Probe into Component-Level Licensing and Judicial Pricing of Standard Essential Patents

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I. Introduction

The specialization and division of labor in technology have involved new professional participants into industrial chains, boosting the extension of the corresponding industrial chain and the relative independence of each link. However, technical standards are applicable to all links of product manufacturing and sales in the industrial chains. Spurred by the Internet of Things (IoT) industry, the needs for clarifying the licensing rules of standard essential patents (SEPs) between the upstream and the downstream of the industrial chain have become increasingly urgent. Regarding whether the SEP holders have the freedom to choose the licensing level, those who advocate the "access to all" model propose that since the provisions on fair, reasonable and non-discriminatory (FRAND) commitments in the patent policies of the standard-setting organizations (SSOs) are so vague that the obligation to grant licenses to any applicant cannot be clearly derived therefrom, the patent holders are entitled to choose the level of licensing at will. [1] Those who advocate the "license to all" model deem that the non-discrimination prong of FRAND commitment means that the patent holder should not license only at a certain level based on financial incentive. The patent holder is obliged to grant a license to any implementer who requests an SEP license on FRAND terms and conditions, regardless of whether the applicant is an end-product manufacturer or a component manufacturer. [2]

This article sides with the "license to all" model, highlighting that patent holders do not have the freedom to choose the licensing level, and any standard implementer, including end-product manufacturers and their upstream component manufacturers, has the right to obtain an SEP license on FRAND terms and conditions, and further demonstrating the rationality of component-level licensing of SEPs in conjunction with the composite attribute of SEPs. Although the component-level licensing of SEPs is rational, there still exist many difficulties in determining royalties. On the premise that component manufacturers are willing to pay royalties for SEPs, the determination of royalties is essentially of a contractual dispute nature. Regarding how the court determines the component-level royalties, that is, judicial pricing, this article attempts to provoke discussion from a new perspective: it is determined that the acts of the component manufacturer and the end-product manufacturer implementing SEPs without the patent holder's authorization constitute infringement. In the light of the causal potency criterion and the principle of fairness, both the end-product manufacturer and the component manufacturer should bear partial joint and several liability for damages, while the component manufacturer is only jointly and severally liable for the upstream component-level damages; and the total amount of royalties is determined under the rule of apportionment, and the component-level royalties that the component manufacturer should pay is determined through profit sharing.

II. Review of rationality of component-level licensing of SEPs

From the perspective of the FRAND principle and SEP attributes, the rationality of component-level licensing of SEPs should be confirmed: the FRAND principle ensures that every standard implementer has the right to obtain a FRAND license, so the component manufacturers are eligible to be licensed with the SEPs; and the SEPs combine the private nature of patents and public nature of standards, and the component-level licensing conforms to the compos-

ite attributes of the SEPs.

1. Lenient understanding of the FRAND rule

The controversy between the "license to all" model and the "access to all" model lies essentially in whether a FRAND commitment means a patent holder's waiver of the right to refuse to grant a license. Such an issue cannot be understood without referring to the interpretation of the FRAND terms and conditions. The authors are of the view that the FRAND commitment imposes a comprehensive licensing obligation on patent holders, and the component-level licensing of SEPs is definitely rational in consideration of the regulatory purpose of the FRAND rule.

The interpretation of the FRAND commitment should be rooted in patent policies *per se*. As regards whether a requirement that "the patent holder has the obligation to grant licenses at all levels" is set forth, the patent policies of standard-setting organizations can be divided into three types.

The first type is the patent policies that clearly set forth a requirement that the patent holders have the obligation to grant licenses to all. The IEEE-SA Standards Board Bylaws approved by the IEEE-SA, a standard-setting organization under the Institute of Electrical and Electronics Engineers, Inc. (IEEE), is a typical representative of patent policies that are definitely for the "license to all" model, requiring that the patent holder should grant a license to any manufacturer of any product (e.g., component, sub-assembly, or end product) or service that conforms to any mandatory or optional portion of a normative clause of an IEEE standard.[3] Under this patent policy, patent holders have restricted freedom to choose the licensing level. In addition, many US standard-setting organizations also derive from the FRAND commitment that patent holders are required to grant licenses to all. Taking the Alliance for Telecommunications Industry Solutions (ATIS) and the Telecommunications Industry Association (TIA) as examples, judicial decisions have clarified the obligation of patent holders under the ATIS and TIA to grant licenses to all applicants.[4]

The second type is the patent policies which are ambiguous in terms of the licensing obligations of patent holders. Although the patent policies of the European Telecommunications Standards Institute (ETSI) stipulate that patent holders must grant licenses to implementers that implement systems or equipment fully conforming to standards,[5] none of them specify the licensing level, thereby triggering the debates on the scope and interpretation of licensing obligations under the ETSI IPR Policy. Bertram Huber, a former member of the ETSI Committee on Intellectual Property Rights, stated that the ETSI IPR Policy should be interpreted in the historical context. When the Policy was formulated, the prevailing industry practice was to license only to manufacturers of end-products, from which it can be derived that the FRAND commitment did not compel patent holders to grant licenses to all, and the patent holders are only required to grant licenses to end-product manufacturers.[6] Karl Heinz Rosenbrock, the former Director General of the ETSI, held a completely opposite opinion that patent holders are obliged to grant licenses to component manufacturers.[7]

The third type is the patent policies that clearly set forth that the patent holders are not required to grant license to anyone who applied. However, there is no patent policy of any standard-setting organization that explicitly supports the patent holder's freedom to choose the licensing level. It can thus be seen that, merely based on the patent policies of standard-setting organizations, the mainstream interpretation of the FRAND commitment is that the patent holders are required to grant licenses to all. In comparison with the "access to all" model, the "license to all" model better conforms to the FRAND rule.

Some scholars who advocate the "access to all" model state that the "access to all" model does not suffice to make adequate compensation for patent holders.[8] This view demonstrates two cognitive misunderstandings. First, no matter at which level the license is granted, the FRAND royalties should be the same, and there is no such a thing that a component-level license charges less royalties in total than an end-product license. Second, this view mistakenly associates the FRAND terms and conditions' regulation of the licensing level with the FRAND royalties. Whether to grant a license at a certain level and how to determine royalties are two separate issues. It is apparently unreasonable to logically start from the financial incentive and argue that patent holders should grant licenses at certain levels. The FRAND commitment is the fundamental key to address the issue as to whether patent holders can refuse to grant licenses at a certain licensing level. Regulation under the FRAND terms and conditions is aimed to balance public needs and the interests of patent holders to further boost the promotion of technical standards and increase the overall social welfare. The "license to all" model that allows licensing at all levels can not only guarantee the promotion efficiency of technical standards at all levels, but also protect implementers at all levels from being exposed to in-

fringement risks. For the sake of all the above factors, the application of the FRAND rule to licensing at all levels should be tolerantly understood.

2. Proper logic from the perspective of attributes of SEPs

The combination of "standard + patent" underlies the composite attributes of "public interest + private rights" of SEPs. Patent right is a statutory exclusive right, and the patent holders are entitled to independently license others to implement their patents. If the component manufacturer fails to pay the patent holder royalties, the patent holder has the right to require the component manufacturer to bear the liability for, e.g., compensation for damages. As the patented technologies are incorporated into the standards with network effects, the scale of the standards will lead to a lock-in effect. [9] The SEPs have much stronger public interest attributes than ordinary patents. In order to balance the conflicting interests between private rights of patents and public interest and thereby construct a mechanism for the relationship of interests of intellectual products that complies with the legislative purpose of the patent law, the exercise of private rights by patent holders must be restricted. [10] The restriction can be embodied in two aspects: on the one hand, the patent holders are restricted in choosing licensees. Private rights of patents endow patent holders with rights to claim against infringers. However, in order not to affect the market access qualifications of implementers under the same standard, the determination of licensees should not completely rely on patent holders, but be a free choice in the market. On the other hand, remedies that the patent holders can seek are limited. Where patents are private rights, the patent holders can choose various remedies to safeguard their legitimate rights and interests at will. However, the significance of technical standardization lies in stimulating interconnection and compatibility of technologies in the field. For the sake of promoting technical standards, the component manufacturers that are willing to pay FRAND royalties are entitled to obtain patent licenses, and the courts should hold a prudent attitude towards injunctive reliefs.

III. Clarification of liability in the case of component-level licensing of SEPs

To determine the licensing levels and royalty rates of SEPs, it is necessary to take into account such issues as whether upstream and downstream manufacturers in industrial chains have committed infringement, the value of SEPs to different manufacturers and the assumption of liability for infringement. SEPs in the fields of wireless communications, automobiles and streaming media are mostly process patents and entangled in multi-party infringement. This article is going to make analysis from two aspects: 1) determine the liability for infringement of process patents committed by multiple parties and 2) clarify the compensation liability for specified multi-party infringement, which serves as the basis for exploring the determination of component-level royalties.

1. Determination of liability for infringement of process patents committed by multiple parties

If the SEP is a process patent, the liability for infringement of the SEP should be determined in the same way as an ordinary process patent. In the field of, e.g., telecommunications, the SEPs mostly involve technical methods encompassing functions like signal transmission, data reception and data processing in the process of telecommunications. The determination of liability for infringement committed by multiple parties involves whether the manufacturers of components, end products and the like have implemented the process patent in suit without the permission of the patent holder and whether the exhaustion of rights defense is tenable.

(1) Component manufacturers may implement process patents without the permission of patent holders

Component manufacturers may be those producing chips and modules. Whether and how they use process patents are crucial issues. In the determination of process patent infringement, the term "use" should be understood on the basis of every step for directly exploiting the patented process. In the second-instance judgment of *Jixiang Tengda v. Shenzhen Dunjun*, a dispute over patent infringement, the Supreme People's Court of China further specified the use of the process patent as "incorporating the essential content of the patented process into the accused product for production or business purpose", [11] which clarified the "incorporation + irreplaceable substantive role rule" used in determining when infringement has occurred. This rule implies three aspects. First, according to the all-elements rule for determining patent infringement, the necessary requirement is that the accused technical solution implemented by the accused infringer should fully cover all the technical features recorded in the patent claims, and the process of incorporating the essential content of the patented pro-

cess should meet the requirement of fully covering all the technical features of the patent. Second, the incorporated essential content should be determined in consideration of whether the user can mechanically reproduce the process while using the relevant product. The process patent intends to protect a particular method, steps and operation process. If all the technical features embodying the steps and operation process of the patented process are incorporated into a product in the form of software for production or business purpose, the user can definitely reproduce the patented process in normal use of the product. Third, in view that the scope of the process patent should be commensurate with the technical contributions it made, only the acts of "use" that play a substantive role in the implementation of the particular patented process should be subject to regulation. As for the process patent implemented by multiple parties with the help of multiple physical objects, the implementation of components and that of end products are combined so that the user can mechanically reproduce the patented technical solution through normal operation of the end-device. In such a way, the industry incorporates the substantial content of the process patent, and the particular device incorporating the essential content of the patented process will play an "irreplaceable substantive role" in the implementation of the process patent. Under such circumstances, if the technical solutions of components and end products fully cover the specific technical features of the patent, then the implementation of components and end products constitutes the use of the patented process, and therefore constitutes patent infringement.

(2) Reflections on the application of the exhaustion of rights defense of process patents

Components and end products are in an upstream-downstream coordination relationship due to division of labor and market circulation of commodities. As such, in SEP-related disputes, the exhaustion of rights defense may be raised. But the judiciary of each country holds a different attitude towards whether the exhaustion of rights defense is applicable to process patents.

In *LG Electronics, Inc. v. Bizcom Electronics, Inc.*, the US Court of Appeals confirmed the application of the patent exhaustion rule to products used for realizing patented methods for the first time, [12] holding that combining microprocessor and chipsets manufactured by implementing specific patented methods with other components into finished computers is the only route to ultimately make the patented method come true. Licensed sale of products exhausts the patentee's right. In *Quanta Computer, Inc., et al. v. LG Electronics, Inc.*, the U.S. Supreme Court held the same attitude and further clarified that the patent exhaustion doctrine applies to method patents, and method patents are exhausted by the sale of products embodying the method. [13]

In the light of Article 75.1 of the current Patent Law of the People's Republic of China, the patent exhaustion doctrine is merely applicable to "a patented product or products directly obtained through the patented method". According to Article 1.2.3 of the Guidelines for Patent Infringement Determination (Trial) issued by the China National Intellectual Property Administration, the technical solution can be divided into a method for manufacturing a product and a method for operating or using a product. But it is still unclear what "products directly obtained through the patented method" are. In *Computer Trading (Shanghai) Co., Ltd. v. Xi'an Wireless Network Communications Co., Ltd.*, an appeal concerning a dispute over patent infringement, the Supreme People's Court of China made this issue clearer, stating that under the current legal framework in China, "products directly obtained through the patented method" only refer to patents in relation to methods for manufacturing products, and products directly obtained by methods for operating or using products only constitute the pure use of method patents, under the circumstances of which patent exhaustion does not exist. [14]

2. Clarification of compensation liability for specified multi-party infringement

As both component manufacturers and end-product manufacturer are held liable for infringement of specific SEPs, it is necessary to further analyze and clarify their respective liability for damages. Pursuant to the theory of tort damages, this article favors the view that the component manufacturers and end-product manufacturer bear partial joint and several liability for payment of royalties and bear joint and several liability for upstream component-level damages, and the end-product manufacturer is liable for the remaining downstream damages. Partial joint and several liability has constructed an efficient and reasonable compensation liability system for SEP-related disputes, and provided guidance for how to determine and allocate SEP royalties between the component manufacturers and end-product manufacturer.

(1) Analysis of forms of liability for damages

Where both the upstream component manufacturers and the downstream end-product manufacturer are found to commit patent infringement, the key to dispute resolution is how to determine the respective liability for damages of the two, namely, the form of assuming the tort liability. [15] To put it simply, the crucial factor is to determine the royalties paid by the component manufacturers and end-product manufacturer. In the condition of specified multi-party infringement, the Civil Code of the People's republic of China (hereinafter referred to as the Civil Code) stipulates five forms of liability for damages: proportionate liability, joint and several liability, partial joint and several liability, [16] unreal joint and several liability, [17] and corresponding complementary liability. [18] In consideration that the loss suffered by the patent holder is jointly caused by the component manufacturers and end-product manufacturer, and does not result from the fault of a third party, the forms of liability for damages assumed by infringers in SEP-related disputes can be confined to "proportionate liability, joint and several liability, partial joint and several liability", the comparison of which is shown in Table 1. The theory of partial joint and several liability stems from Japan. It places emphasis on the observation of the causative potency that leads to damages. In the case of joint infringement, the party with greater causative potency is liable to pay the total amount of damages, and the party with less causative potency is jointly and severally liable for damages where causative potencies overlap. [19] The Civil Code recognizes the application of partial joint and several liability. Take the form of assumption of liability of internet service providers for example. The internet service providers are bearing causative potency of damages due to their failure to take necessary measures in a timely manner. Meanwhile, individual users committing infringement also bear causative potency of damages. They both should be jointly and severally liable for damages where causative potencies overlap. The individual users should also bear proportionate liability according to rest causative potencies.

The forms of liability for damages assumed by the component manufacturers and end-product manufacturer in SEP-related disputes can be analyzed from the two aspects, i.e., the causative potency criterion and the principle of fairness.

Firstly, according to the causative potency criterion, the proportionate liability, and joint and several liability can be excluded in the context of SEP-related disputes. The causative potency criterion emphasizes that in the case of joint infringement, the liability for damages should be divided in accordance with the causal relationship between infringement and damages, and the behaviour that causes part of damages is that the party having less causative potency is merely jointly and severally liable where the causative potencies overlap. [20] The analysis of the causative potency criterion can be internalized into two questions: how to determine where the causative potencies overlap? And how to determine the strength of the causative potency of each behaviour? On the one hand, the determination of where the causative potencies overlap has nothing to do with the overlap of the chronologically arranged objective behaviours, but depends on the overlap of the causative potencies resulting in the same damage. Where both upstream and downstream enterprises in the industrial chain commit infringement, infringement generated upstream will inevitably act on the downstream enterprises, and the damage resulting downstream from infringement will surely constitute the overlap of causative potencies. Take the joint liability for environment infringement for example. The infringed can require the infringer, the act of which suffices to cause all the

	Proportionate liability	Joint and several liability	Partial joint and several liability
Causes	No overlap between causes	Complete overlap between causes	Partial overlap between causes
Assumption of liability	The infringers should assume liability in proportion to their respective share of fault or equally	Externally, the infringers should assume partial or full liability according to the requirements of the right holders; Internally, the tortfeasors should assume liability in proportion to their respective share of fault or equally	For the overlapping causes, each infringers should bear joint and several liability, and for the non-overlapping causes, the party who caused the damage should bear the liability alone.

Fig. 1 Chart showing forms of liability for damages

damage, to bear full liability for damages, and other infringers should be jointly and severally liable for the damages jointly caused by all infringers. [21] It can be seen that when applying the causative potency criterion, it is whether infringement suffices to cause all the damage, or in other words, whether the causative potency works in the whole infringing process, rather than whether the chronologically arranged objective behaviours overlap, that needs to be considered. Where the causative potency of one party works in the whole infringing process, the causative potency of the other party, which is weaker, surely constitutes the overlap between the causative potencies. On the other hand, the strength of the causative potency is decided by whether the behaviour is critical to the damage. The term "critical" herein does not mean to attach importance to the source of the causative potency, but intends to emphasize whether the causative potency is crucial and indispensable to the formation of the damage. Turning back to the context of the SEP-related disputes, the damage suffered by the patent holder is the loss of FRAND royalties for specific patents. Since the patent holder can only benefit from the value created by its own patented technology, the FRAND royalties claimed by the patent holder should be determined on the basis of the technical value of the patent. The technical value of the patent lies in the technical function realized thereby, and the technical function realized thereby determines the market value of the end products to some extent and is also in close association with the application and market demands of the latter. In terms of the embodiment of the value of the patented technology, the infringement committed by the end-product manufacturer rendered the patent holder unable to obtain profits from the value created by its own patented technology. The infringement was sufficient to cause all the damage, and the infringing end- product manufacturer is the infringer with a stronger causative potency. By analogy, the component manufacturer has a weaker causative potency, and the causative potencies of the two manufacturers partially overlap in the weaker causative potency. As such, the proportionate liability with "no overlap between causes" and the joint and several liability with "complete overlap between causes" are not applicable to SEP-related disputes.

Secondly, under the principle of fairness, partial joint and several liability is better in line with the self-responsibility requirement in the context of SEP-related disputes. The principle of fairness requires that an actor is responsible only for his or her own behaviours, and does not need to bear the adverse consequences caused by other's behaviours, in such a way to achieve fair apportionment of liability. The assumption of liability for damages as a result of joint infringement must conform to the principle of fairness. In SEP-related disputes, neither proportionate liability nor joint and several liability can meet the requirement of self-responsibility: if proportionate liability is adopted, the end-product manufacturer that suffices to cause all the damage cannot bear the corresponding liability for damages caused upstream; and if joint and several liability is adopted, the component manufacturer is liable to compensate for the damages first, which is unfair to the component manufacturer that only causes partial damage. Comparatively speaking, partial joint and several liability is applicable to the SEP-related disputes. Under the system of partial joint and several liability, the determination of the scopes of liability for damages borne by the component and end-product manufacturers in view of their respective causal relationships can guarantee self-responsibility and avoid the disproportionation between behaviours and liability, [22] which is more conductive to accomplishing fairness and justice.

(2) To claim royalties from end-product manufacturer

Under the circumstance of partial joint and several liability, if the patent holder claims royalties from the end-product manufacturer, the end-product manufacturer should be liable to pay full royalties, and the patent holder should not claim royalties from the upstream component manufacturers in the same industrial chain so as to avoid duplicate charges. This is also similar to the condition that the sale by the component manufacturers does not constitute infringement any longer due to the payment of royalties by the end-product manufacturer, precisely speaking, the component manufacturers obtain "have-made rights" to achieve the indirect licensing effect. According to "have-made rights", if the end-product manufacturer has obtained license, the component manufacturers can obtain an indirect license from the patent holder accordingly. [23] This is different from the independent license obtained by the component manufacturers, on the grounds that it is established on the valid license obtained by the end-product manufacturer. Once the legal effect of the license for end-product manufacture terminates, the indirect license of the component manufacturers will also be affected because a thing cannot exist without its basis, just as a Chinese saying goes "when the hide wears out, the fur will go too".

After the end-product manufacturer pays all the damages, it may claim reimbursement from the component manufacturers that have not fulfilled their liability to compensate for the damages caused by the overlap with the causative potency in the upstream market. However, in view that the component manufacturers are at the upstream of the industrial chain, for the sake of business conventions and efficiency rules, the component manufacturers and end-product manufacturer can negotiate in advance and count the reimbursed damages into the component price to adjust the sales price of components and accomplish efficient operation and benign cooperation between the upstream and downstream manufacturers of the industrial chain.

(3) To claim royalties from component manufacturers

Under partial joint and several liability, if the patent holder claims royalties from the component manufacturers, the component manufacturers should be merely jointly and severally liable to pay damages for the part where the causative potencies overlap in the upstream market. As for the downstream market damages, they should be borne by the end-product manufacturer alone, and be claimed by the patent holder from the end-product manufacturer separately.

Although the multi-party compensation model set up under the partial joint and several liability may raise the collaboration cost of the patent holder, it better conforms to the industrial chain structure and business practice logic of SEPs. The component manufacturers are located upstream of the industrial chain, and are left with a limited profit margin. If the component manufacturers are required to bear all the royalties, it may have two negative effects. On the one hand, if the component manufacturers pay all the royalties in advance, it will inevitably result in the transfer of royalties. The royalties which are much higher than the profits will significantly enhance the cost of the component manufacturers. As a result, the cost pressure is passed onto the downstream enterprises by means of increasing the component price, which will sharply increase the cost of the downstream end-product manufacturer in a short period of time, and will be eventually paid by consumers. It is the interests of consumers that are harmed. On the other hand, if the component manufacturers have difficulty in paying all the royalties, a shortage of components will occur. The inability of the component manufacturers to pay royalties that are much higher than their profits will result in a lawsuit for injunction brought by the patent holder. Under the circumstances that some components are in short supply, the withdrawal of the component manufacturers from relevant market will definitely aggravate the shortage in component supply. In addition to the component manufacturers, the end-product manufacturer and the patent holder are beneficiaries of partial joint and several liability. Compared with the component manufacturers, the end-product manufacturer downstream of the supply chain earns most of the profits and is capable of paying royalties. The multi-party compensation model can not only evade the shift of transaction costs as a result of the transfer of royalties, but also lower the transaction costs for the patent holder, component manufacturers and end-product manufacturer. For the patent holder, the model can prevent repeated negotiations or even the breakdown of licensing negotiations due to the inability of the component manufacturers to pay royalties that are much higher than their profits, which is conducive to improving the efficiency of licensing negotiations.

IV. Judicial pricing of component-level licensing of SEPs

The judicial pricing of SEPs must be based on the value of the patented technology *per se*. In consideration that the value of the patented technology lies in the realization of its technical function and the technical function of a multi-component product is fully demonstrated in the downstream market, the examination of the actual value contribution of the patented technology to the product should focus on the downstream market. The determination of judicial pricing of the component-level licensing of the SEP is summarized herein as "two types of apportionment": first, the value of the SEP should be separated from the value of the product and the value of technologies of all the SEPs contained in the product through technology apportionment, thereby determining the total amount of royalties of the SEP; [24] and second, the royalties that should be paid by the component manufacturers in the upstream market should be separated from the total amount of royalties through profit apportionment.

1. Rules for determining the royalty base of SEPs

Royalties for patents within the scope of the same patented technology should be the same, i.e., in an ideal situation, "high base × low royalty rate = low base × high royalty rate". Irrespective of whether the patent holder grants a component-level licensing or an end-product-level licensing, the royalties should always be the same where the tech-

nical value of the SEP is identical. Nevertheless, the SEP is valued differently by component-level manufacturers and end-product manufacturer. In order to accurately apportion the technical value of a particular patent, two apportionment rules are derived from the rule of apportionment, namely the entire market value rule and the smallest salable patent-practicing unit rule (hereinafter referred to as the SSPPU rule). It should be noted that the licensing level and the royalty base are, as a matter of fact, two independent issues, and the component-level royalty can also be calculated using the price of the end product as the royalty base. Since the patented features covered by individual components in a multi-component product may not necessarily contribute to the value of the entire product, judicial practices are divided as to whether the price of the end product or the price of the component acting as the smallest salable unit should be taken as the royalty base.

(1) Cause of dispute: difficulty in accurately determining the technical contribution made by the patent to products

In *Garretson v. Clark* (1884), the entire market value rule was first proposed. The U.S. Supreme Court held that if the patentee does not give evidence tending to separate or apportion the patentee's damages between the patented feature and the unpatented features, he must show by "equally reliable and satisfactory evidence" that the defendant's profits and the patentee's damages are to be calculated based on the whole machine, for the reason that the entire value of the whole machine, as a marketable article, is "properly and legally attributable to the patented feature". [25] In short, the profits infringers obtained and the damages patent holders suffered should be calculated based on the value of the entire product. The entire market value rule is in essence a supplementary rule for the special scenario where the value cannot be apportioned according to the patented feature. *W. Elec v. Stewart-Warner* triggers further reflections on why "the entire value of the whole machine, as a marketable article, is properly and legally attributable to the patented feature"[26]. In this case, the court held that the patent in suit was a leading one in its field, and also constituted the essential part of the entire market value of the product. [27] Therefore, the court ruled to calculate the royalties based on the product value. In the judicial practice of the United States where the entire market value rule is applied strictly, the courts have provided various perspectives for how to accurately determine the technical contribution made by a particular patent to the product value, such as examining whether the particular patent is the basis for customer demand for the entire product, [28] or whether the particular patent is the major driving factor of the market demand for downstream products, [29] and have managed to, through a market research method, directly investigate whether the factor that drives consumers to purchase the product is attributable to the recognition of the specific patented technology. [30] Even though the U.S. courts have tried to specify the contribution of the particular patent to the product value, the positive factors for evaluating the value of the patented technology are still too abstract. With the increasing intensification of the product technology and the closer association between unpatented factors, such as brand marketing and market environment, and the market demand for products, the role of the patented technology in driving the product value is surely impacted. [31] As a result of persisting in adhering to the strict application requirements, the application of the entire market value rule will gradually lose its evidentiary basis. In comparison with the United States, China does not directly examine the contribution made by the patent to the product value, but determines the application condition of the entire market value rule under the standard of "whether the royalty claim exceeds the scope of the particular patent". [32]

The SSPPU rule has emerged under the tendency that products are composed of multiple components and judicial rationality is refined. In *Cornell University v. Hewlett-Packard Co.*, the U.S. court decided to use the component price as the base for calculating a reasonable royalty on the grounds that the technical contribution made by the patent in suit was not sufficient to represent the substantial value of the end product, thereby avoiding the jury from being misled by an unjust or grossly excessive royalty base to make a verdict to award excessive damages. [33] This is the origin of the SSPPU rule. On the basis of the SSPPU rule, the economic footprint theory further attaches importance to the scope of impact of a particular patent on the economic value of the product implementing the patent, and that the amount of damages should be linked to the superiority of the incremental value added to the product by the patented technology. [34] However, either success or failure boils down to the technical contribution of the patent. Since it is difficult to accurately determine the technical contribution of the particular patent to the product, the application of the SSPPU rule still faces great limitations.

(2) Stance of evaluation: Flexible determination of the royalty base under the FRAND rule

Both the entire market value rule and the SSPPU rule are, in essence, evidentiary tools based on the rule of apportionment, the ultimate goal of which is to carry out the FRAND rule. Where the technical contribution of the particular patent to the product cannot be accurately determined under both rules, it is necessary to refer to the FRAND terms and conditions as a guidance to determine the royalty base of SEPs.

Taking the FRAND rule as the starting and end points of the calculation logic, comprehensive consideration should be given to the technical contribution of the particular patent to end products through market research and economic analysis, followed by the flexible application of the entire market value rule and the SSPPU rule. The FRAND rule confirms the rationality of taking the product end or component end as the royalty base, and meanwhile demonstrates a flexible attitude against the absolute application of a particular royalty base. The normative significance of the FRAND rule lies in its function to balance the interests between patent holders and implementers by regulating patent hold-up and patent hold-out, thereby further boosting the promotion of technical standards. Improper royalty base determination may give rise to the non-FRAND anchoring effect of royalties, which will lead to patent hold-up and patent hold-out. This article is going to optimize the applicable logic of the entire market value rule and the SSPPU rule from the following aspects.

First, the SSPPU rule takes precedence. As for multi-component products, the calculation of the infringer's profits and the patentee's damages based on the entire product will surely enlarge the technical contribution of the particular patent to the product to some degree. By calculating royalty based on the price of an entire product, the patentee will gain benefits that unreasonably exceed the value created by the patented technology, thereby resulting in patent hold-up. Therefore, where the value contribution ratios of specific patented features to the product value are clear, the SSPPU rule should be prioritized, and the entire market value rule should serve as a supplement. Second, the requirements for applying the entire market value rule should not be over-strict. Currently, judging from the development of the U.S. case law, the requirements for applying the entire market value rule are increasingly stringent. Under the consumer-driven standards, the application of the entire market value rule is premised on that the technical value of the particular patent serves as the "sole factor", which is narrowed down from "important basis", for driving consumer demands. Regardless of the difficulty in proving the "sole driving factor" in the context of prevailing multi-component products, consumer demand is also affected by a series of unpatented features such as commercial reputation and brand marketing. In this sense, under such stringent conditions, it is nearly impossible to apply the entire market value rule.[35] The SSPPU rule takes priority in terms of application only when the ratios of contribution of specific patented features to the product value are clear. In the absence of evidence proving the ratios of contribution, comprehensive consideration should be given to the technical field and contribution of the particular patent, as well as the correlation or complementary effects of different technologies in the functions of the end product, in order to choose the royalty base that better reflects the patentee's real technical contribution between the base at the end-product level and that at the component level. Since the subsequent application of the entire market value rule and the SSPPU rule totally depends on case-by-case analysis, there is no need to set stringent conditions for the application of the entire market value rule.

2. Factors considered when apportioning component-level royalties for SEPs

Since the component manufacturers and end-product manufacturer implement the same patent, it is impossible to continue to apportion the value according to the patented technology. As for how to separate the royalties that should be paid by the component manufacturers from the royalties of the whole product, this article proposes to apportion the total royalties for the SEP according to the ratio of the component manufacturers' profits to the end-product manufacturer's profits, in such a way to determine the component-level royalties. The rationality of taking the profit ratio as the basis for apportionment lies in two aspects: on the one hand, each implementer should pay royalties within the scope of its profits, and the claim of royalties that exceed the market profits earned by the implementer will only lead to the consequences that the interests of the patentee, implementer and the public will all be harmed; on the other hand, since implementers are at different links of the industrial chain, and faced with greatly diverse market competition environments and prices, taking the profit ratio as the basis for apportionment is more fair and in line with the ba-

sic principle for calculating damages. Although the profit margins of the component manufacturers and the end-product manufacturer are not completely available, they can still be estimated based on factors such as the public financial data and cost sharing at each link. First, the public financial data like the financial reports of listed companies or industry research reports provide information support. Take Qualcomm for example. According to Qualcomm's financial report for the first quarter of fiscal year 2025, its gross profit in the first quarter was US $6.508 billion, with a gross profit margin of 55.8%, wherein the mobile phone chip revenue accounted for more than 60% of the total and amounted to US$7.574 billion. [36] The relevant data in this financial report is valuable as a reference for accurately determining the profit margin of the component manufacturers. Second, even the component, as the smallest salable unit, involves multiple links of the industrial chain, including, but not limited to, design and R&D, manufacturing, package testing, and sales, wherein the design and R&D cost and the package testing cost make up a large proportion of the total cost. Hence, effort can be made to delve into the cost of the component manufacturers based on the above two costs and the production scale factor affected by the market competition environment, thereby evaluating the profits of the component manufacturers.

V. Conclusion

With the advent of the IoT era, the component-level licensing of SEPs is of great concern. There have not been formed currently systematic researches on the component-level licensing of SEPs. This article builds up a logically complete research framework for the component-level licensing of SEPs from three aspects: licensing rationality, liability assumption and judicial pricing, in hope of boosting the benign operation of the component-level licensing. Although the "license to all" model and the composite attributes of SEPs are not explicitly directed to the component-level licensing, the confirmation about implementers' entitlement to license is an indirect recognition of the rationality of incorporating the component-level licensing. In SEP disputes, the component manufacturers and end-product manufacturer all commit SEP infringement, and shall bear partial joint and several liability for damages. The component manufacturers and end-product manufacturer are liable for upstream component-level damages, and the end-product manufacturer alone is liable for the remaining downstream damages. The form of assumption of tort liability provides a reference for the apportionment of SEP royalties. The component-level royalties of SEPs shall be calculated on the basis of the total royalties obtained under the rule of apportionment, and then determined and allocated within the scope of profits earned by upstream and downstream manufacturers. ■

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China Strengthens IP Protection Efforts for Private Enterprises

China has implemented a series of measures to enhance intellectual property (IP) protection for private enterprises, ensuring a supportive environment that nurtures their growth, said the country's top IP regulator on 24 April 2025.

According to the China National Intellectual Property Administration (CNIPA), national IP protection centers in 2024 received over 240,000 patent pre-examination requests from private enterprises, providing them fast, timely protection.

Nationwide IP departments also handled 37,000 patent infringement cases involving private firms last year, offering multiple dispute resolution channels.

The CNIPA has launched a patent industrialization program to support the growth of small and medium-sized enterprises, with nearly 17,000 private enterprises participating in it. In addition, IP-backed financing has been extended to over 40,000 private enterprises.

Furthermore, the country's top IP regulator has strengthened early warning mechanisms for overseas IP risks in recent years, helping private enterprises save over 400 million yuan (about 55 million U.S. dollars) in dispute resolution costs. It has also provided training on international IP applications to better equip private enterprises for global competition.

Noting that the private economy serves as a crucial driving force in advancing China's modernization, Shen Changyu, CNIPA Comissioner, said that greater IP protection efforts will be devoted to private enterprises.

Source: Xinhua