IPLYTICS | Intellectual Property Analytics

How to Navigate Risk Webinar Part 2:

The Role of Standard Essential Patents for Smart Factory Applications

Tim Pohlmann, CEO IPlytics GmbH

Recording: https://youtu.be/Hbtt9_xUG0Q

IPlytics Navigate Risk Webinar Series 2021

I. Navigate Risk Part 1: "The Role of SEPs in the **Auto Industry**"
October 12th, 2021
Recording: https://www.iplytics.com/webinars/upcoming/

II. Navigate Risk Part 2: "The Role of SEPs for **Smart Factory** applications"
November 23rd, 2021
Recording: https://www.iplytics.com/webinars/upcoming/

III. Navigate Risk Part 3: "The Role of SEPs for **Smart Energy** applications"
December 14th, 2021
Registration: https://www.iplytics.com/webinars/upcoming/

Today's Speaker

- PhD and Post Doc. from CERNA, **MINES ParisTech** and **TU Berlin**.
- CEO and founder of IPlytics.
- 2021 IAM Strategist 300. Panel speaker and thought leader.
- Appointed faculty lecturer at:
  - **Technical University of Berlin -** Strategic Standardization
  - **CEIPI Université de Strasbourg -** SEPs and FRAND licensing
  - **EPFL Lausanne -** Big Data Driven Patent Intelligence
  - **PATON Ilmenau** – The Interplay of Patents and Standards
  - **European Patent Office** – SEP / FRAND and standards development

Today's Agenda

I. SEPs and Standards and IoT

II. 5G SEPs and Standards for Smart Factory Applications

III. Edge Computing SEPs and Standards for Smart Factory Applications

IV. Wi-Fi SEPs and Standards for Smart Factory Applications

V. VVC SEPs and Standards for Smart Factory Applications

VI. Standard Developing Initiatives in the Manufacturing Industry

VII. Patents and Standards Data to Navigate Risk

VIII. Takeaways

I. SEPs and Standards and the IoT

The Internet of Things and SEPs

- Connectivity is based on **technology standards such as 4G/5G, Wi-Fi or video compression (HEVC/VVC) and others** which allow e.g. machines, devices or whole factories to communicate in the **IoT.**

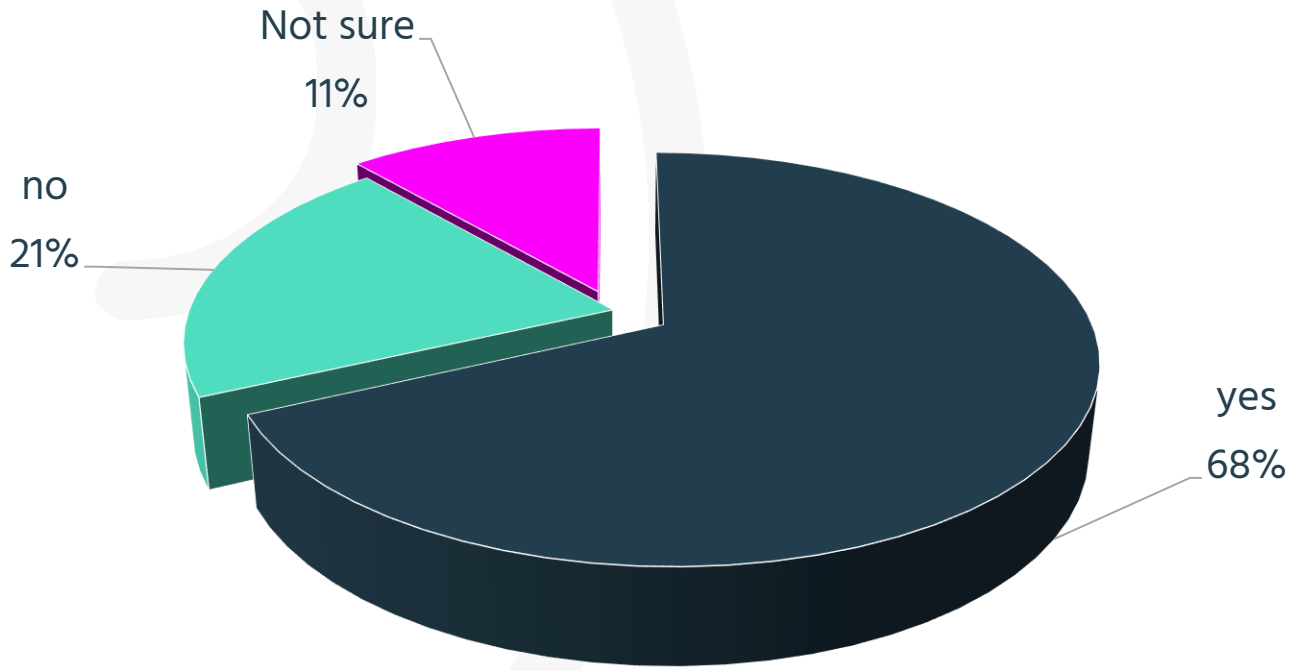
- **Connectivity standards** are subject to ten-thousands of **standard essential patents (SEPs)** and while the licensing of SEPs is well understood in the smartphone industry there is yet **little experience to license SEPs for the IoT**.

- It is expected that **most patent holders will actively monetize and enforce** their SEP portfolios covering connectivity standards in this fast-moving, high-investment environment.

- Yet there is no SEP license program for IoT use case which creates **legal uncertainty** in the market as **standards subject to SEPs have been widely implemented!**

TU Berlin Industry Survey

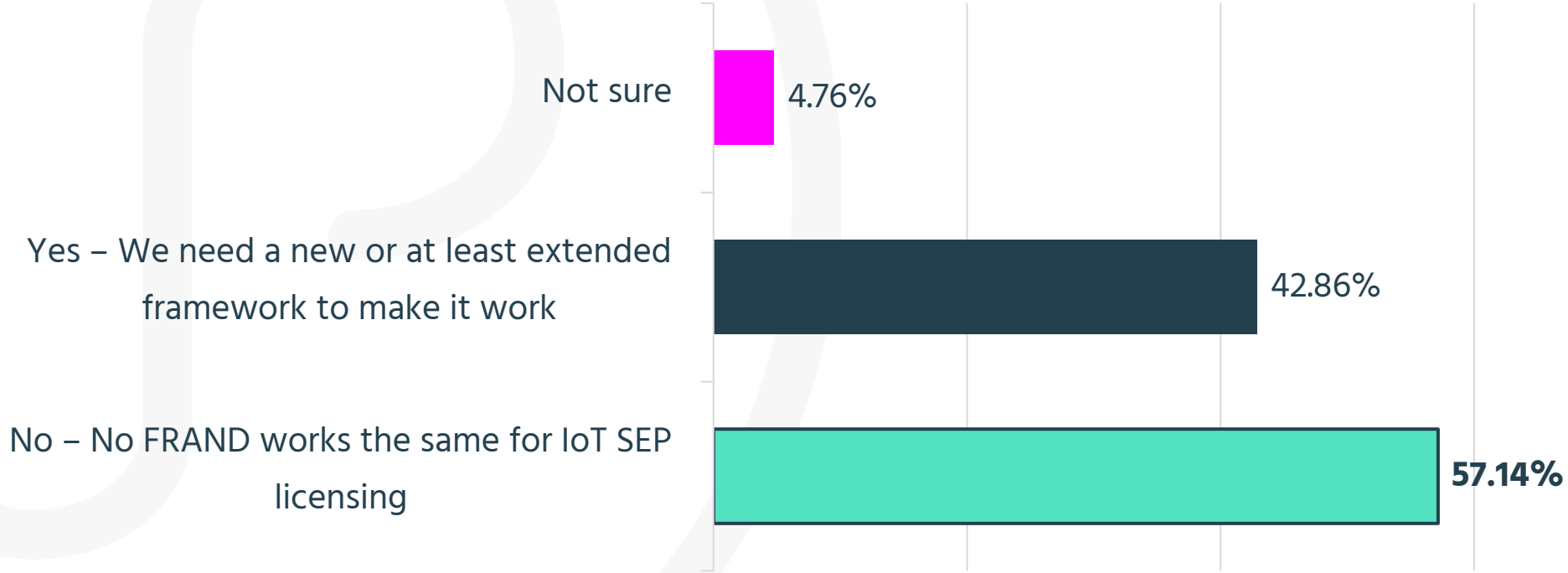
Q1: Do you think that SEP licensing will be more challenging for IoT applications compared to the smartphone market? (N=54)



Source: https://www.iplytics.com/report/video-recording-tu-berlin-virtual-conference-licensing-of-seps/

TU Berlin Industry Survey

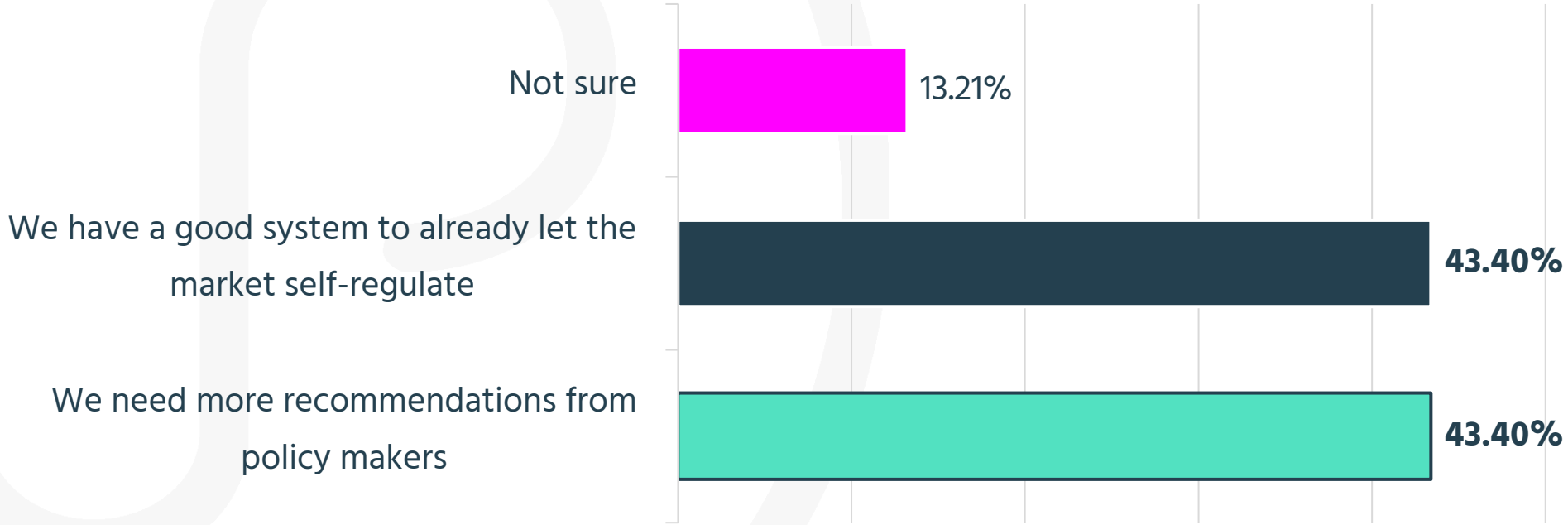
Q2: Do we have to rethink the FRAND framework for SEP licensing for IoT? (N=52)



Source: https://www.iplytics.com/report/video-recording-tu-berlin-virtual-conference-licensing-of-seps/

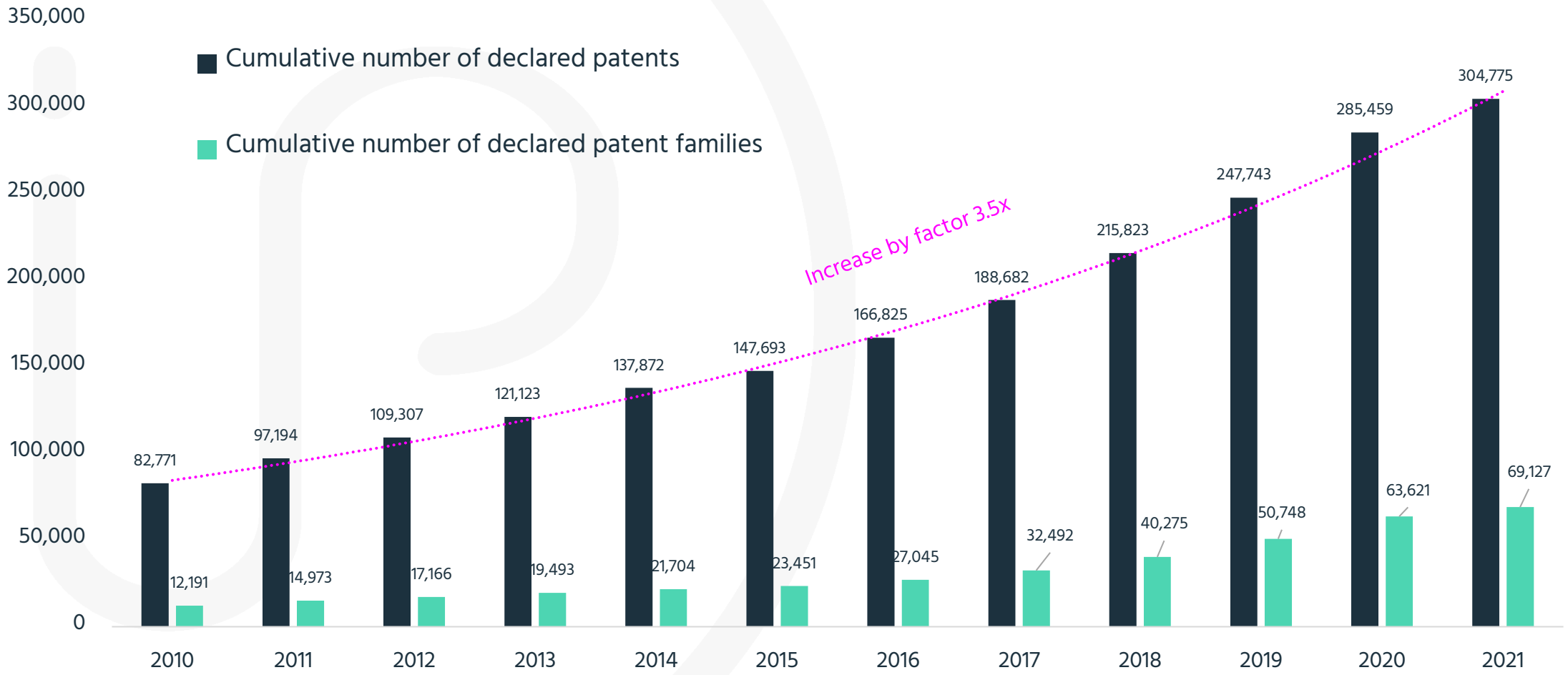
TU Berlin Industry Survey

Q3: Should policy makers provide solutions for FRAND or should the market self-regulate? (N=63)



Source: https://www.iplytics.com/report/video-recording-tu-berlin-virtual-conference-licensing-of-seps/

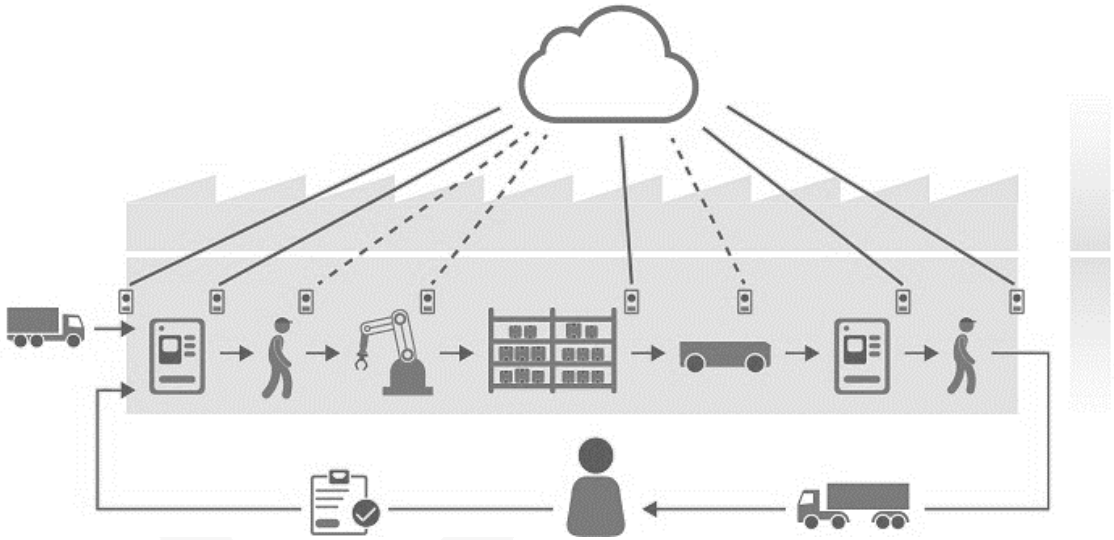
Number of declared patents over time (IPlytics 2021)



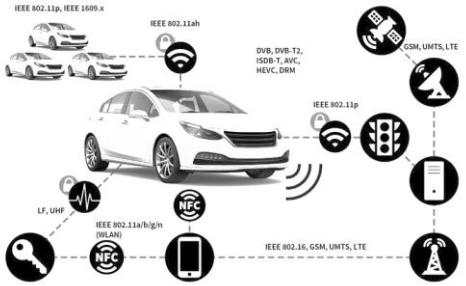
Source: https://www.iplytics.com/report/rise-standard-essential-patents/

Standards in the connected world

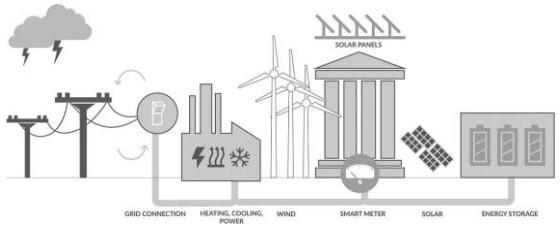
Smart Factory



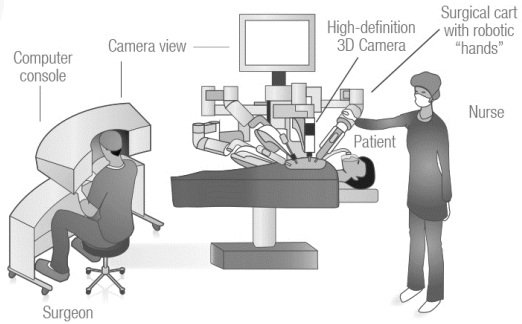
Smart Cars



Smart Energy



Smart Healthcare



Smart Home

Remote and off-site operational work

Disruptive technology trends in the manufacturing industry:

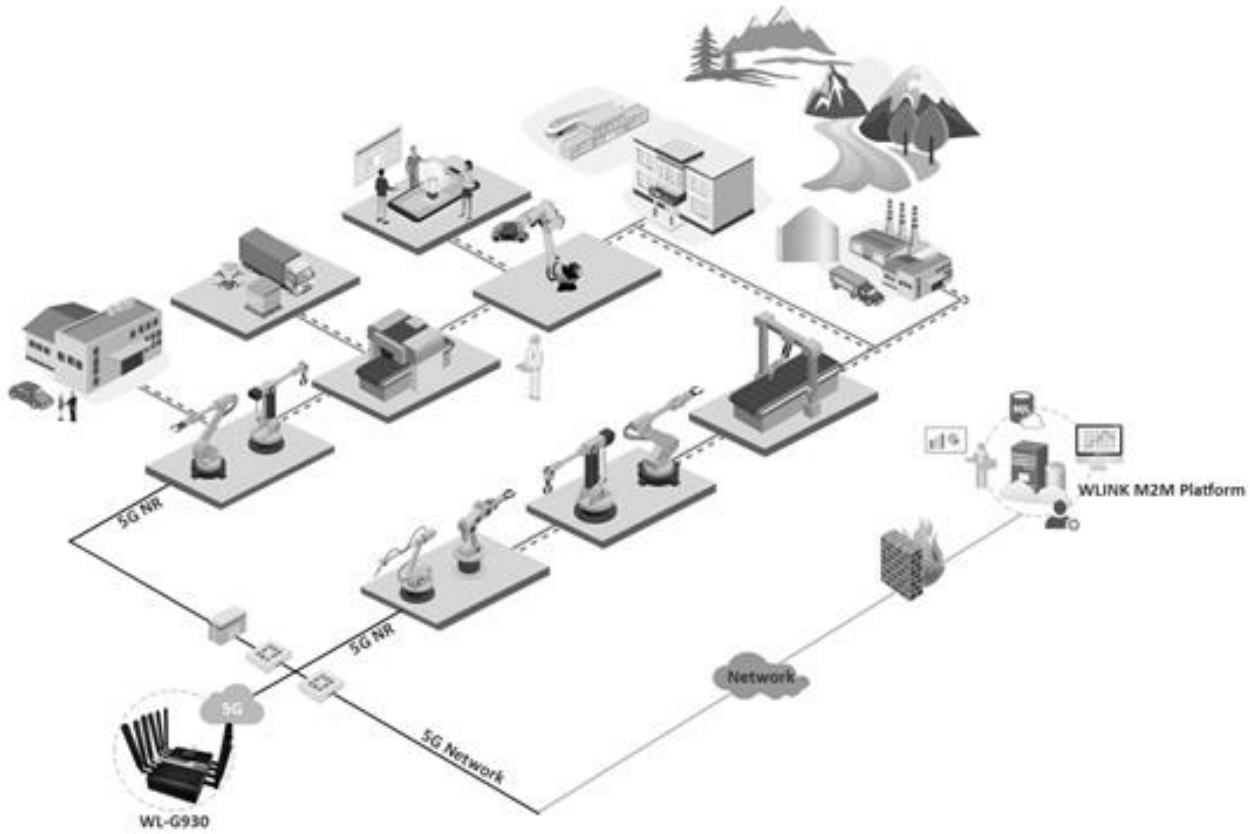
- **Virtual Maintenance**
  - Utilizing technologies such as **virtual reality** and **augmented reality**, or **artificial intelligence** to allow multi-person collaboration, remote assistance or fully automated processes.
- **Machine Monitoring**
  - Making use of **sensors**, **connected devices**, advanced **video** surveillance enable real-time machine health monitoring as well early waring and condition projections.
- **Advanced Predictions**
  - The implementation of technologies like **edged computing** allow real time analysis of machine performance data for predicting maintenance for a proactive monitoring ensuring more efficiency and reduced downtimes.

II. 5G SEPs and Standards for Smart Factory Applications

5G and Connectivity – **Smart Factory**

- Factory/Process automation: **5G's** density, speed, wide bandwidth and low latency will allow for considerable flexibility. **Tools** and **robots** can be re-purposed quickly, improving efficiency and creating an environment which allows for **mass customization** and **manufacturing on demand**.

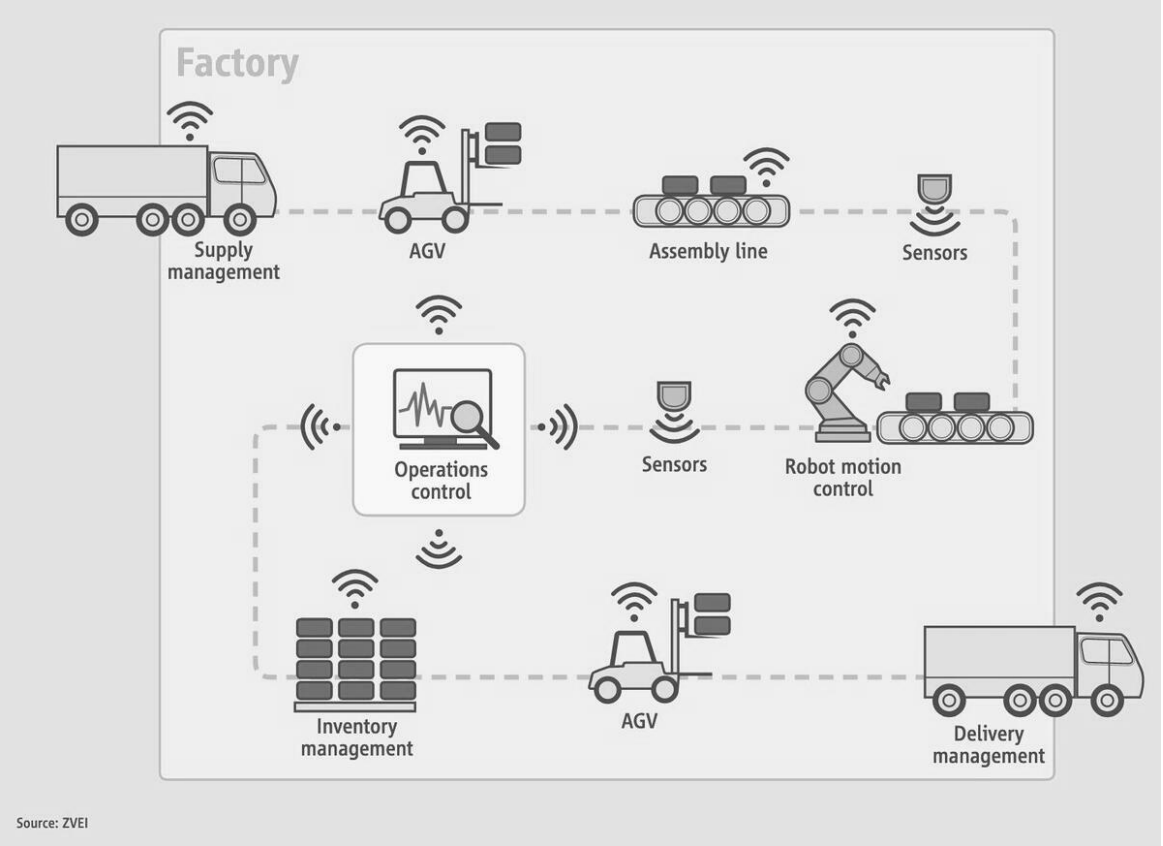
- Human-Machine Interface (HMI): The speed and density of **5G** is such that it will free staff from computer terminals, providing the means to equip them with mobile data and visualization solutions, such as **tablets** and **augmented reality gear**, enabling visual interaction with machines and products.



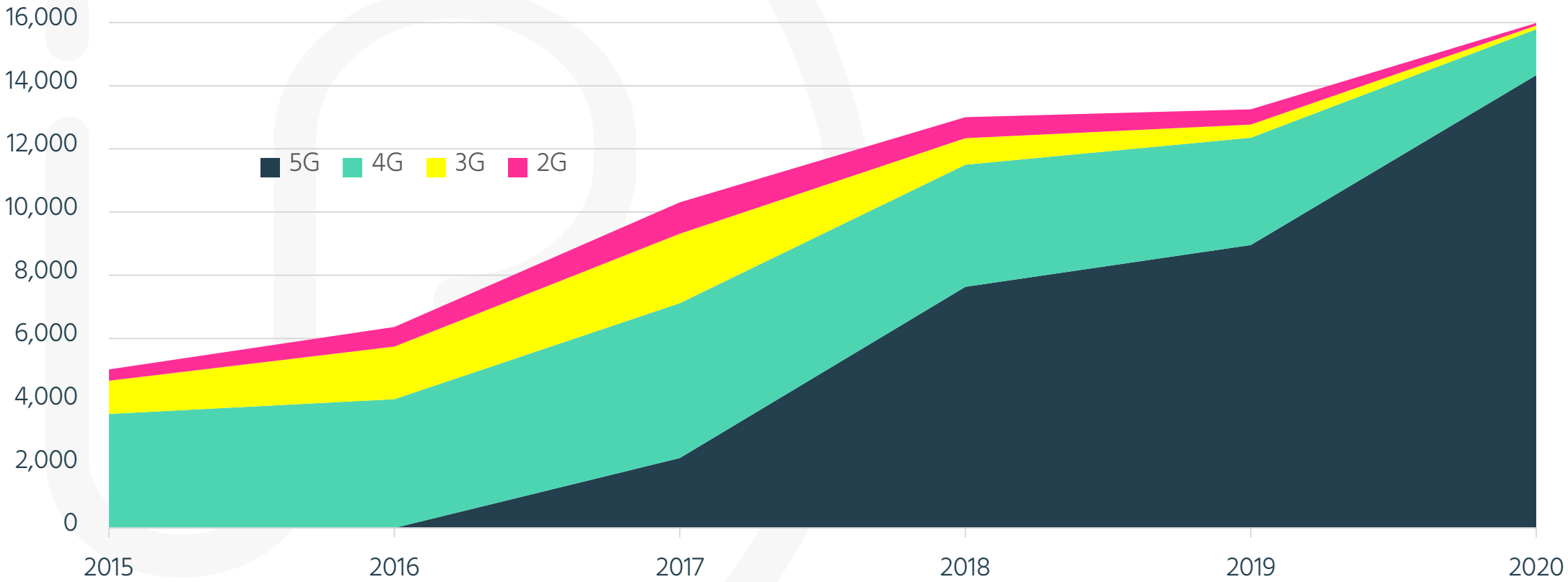
5G and Connectivity – **Smart Factory**

- Supply chain integration: Improved tracking will accelerate distribution, which sees 5G boosting **warehouse applications**. With 5G's greater capacity for **smart devices, IoT trackers** in the logistics chain will allow buyers to monitor their goods in real time, while 5G networks will communicate with autonomous trucks so they can react quickly to changing traffic conditions.

- Safety: 5G's near **instantaneous response time** will create a far more safer manufacturing environment, with fewer people needed on the factory floor and more responsive emergency shut-off signals.



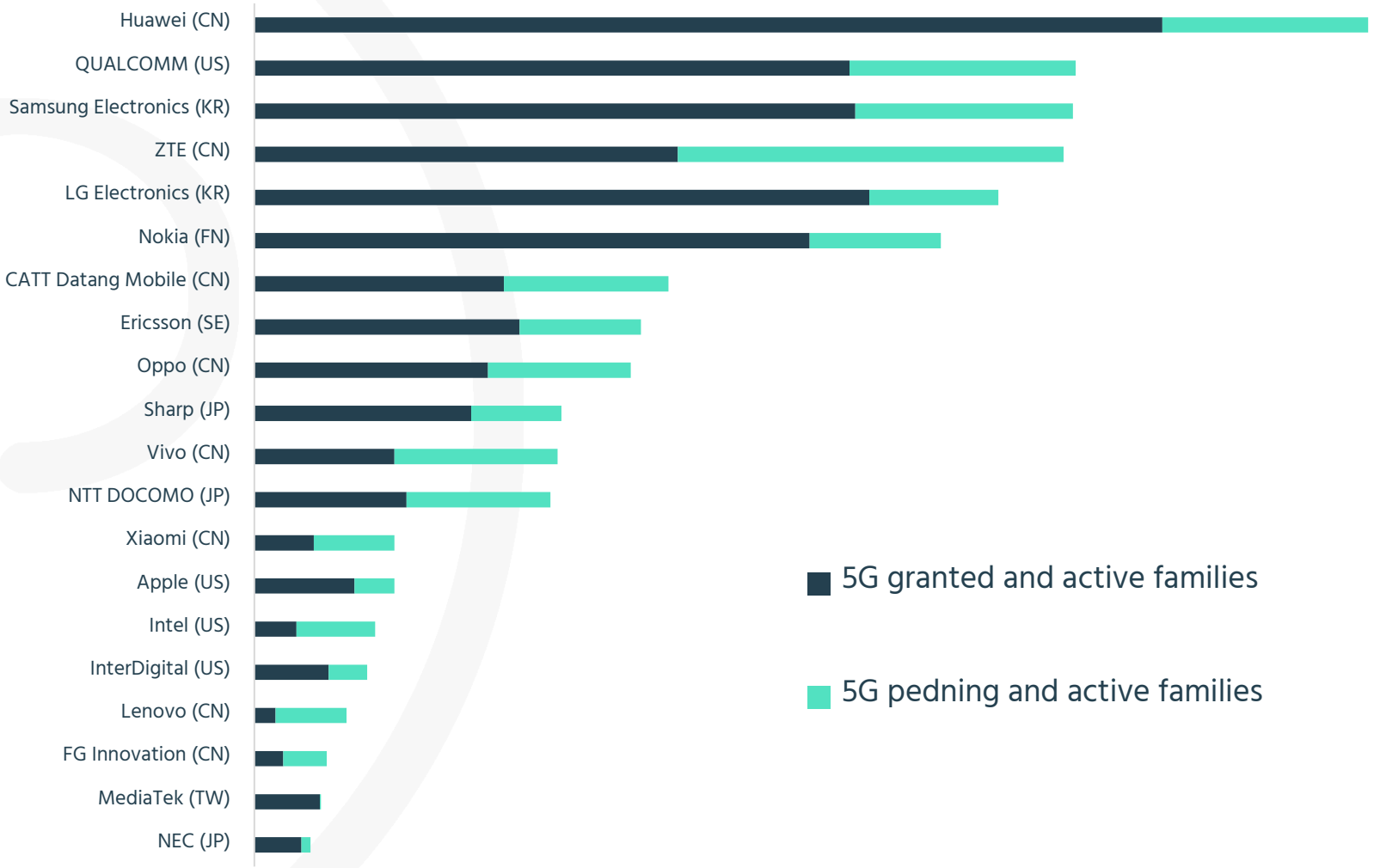
3G, 4G, 5G declared patent families by declaration year



Source: https://www.iplytics.com/report/5g-patent-race-november-2021/

5G declaring companies

- **Self-declared patent families** by the top 5G patent owners as to granted or pending.



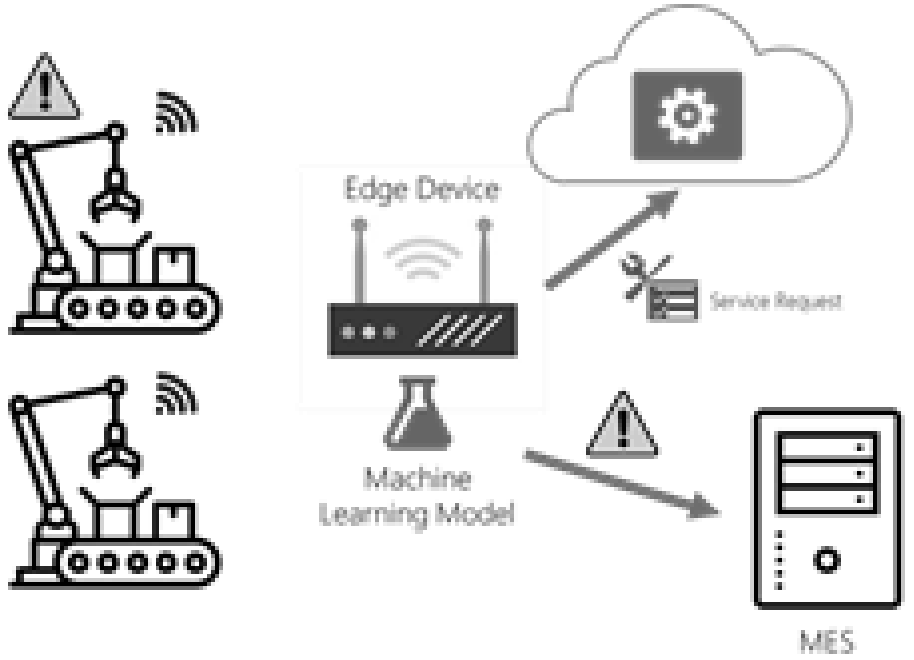
Source: https://www.iplytics.com/report/5g-patent-race-november-2021/

III. Edge Computing SEPs and Standards for Smart Factory Applications

Edge Computing and Connectivity – **Smart Factory**

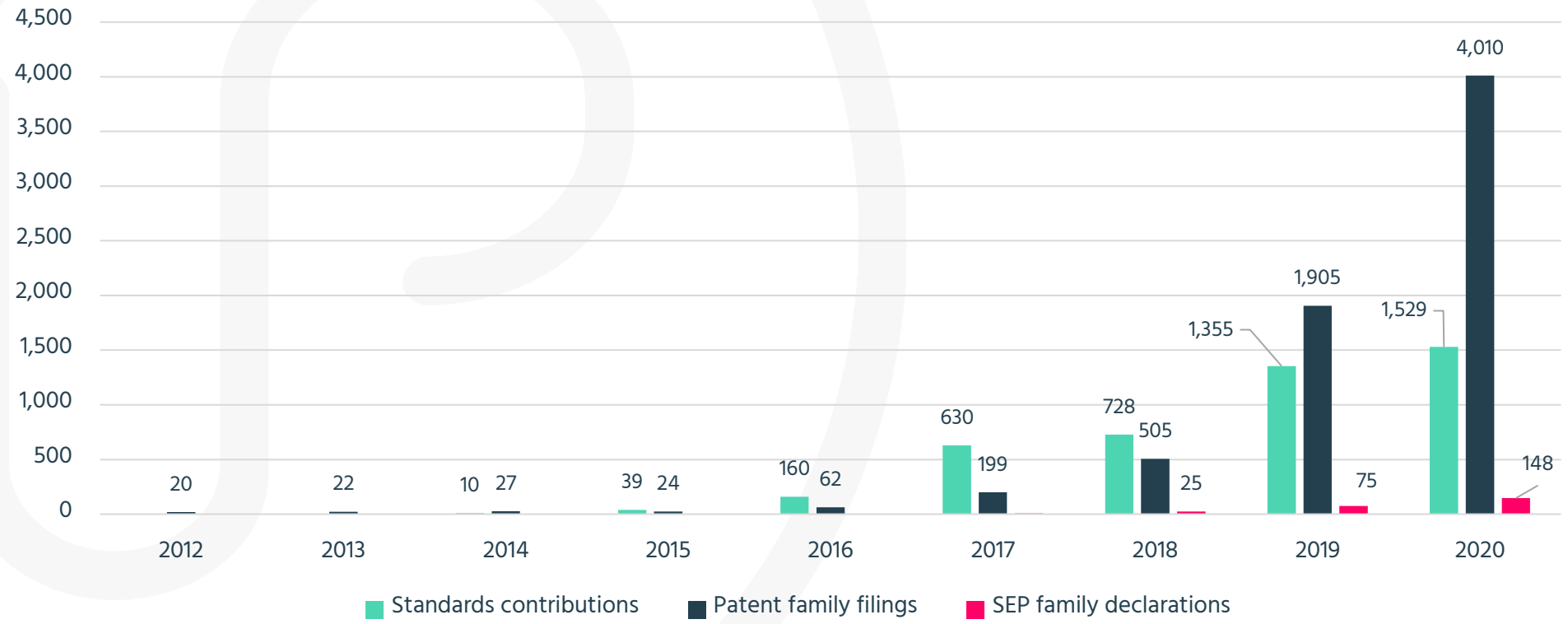
- Failure prediction close to the edge: The aim of Smart Manufacturing is to utilize a more **programmatic data-led approach** to develop new and higher quality goods faster. **Edge Computing** can enable this autonomy where machines in the factory floor extract insight and formulate actions **at near real-time** running AI/machine learning algorithms in their own electronics.

- The robots are connected to an edge device that is running a **machine learning model** listening to sensor data from the robots and whose mission is to predict an impending failure.



Edge Computing Patents and Standards

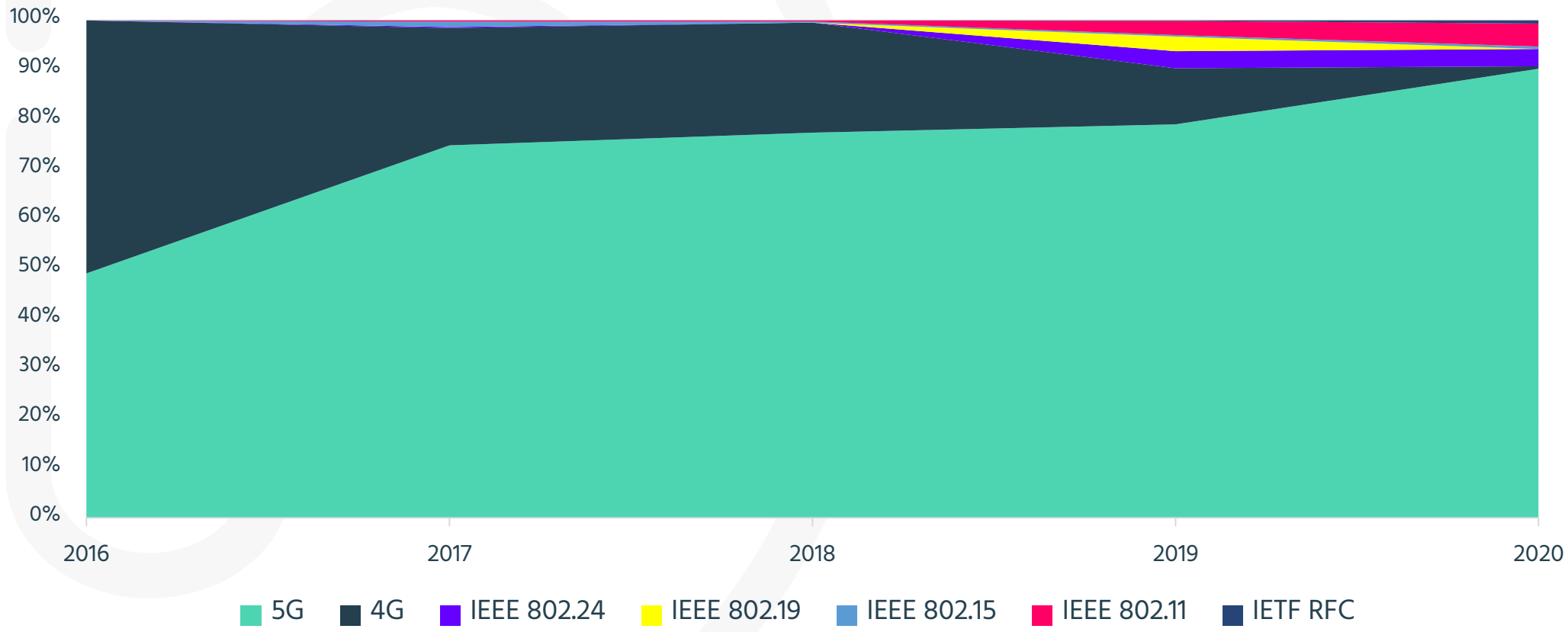
- Number of **standards contributions**, number of **patent families** as to publication year and number of **declared SEP families** as to year of declaration that describe edge computing technologies over time



Source: https://www.iplytics.com/report/leading-5g-patent-race-edge-computing/

Edge Computing

- Number of number of **standards contributions** over time that describe edge computing technologies as to standards technology



Source: https://www.iplytics.com/report/leading-5g-patent-race-edge-computing/

Edge Computing

- Number of **patents filed** (pending and granted), **number of SEP families declared** and number of **standards contributions** that describe edge computing technologies as to current assignee / standards developer.

Current Assignee / Standards Developer	Patent Filings	SEP Declaration	Standards Contributions
Huawei (CN)	821	138	862
Intel (US)	686	42	488
Nokia (FN)	576	87	439
SAS Institute (US)	426	0	0
Apple (US)	386	72	41
Samsung Electronics (KR)	287	16	536
Verizon (US)	196	0	50
Microsoft (US)	188	0	0
Cisco (US)	168	0	39
Ericsson (SE)	163	6	374
LG Electronics (KR)	160	33	144
NEC (JP)	158	3	55
Pure Storage (US)	155	0	0
IBM (US)	125	0	0
Siemens (DE)	120	0	30
Sony (JP)	119	0	66
AT&T (US)	99	0	130
ZTE (CN)	96	4	193
QUALCOMM (US)	68	6	256
Tencent (CN)	64	0	117
Convida Wireless (US)	60	0	88
CATT Datang Mobile (CN)	55	2	0
China Mobile (CN)	54	0	206
Deutsche Telekom (DE)	47	0	64
InterDigital (US)	46	2	77

Source: https://www.iplytics.com/report/leading-5g-patent-race-edge-computing/

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Patents, SEPs and contributions

Only patents

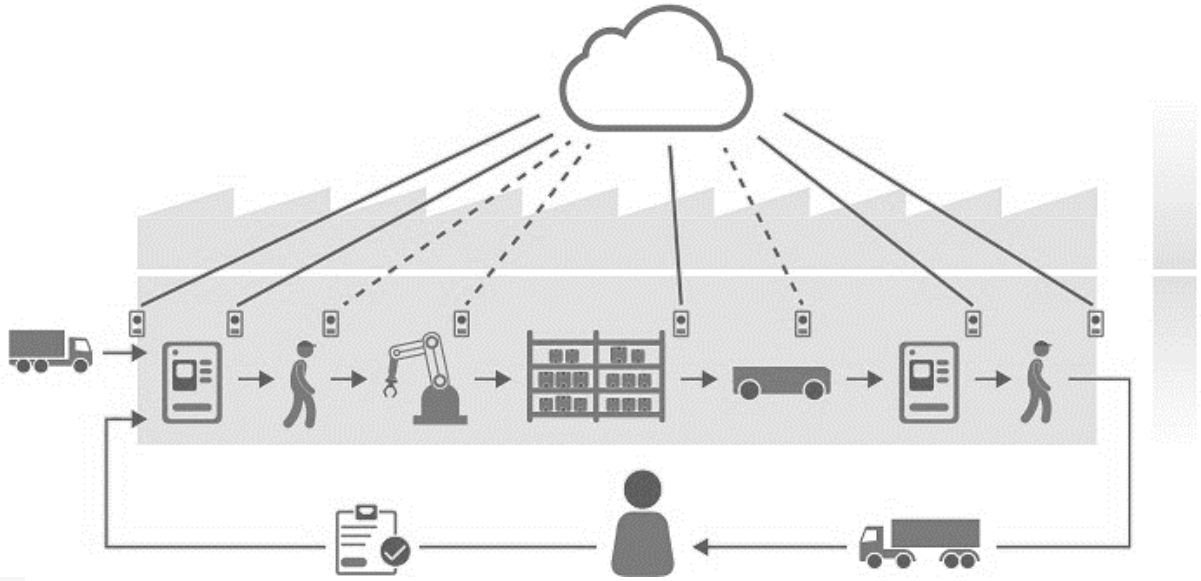
Patents and contributions

Source: https://www.iplytics.com/report/leading-5g-patent-race-edge-computing/

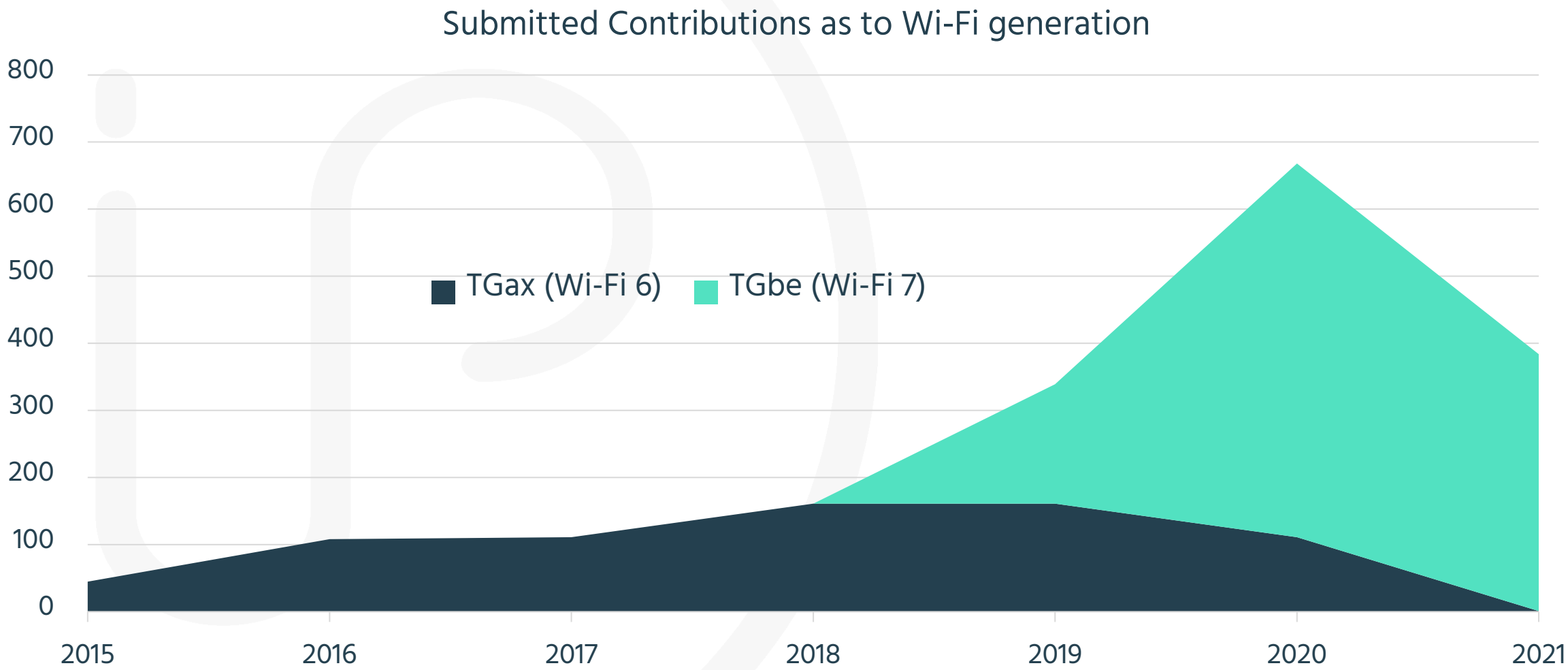
IV. Wi-Fi 6 SEPs and Standards for Smart Factory Applications

Wi-Fi 6 and Connectivity – **Smart Factory**

- **Wi-Fi 6** networks connect machines with cloud services and data centers.
- **Wi-Fi 6** technologies OFDMA and MU-MIMO allow more IoT devices to operate unimpeded on the network and thus allows to connect millions of machine components and real time data points to operate at low-power consumption.

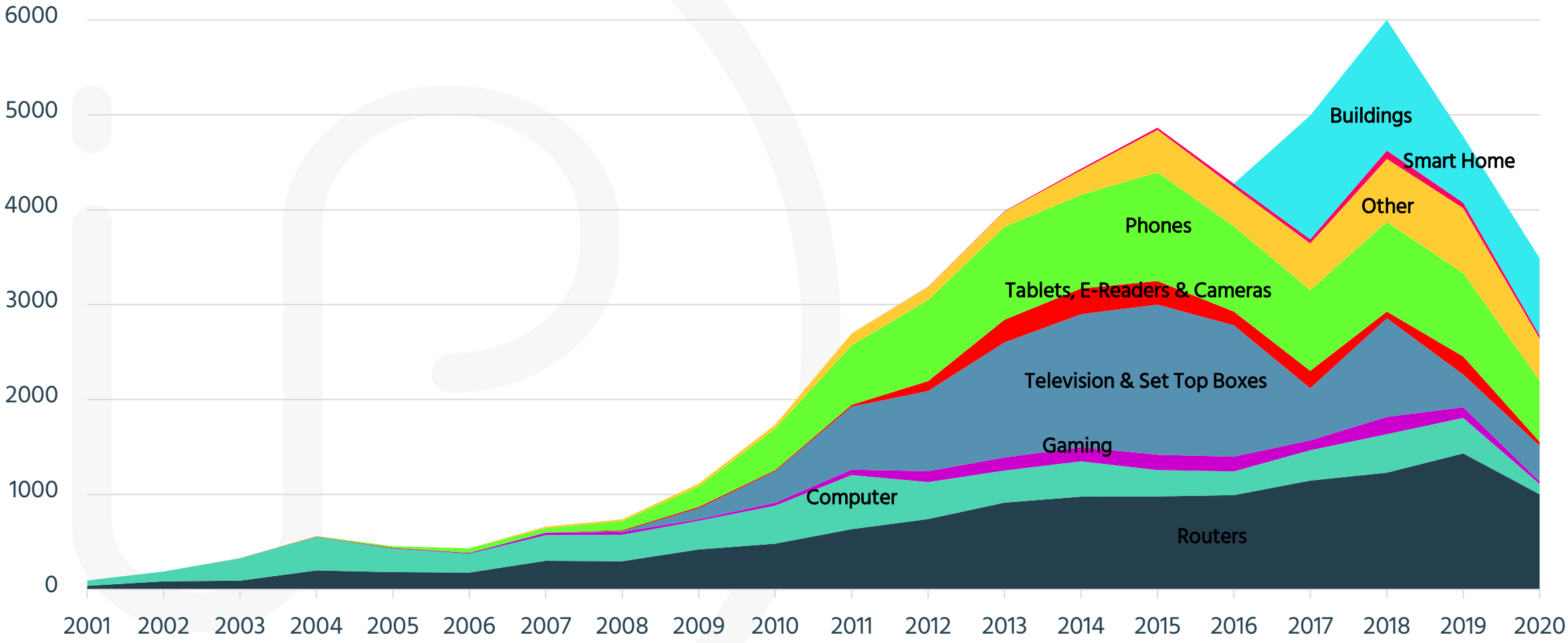


Wi-Fi Generations



Source: https://www.iplytics.com/report/whos-ahead-wi-fi-6-patent-race/

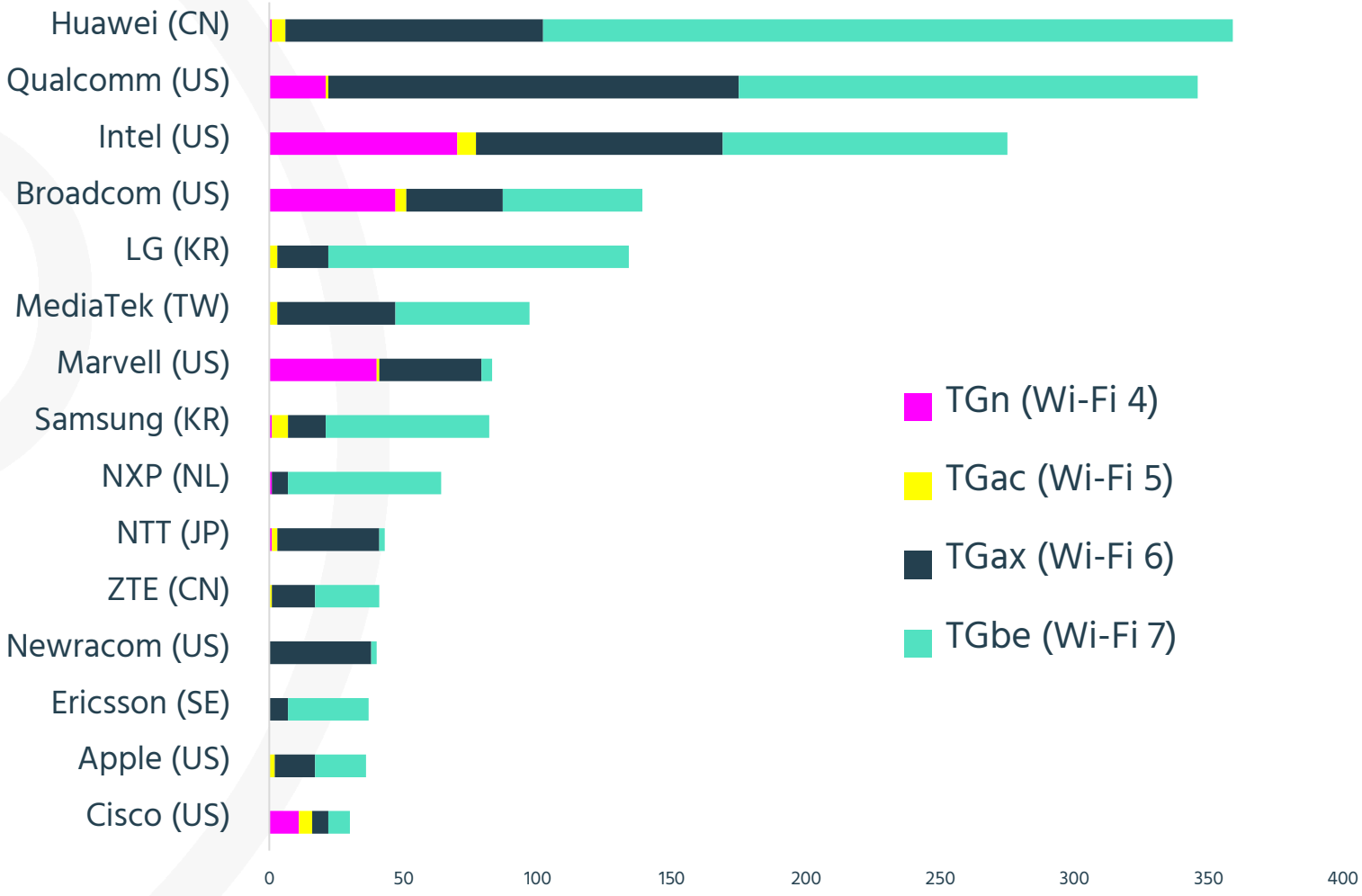
Wi-Fi adoption (Wi-Fi Alliance certified products)



Source: https://www.iplytics.com/report/whos-ahead-wi-fi-6-patent-race/

Wi-Fi standards contributions

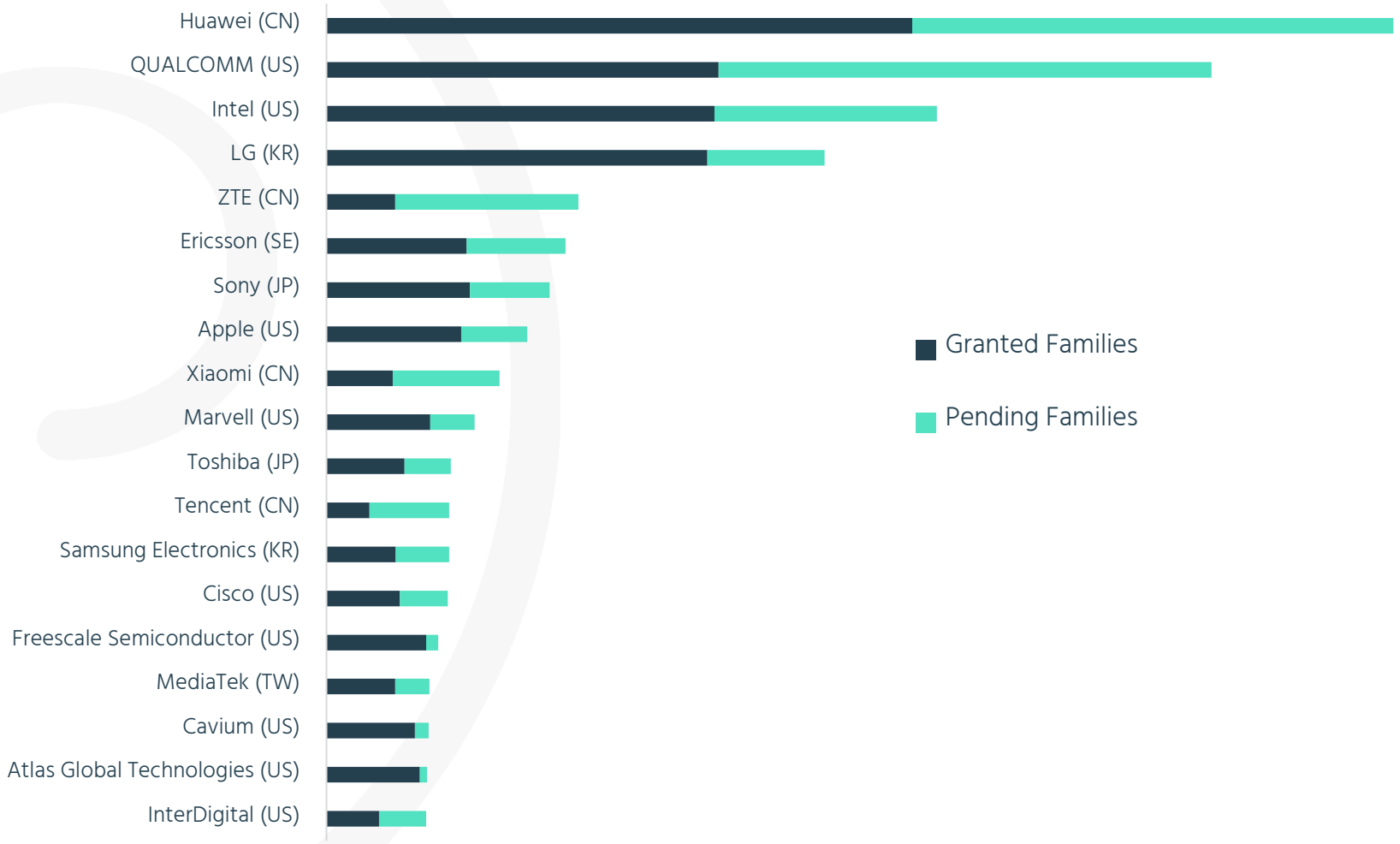
- Submitted **contributions** as to Wi-Fi 4, 5, 6 and 7 as to contributing company



Source: https://www.iplytics.com/report/whos-ahead-wi-fi-6-patent-race/

Wi-Fi 6 patent Universe

- Number of **potentially essential Wi-Fi 6 patent families,** pending and granted.

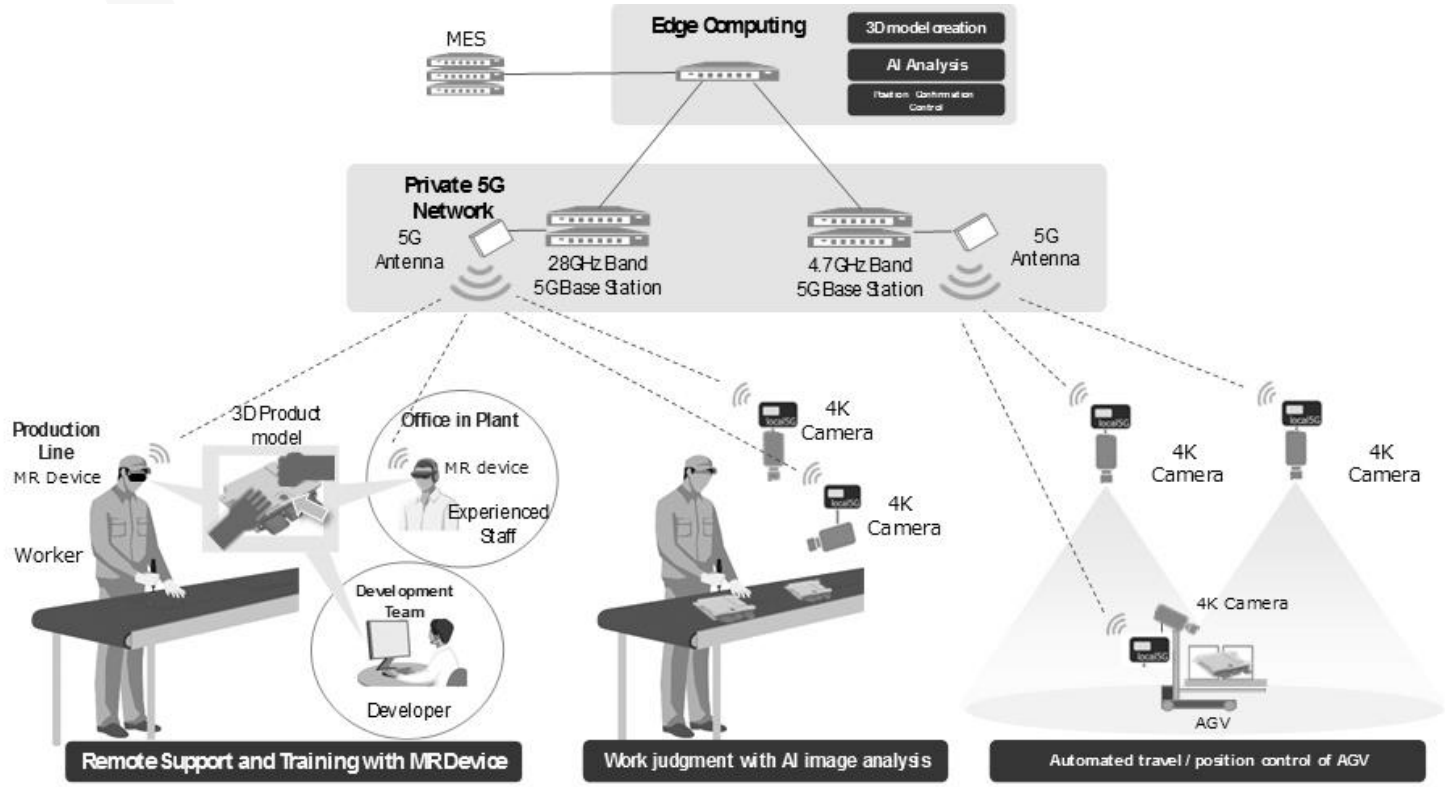


Source: https://www.iplytics.com/report/whos-ahead-wi-fi-6-patent-race/

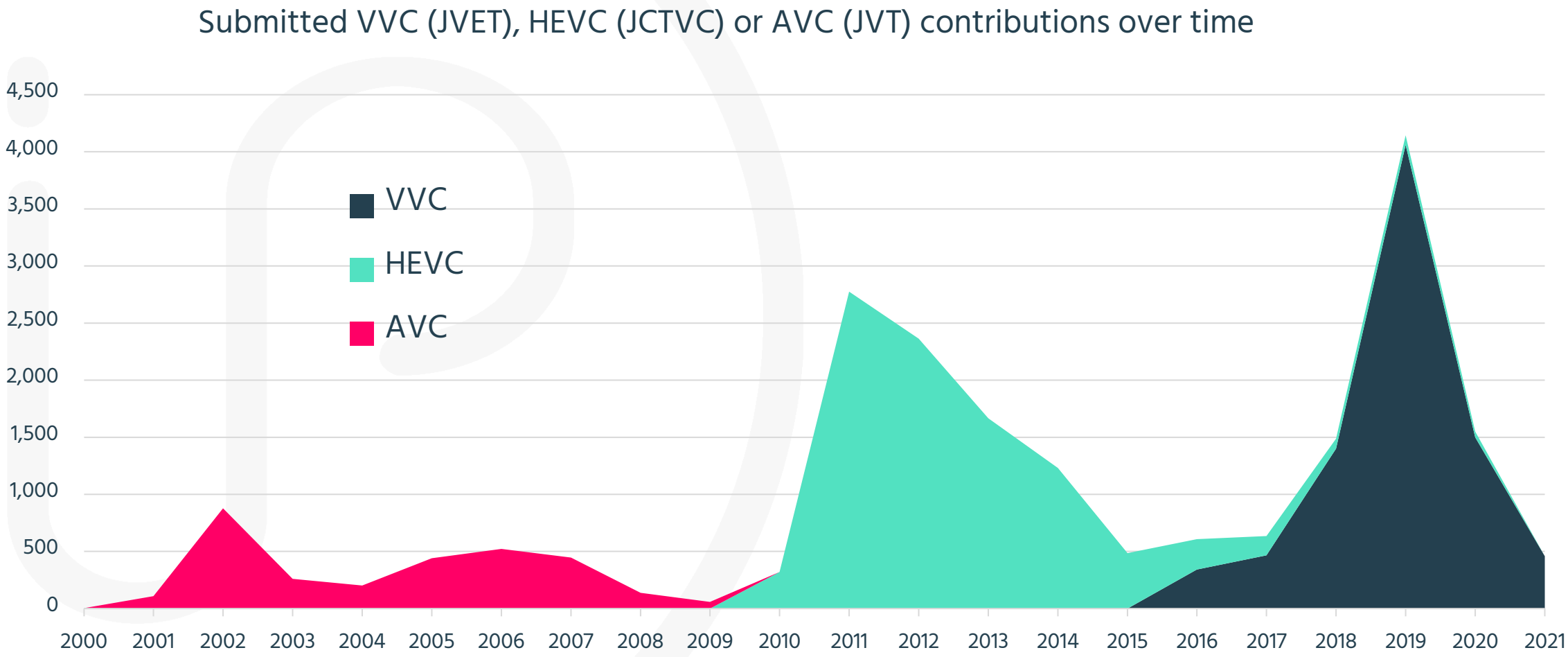
V. Video Codec SEPs and Standards for Smart Factory Applications

VVC and Connectivity – **Smart Factory**

- Video compression standards such as **VVC** (Versatile Video Coding) allow cameras to sense and analyze their environments and fulfill automated tasks:
  - Smart factory **surveillance cameras**
  - Industrial **robot vision**
  - **Virtual, Augmented and Extended Reality**



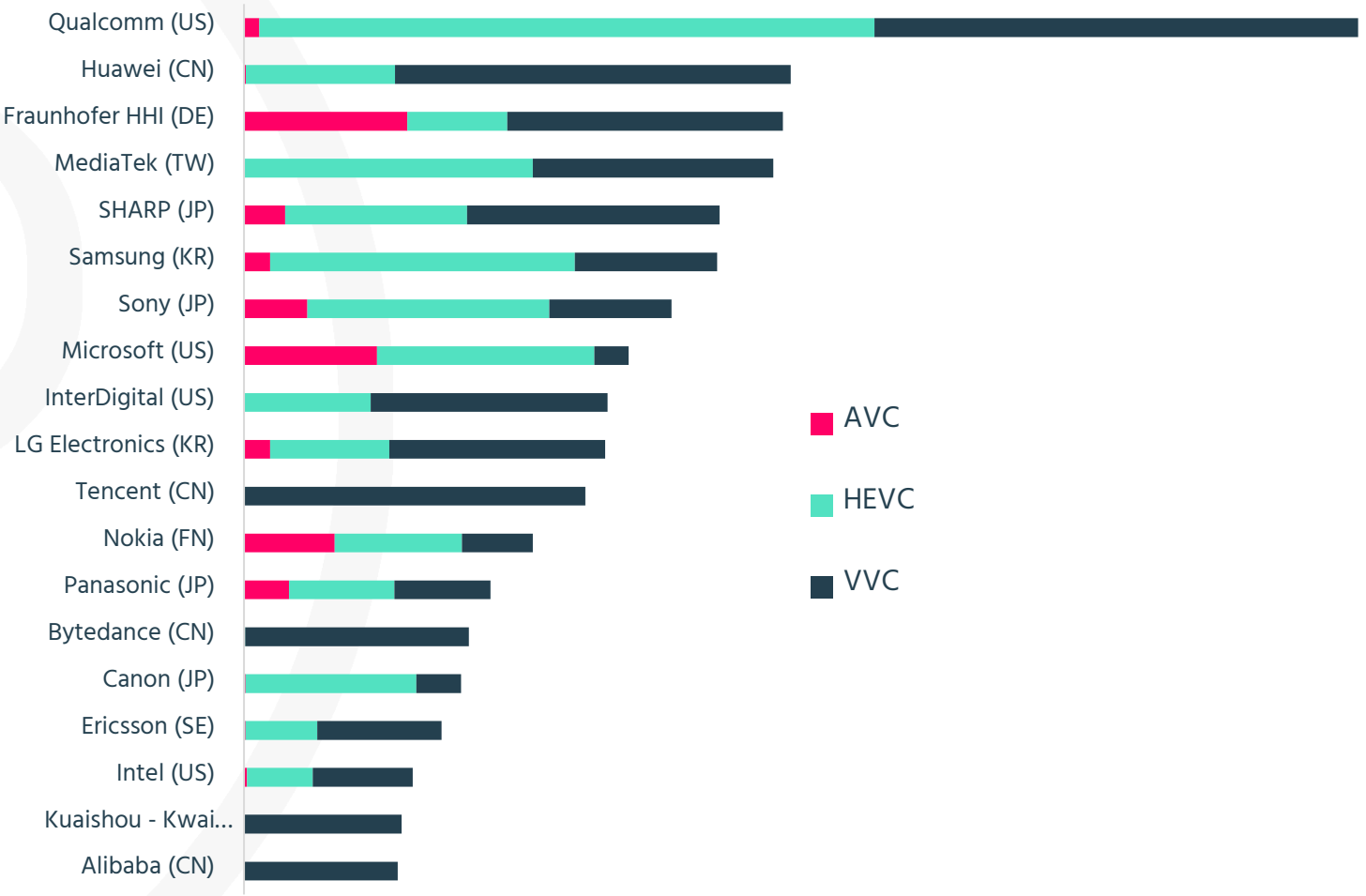
VVC standards contributions



Source: https://www.iplytics.com/report/versatile-video-coding-technology-race/

VVC standards contributions

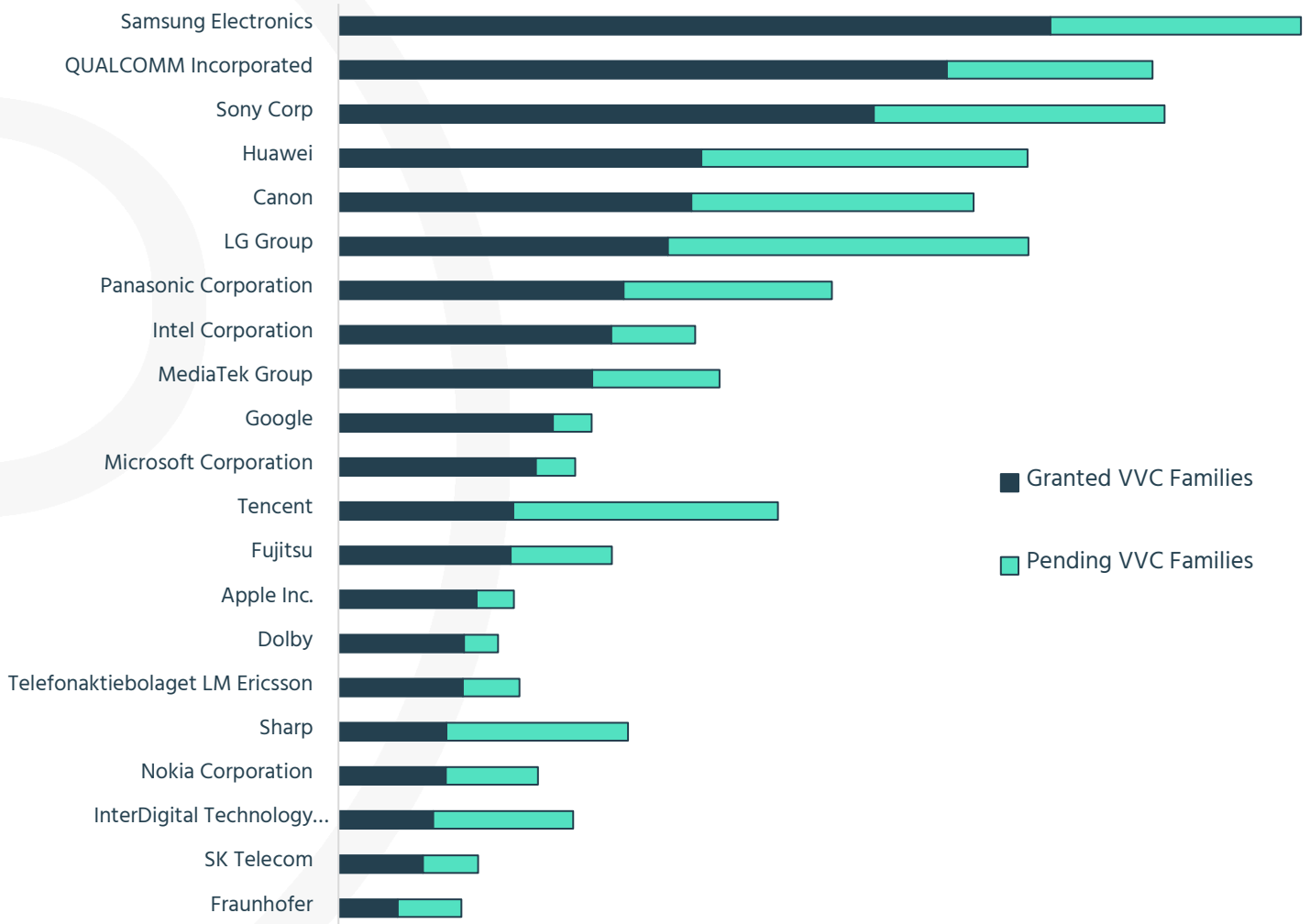
- Submitted **contributions** as to AVC (H.264), HEVC (H.265) and VVC (H.266) as to contributing company .



Source: https://www.iplytics.com/report/versatile-video-coding-technology-race/

VVC standards contributions

- Number of **potentially essential VVC patent families**, pending and granted.

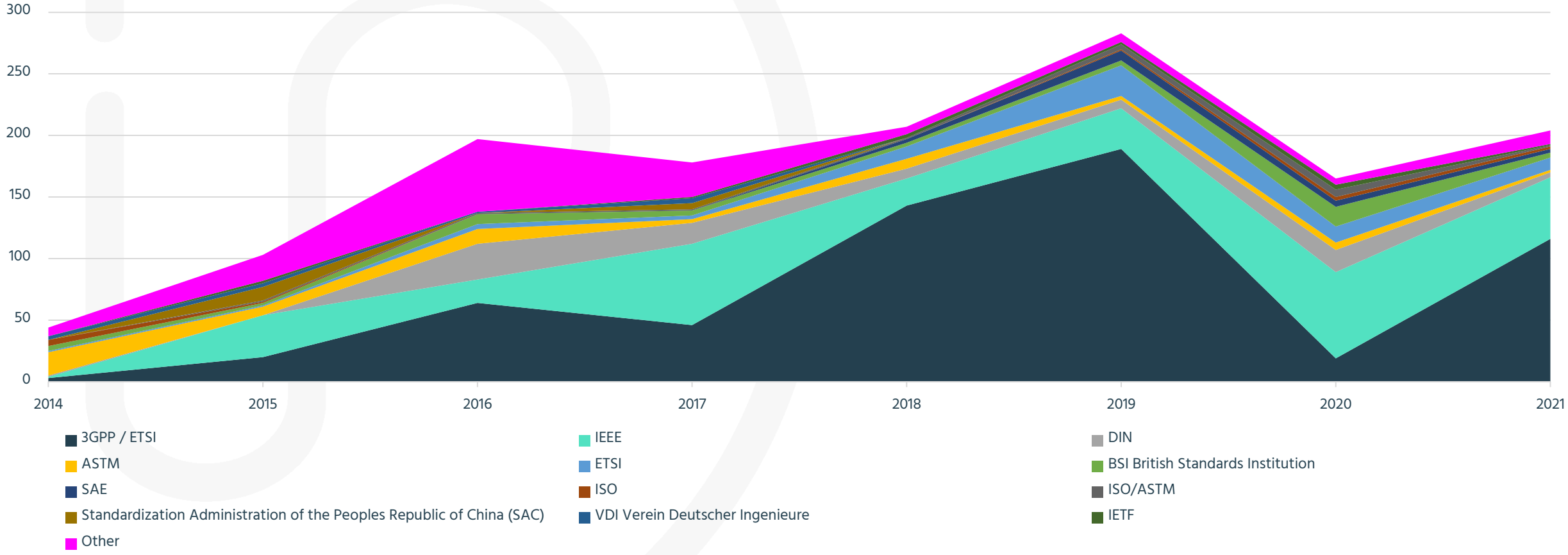


Source: https://www.iplytics.com/report/versatile-video-coding-technology-race/

VI. Standard Developing Initiatives in the Manufacturing Industry

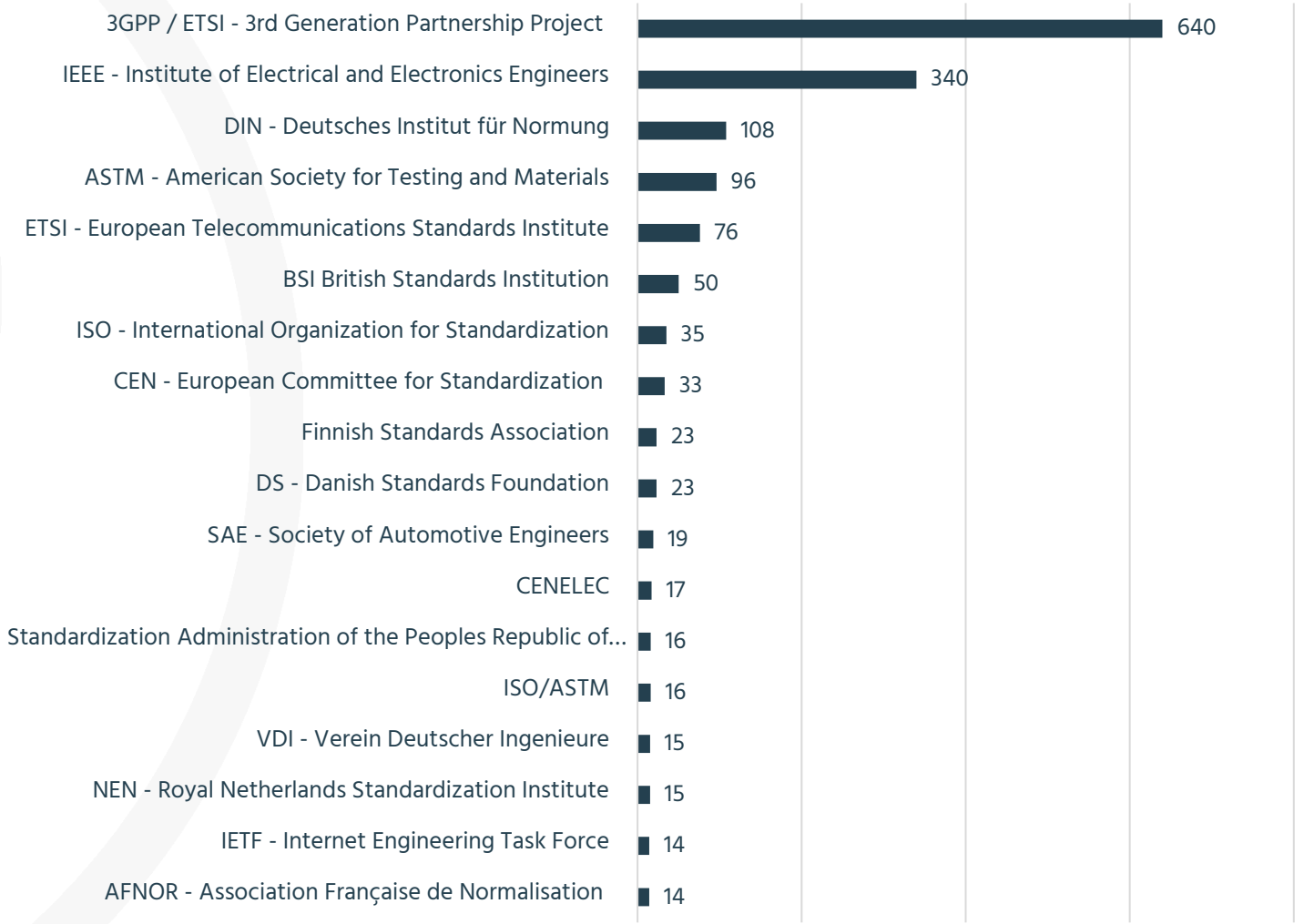
Standard Organizations

Number of standard specifications and contributions that describe a smart manufacturing application as to standards organization (IPlytics 2021)



Standard Organizations

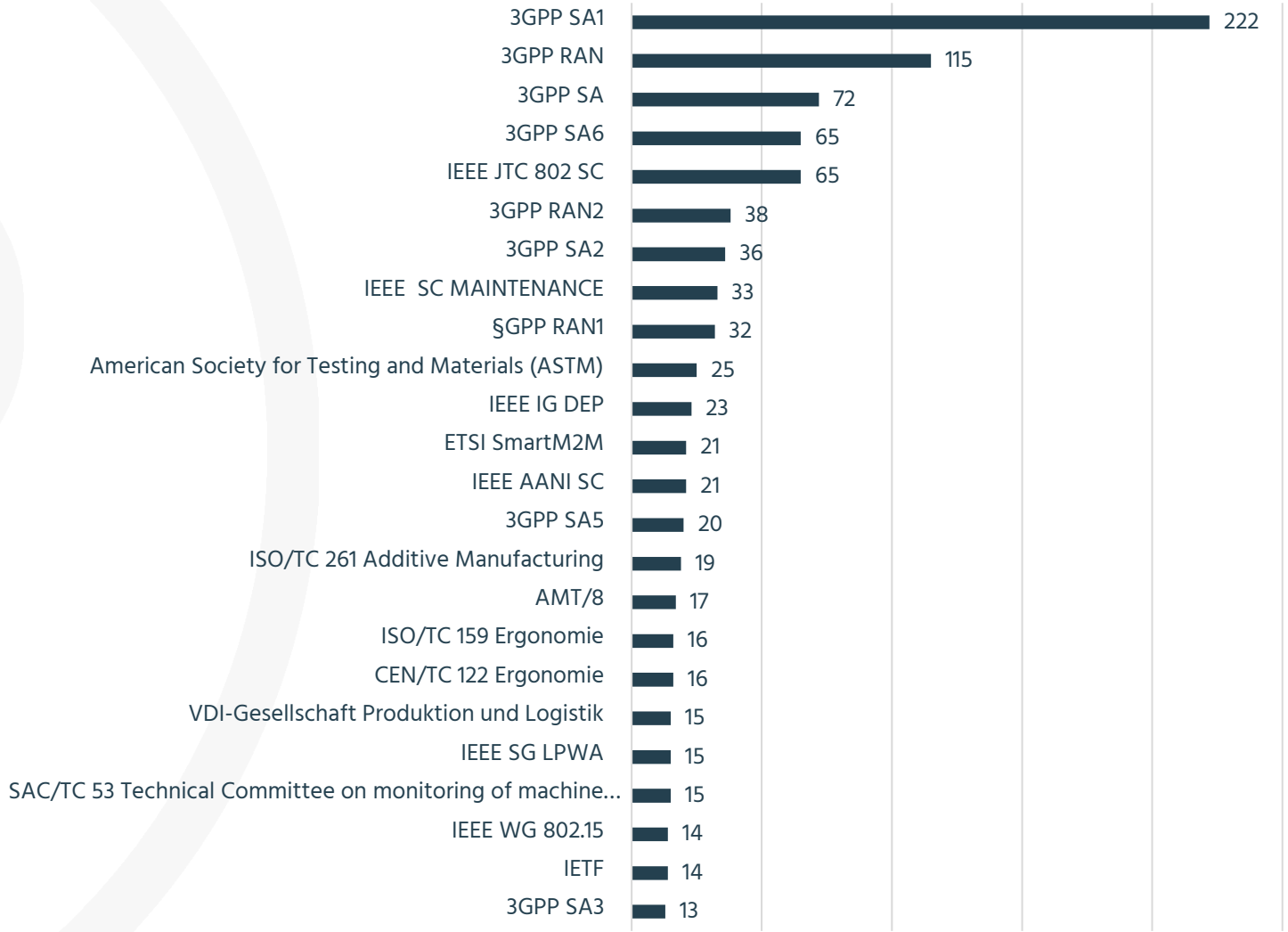
- Number of standard specifications and contributions that **describe a smart manufacturing application** as to standards organization (IPlytics, 2021)



Source: https://www.iplytics.com/report/standard-essential-patents-auto-industry/

Standard Organizations

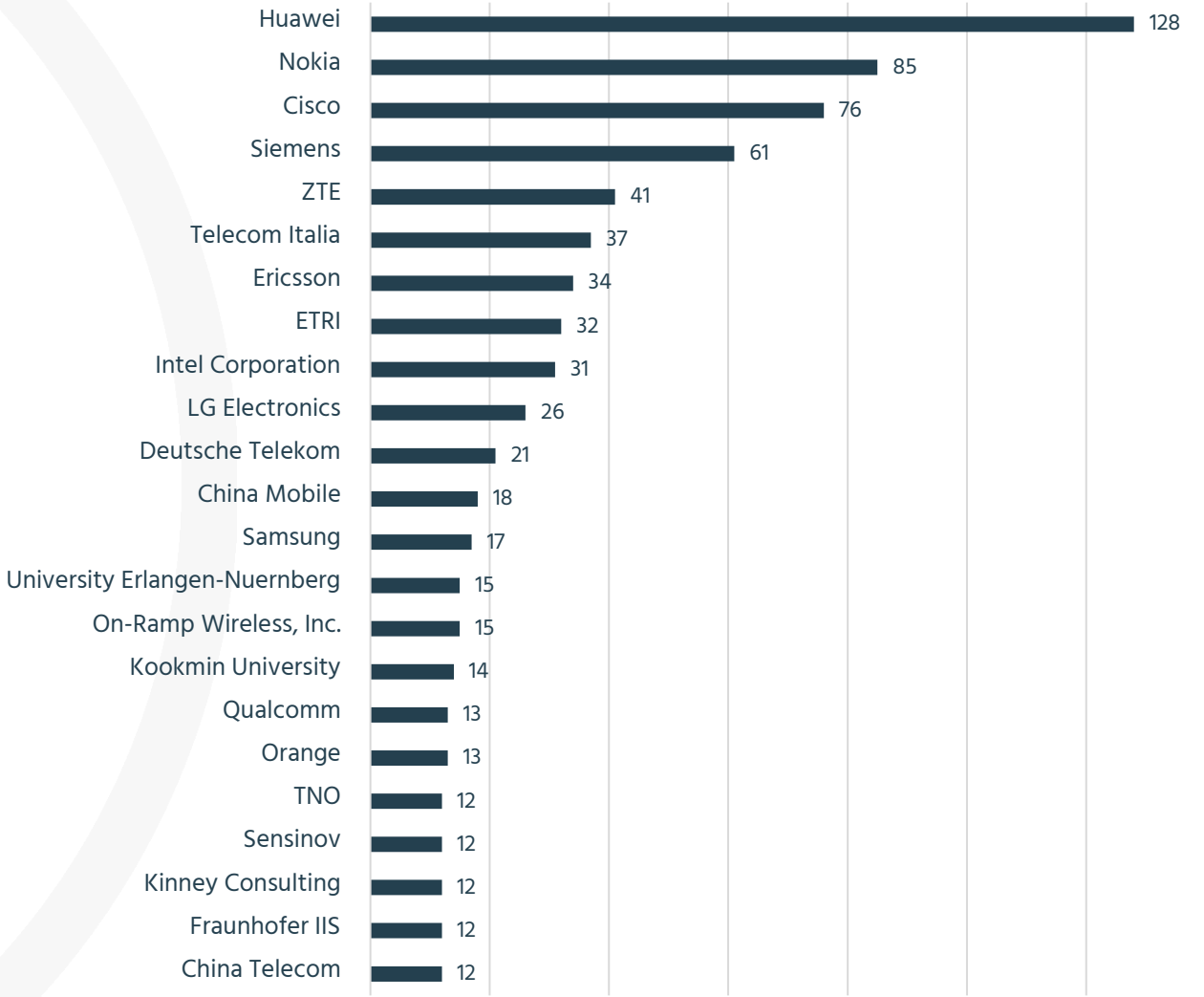
- Number of standard specifications and contributions that **describe a smart manufacturing application** as to standards committee (IPlytics, 2021)



Source: https://www.iplytics.com/report/standard-essential-patents-auto-industry/

Standard Organizations

- Number of standard specifications and contributions that **describe a smart manufacturing application** as to standards company/entity (IPlytics, 2021)



Source: https://www.iplytics.com/report/standard-essential-patents-auto-industry/

VII. Patents and Standards Data to Navigate Risk and Identify Opportunities

Increasing complexity

- **Connectivity is everywhere**, and it heavily relies on standards that are subject to SEPs.
- The **number and variety of use case of standardized connectivity** technology has increased over the past 5 years with a growing number of newly implemented standard subject to SEPs
- It is **challenging** to keep up with technology trends, new standards projects as well as SEPs or new pool license programs.
- **Multidimension access** to patents and standards data is crucial to be part of the discussion and have a **seat at the table** where standards are developed, patents are licensed, and pools are formed.

Source: https://www.marketresearchfuture.com/reports/in-car-wireless-charging-market-5746

Standard Essential Patent Data (1978-2021)

SSO	Example Standards	Declared SEPs
ETSI	2G, 3G, 4G, 5G, NB IoT, LTE-E, ITS, C-V2X, DVB, DMR, DECT, TERA	280,000
ITUT	AVC H.264, HEVC H.265, VVC H.266	15,000
ATSC	ATSC -1.0- 3.0, Over the Air Internet TV Broadcasting	9,900
ISO	RFID, MPEG 1-4, mp3	4,800
ATIS	2G, 3G, 4G, 5G	4,700
IETF	Internet Protocol Standards	1,700
IEEE	Wi-Fi 1-7, DSRC, WAVE, LAN/MAN, Bluetooth, ZigBee, FireWire, WiMAX, Ethernet	1,500
ARIB	2G, 3G, 4G, 5G	1,500
Wireless Power Con.	Wireless Charging Qi Standard	1,150
ISO/IEC	MPEG Visual	1,100
SMPTE	Motion Picture and Television	800
OMA	GSM, UMTS or CDMA2000	700
IEEE / IEC	Wi-Fi 1-7, DSRC, WAVE, LAN/MAN, Bluetooth, ZigBee, FireWire, WiMAX, Ethernet	260

Standard Essential Patent Data (1978-2021)

SSO	Example Standards	Declared SEPs
ANSI	Wi-Fi 1-7, LAN/MAN, Bluetooth, ZigBee, FireWire, WiMAX, Ethernet	210
IEC	Electric vehicle conductive charging, Industrial Networks, CQN series RF, RFID	113
ATSC	Advanced Television Systems, Digital Television Transmission over Terrestrial	81
ITUR	Radio Transmission	44
VESA	DisplayPort	40
OASIS	XrML WSRP UOML | UOML UDDI	35
Broadband Forum	Ethernet, ADSL, DSL, Optical Fiber	21
TIA	TDMA, CDMA, WCDMA	19
CEN	IST, Electronic Identification, Authentication and Trusted Services	12
SAE	Broadband PLC Communication for Plug-in Electric Vehicles, Mobile Fueling Station	7
ECMA	NFC	1

Standards Contribution Data (1990-2021)

Detailed contribution data including information on:

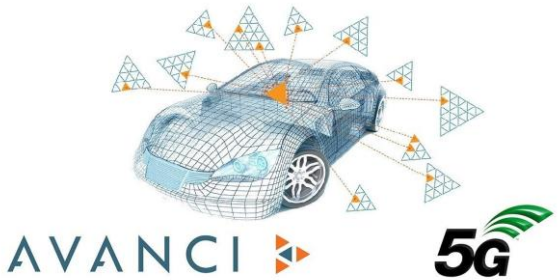
- **Full text specification**
- **Company / Author**
- **Agreed / Approved Status**
- **Group / Subgroup**
- **Standard Generation**
- **References**
- **Category (Tech Input v Correction)**

SSO	Information available	Contribution Count
ETSI - 3GPP	full text	1,209,993
IEEE	full text	118,987
JCT-VC (ITU HEVC)	full text	9,742
IETF	full text	8,774
JVET (ITU VVC)	full text	8,473
JVT (ITU AVC)	full text	3,051

Patent Pool Data (1990-2021)

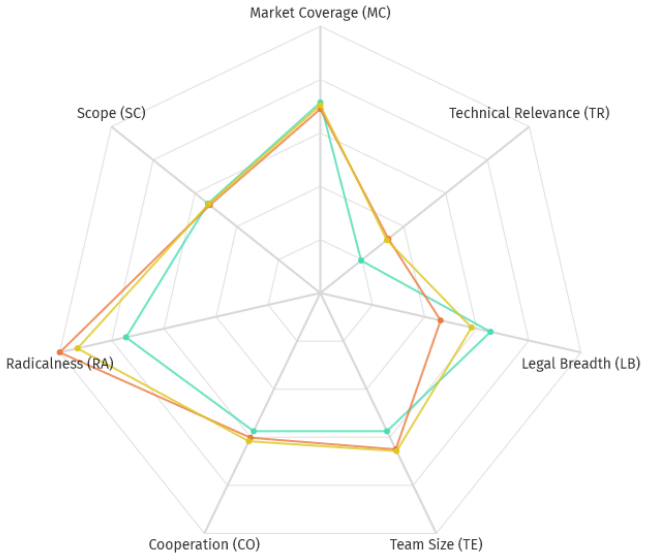
Patent pools listing verified standard essential patents. Among others:

- MPEG LA
- Via Licensing
- SISVEL
- AVANCI
- Access Advance
- ULDAGE
- France Brevets NFC



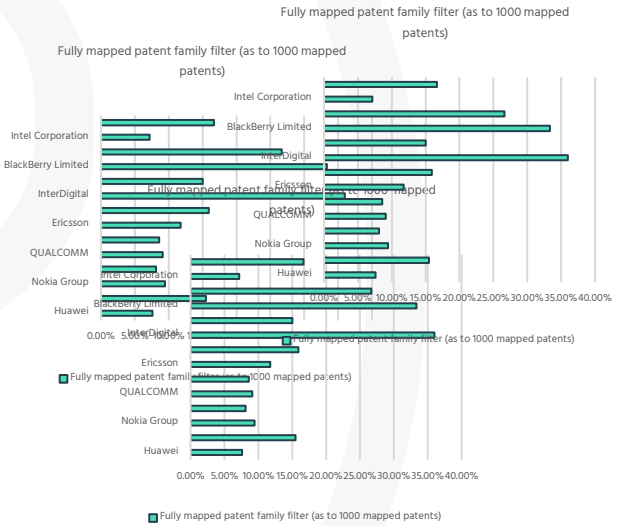
"The question about which patents are essential and which are not, is one of the most debated when negotiating SEP portfolio value, royalties or infringement claims."

1 VALUATION



Objective data correlation

2 RANDOM SAMPLE



SEP essentiality sample share

3 AI SEP DETERMINATION

Predict SEP essentiality

1 - Data Correlation

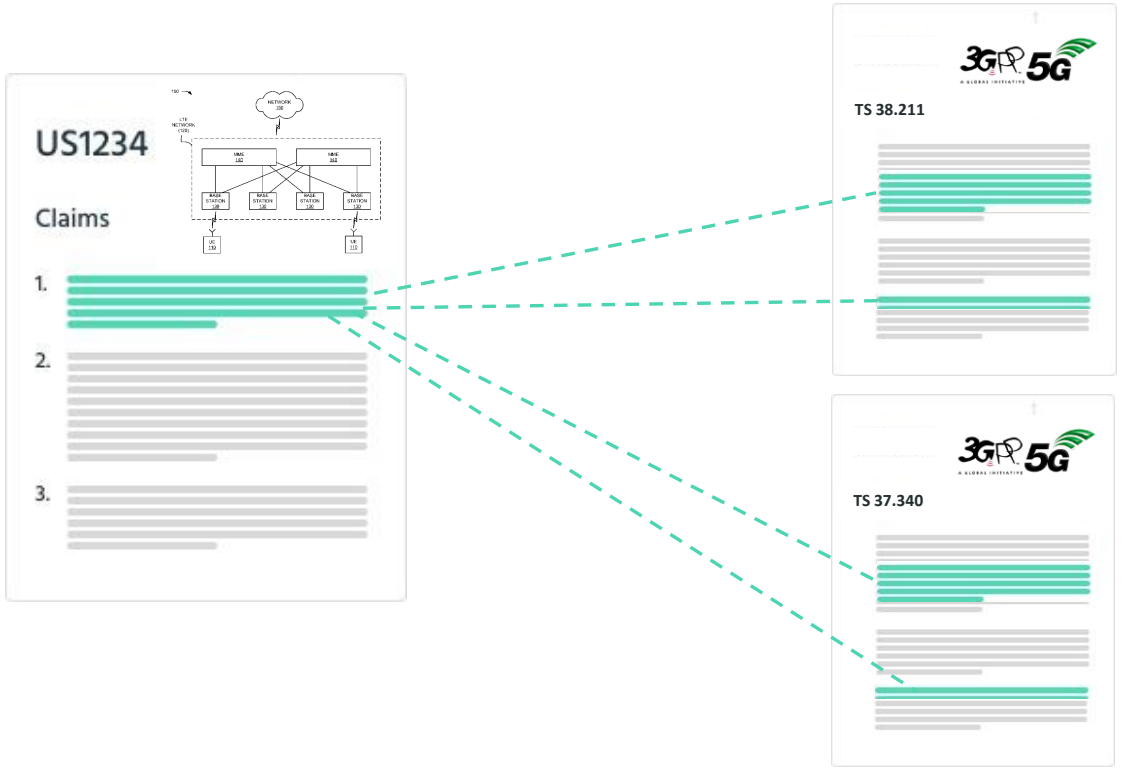
Correlating patents and standards – 7 relevant features:

1. Patent's claims are **semantically similar** to corresponding standard document (TS)
2. Patent's listed **inventors** (name, surname, affiliation) **participated** at corresponding standards meeting
3. Patent's **applicant/assignee** submits accepted and **approved contributions** at to corresponding standard in working group
4. Patent's **prio. date** overlaps with **core date range** of standards development
5. Patent has been **cited by declared SEPs** (excluding self-citations)
6. Patent cites of **predecessor standard** or Tdocs as prior art in the non-patent literature
7. Patent's **IPC/CPC** overlaps with verified SEP's IPC/CPCs

2 - Manually mapped/charted patents across standards

IPlytics SEP sampling

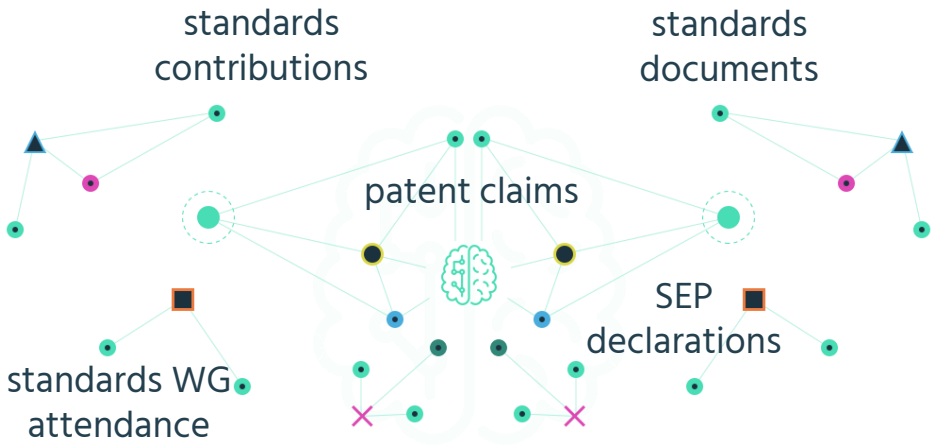
- 2,000 **5G** mapped patents (randomly selected and representative across top 30 SEP portfolios)
- 1,000 **3G/4G** mapped patents (randomly selected and representative across top 30 SEP portfolios)
- 200 **Wi-Fi 6** mapped patents (randomly selected and representative)
- 400 **VVC** mapped patents (randomly selected and representative)



3 - AI to predict essentiality rates of portfolios

IPlytics – **PES (Patent Essentiality Score)**

- **IPlytics prediction model** scores patents as to their likelihood of being standard essential.
- **A semantic LSI model is trained** to compare independent claims and standard sections.
- **7 correlation features** are incorporated.
- The model uses **firm fixed effects** to consider company specific differences.
- The **model is trained** making use of verified SEP training data from **expert claim charts**.



VIII. Takeaways

Takeaways

Technology revolution:

- **Connectivity in manufacturing** has the potential to fundamentally **disrupt** the production value chain, human machine interaction and productivity and flexibility.
- To implement connectivity standards, manufacturers need to face the complex licensing world of the telecommunications industry:
  - Ensure that they not only have the **right IP strategy** in place but also a **seat at the table** when technology standards are developed.
  - Set up a more **comprehensive monitoring** of patent filings, SEP declarations, as well as patent pooling initiatives or standards development initiatives.
  - **Manage risk** and **identify opportunities** to shape the future of connected technology.

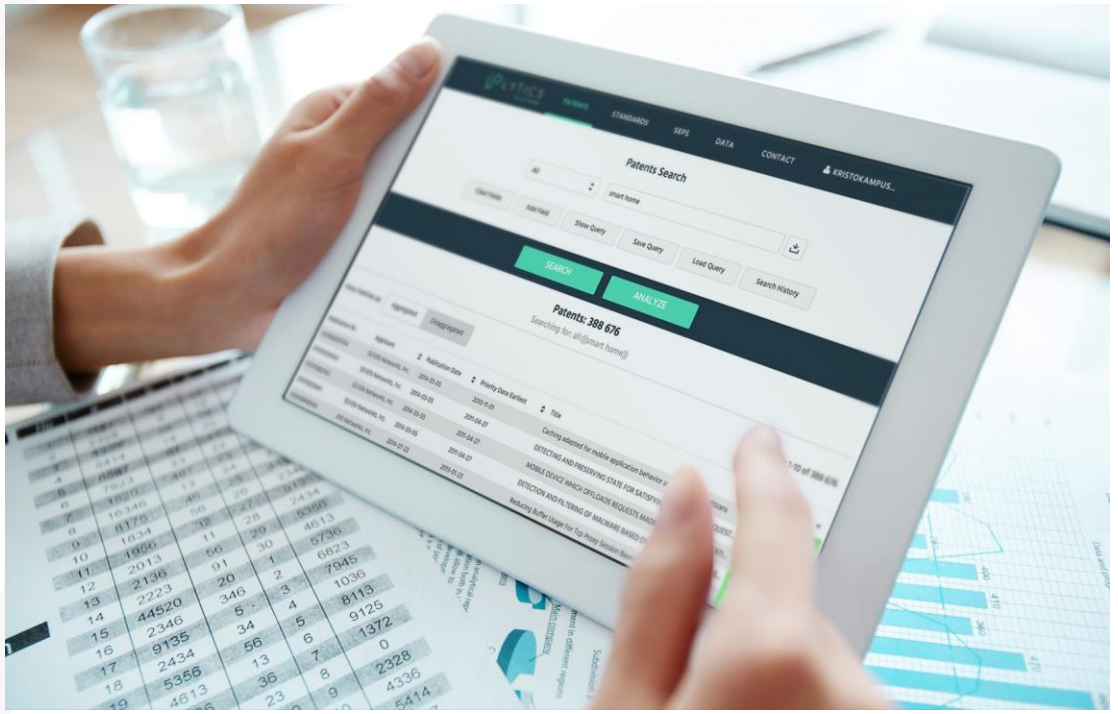
IPlytics Europe and US

For more information on IPlytics Products and Services, please contact us on:

https://www.iplytics.com/request-a-demo/

Or call us at:

Europe +49 30 555 74282 or
USA +1 512 947 1152



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