

# RF Acoustic Wave Filters

## Patent Landscape Analysis

February 2024

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		Murata/Resonant, Skyworks, Qualcomm, Taiyo Yuden, Samsung Electro-Mechanics, ROFS Microsystem, Akoustis, Qorvo, Kyocera, Wisol, and Chinese IP newcomers: MEMSonics, EpicMEMS, StarShine, Sanan IC, Sappland Microelectronics	
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# THE AUTHORS



## Dr. Paul Leclaire

Paul works at Knowmade as a Patent Analyst in the field of RF technologies, wireless communications and MEMS sensors. He holds a PhD in Micro and Nanotechnology from the University of Lille (France), in partnership with the IEMN of Villeneuve-d'Ascq and the CRHEA-CNRS of Sophia-Antipolis (France). Paul previously worked in innovation strategy consulting firm as Consultant.

Contact: [paul.leclaire@knowmade.fr](mailto:paul.leclaire@knowmade.fr)



## Dr. Nicolas Baron

Nicolas is CEO and co-founder of Knowmade. He manages the development and strategic orientations of the company and personally leads the Semiconductor department. He holds a PhD in Physics from the University of Nice Sophia-Antipolis, and a Master of Intellectual Property Strategies and Innovation from the European Institute for Enterprise and Intellectual Property (IEEPI Strasbourg), France.

Contact: [nicolas.baron@knowmade.fr](mailto:nicolas.baron@knowmade.fr)



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# SCOPE OF THE REPORT

- This report provides a detailed picture of the patent landscape for **RF acoustic wave filters** (SAW, TC-SAW, BAW, FBAR, SMR, LBAW, XBAR, etc.), from **materials** and **devices** to **RF circuit/architecture (multiplexers)** and **RF front-end modules** using them. This report is an update of the previous report published in 2019.
- This report covers **patents published worldwide** up to **July 2023**. We have selected and analyzed more than **26,900+ patents and patent applications** grouped in more than **11,300+ patent families** relevant to the scope of this report.
- The patent search strategy has been implemented by using advanced search equations in the patent database and by a cautious patent selection, that has been performed by the analyst, in order to get the most out of the corpus.


  
 Your needs are out of scope of the report?
   
 You want a deeper analysis on technologies or companies?
   
 Contact us for a custom report
   


Example	Selected patents		
	Relevant	Related	Excluded
Patents related to SAW, BAW, FBAR, SMR, XBAR, LBAW for mobile applications	X		
Patents related to multiplexers, diplexers, duplexers using acoustic wave filters	X		
Patents related to materials and substrate for acoustic wave filter applications	X		
Patents related to RF front-end module claiming the use of acoustic wave filters		X	
Patents related to acoustic wave filters for other applications (defense, automotive, medical, etc.)			X
Patents related to non acoustic RF filter (LC, microstrip, etc.)			X
Patents related to SAW, BAW, etc. for sensor applications			X

# METHODOLOGY

## Methodology for patent search, selection and analysis

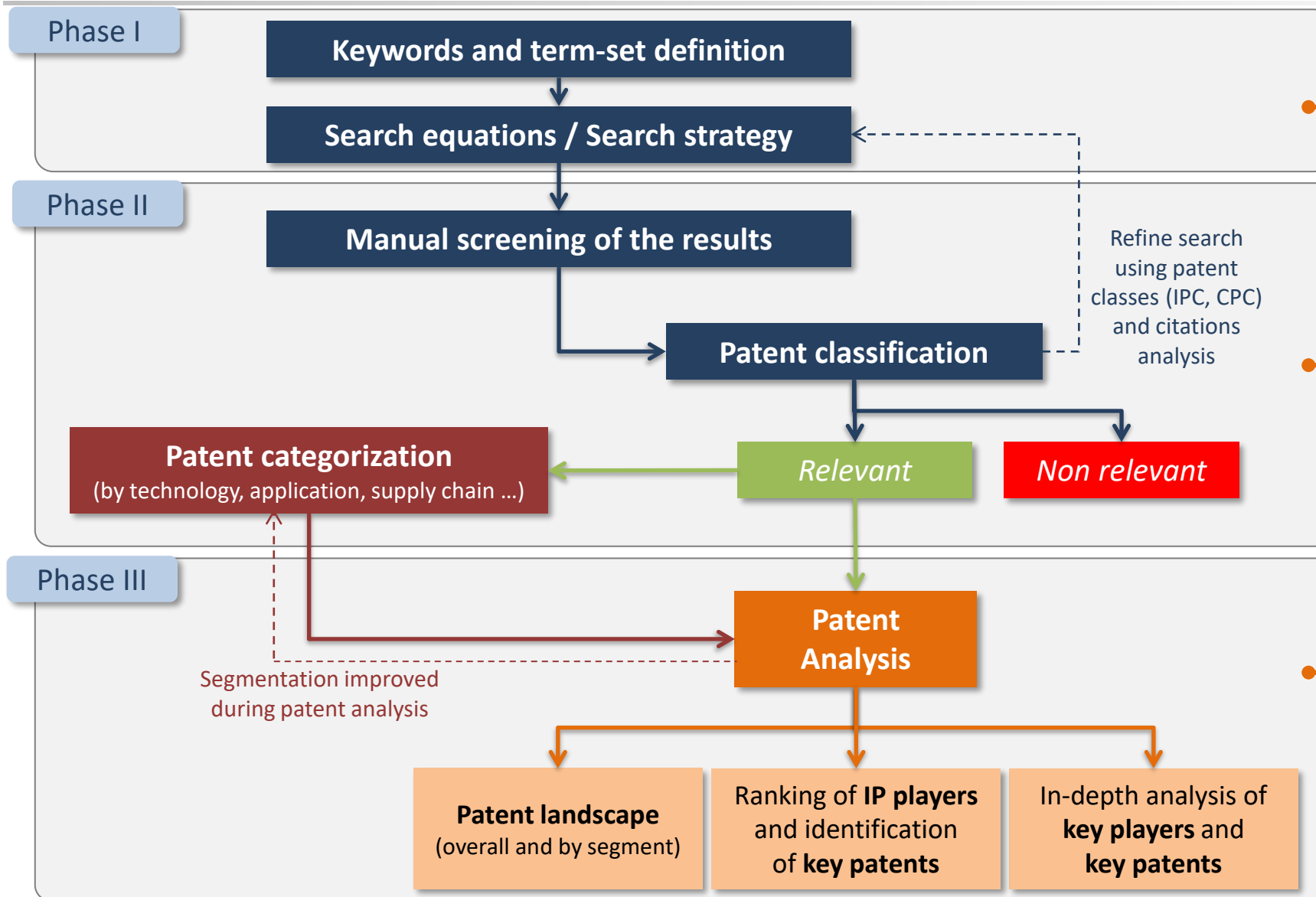
- The data are extracted from the **FamPat worldwide patent database** (Questel-ORBIT) which provides 100+ million patent documents from 100 patent offices (USA, Japan, Europe, China, Korea, Taiwan, Hong Kong, Singapore, etc.)
- The search for patents was completed in **July 2023**, hence patents published after this date are not available in this report.
- Both the **selection of relevant patents and their categorization into technologies and/or applications** are **manually** performed using **keywords and patent classes** (IPC, CPC), combined with **manual analysis** of each patent title, abstract, descriptions, illustrations and claims in conjunction with **expert review** of the subject-matter of the inventions.
- Some patents held by different entities are grouped considering the M&A history.
- The patents are grouped in **patent families**. A patent family is a set of patent applications filed in multiple countries to protect a single invention by a common inventor(s). A first patent application is filed in one country – the priority country – and is then extended to other countries.
- **Data analysis** is performed using the **Questel Orbit IP Business Intelligence analytics platform** combined with **Excel-based data processing** and will be supplemented by **expert analysis**.

We have selected and analyzed more than  
**11,300 patent families (inventions)**  
relevant to the scope of this report

# METHODOLOGY

## Methodology for patent search, selection and analysis

SAMPLE



**Worldwide patent database (Questel-ORBIT)**  
Provides 100+ million patent documents from 100 offices (USA, Japan, Europe, China, Korea, Taiwan, Hong Kong, Singapore, etc.)

**IP analysts** with PhD degree combining **technical** and **patent expertise**. **Manual screening** of patent pools with patent classification between relevant & non relevant patent families based on their technical content & scope of the claims. **Categorization** of relevant patent families by technology, application or supply chain.

**Analytics tools** and **proprietary methodologies** dedicated to **IP business intelligence** including quantitative and qualitative analysis.

# WHY STUDY THE PATENT LANDSCAPE

## Understanding the **competitive landscape** and **technology developments** from a **patent perspective**

- **Key IP players** (key patents, IP strategy, technology roadmap)
- **Newcomers** (technologies and markets of interest)
- **Technology trends & Emerging technologies**
- **Benchmark patent portfolios** (competitors' strength & weakness)
- **Key patents** (blocking, valuable)
- **Key technical solutions**
- **Risks** (patent infringement, new entrants, etc.)
- **Opportunities** (partnership, technology acquisition, licensing, etc.)



Perfectly complement market research

Give another point of view of the competitors, technologies and markets

Links between patents and

- Key market players
- Supply chain
- Technology Readiness Levels (TRL)
- Market product
- Emerging technologies/applications
- Forecast

# INTRODUCTION

## Context and objectives of the report

SAMPLE

### Acoustic wave filters: definitions and applications in mobile communications

### Where did we stand in 2019? (main results from our previous IP report)

This block contains a collage of introductory slides from the report. The slides cover the following topics:

- Applications of acoustic wave filters in mobile communications:** RF front end module and several filters.
- Acoustic waves filters:** Acoustic waves are of small sizes at low cost. Applications include mobile communications.
- TC-SAW and BAW:** The RF filter market is divided into three main technological approaches: Surface Acoustic Wave (SAW), Bulk Acoustic Wave (BAW), and Thin-Film Bulk Acoustic Resonator (TFBAR).
- Definition: Bulk acoustic wave filters (BAW):** BAW filters are fabricated on a piezoelectric layer.
- Definition: Surface acoustic wave filters (SAW):** SAW filters are the most simple and most widely used for mobile communications. They consist of a piezoelectric substrate with a thin layer of piezoelectric material on top.

This block contains a collage of slides from the 2019 IP Landscape Overview report. The slides provide the following insights:

- SAW filters:** In 2019, more than 750 patent assignees were involved in the patent landscape related to SAW filters for handsets. Qualcomm is the dominant player.
- SAW filters:** IP leadership of patent assignees for SAW filters. Qualcomm leads with a high number of granted patents and pending applications.
- BAW filters:** In 2019, more than 330 patent assignees were involved in the patent landscape related to BAW filters for handsets. Qualcomm and Samsung are the top players.
- BAW filters:** IP leadership of patent assignees for BAW filters. Qualcomm and Samsung are the dominant players.
- WHERE DID WE STAND IN 2019?:** A summary slide comparing the IP landscapes of SAW and BAW filters, highlighting the competitive dynamics between Qualcomm, Samsung, and other players.



# Excel file with all patents analyzed in the report

Useful patent database allows multi-criteria searches

SAMPLE

With the present report is provided an extensive **Excel database with the 11,300+ patent families** (inventions) analyzed in this study. This useful patent database allows for multicriteria searches and includes patent publication numbers, **hyperlinks to an updated online database** (original documents, legal status, etc.), priority date, title, abstract, patent assignees, patent assignees, patent's current legal status, and segments (SAW, BAW, LBAW/XBAR, multiplexers & RF FEM using them).

Questel unique family ID (FAM)	Publication numbers	Title	Abstract	Biblio summary	Current assignee	Earliest application date	Earliest publication date	Grant dates	Expected expiry dates	Legal status (Pending, Granted, Expired)	SAW	BAW	LBAW / XBAR	Modules
107545093	CN117083798 WO2022210687	(WO2022210687) Elastic wave device	(WO2022210687) An elastic wave	Open	MURATA MANUFACTURING	2022-03-29	2022-10-06		(WO2022210687A1) 2024-09-30	(WO2022210687A1) PENDING				
107545068	CN117083800 WO2022210378	(WO2022210378) Elastic wave device	(WO2022210378) An elastic wave	Open	MURATA MANUFACTURING	2022-03-25	2022-10-06		(WO2022210378A1) 2024-09-30	(WO2022210378A1) PENDING				
107545054	KR10-2023-0148205 CN117121377	(WO2022209860) Elastic wave device	(WO2022209860) Provided is an elastic	Open	MURATA MANUFACTURING	2022-03-15	2022-10-06		(CN117083900A1) 2024-09-30	(CN117083900A1) PENDING				
107430334	WO2022210689 US20230130157	(WO2022210689) Elastic wave device	(WO2022210689) An elastic wave	Open	MURATA MANUFACTURING	2022-03-29	2022-10-06		(WO2022210689A1) 2024-09-30	(WO2022210689A1) PENDING				
107424585	WO2022183696 CN116001702	(WO2022183696) An alternative	(WO2022183696) Improved surface	Open	SENSANNA	2021-03-10	2021-09-16		(CN116001702A1) 2024-10-30	(CN116001702A1) PENDING				
107385238	EP2176954 KR10-2015-0145941	(EP2176954) System and method	(EP2176954) for high-frequency	Open		2009-02-19	2009-02-19	(US200723003) 2011-12-06	(US200723003A1) 2028-08-11	(US200723003A1) GRANTED				
107092622	US6873226 US2022121374	(US6873226) Edge-reflection	(US6873226) An edge-reflection	Open	MANUFACTURING	2002-09-19	2002-09-19	(US200723003) 2005-03-29	(US200723003A1) 2023-01-08	(US200723003A1) EXPIRED				
106670559	US11545956 US20221032330	(US11545956) Bulk acoustic	(US11545956) resonator	Open		2021-10-28	2022-10-27	(US11545956) 2023-01-03	(US20221032330A1) 2040-07-27	(US20221032330A1) GRANTED				
106319065	US20230402991 CN116888881	(US20230402991) Resonator	(US20230402991) A resonator is	Open		2021-10-28	2022-10-27	(US20230402991) 2023-12-14	(US20230402991A1) 2041-10-28	(US20230402991A1) PENDING				
105549187	ATE73272	(ATE73272) Surface-acoustic	(ATE73272) wave device	Open		1992-03-15	1992-03-15	(ATE73272) 1992-03-15	(ATE73272A1) 2023-03-15	(ATE73272A1) LAPSED	X			
105474568	CN116318043 CN116318043	(CN116318043) Elastic wave	(CN116318043) device	Open		2023-12-22	2023-12-22	(CN116318043B) 2023-12-22	(CN116318043BB) 2043-02-28	(CN116318043BB) GRANTED	X			X
105398019	KR10-2023-0090209	(KR20230090209) Bulk acoustic	(KR20230090209) A volume acoustic	Open	ELECTRO METALLICS	2022-04-20	2023-06-21	(KR20230090209A) 2042-04-20	(KR20230090209A1) PENDING	(KR20230090209A1) PENDING		X		X
105389628	WO2023113003	(WO2023113003) Elastic wave device	(WO2023113003) and composite filter	Open		2023-06-22	2023-06-22	(WO2023113003A1) 2025-06-15	(WO2023113003A1) PENDING	(WO2023113003A1) PENDING	X			X
105389295	WO2023112652	(WO2023112652) Elastic wave device	(WO2023112652) Provided is an elastic	Open	MURATA MANUFACTURING	2022-11-28	2023-06-22	(WO2023112652A1) 2025-06-15	(WO2023112652A1) PENDING	(WO2023112652A1) PENDING	X			
105387709	WO2023110081	(WO2023110081) Surface acoustic	(WO2023110081) A surface acoustic	Open	HUAWEI	2021-12-15	2023-06-22	(WO2023110081A1) 2025-06-15	(WO2023110081A1) PENDING	(WO2023110081A1) PENDING	X			
105387443	CN116322270 WO2023108877	(CN116322270) Micron-scale acoustic	(CN116322270) A micron-scale	Open	INSTITUTE OF ADVANCED SCIENCE & TECHNOLOGY OF WUHAN MINSHENG NEW TECHNOLOGY	2021-12-18	2023-06-22	(WO2023108877A1) 2025-06-18	(WO2023108877A1) PENDING	(WO2023108877A1) PENDING	X			
105387372	WO2023108590	(WO2023108590) High-frequency high-	(WO2023108590) The present	Open		2021-12-17	2023-06-22	(WO2023108590A1) 2025-06-17	(WO2023108590A1) PENDING	(WO2023108590A1) PENDING			X	
105351813	CN219204472	(CN219204472) Transverse excitation	(CN219204472) The utility model	Open		2022-12-21	2023-06-16	(CN219204472L) 2023-06-16	(CN219204472JU) 2032-12-21	(CN219204472JU) GRANTED			X	
105332596	US20230198504	(US20230198504) Resonator-assisted lc	(US20230198504) A filter circuit	Open	QORVO	2022-12-16	2023-06-22	(US20230198504A1) 2042-12-16	(US20230198504A1) PENDING	(US20230198504A1) PENDING		X		
105323888	WO2023121866	(WO2023121866) Filter	(WO2023121866) A filter circuit	Open	SKYWORKS	2023-03-03	2023-06-22	(WO2023121866A1) 2023-11-03	(WO2023121866A1) PENDING	(WO2023121866A1) PENDING	X			

## Patent information

Dates and numbers of priority/application/publication/grant  
Title, abstract, claims

Patent applicants, current assignees, inventors

Current legal status of patents (granted, pending, expired, etc.)

Hyperlinks to an updated online database

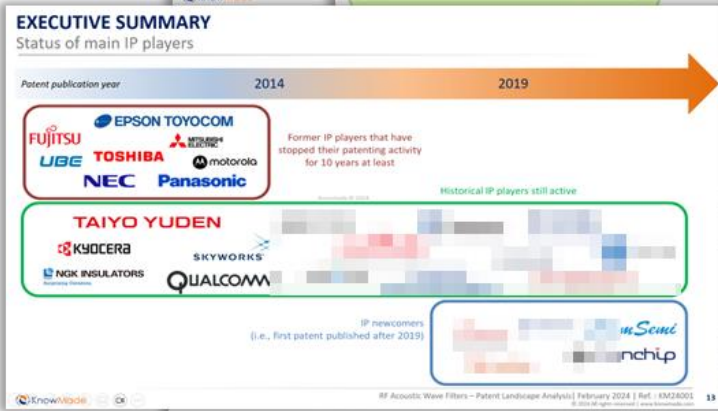
## Segments

SAW, BAW, LBAW/XBAR, multiplexers & RF FEM using them

# Executive summary

Take away messages, IP leaders, IP activities, IP competition

SAMPLE



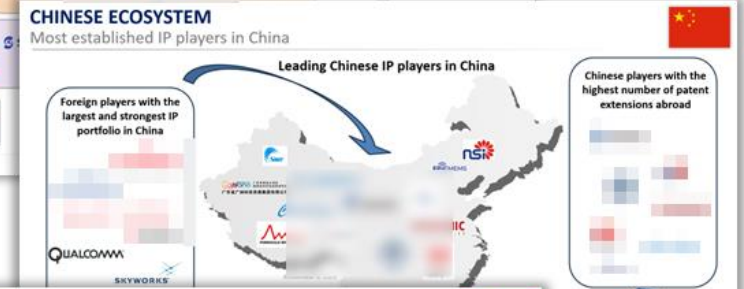
SAW IP leaders have already modules.

**RF BAW filter IP landscape**

Contrary to SAW, the BAW filter recent patenting activity has not create a patent portfolio (the volume of patents) with of. The acquisition of Resonant band but without risking patents main competitors like Sam market size is important. Murata XBAR patents.

BAW filters IP players are pro BAW.

## China ecosystem



**CHINESE ECOSYSTEM Summary**

**National ecosystem**

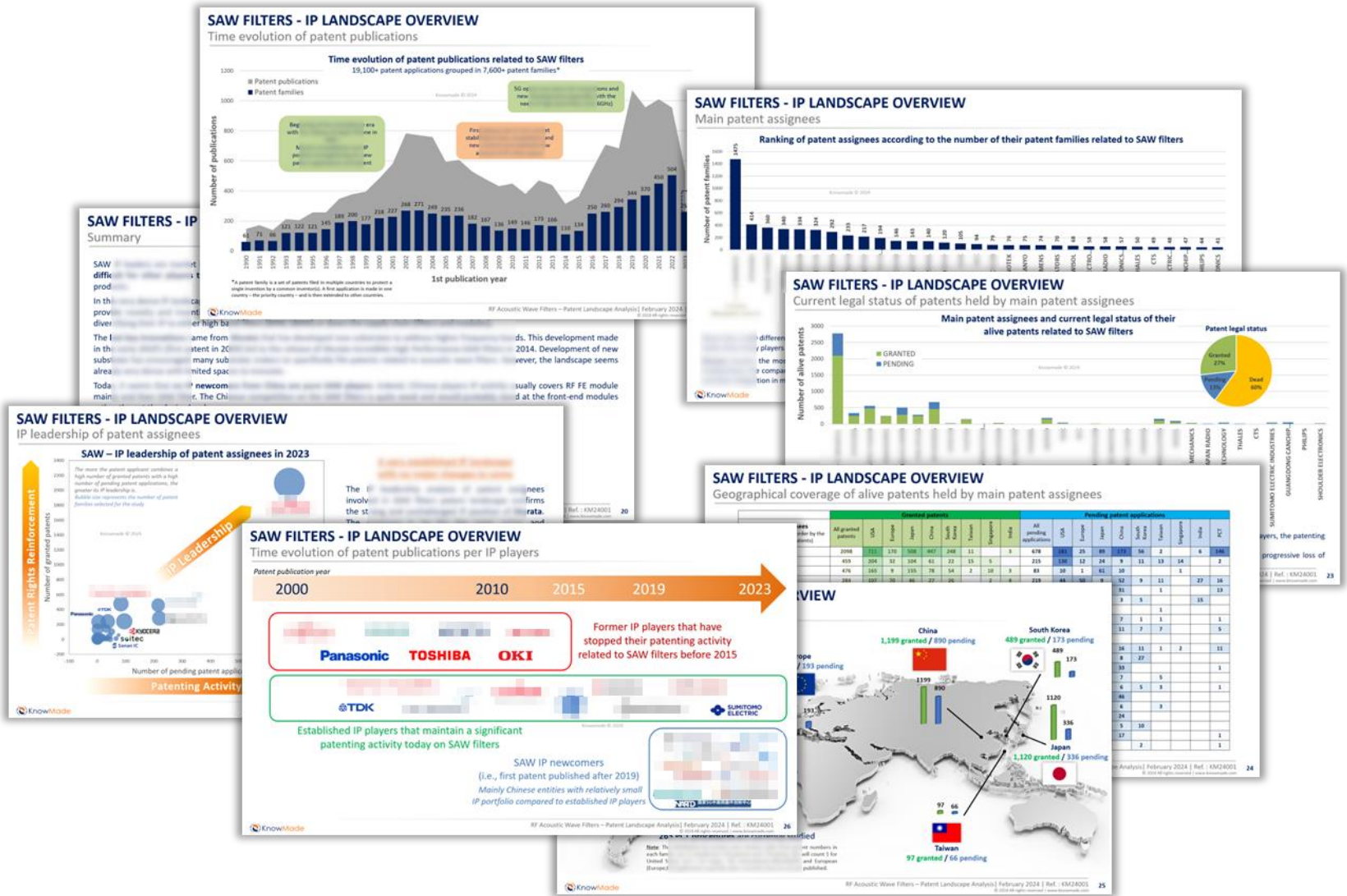
Chinese ecosystem a strong base of C RDFS Microsystem. A strong national ecosystem that covers multiple Chinese players. Another point this announcement. Fr launch their products. Today, this threat overcome the US issues related to R support their competitors.

**Chinese players**

An important aspect narrower. We witness a balance IP leadership in China. The question of CI scope and are not rather than the risk develop and secure other markets such

# SAW filters - Patent landscape overview

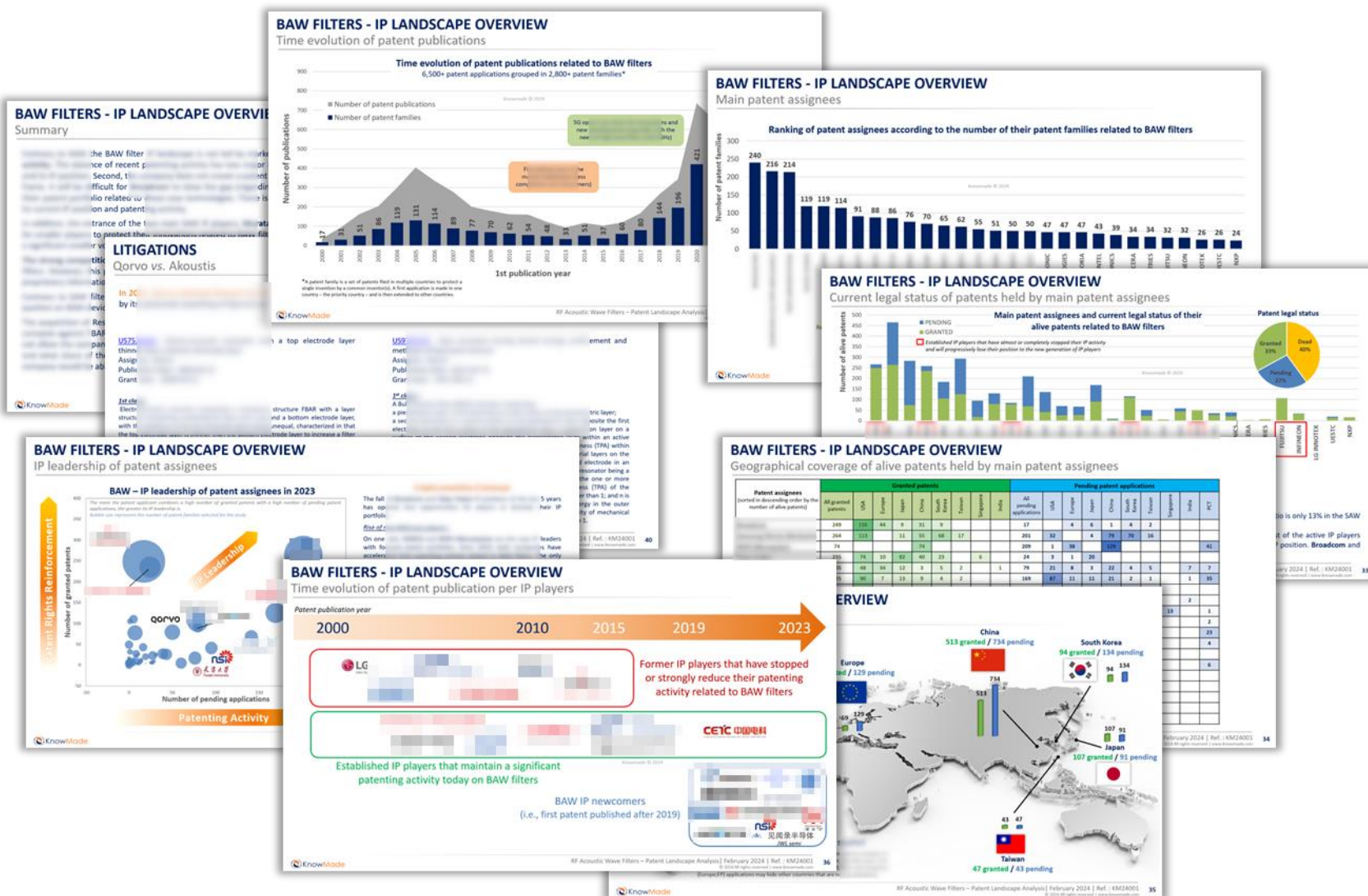
## General trends, key patent assignees and newcomers



# BAW filters - Patent landscape overview

## General trends, key patent assignees and newcomers

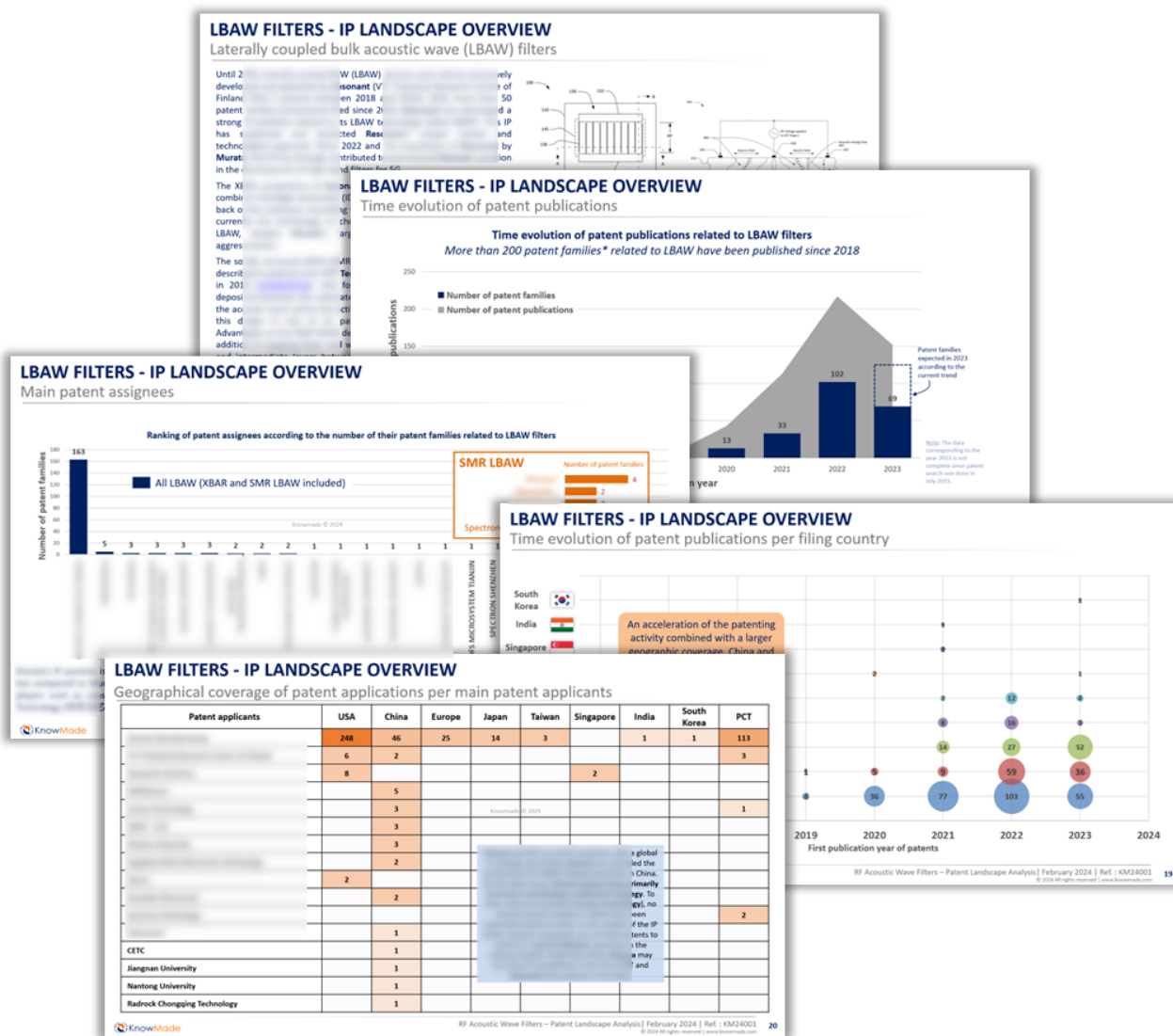
SAMPLE



# LBAW/XBAR filters - Patent landscape overview

General trends, key patent assignees and newcomers

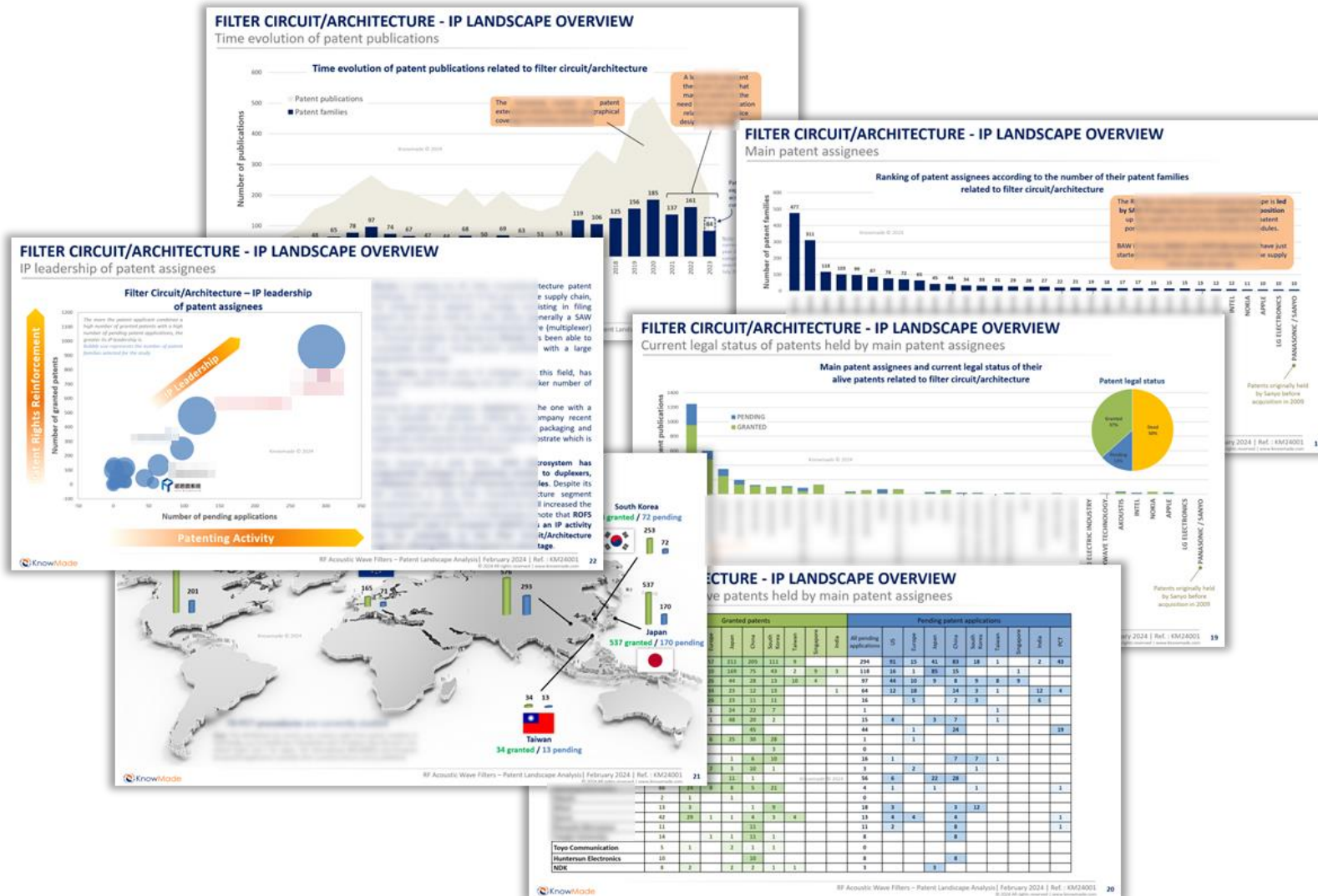
SAMPLE



# Multiplexers & RF FEM using acoustic filters - Patent landscape overview

General trends, key patent assignees and newcomers

SAMPLE



# Recent key innovations

Technical solutions claimed in patents, examples of innovations for SAW and BAW

SAMPLE

## Composite substrate

## AlScN

**MAIN TECHNICAL CHALLENGES AND SOLUTIONS CLAIMED IN PATENTS**  
Material is the new center of interest

**Incremental Innovation**      **BAW : Need to increasing the kt<sup>2</sup>**

**RECENT INNOVATION**  
Incremental innovation : examples

**SAW FILTERS**

**RECENT INNOVATION**  
Incremental innovation : examples

**BAW FILTERS**

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**Composite substrate**  
Main IP players per country of origin

**Composite substrate**  
The key to unlock higher performances

**Composite piezoelectric substrate : the new standard**

**Composite substrate**  
Main bonding processes claimed in today's patents

Smart cut	Direct bonding	Organic Adhesive
High	Medium	Low

**Composite substrate**  
Smart Cut: the leading solution

**Composite substrate**  
Main support substrates other than silicon

Support Substrate	Number of patent families
Si	121
AlN	87
SiC	100

**Time evolution of patent publications for each type of support substrate**

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**BAW recent innovation on active material**  
AlScN : the solution to reach the sub 6GHz bands

**BAW recent innovation on active material**  
Time evolution of patenting activity related to AlScN

**BAW recent innovation on active material**  
Sc Doping or AlScN alloy: Main IP players

**Sc Doping (\$30+ inventions)**

**AlScN growth (\$90+ inventions)**

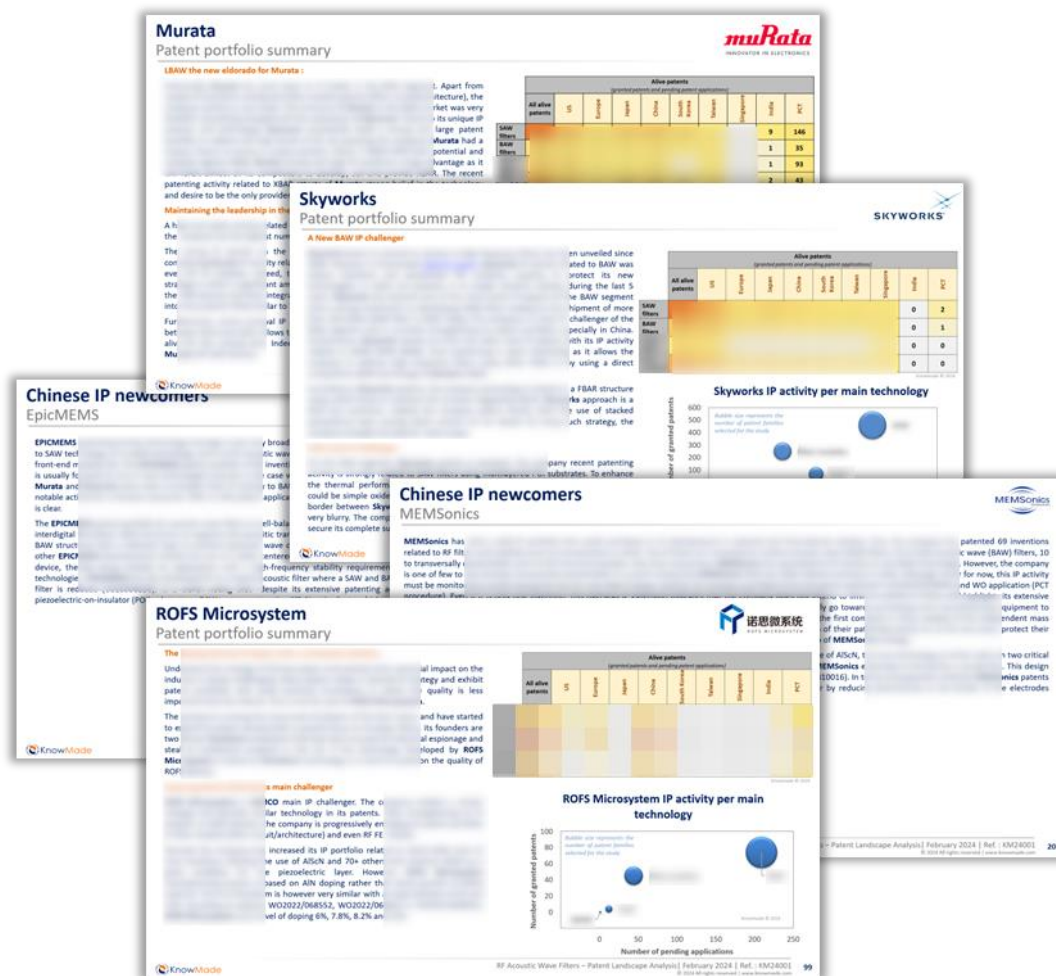
RF Acoustic Wave Filters – Patent Landscape Analysis | February 2024 | Ref. : KM24001

# IP profile of key players

## IP portfolio summary, IP strategy, key patents and recent IP activity

SAMPLE

A focus on the **key IP players** and **Chinese IP newcomers** is provided in a dedicated section. For each player, the patent portfolio related to **RF acoustic wave filters** is analyzed to provide an overview of its **level of IP activity, technological coverage, geographical coverage, strengths, potential for reinforcement, and recent patenting activity.**





# ORDER FORM

## RF Acoustic Wave Filters

Patent Landscape Analysis – February 2024

Ref.:KM24001



### SHIP TO

Name (Mr/Ms/Dr/Pr):

Job Title:

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State:

Postcode/Zip:

Country:

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BIC/SWIFT: CCBPFRPPMAR

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*\*The report can be shared with the employees of the company purchasing the report. Subsidiaries and joint-ventures are excluded. Please be aware that the report is watermarked on each page, with the name of the recipient and the organization (the name mentioned in the PO). This watermark also reaffirms that report sharing is not allowed.*

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“Buyer”: Any business user (i.e. any person acting in the course of its business activities, for its business needs) entering into the following general conditions to the exclusion of consumers acting in their personal interests.

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2. Corporate license: the report can be used by unlimited users within the company. Subsidiaries and joint ventures are not included.

“Products”: Reports are established in PowerPoint and delivered on a PDF format and the database may include Excel files.

“Seller”: Based in Sophia Antipolis (France headquarters), Knowmade is a technology intelligence company specialized in the research and analysis of scientific and technical information. We provide patent landscapes and scientific state of the art with high added value to businesses and research laboratories. Our intelligence digests play a key role to define your innovation and development strategy.

## 1. SCOPE

1.1 The Contracting Parties undertake to observe the following general conditions when agreed by the Buyer and the Seller. Any additional, different, or conflicting terms and conditions in any other documents issued by the buyer at any time are hereby objected to by the seller, shall be wholly inapplicable to any sale made hereunder and shall not be binding in any way on the seller.

1.2 This agreement becomes valid and enforceable between the Contracting Parties after clear and non-equivocal consent by any duly authorized person representing the Buyer. For these purposes, the Buyer accepts these conditions of sales when signing the purchase order which mentions “I hereby accept Knowmade’s Terms and Conditions of Sale”. This results in acceptance by the Buyer.

1.3 Orders are deemed to be accepted only upon written acceptance and confirmation by the Seller, within [7 days] from the date of order, to be sent either by email or to the Buyer’s address. In the absence of any confirmation in writing, orders shall be deemed to have been accepted.

## 2. MAILING OF THE PRODUCTS

2.1 Products are sent by email to the Buyer:

- within [1] month from the order for Products already released; or

- within a reasonable time for Products ordered prior to their effective release. In this case, the Seller shall use its best endeavours to inform the Buyer of an indicative release date and the evolution of the work in progress.

2.2 Some weeks prior to the release date the Seller can propose a pre-release discount to the Buyer.

The Seller shall by no means be responsible for any delay in respect of article 2.2 above, and including in cases where a new event or access to new contradictory information would require for the analyst extra time to compute or compare the data in order to enable the Seller to deliver a high quality Products.

2.3 The mailing of the Product will occur only upon payment by the Buyer, in accordance with the conditions contained in article 3.

2.4 The mailing is operated through electronic means either by email via the sales department. If the Product’s electronic delivery format is defective, the Seller undertakes to replace it at no charge to the Buyer provided that it is informed of the defective formatting within 90 days from the date of the original download or receipt of the Product.

2.5 The person receiving the Products on behalf of the Buyer shall immediately verify the quality of the Products and their conformity to the order. Any claim for apparent defects or for non-conformity shall be sent in writing to the Seller within 8 days of receipt of the Products. For this purpose, the Buyer agrees to

produce sufficient evidence of such defects.

2.6 No return of Products shall be accepted without prior information to the Seller, even in case of delayed delivery. Any Product returned to the Seller without providing prior information to the Seller as required under article 2.5 shall remain at the Buyer’s risk.

## 3. PRICE, INVOICING AND PAYMENT

3.1 Prices are given in the orders corresponding to each Product sold on a unit basis or corresponding to annual subscriptions. They are expressed to be inclusive of all taxes. The prices may be reevaluated from time to time. The effective price is deemed to be the one applicable at the time of the order.

3.2 Payments due by the Buyer shall be sent by cheque payable to Knowmade, PayPal or by electronic transfer to the following account:

Banque Populaire Méditerranée, CAP 3000 Quartier du lac, 06700 St Laurent du Var, France

BIC or SWIFT code: CCBPFRPPMAR

IBAN: : FR76 1460 7003 6360 6214 5695 139

To ensure the payments, the Seller reserves the right to request down payments from the Buyer. In this case, the need of down payments will be mentioned on the order.

3.3 Payment is due by the Buyer to the Seller within 30 days from invoice date, except in the case of a particular written agreement. If the Buyer fails to pay within this time and fails to contact the Seller, the latter shall be entitled to invoice interest in arrears based on the annual rate Refi of the «BCE» + 7 points, in accordance with article L. 441-6 of the French Commercial Code. Our publications (report, database, tool...) are delivered only after reception of the payment.

3.4 In the event of termination of the contract, or of misconduct, during the contract, the Seller will have the right to invoice at the stage in progress, and to take legal action for damages.

## 4. LIABILITIES

4.1 The Buyer or any other individual or legal person acting on its behalf, being a business user buying the Products for its business activities, shall be solely responsible for choosing the Products and for the use and interpretations he makes of the documents it purchases, of the results he obtains, and of the advice and acts it deduces thereof.

4.2 The Seller shall only be liable for (i) direct and (ii) foreseeable pecuniary loss, caused by the Products or arising from a material breach of this agreement

4.3 In no event shall the Seller be liable for:

a) damages of any kind, including without limitation, incidental or consequential damages (including, but not limited to, damages for loss of profits, business interruption and loss of programs or information) arising out of the use of or inability to use the Seller’s website or the Products, or any information provided on the website, or in the Products;

b) any claim attributable to errors, omissions or other inaccuracies in the Product or interpretations thereof.

4.4 All the information contained in the Products has been obtained from sources believed to be reliable. The Seller does not warrant the accuracy, completeness adequacy or reliability of such information, which cannot be guaranteed to be free from errors.

4.5 All the Products that the Seller sells may, upon prior notice to the Buyer from time to time be modified by or substituted with similar Products meeting the needs of the Buyer. This modification shall not lead to the liability of the Seller, provided that the Seller ensures the substituted Product is similar to the Product initially ordered.

4.6 In the case where, after inspection, it is acknowledged that the Products contain defects, the Seller undertakes to replace the defective products as far as the supplies allow and without indemnities or compensation of any kind for labor costs, delays, loss caused or any other reason. The replacement is guaranteed for a maximum of two months starting from the delivery date. Any replacement is excluded for any event as set out in article 5 below.

4.7 The deadlines that the Seller is asked to state for the mailing of the Products are given for information only and are not guaranteed. If such deadlines are not met, it shall not lead to any damages or cancellation of the orders, except for non-acceptable delays exceeding [4] months from the stated deadline, without information from the Seller. In such case only, the Buyer shall be entitled to ask for a reimbursement of its first down payment to the exclusion of any further damages.

4.8 The Seller does not make any warranties, express or implied, including, without limitation, those of saleability and fitness for a particular purpose, with respect to the Products. Although the Seller shall take

reasonable steps to screen Products for infection of viruses, worms, Trojan horses or other codes containing contaminating or destructive properties before making the Products available, the Seller cannot guarantee that any Product will be free from infection.

## 5. FORCE MAJEURE

The Seller shall not be liable for any delay in performance directly or indirectly caused by or resulting from acts of nature, fire, flood, accident, riot, war, government intervention, embargoes, strikes, labor difficulties, equipment failure, late deliveries by suppliers or other difficulties which are beyond the control, and not the fault of the Seller.

## 6. PROTECTION OF THE SELLER’S IPR

6.1 All the IPR attached to the Products are and remain the property of the Seller and are protected under French and international copyright law and conventions.

6.2 The Buyer agreed not to disclose, copy, reproduce, redistribute, resell or publish the Product, or any part of it to any other party other than employees of its company. The Buyer shall have the right to use the Products solely for its own internal information purposes. In particular, the Buyer shall therefore not use the Product for purposes such as:

- Information storage and retrieval systems;

- Recordings and re-transmittals over any network (including any local area network);

- use in any timesharing, service bureau, bulletin board or similar arrangement or public display;

- Posting any Product to any other online service (including bulletin boards or the Internet);

- Licensing, leasing, selling, offering for sale or assigning the Product.

6.3 The Buyer shall be solely responsible towards the Seller of all infringements of this obligation, whether this infringement comes from its employees or any person to whom the Buyer has sent the Products and shall personally take care of any related proceedings, and the Buyer shall bear related financial consequences in their entirety.

6.4 The Buyer shall define within its company point of contact for the needs of the contract. This person will be the recipient of each new report in PDF format. This person shall also be responsible for respect of the copyrights and will guaranty that the Products are not disseminated out of the company.

## 7. TERMINATION

7.1 If the Buyer cancels the order in whole or in part or postpones the date of mailing, the Buyer shall indemnify the Seller for the entire costs that have been incurred as at the date of notification by the Buyer of such delay or cancellation. This may also apply for any other direct or indirect consequential loss that may be borne by the Seller, following this decision.

7.2 In the event of breach by one Party under these conditions or the order, the non-breaching Party may send a notification to the other by recorded delivery letter upon which, after a period of thirty (30) days without solving the problem, the non-breaching Party shall be entitled to terminate all the pending orders, without being liable for any compensation.

## 8. MISCELLANEOUS

All the provisions of these Terms and Conditions are for the benefit of the Seller itself, but also for its licensors, employees and agents. Each of them is entitled to assert and enforce those provisions against the Buyer.

Any notices under these Terms and Conditions shall be given in writing. They shall be effective upon receipt by the other Party.

The Seller may, from time to time, update these Terms and Conditions and the Buyer, is deemed to have accepted the latest version of these terms and conditions, provided they have been communicated to him in due time.

## 9. GOVERNING LAW AND JURISDICTION

9.1 Any dispute arising out or linked to these Terms and Conditions or to any contract (orders) entered into in application of these Terms and Conditions shall be settled by the French Commercial Courts of Grasse, which shall have exclusive jurisdiction upon such issues.

9.2 French law shall govern the relation between the Buyer and the Seller, in accordance with these Terms and Conditions.

# KNOWMADE

## Patent and Technology Intelligence

# KNOWMADE PURPOSE

Turning **patent information** and **scientific literature** into actionable insights, providing high added value reports for **decision-makers** working in **R&D, Intellectual Property, Innovation Strategy, and Marketing**

Competitive landscape | Technology trends | Opportunities / Risks | R&D and IP strategy



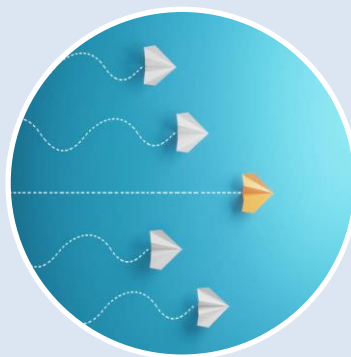
# WHAT INFORMATION CAN YOU GET ?



## MARKET

*For executives,  
business developers*

- Identify competitors
- Compare IP with market position
- Evaluate the level of investment
- Future products & target markets



## TECHNOLOGY

*For R&D teams,  
engineers, scientists*

- R&D activities
- Technological roadmap
- Position on the supply chain



## INTELLECTUAL PROPERTY

*For IP teams,  
patent attorneys*

- Risks and opportunities (FTO, litigations, licensing)
- Key patents
- Link between patents and products

# KNOWMADE OFFER

## CUSTOM SERVICES

(Tailor-made analysis)

*To meet your needs and budget/lead time constraints*

- Specific and dedicated report.
- Prior-art search, freedom-to-operate, patent landscape, patent valuation, technology scouting, monitoring service, etc.

- Format
- PDF file with analyses.
  - Excel file with data.
  - Access to the analyst.

## REPORTS

(multi-client product)

*To understand the competitive landscape and explore the emerging ecosystems and new technologies*

- Stand alone report
- Patent landscape.
- Overview on IP dynamics, trends and players.
- Competitor, technology and strategy analysis.
- Benchmark of patent portfolios.
- Key IP players & key patents.

- Format
- PDF file with analyses.
  - Excel file with patent data.

## MONITORS

(multi-client product)

*To track the latest R&D developments and IP activities, and to be sensitive to weak signals*

- Annual subscription
- Patent monitoring service.
- Quarterly updated patent data and technology trends.
- Current R&D and IP activities.
- Early detect weak signals, opportunities and risks.
- Open discussion with analyst.

- Format
- PDF file with analyses.
  - Excel file with patent data.
  - Direct access to the analyst.

## INSIGHTS

(free article & webinar)

*To get unique information about industry and technology*

- Analyst point of view about industry news (product release, M&A, start-up, fund-raising, etc.) from a patent perspective.

- Format
- Knowmade website

# MAIN FIELDS OF EXPERTISE

## SEMICONDUCTORS

- Materials & Substrates
- Power electronics
- RF & Wireless datacom
- MEMS, Sensing & Imaging
- Photonics, Lighting & Display
- Memory
- Packaging

## ENERGY

- Batteries
- Fuel-cells
- Solar PV
- Power management

## HEALTHCARE

- Therapeutic tools
- Diagnostics and Theragnostics
- Medical devices and imaging
- Drug discovery and delivery

## AGRI-FOOD

- Food processing & formulation
- Vegan food
- Next-gen packaging
- Agriculture 4.0









KnowMade SARL  
2405 route des Dolines  
06902 Sophia Antipolis, France

[www.knowmade.com](http://www.knowmade.com)  
[contact@knowmade.fr](mailto:contact@knowmade.fr)