

https://www.zepp.com/press-release/huami-announces-launch-of-new-amazfit-health-band, https://www.amazfit.com/products/amazfit-gts-4

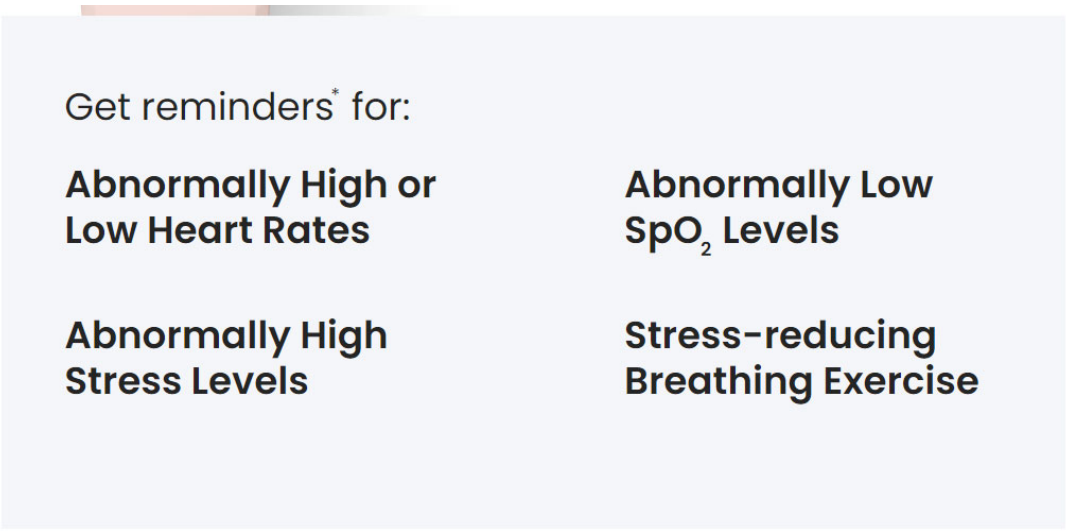
ZEPP

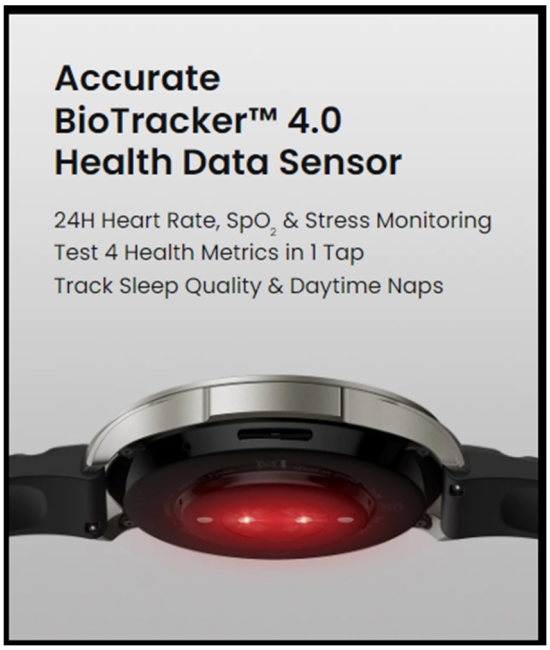
Huami Announces Launch of New Amazfit Health Band 1S and Introduces Groundbreaking Smart Wearable AI Chip, Huangshan-1

BEIJING, China September 18, 2018 PRNewswire

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Utilizing an embedded AI algorithm, the new Amazfit Health Band 1S serves as a convenient extension of established heart health monitoring techniques and offers a battery life of up to 7 days. For the first time, the new band features self-developed optical modules that provide highly accurate photoplethysmography (PPG) and deliver continuous, real-time heart rate and heart rhythm monitoring. The Amazfit Health Band 1S is capable of screening the user's heart rhythm in the background and sending an alert if an arrhythmia including atrial fibrillation is detected. Once an arrhythmia is detected, the user is instructed to put a finger on top of the band to start a 30 to 120 second ECG recording process to capture detailed heart health data in real time.





419. On information and belief, the algorithm used by the Accused Zepp Watches obtains a time frequency spectrum of a segment of the signal used as the PPG signal, including as shown below. https://www.zepp.com/press-release/huami-announces-launch-of-new-amazfit-health-band, https://www.amazfit.com/products/amazfit-gts-4

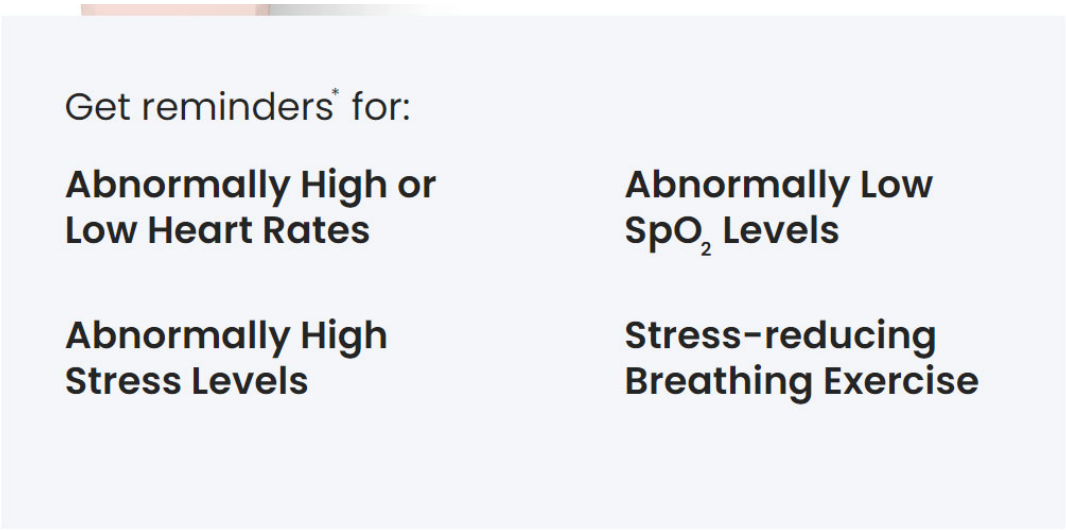
ZEPP

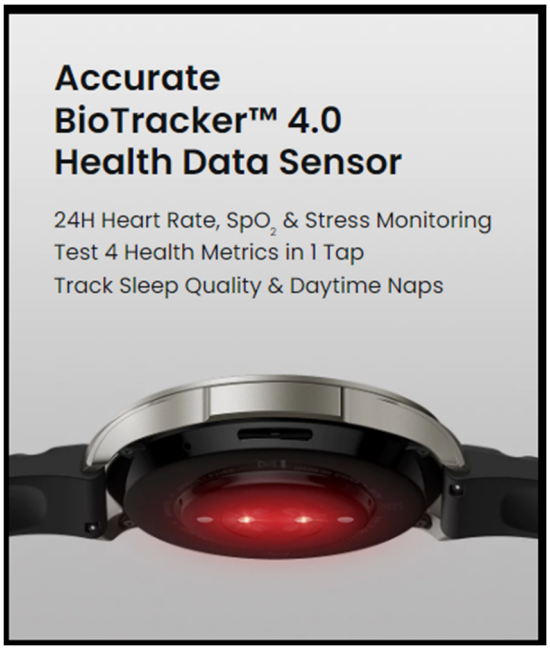
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Technical Specifications

Design

Colors	Superspeed Black (Fluoroelastomer strap, Liquid silicone strap) Vintage Brown Leather (Leather strap) Racetrack Grey (Nylon strap)[22]
Dimensions (without heart rate base)	46x46x10.6mm
Weight (without strap)	34g
Body Material	Aluminum alloy middle frame + high-gloss sprayed PC bottom shell
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Sensors

Health	BioTracker™ 4.0 PPG biometric sensor (supports blood-oxygen, 4PD + 2LED)
Movement	Acceleration sensor Gyroscope sensor Geomagnetic sensor Barometric altimeter Ambient light sensor
Positioning	Dual-band & 6 satellite positioning systems
Connection	WLAN 2.4GHz, Bluetooth 5.0 & BLE

420. On information and belief, the algorithm used by the Accused Zepp Watches obtains, from the time frequency spectrum, a noise quality index for the segment, the noise quality index being used to determine whether the segment is corrupted by motion and noise artifacts.

421. On information and belief, the algorithm used by the Accused Zepp Watches obtains a noise quality index.

422. On information and belief, the algorithm used by the Accused Zepp Watches determines a dominant frequency in the time frequency spectrum of the segment.

423. On information and belief, the algorithm used by the Accused Zepp Watches normalizes the time frequency spectrum to a total power in a narrow band centered at the dominant frequency.

424. On information and belief, the algorithm used by the Accused Zepp Watches determines a first trace of amplitudes in the narrow band spectrum of the time frequency spectrum centered at the dominant frequency.

425. On information and belief, the algorithm used by the Accused Zepp Watches determines a second trace of amplitudes in a narrow band spectrum of the time frequency spectrum centered at twice the dominant frequency.

426. On information and belief, the algorithm used by the Accused Zepp Watches determines a third trace of amplitudes in a narrow band spectrum of the time frequency spectrum centered at three times the dominant frequency.

427. On information and belief, the algorithm used by the Accused Zepp Watches subtracts the first, second and third traces of amplitudes from the time frequency spectrum.

428. On information and belief, the algorithm used by the Accused Zepp Watches obtains, after subtracting, a total power remaining in the time frequency spectrum, said total power remaining referred to as a residual noise power.

429. On information and belief, the algorithm used by the Accused Zepp Watches determines a difference in frequency between the first trace and the second and third traces, the difference in frequency referred to as a projected difference, the noise quality index being a weighted sum of factors including the residual noise power and the projected difference, weights being selected such that each weighted factor represents less than a predetermined percentage of power in an uncorrupted segment.

430. On information and belief, the algorithm used by the Accused Zepp Watches applies a statistical learning method, using the noise quality index, to determine whether the segment is corrupted by motion and noise artifacts or not corrupted by motion and noise artifacts, if motion and noise artifacts are not present, including the segment in determination of a physiological parameter.

431. On information and belief, the Accused Zepp Watches utilize Plaintiffs' algorithm and system claims to detect motion and noise artifact and reconstruct algorithms for PPG and equivalent signals. Additionally, the algorithm covers a pulse oximeter embedded with a motion and noise artifact detection algorithm based on extraction of time-varying spectral features that are unique to the clean and corrupted components.

432. On information and belief, Zepp had knowledge of Plaintiffs' algorithm and apparatus as claimed in Claim 1 from the publication of the '362 patent claims the

United States Patent and Trademark Office, but in any event at least as of the filing of this lawsuit.

433. Zepp's infringement of the '362 patent is willful, deliberate, and intentional by Zepp. On information and belief, Zepp has known about the '362 patent and its infringement of that patent since at least the filing of the complaint.

434. Because of Zepp's infringement of the '362 patent, Plaintiffs have suffered and will continue to suffer irreparable harm and injury, including monetary damages in an amount to be determined at trial.

435. On information and belief, Zepp has acted with full knowledge or at least willful blindness of the '362 patent and without a reasonable basis for believing that they would not be liable for direct infringement of the '362 patent and active inducement of infringement of the '362 patent.

436. Zepp has infringed and continues to infringe the '362 patent by making, using, selling, offering to sell, and/or importing, without license or authority, the Accused Zepp Watches, as alleged herein, which embody or use the inventions claimed in the '362 patent literally or under the doctrine of equivalents.

437. Zepp has induced infringement and continues to induce infringement of the '362 patent by actively and knowingly inducing others to make, use, sell, offer to sell, and/or import, without license or authority, the Accused Zepp Watches, as alleged herein, which embody or use the inventions claimed in the '362 patent literally or under the doctrine of equivalents.

438. Zepp markets, advertises, offers for sale, and/or otherwise promotes the Accused Zepp Watches and, on information and belief, does so to actively and knowingly induce, encourage, instruct, and aid one or more persons in the United States to make, use, sell, offer to sell and/or import the Accused Zepp Watches. For example, Zepp knowingly and intentionally induces retailers to advertise, offer for sale, and/or otherwise promote the Accused Zepp Watches on their websites and in stores. Additionally, Zepp, or one or more related entities, induces end users by, for example, instructing in its manual users of the Accused Zepp Watches to use its Zepp app to monitor physiological parameters. Therein, on information and belief, Zepp describes and touts the use of the subject matter claimed in the '362 patent, as described and alleged herein.

439. Plaintiffs reserve the right to assert additional claims of the '362 patent that Zepp infringes.

440. On information and belief, Zepp has known of the existence of the '362 patent and its applicability to the Accused Zepp Watches since at least the filing of the complaint, and committed acts of infringement that were willful, demonstrated willful blindness, and disregard for the '362 patent, without any reasonable basis for believing that it had a right to engage in the infringing conduct. Plaintiffs are entitled to increased damages of three times the damages assessed pursuant to 35 U.S.C. § 284, as well as an award of attorney's fees pursuant to 35 U.S.C. § 285.

JURY DEMANDED

Pursuant to Rule 38(b) of the Federal Rules of Civil Procedure, Plaintiffs request a trial by jury on all issues so triable.

PRAYER FOR RELIEF

WHEREFORE, Plaintiffs respectfully request the Court to enter judgment in their favor and against Defendants as follows:

a. finding that Defendants have infringed and are infringing the patents-in-suit;

b. awarding Plaintiffs damages under 35 U.S.C. § 284, or otherwise permitted by law, including treble damages based on Defendants' willful infringement, and damages for any continued post-verdict infringement;

c. awarding Plaintiffs pre-judgment and post-judgment interest on the damages award and costs;

d. declaring this case exceptional pursuant to 35 U.S.C. § 285;

e. awarding costs of this action and attorney fees pursuant to 35 U.S.C. § 285, or as otherwise permitted by law; and

f. awarding such other costs and further relief the Court determines to be just and equitable.

Dated: September 11, 2023

Respectfully submitted,

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CERTIFICATE OF SERVICE

I hereby certify that, on September 11, 2023, the foregoing document was filed electronically in compliance with Local Rule CV-5(a), which will provide notice of the same to all counsel of record.

/s/ Claire Abernathy Henry
Claire Abernathy Henry