

ULTRASOUND SENSING TECHNOLOGIES FOR MEDICAL, INDUSTRIAL AND CONSUMER APPLICATIONS

Market & Technology report - July 2018

New applications along with manufacturing capabilities and technological readiness are driving the takeoff of micro-machined ultrasonic transducers.

KEY FEATURES

- Ultrasound market segmentation: medical, consumer, industrial, and automotive
- Ultrasound modules market data and forecasts 2017 – 2023, per application (in \$M, Munits, and ASP)
- Ultrasound modules market data and forecasts 2017-2023, per technologies (in \$M and Munits)
- Penetration of CMUT and PMUT, per application - comparisons 2017 - 2023 (in Munits)
- Drivers and market dynamics for each application
- Application and technology roadmap
- Technology trends for ultrasonic transducers: bulk, CMUT, and PMUT
- Industrial landscape: key players, per application
- Supply chain analysis

MICRO-MACHINED ULTRASONIC TRANSDUCERS ARE COMING TO MARKET: WHY NOW?

For decades, micro-machined ultrasonic transducers, either in the form of PMUT (Piezoelectric micro-machined ultrasonic transducers) or CMUT (capacitive micro-machined ultrasonic transducers), have been knocking at the door of mass-markets. At last, mass-market is about to happen: Why now?

There are four concurrent factors explaining this timing. First, applications are pushing for these technologies. Medical ultrasonic imaging will democratize into general practitioners and even homes, thanks to cheaper and smaller probes. In consumer applications, ultrasonic fingerprint-sensing allows for under-the-display operation, resulting in all-screen smartphones just 10 years after the iPhone removed the keyboard.

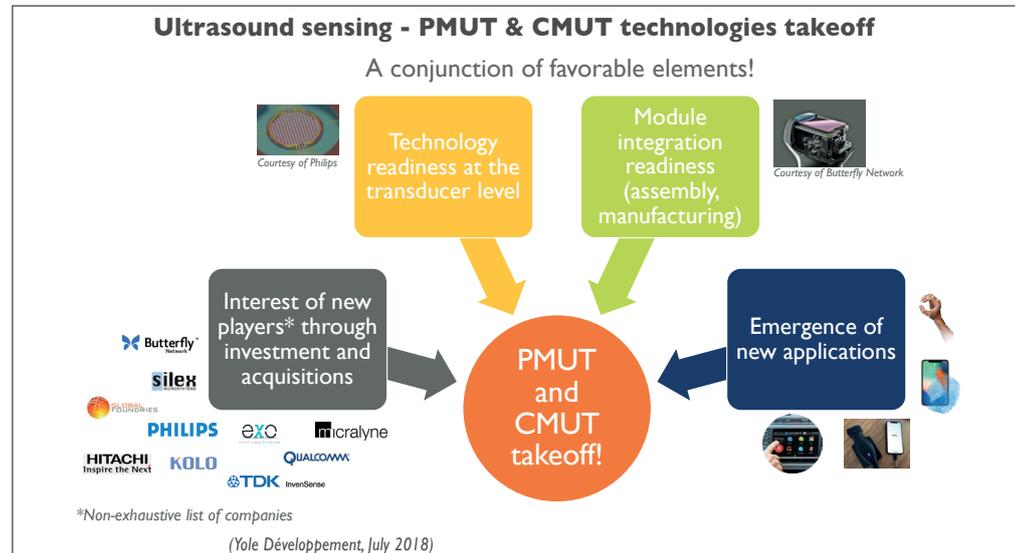
Secondly, the technology is ready. PMUT, which requires a thin, controlled piezoelectric film, has benefited from this technology's increased usage for

inkjet printhead. Meanwhile, CMUT also requires a delicate manufacturing process with large and thin membranes, in which mechanical stress usually remains.

Thirdly, several industry players have consistently invested in these technologies, thus readying the supply chain: Hitachi and Philips for CMUT, Dimatix and STMicroelectronics for PMUT, and GlobalFoundries and Silex for both.

Last but not least, assembly is an important part of manufacturing, especially if mass-market is targeted. Companies like Tong Hsing Electronic, Philips, and SilTerra have readied the supply chain.

This alignment of favorable factors, similar to an arrangement of fortuitous stars, has set the stage for ultrasonic sensing's arrival in several applications and markets.



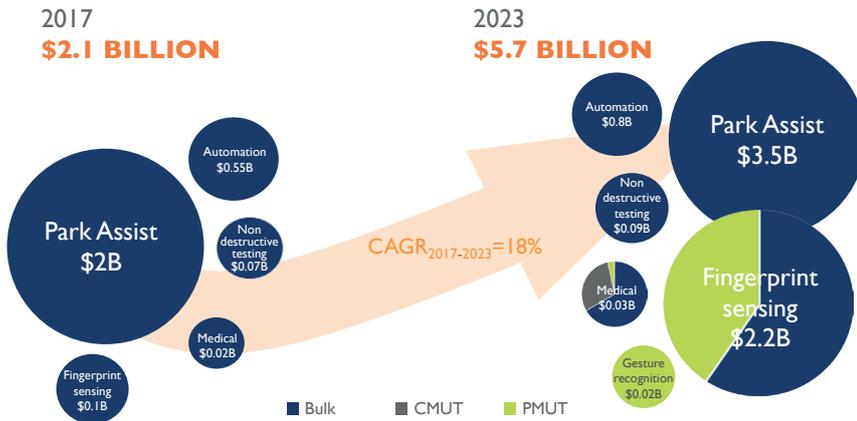
ULTRASONIC SENSING MODULES: A \$2B MARKET IN 2017, POISED TO REACH AROUND \$6B IN 2023

Thanks to new applications, the ultrasound modules market will boom in the next five years, at a CAGR₂₀₁₇₋₂₀₂₃ of 18%! In 2017 the biggest market was park assist, followed by automation. But the impressive growth of the ultrasound modules market is coming from new applications in the fingerprint and medical markets. Fingerprint sensing will achieve the biggest growth, and with the integration of PMUT is poised to see the largest changes in

terms of technology. From a small market in 2017, fingerprint sensing will reach \$2B in five years thanks to its integration into smartphones.

The medical ultrasound market will also see many changes with the arrival of new products like the \$2,000 Butterfly IQ ultrasound probe. This handheld, low-cost device will reshape medical ultrasound usage, with new customers such as

Ultrasound modules market forecast by segment & by technology



(Yole Développement, July 2018)

primary care, emergency physicians, and nurses being able to use imaging as an everyday tool. Ultrasound might be the new stethoscope!

From a technology perspective, we see that the ultrasound modules market is today almost exclusively comprised of bulk piezoelectric transducers. This is the conventional method for ultrasound sensing and will remain the gold standard for applications like park assist and automation. CMUT, which was developed 30 years ago, is traditionally used in medical applications and, has only recently found its killer application: handheld ultrasound. Regarding PMUT, it will mainly be used in high-volume applications thanks to its high level of integration. Miniaturization, low cost, and integration are major drivers for ultrasonic transducers, which explains the popularity of new technologies coming from the semiconductor industry.

In this report, Yole Développement's analysts explain how the ultrasonic transducer ecosystem may evolve, and how Micro-machined ultrasound transducer (MUT) technologies will rapidly penetrate the ultrasound market.

MAJOR MUT CHALLENGES SOLVED - AN INDUSTRY READY FOR PRODUCTION

MUT technologies have created a high level of excitement after a long, quiet period that lasted for 10 years after Hitachi introduced the first ultrasound technology probe. Not everyone was quiet, though: R&D teams still worked intensively to develop new ultrasonic transducers and overcome the challenges linked to MUT.

More than performance, MEMS devices require a huge investment in development and production tools. MEMS foundries are now ready to offer services for ultrasound devices. At the front-end level, the thin-film piezoelectric layer deposition process made huge progress and found the right uniformity and homogeneity. Work done on scandium-doped AIN by Dalsa (Teledyne Dalsa) and niobium-doped PZT (Fujifilm) has dramatically increased PMUT device performance.

CMUT's main challenges were two-fold: the short lifetime of CMUT structures because of high electrical fields, and settling on the membrane material. Notably,

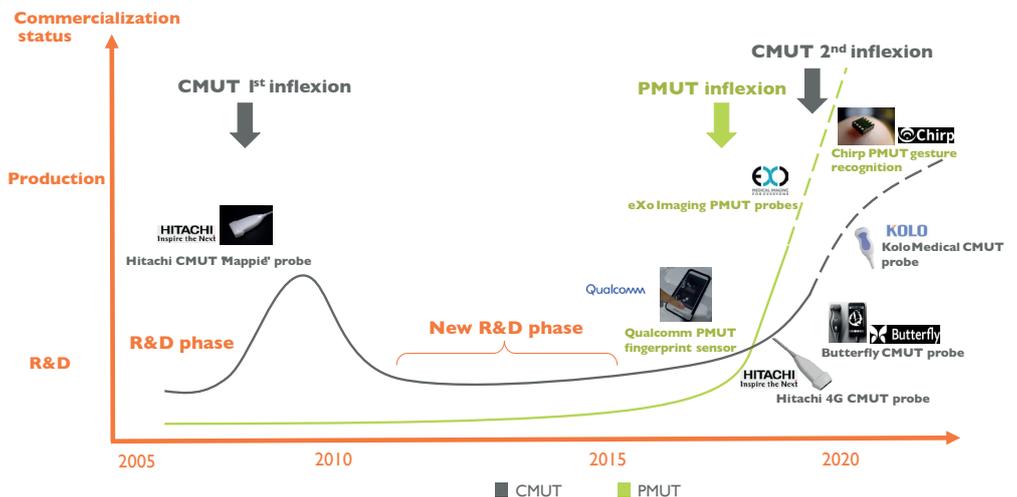
Philips Innovation Services and Micralyne spent more than 15 years developing such capabilities.

MUT devices also impose strong assembly challenges. Due to its structure and the presence of electrodes on both sides, CMUT assembly is more complex than PMUT. For these reasons, PMUT is a better candidate for a high level of integration and miniaturization.

So, why now? And what happens 10 years? CMUT and PMUT usage are highly segmented by applications with a smooth difference in operational frequencies and operational medium: air or fluids. PMUT has a broader frequency range and can work in air and fluids better than CMUT. What does the future hold for both? Will their parallel development in their specific fields result in a winning technology that enables higher volumes and a wider applications range?

This report describes ultrasonic technologies' current challenges, and offers a roadmap for the next decade.

Ultrasound sensing: product introduction & technology roadmap



(Yole Développement, July 2018)

OBJECTIVES OF THE REPORT

1. Provide forecast metrics for each ultrasound sensing modules:

- Ultrasound market revenue and volume shipment forecasts at the system level for various industries (consumer, medical, industrial and automotive)
- Ultrasound modules' average selling price forecast, revenue forecast and volume shipments forecast
- Technology penetration rates: CMUT and PMUT technologies vs. bulk piezo

2. Deliver an in-depth understanding of the ecosystem and players

- Who are the players from the various areas: foundry, transducer, packaging, system level integrator, etc.
- Who are the key suppliers and which technologies do they provide

3. Share key technical insights and analysis on future technology trends and challenges

- The industry's state-of-the-art technologies
- Dynamics of key technologies
- Emerging technologies and roadmaps

COMPANIES CITED IN THE REPORT (non exhaustive list)

Apple, Avinger, Baidu, BD, BenQ, Blatek, Bosch, Boston Scientific, Butterfly Network, Canon, Caresono, Carestream, Carewell, CEA, Ceramtec, CGM, Chirp Microsystems, Chison, CK Electronic, Clarius Mobile Health, Continental, Cortex Technology, Denso, DTU, Dyson, Egis, Ellipticlabs, Endress Hauser, Esaote, Exact Imaging, Exo Imaging, Fingerprints, FlexEnable, Fraunhofer, Fujifilm Dymatix, Fujitsu, Fukuda Denshi, GE Healthcare, GlobalFoundries, GlobalMed, Goodix, Healcerion, Hitachi, Holitech, Hologic, HTC, Huawei, Idex, Imasonic, Infineon, Infraredx, iRobot, Isorg, Kaixin, Kejian, Keyence, Kolo Medical, Konica Minolta, Kyocera, Lam Research, LG, Lyft, Meggitt, Micralyne, MicroArray, Microsoft, Mindray, Mistras, Mitsubishi Electric, MobiSante, Murata, Neato, Next Biometrics, NIT, Novosound, Oculus, Oldelft Ultrasound, Olympus, Omron, Oxi Technology, Pentax Hoya, Pepperl Fuchs, Philips, Prometheus, Qualcomm, Rohm, Samsung, Schneider Electric, Senix, Sick, Siemens, Silead, Silex, Silicon Sensing, Silterra, Sintef, SIUI, Smartisan, Sonatest, Sonavation, Sonic Concepts, SonoScape, Sonosite, SonoStar, Sonotron NDT, SPTS, STMicroelectronics, Supersonic, Synaptics, TDK Epcos, TDK Invensense, Tong Hsing Electronic Industries, Toposens, TPM, Tronics, Tung Thih Electronic, Uber, Ultrahaptics, Ulvac, Valeo, Validity, Vega, Verasonics, Vermon, Volkswagen, VTT, Waymo, Xiaomi, Zetec, and many more!

TABLE OF CONTENTS (complete content on i-Micronews.com)

Executive summary	11	> Automotive applications (park assist, gesture recognition)
Introduction	41	> Consumer applications (fingerprint sensor, spatial cognition)
> Ultrasound technologies, applications, and history		> Medical ultrasound (diagnostics, ultrasound)
> Yole Développement's segmentation of the ultrasound market		Technology trends for ultrasonic transducers
> Introduction to ultrasound transducer technologies: bulk piezoelectric, CMUT and PMUT		125
> Report scope		> Bulk piezoelectric vs. MUT
Global ultrasound market analysis	56	> CMUT technology trends
> Hypothesis for our market data and forecasts		> PMUT technology trends
> Market data and forecasts 2017 - 2023		> Key differences between CMUT and PMUT
- Ultrasound modules market, per application (in \$M, Munits, and ASP)		> Ultrasonic sensors - teardowns
- Ultrasound modules market per technology (in \$M and Munits)		Industrial landscape
- Penetration of bulk piezoelectric, CMUT and PMUT per application - comparisons 2017 - 2023 (in Munits)		176
> Drivers for each application		> Ecosystem
> Market dynamics		- Key players per application, at the system and device level
> Applications roadmap		- Company profiles
> Technology roadmap		- Mergers and acquisitions
Applications	73	> Supply chain analysis
> Industrial applications (non-destructive testing, automation)		- Supply chain, by application
		- Foundry players and capabilities
		- Equipment manufacturers (thin-film deposition, etching)
		General conclusions
		195

RELATED REPORTS

Benefit from our Bundle & Annual Subscription offers and access our analyses at the best available price and with great advantages



- Fingerprint Sensor Applications and Technologies – Consumer Market Focus
- Qualcomm Snapdragon Sense ID 3D Qualcomm's New Ultrasonic Fingerprint Sensor
- Bosch Mobility Ultrasonic Sensor

Find all our reports on www.i-micronews.com

AUTHORS

Dr. Alexis Debray, part of the Photonics, Sensing & Display division and Dr. Marjorie Villien and Jérôme Mouly, part of the Life Sciences & Healthcare division at Yole Développement (Yole) co-authored the Ultrasound Sensing Technologies for Medical, Industrial & Consumer report:



Dr. Alexis Debray is

a Technology & Market Analyst, Optoelectronics at Yole. After spending 2 years at the University of Tokyo to develop an expertise focused on MEMS technologies, Alexis served as a research engineer at Canon Inc. Alexis is the author of various scientific publications and patents. He graduated from ENSICAEN and holds a PhD in applied acoustics (Caen, France).



Jérôme Mouly serves

as a Technology & Market Analyst specialized in microtechnologies for inkjet & bioMEMS sensors, within the Life Sciences & Healthcare division at Yole Développement (Yole). Since 2000, Jérôme has participated in more than 100 marketing and technological analyses for industrial groups, start-ups and institutes related to semiconductor & medical technologies industry. Jérôme holds a Master of Physics from the University of Lyon (France).



Dr. Marjorie Villien

Technology & Market Analyst, Medical Imaging & Biophotonics, is daily exchanging with clinicians, researchers and industrial partners to understand technology issues and ensure the connection between R&D and applications. After spending two years at Harvard, Marjorie served as a research scientist at INSERM in the field of medical imaging for the treatment of Alzheimer's disease, stroke and cancers. She has spoken in numerous international conferences and has authored or co-authored 11 papers and 1 patent. Marjorie graduated from Grenoble INP and holds a PhD in physics & medical imaging (Grenoble, France).

Find more details about this report here:





ORDER FORM

Ultrasound Sensing Technologies for Medical, Industrial and Consumer Applications

BILL TO

Name (Mr/Ms/Dr/Pr):

Job Title:

Company:

Address:

City:

State:

Postcode/Zip:

Country*:

*VAT ID Number for EU members:

Tel:

Email:

Date:

PAYMENT

BY CREDIT CARD

Visa Mastercard Amex

Name of the Card Holder:

Credit Card Number:

□□□□ □□□□ □□□□ □□□□

Card Verification

Value (3 digits except AMEX: 4 digits):

□□□□

Expiration date:

□□ / □□

BY BANK TRANSFER

BANK INFO: HSBC, 1 place de la Bourse,
F-69002 Lyon, France,
Bank code: 30056, Branch code: 00170
Account No: 0170 200 1565 87,
SWIFT or BIC code: CCFRFRPP,
IBAN: FR76 3005 6001 7001 7020 0156 587

RETURN ORDER BY

- FAX: +33 (0)472 83 01 83
- MAIL: YOLE DÉVELOPPEMENT, Le Quartz,
75 Cours Emile Zola, 69100 Villeurbanne/Lyon - France

SALES CONTACTS

- Western US & Canada - Steve Laferriere:
+ 1 310 600-8267 – laferriere@yole.fr
- Eastern US & Canada - Troy Blanchette:
+1 704 859 0453 – troy.blanchette@yole.fr
- Europe & RoW - Lizzie Levenez:
+ 49 15 123 544 182 – levenez@yole.fr
- Japan & Rest of Asia - Takashi Onozawa:
+81 34405-9204 – onozawa@yole.fr
- Greater China - Mavis Wang:
+886 979 336 809 – wang@yole.fr
- Specific inquiries: +33 472 830 180 – info@yole.fr

⁽¹⁾ Our Terms and Conditions of Sale are available at
www.yole.fr/Terms_and_Conditions_of_Sale.aspx
The present document is valid 24 months after its publishing date:
July 26, 2018

PRODUCT ORDER - Ref YDI8031

Please enter my order for above named report:

- One user license*: Euro 5,990
 Multi user license: Euro 6,490

- The report will be ready for delivery from August 8, 2018
- For price in dollars, please use the day's exchange rate. All reports are delivered electronically at payment reception. For French customers, add 20% for VAT

I hereby accept Yole Développement's Terms and Conditions of Sale⁽¹⁾

Signature:

*One user license means only one person at the company can use the report.

SHIPPING CONTACT

First Name:

Email:

Last Name:

Phone:

ABOUT YOLE DEVELOPPEMENT

Founded in 1998, Yole Développement has grown to become a group of companies providing marketing, technology and strategy consulting, media and corporate finance services, reverse engineering and reverse costing services and well as IP and patent analysis. With a strong focus on emerging applications using silicon and/or micro manufacturing, the Yole group of companies has expanded to include more than 80 collaborators worldwide covering MEMS and image sensors, Compound Semiconductors, RF Electronics, Solid-state lighting, Displays, Software, Optoelectronics, Microfluidics & Medical, Advanced Packaging, Manufacturing, Nanomaterials, Power Electronics and Batteries & Energy Management.

The "More than Moore" market research, technology and strategy consulting company Yole Développement, along with its partners System Plus Consulting, PISEO and KnowMade, support industrial companies, investors and R&D organizations worldwide to help them understand markets and follow technology trends to grow their business.

CONSULTING AND ANALYSIS

- Market data & research, marketing analysis
 - Technology analysis
 - Strategy consulting
 - Reverse engineering & costing
 - Patent analysis
 - Design and characterization of innovative optical systems
 - Financial services (due diligence, M&A with our partner)
- More information on www.yole.fr

MEDIA & EVENTS

- i-Micronews.com website & related @Micronews e-newsletter
 - Communication & webcast services
 - Events: TechDays, forums...
- More information on www.i-Micronews.com

REPORTS

- Market & technology reports
 - Patent investigation and patent infringement risk analysis
 - Teardowns & reverse costing analysis
 - Cost simulation tool
- More information on www.i-micronews.com/reports

CONTACTS

- For more information about :
- Consulting & Financial Services: Jean-Christophe Eloy (eloy@yole.fr)
 - Reports: David Jourdan (jourdan@yole.fr) Yole Group of Companies
 - Press Relations & Corporate Communication: Sandrine Leroy (leroy@yole.fr)

Definitions: "Acceptance": Action by which the Buyer accepts the terms and conditions of sale in their entirety. It is done by signing the purchase order which mentions "I hereby accept Yole's Terms and Conditions of Sale".

"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.

"Contracting Parties" or "Parties": The Seller on the one hand and the Buyer on the other hand.

"Intellectual Property Rights" ("IPR") means any rights held by the Seller in its Products, including any patents, trademarks, registered models, designs, copyrights, inventions, commercial secrets and know-how, technical information, company or trading names and any other intellectual property rights or similar in any part of the world, notwithstanding the fact that they have been registered or not and including any pending registration of one of the above mentioned rights.

"License": For the reports and databases, 3 different licenses are proposed. The buyer has to choose one license:

- One user license: one person at the company can use the report.
- Multi-user license: the report can be used by unlimited users within the company. Subsidiaries and Joint-Ventures are not included.
- Corporate license: purchased under "Annual Subscription" program, the report can be used by unlimited users within the company. Joint-Ventures are not included.

"Products": Depending on the purchase order, reports or database on MEMS, CSC, Optics/MOEMS, Nano, bio... to be bought either on a unit basis or as an annual subscription. (i.e. subscription for a period of 12 calendar months). The annual subscription to a package (i.e. a global discount based on the number of reports that the Buyer orders or accesses via the service, a global search service on line on I-micronews and a consulting approach), is defined in the order. Reports are established in PowerPoint and delivered on a PDF format and the database may include Excel files.

"Seller": Based in Lyon (France headquarters), Yole Développement is a market research and business development consultancy company, facilitating market access for advanced technology industrial projects. With more than 20 market analysts, Yole works worldwide with the key industrial companies, R&D institutes and investors to help them understand the markets and technology trends.

I. 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 Yole'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 incases 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 or automatically online via an email/password. 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 Yole may offer a pre release discount for the companies willing to acquire in the future the specific report and agreeing on the fact that the report may be release later than the anticipated release date. In exchange to this uncertainty, the company will get a discount that can vary from 15% to 10%.
- 3.3 Payments due by the Buyer shall be sent by cheque payable to Yole Développement, credit card or by electronic transfer to the following account:
HSBC, 1 place de la Bourse 69002 Lyon France
Bank code: 30056
Branch code: 00170
Account n°: 0170 200 1565 87
BIC or SWIFT code: CCFRFRPP
IBAN: FR76 3005 6001 7001 7020 0156 587

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.

- 3.4 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.
- 3.5 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 sale ability 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.
- 6.5 In the context of annual subscriptions, the person of contact shall decide who within the Buyer, shall be entitled to access on line the reports on I-micronews.com. In this respect, the Seller will give the Buyer a maximum of 10 password, unless the multiple sites organization of the Buyer requires more passwords. The Seller reserves the right to check from time to time the correct use of this password.
- 6.6 In the case of a multisite, multi license, only the employee of the buyer can access the report or the employee of the companies in which the buyer have 100% shares. As a matter of fact the investor of a company, the joint venture done with a third party etc...cannot access the report and should pay a full license price.

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 Lyon, 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.