



Automotive Industry Expertise

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Introduction

- The automotive industry is facing unprecedented technological and business disruptions caused first by the shift to electrical vehicles and, in recent years, by the progression towards autonomous driving.
- Working with our clients in the automotive industry has enabled us to build knowledge of current and emerging technologies, suppliers, supply chain dynamics, standards, and products, as well as the competitive and patent landscapes.
- Our experience with semiconductors, wireless and software patent analysis, and product reverse engineering and testing has proven to be directly applicable to the new automotive industry.

Outline

- ❑ **Examples of Projects with Automotive OEMs and Automotive Suppliers**
- ❑ Summary of Automotive Technology and IP Experience
- ❑ Our view of the Automotive Industry Disruption

Patent Strategy Advisory

- Client: Automotive OEM developing autonomous vehicles strategy
- Our Patent Analysis & Reverse Engineering Services:
 - Assessment of patents owned by the client for applicability to connected cars and autonomous vehicles, and specifically to ETSI 3GPP and Intelligent Transport standards. Identification of gaps.
 - Patent landscapes in the autonomous driving technologies. Assessment of the potential business exposure to patent assertion. Identification of the high-risk adversaries
 - Recommendation of patents for acquisition to prepare the client for counter-assertion. Patent assessment and patent-product mapping.

Defense support through non-infringement analysis

- Client: Automotive OEM infotainment module processor accused of infringement by a semiconductor company
- Our Patent Analysis & Reverse Engineering Services:
 - Non-infringement analysis of the accused processor through material and process reverse engineering
 - Technical analysis in collaboration with Tier 1 (module manufacturer) and Tier 2 (chip manufacturer) suppliers
 - Preparation of non-infringement EoU

Defensive Patent Acquisition Support

- Client: Automotive OEM preparing for potential counter-assertion from a high-risk adversary from wireless industry
- Our Patent Analysis & Reverse Engineering Services:
 - Assessment of patents identified by the client for mapping on the adversary's wireless networking products
 - Preparation of the EoU documents on candidate patents through mapping on wireless standards: cellular 4G/5G, IoT (MTC), V2X
 - Live network testing to demonstrate use in commercial networks

New product FTO analysis

- Client: Automotive OEM considering acquisition of Silicon Photonics product from an SME for adoption in new vehicles
- Our Patent Analysis & Reverse Engineering Services:
 - Assessment of product originally developed for use in telecom industry for suitability in the automotive use: high reliability, harsh environmental conditions. Material analysis, process and structural analysis, testing.
 - Development of a patent landscape for Silicon Photonics automotive products
 - Assessment of a potential threat of patent assertion

Assessment of Risk of an NPE Litigation Campaign

- Client: Automotive Tier 1 module manufacturer preparing response to litigation campaign launched by an NPE
- Our Patent Analysis & Reverse Engineering Services:
 - Assessment of asserted patents for applicability to the products in the supply chain: OEM, Tier 1, Tier 2
 - Assessment of the severity of exposure of the products in various levels of supply chain

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Automotive Technology Experience

Hands-on knowledge:

- Navigation systems: GPS, GNSS
- Driver Assistance
- Sensors: Vision, LiDAR
- Collision detection
- OTA software updates security
- Robust, secure processor architecture
- 3GPP standards for V2X

Other:

- Battery management in electrical vehicles
- CAN bus, Car Ethernet
- Modern LED car lighting systems

Applicable Expertise from Other Fields

- Wireless cellular and short-range standards
- Wireless mobile devices and network system testing
- Software/firmware RE and system testing
- Security and reliability of processors, controllers and systems
- Digital media standards and system testing: video, audio, imaging
- Semiconductors material, circuit and process analysis and reverse engineering
- Optical fiber, LAN/ethernet connectivity systems

Automotive IP Patent Analysis & Reverse Engineering Services Experience

Patent landscapes covering range of automotive technologies from conventional to connected cars and autonomous vehicles

Automotive companies patent portfolio assessment for evaluating gaps and risk in an event of patent assertion

Automotive products exposure analysis to adversaries patents in all stages of the supply chain

Assessment of patent portfolios for acquisition and demonstration of EoU on target products

Non-infringement analysis through testing and reverse engineering

Patents mapping on automotive V2X standards and related wireless connectivity standards Freedom to operate analysis of new technology for adoption by automotive companies

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- ❑ Examples of Projects with Automotive OEMs and Automotive Suppliers
- ❑ Automotive Technology and IP Experience
- ❑ **Our view of the Automotive Industry Disruption**

Signs of Disruption in the Automotive OEM Industry

- New Entrants outside the automotive industry with large market capitalization are becoming OEMs competitors
- Strategic Acquisitions, partnerships and mega-investments in new technologies by suppliers and OEMs (Intel –MobileEye, Samsung-Harman).
- Technological Disruption. Increased dependence on semiconductor, wireless, imaging, and software technologies.
- Software-intensive systems. Security, Cloud and IoT, OTA software updates.
- Steady increase of Patent Litigations from NPEs against Automotive OEMs in connectivity and infotainment technologies since 2014.
- Threat of Patent Litigations from Operating companies in semiconductor, wireless and software industries.

Automotive Technology Evolution and Disruption

Connectivity

- From: CAN in-vehicle connectivity; Bluetooth 2 for phone connectivity; standalone GPS, NFC
- To:
 - Multiple optimized in-vehicle standards (PoE, Car Ethernet, PoDL, PoCoax), WAVE
 - 802.11 p DSRC; eCall
 - V2X: vehicle-optimized wireless standards for cellular and direct communications;
 - Bluetooth 5, WiFi built-in Hot spots

ADAS

- From: radar/LiDAR, rear camera, adaptive cruise control, lane departure warning
- To:
 - V2X and Cloud for non line-of-sight awareness
 - Adaptive headlights
 - Computer vision; Night vision - FIR
 - Precise positioning with Cloud assistance, GNSS

Infotainment

- From: single dash display,
- To:
 - Head- on Display, Augmented Realty; Haptic touch
 - Advanced voice controls

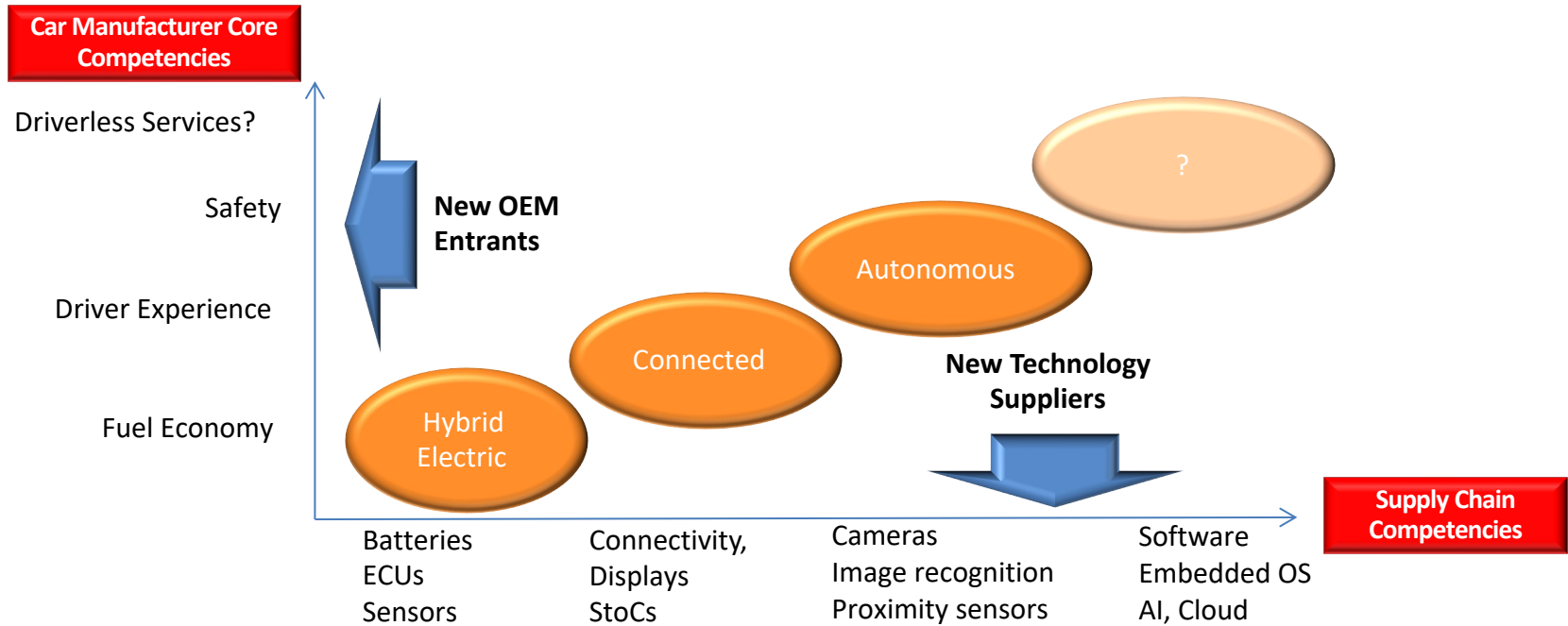
Data Collection & Analysis

- From: Acceleration/Tire pressure sensors; local data monitoring; off-line software updates
- To:
 - OTA real-time data management, Firmware updates, Diagnostics
 - Cloud-hosted and AI-assisted data analysis
 - Applications downloading from the cloud

System Integration

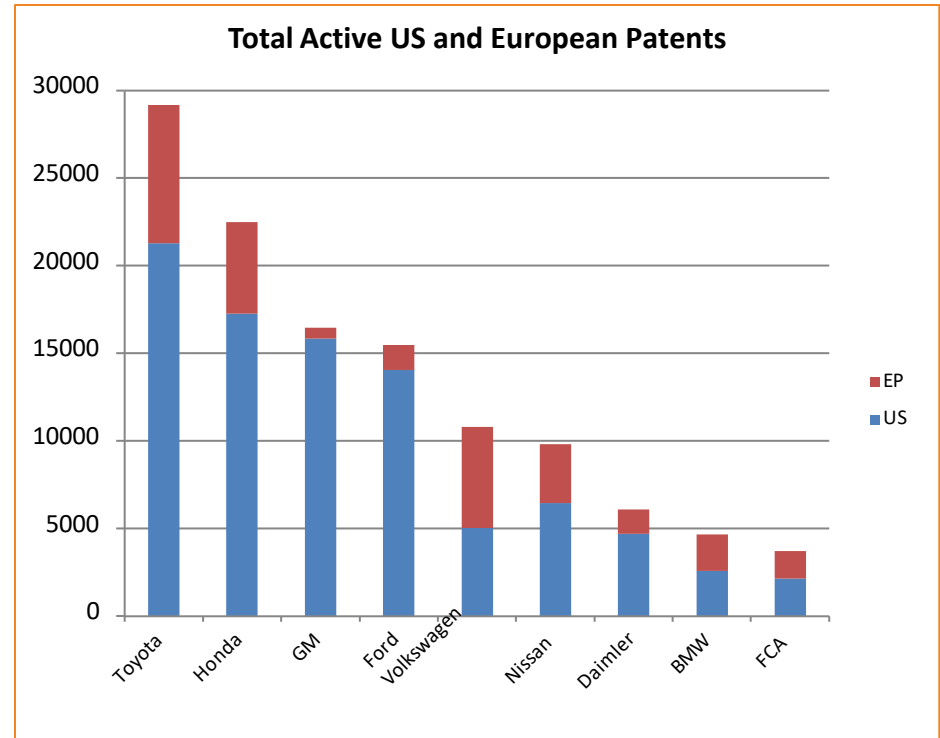
- From: multiple ECU and sensor systems, dedicated processors
- To:
 - Integrated platforms for Connectivity, Infotainment,
 - Automotive-optimized OS

Automotive OEMs Business Disruption



Automotive Patent Holdings – Overview (2019)

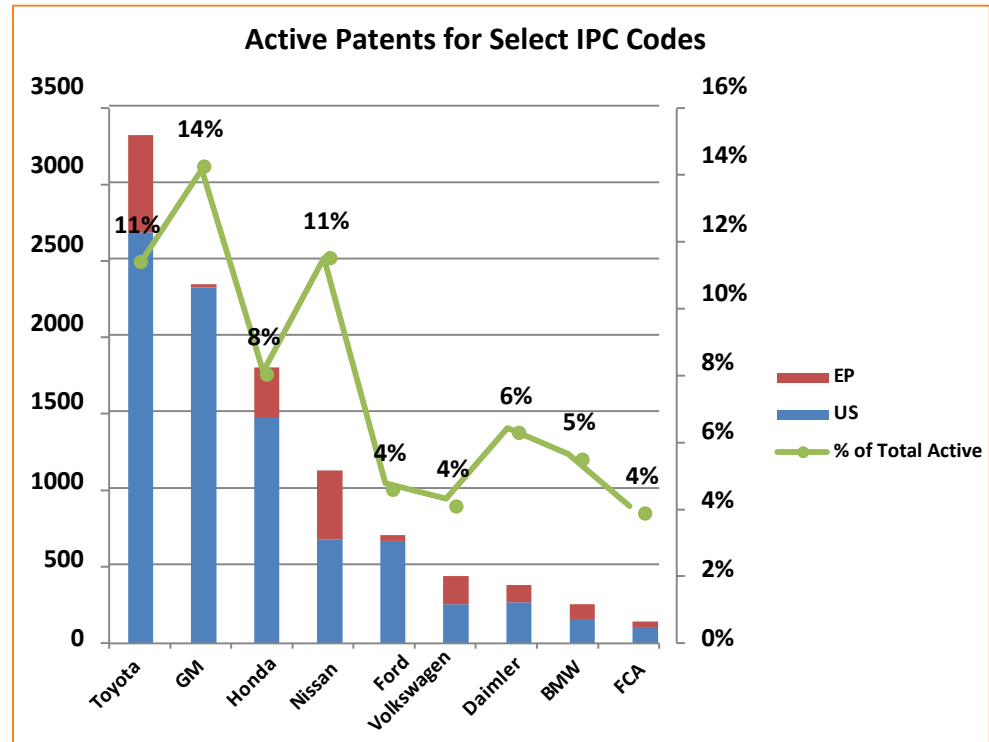
- Patent holdings and protection varies greatly between the major auto manufacturers
- European and Japanese based companies have more balanced global portfolios
- Portfolios of the US-based companies are US-centric offering little protection outside the United States



Source: Clarivate Database; Analysis

Automotive Patent Holdings – Semiconductor, Electronics, Computers, Connectivity and Measurements (2019)

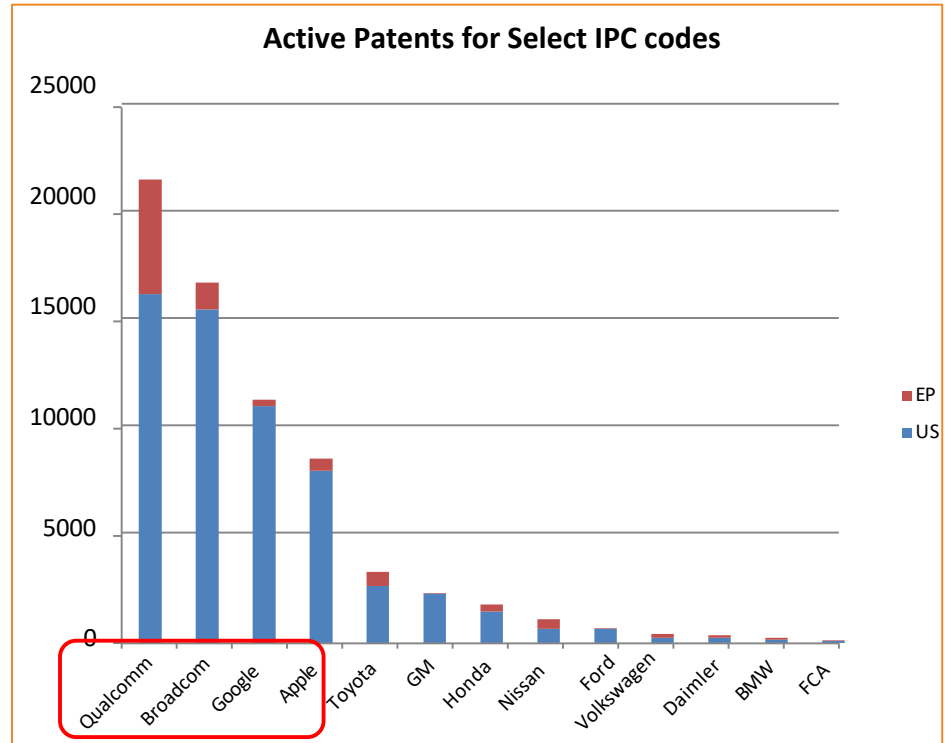
- Only a fraction of granted patents in each of the auto company portfolios are potentially applicable to products/services of new entrants in the connected car and autonomous vehicle markets
- These fractions vary widely from roughly 4 – 14%



Source: Clarivate Database; Analysis

Comparative Patent Holdings - Semiconductor, Electronics, Computers, Connectivity and Measurements (2019)

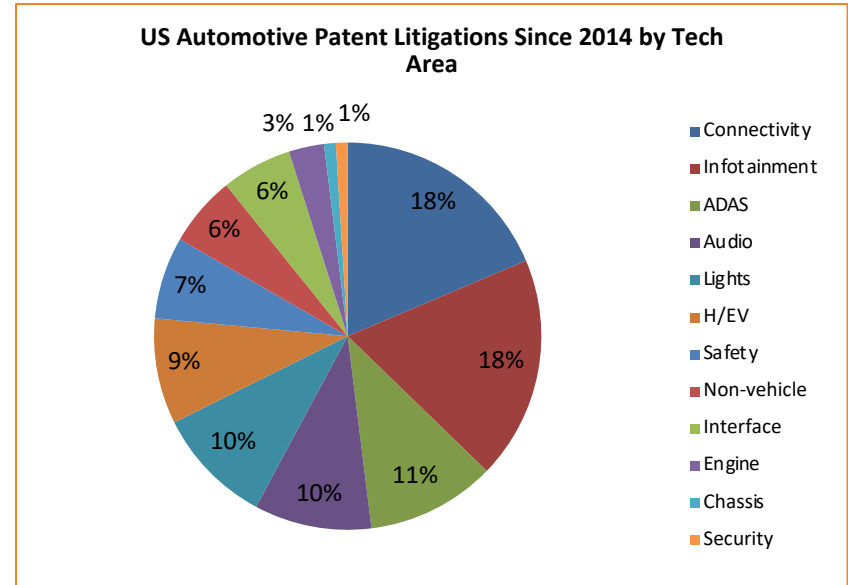
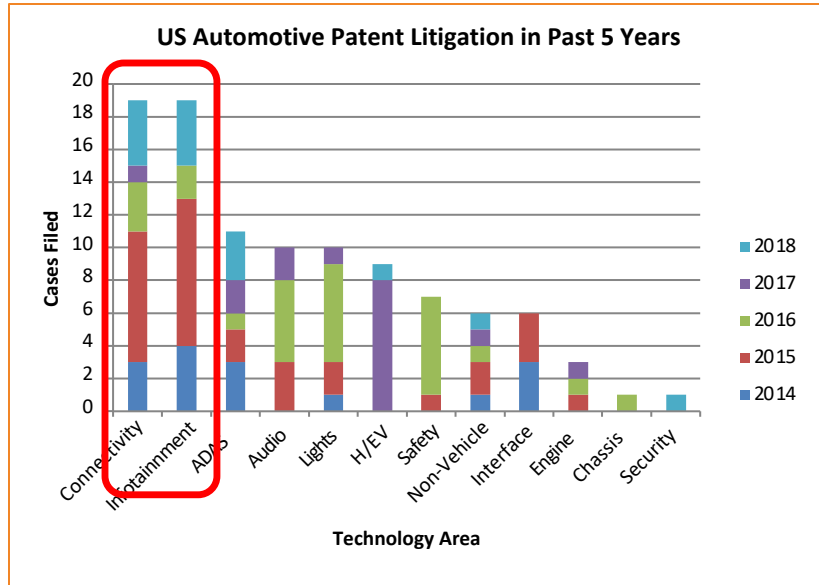
- Auto manufacturers have relatively few patents compared to number of patents in similar classifications held by new threats and/or entrants into the auto sector
- In a typical portfolio, only a small fraction of the potentially relevant patents will likely provide value or leverage for litigation/licensing/cross-licensing activities
- The new threats/entrants have a large advantage in IP that may be potentially relevant to connected cars and autonomous vehicles
- Auto manufacturers have relatively few patents that may have potential relevance to products and services of the new threats and/or entrants



Source: Clarivate Database; Analysis

Automotive OEM litigation in the US - by Technology Area (2018)

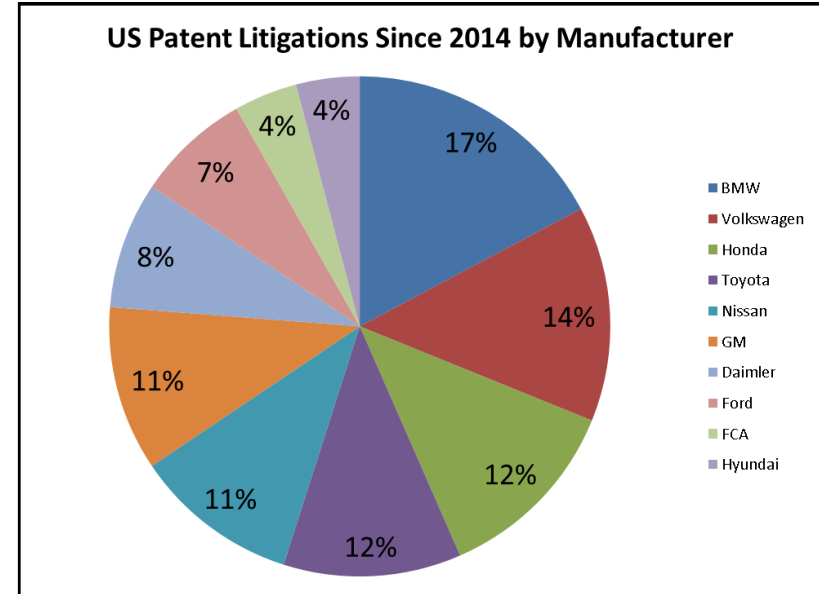
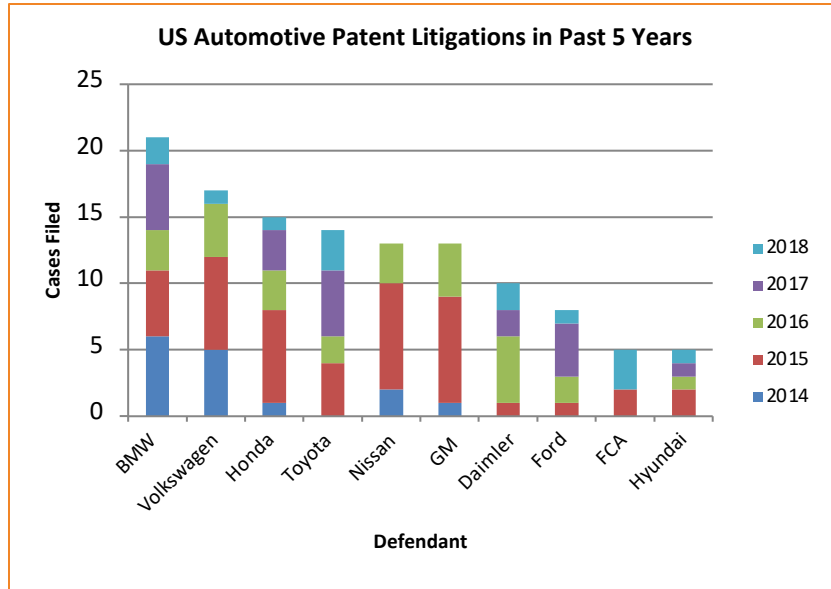
- Since 2014, 36% of patent litigation against automotive OEMs has been related to vehicle connectivity and infotainment systems. ADAS accounted for 11% cases and Audio and Lights for 10% each.
- In 2018, connectivity and infotainment represented 57% of cases and ADAS accounted for 21%.



Source: RPX Database; Analysis

Automotive OEM Litigation in the US – Defendants (2018)

Automotive OEMs have been defendant in a majority (101) cases since 2014.



Source: RPX Database; Analysis

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Our technical professionals have opined on infringement issues across a wide range of technologies, including semiconductors, wireless, telecom, and software, among others. J.S. Held's team of industry-experienced technical and scientific experts supports our IP technical assessment. Subsidiaries of the firm include Ocean Tomo Investments Group, LLC, a registered broker-dealer.

As a part of J.S. Held, Ocean Tomo works alongside more than 1500 professionals globally and assists clients – corporations, insurers, law firms, governments, and institutional investors – on complex technical, scientific, and financial matters across all assets and value at risk.

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