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# MOTOR SPORTS

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## 1 Introduction

As the mobility industry stands in the middle of a profound transformation driven by connected, autonomous, shared, and electric (CASE) technologies, 2018 saw the world of motor sports searching for ways to showcase cars and motorcycles as objects or dynamic concepts deserving of affection, rather than simply as means of transportation.

Stable regulations encouraged fierce battles in all categories of car racing in Japan, with the champions of many series being decided only in the final race. There were also many topics of interest outside Japan as Toyota took its long-awaited maiden victory at the 24 Hours of Le Man as well as its first manufacturers' title in the World Rally Championship (WRC) since its return to the sport. In Formula 1, Honda signed supply contracts with several top teams for 2019 and beyond, news that has raised high expectations for the future. Interest is also growing in non-traditional race series such as Formula-E and the FIA Intercontinental Drifting Cup. The intentions of Japanese automakers in the future related to these events are another focus of attention. In the field of motorcycle racing, Honda won its third successive manufacturers' title in MotoGP, and Kawasaki won its fourth consecutive Superbike World Championship. The consistent success of Japanese manufacturers is a powerful showcase for Japan's technical capabilities.

## 2 Car Racing Trends

### 2.1. Trends in Japan (Table 1)

The two pillars of Japanese motor racing, Super GT and Super Formula saw tight battles for the top positions. The poor weather of the previous year (2017) carried over to the 2018 season and caused the cancellation of the second round of the Super Formula Championship. Despite the season being shortened to six rounds, the thrilling races proved as popular as ever with racing

fans.

#### 2.1.1. Super GT (Fig. 1)

Regulation changes in 2017 were primarily focused on aerodynamics to reduce downforce. These regulations carried over to 2018 and there were no other major changes. Although the specifications of common components such as the monocoque cannot be changed, the present regulations permit adjustments to aerodynamics and engines as a way of demonstrating the technical development prowess of the teams. The regulations covering aerodynamics do not permit changes to the upper body. However, the body shape below the so-called design line, as well as performance-related parts affecting the intake and exhaust system and combustion in the engine can be changed. Super GT uses the turbocharged 2.0-liter inline 4-cylinder Nippon Racing Engine (NRE), equipped with a fuel restrictor that limits fuel flow to 95 kg/h. The 2018 series took place over eight rounds, including the fifth running of an overseas round at the Buriram United International Circuit in Thailand.

In June 2018, the new Class One regulations were agreed, bringing Super GT into full harmonization with the regulations of the German Touring Car Masters (DTM) series. These regulations increase the number of common parts, including the suspension under-cowl, and the like. DTM cars also use turbocharged 2.0-liter inline 4-cylinder engines. The German series will introduce these regulations in 2019, followed by Japan in 2020. Races that combine Super GT and DTM cars are also being considered for 2019. The GT300 class attracted twenty-nine entries. Cars entered under three different performance categories defined by the "mother chassis" (MC) rules, the FIA GT3 regulations, and the JAF GT300 rule book.

#### 2.1.2. Super Formula (Fig. 2)

The 2018 Super Formula series was the fifth year of the current regulations adopting the SF14 chassis manufactured by Dallara Automobili and the standardized

Table 1 Details and Results of Major Car Racing Categories in 2018

Category	Outline of races	Outline of vehicles	Participating Japanese manufacturers	2018 champions		Remarks		
				Drivers	Manufacturers			
World championships	F1	21 rounds (circuits: Melbourne, Shanghai, Monaco, Singapore, Sochi, Suzuka, São Paulo, etc.)	Dedicated race cars (formula) Turbocharged 1.6-liter V6 engines + energy recovery	Honda	Lewis Hamilton	Mercedes		
	WEC	LMP1	8 rounds (circuits: Spa, Circuit de la Sarthe in Le Mans, Silverstone, Fuji, Shanghai, the U.S., etc.)	Dedicated race cars (prototypes) 2 WD (HVs may be 4 WD) HVs: free engine design + energy regeneration Non HVs: free engine design	Toyota	The latest season lasted from 2018 to 2019 and was decided in June 2019.		
		LMP2		Dedicated race cars (prototypes) 2 WD cars using 4.2-liter V8 engine from sole supplier				
		LM-GTE		2 WD cars based on commercially available vehicles Max. 5.5-liter NA engines Max. 4.0-liter turbocharged engines				
	Rally	WRC class	13 rounds on general roads (Monte Carlo, Sweden, Mexico, Argentina, UK, etc.)	4 WD cars based on commercially available vehicles Max. 1.6-liter turbocharged engines	Toyota	Sébastien Ogier/ Julien Ingrassia	Toyota	
		WRC-2 class	13 rounds on general roads (held at same venues as the WRC class)	4 WD cars based on commercially available vehicles Max. 1.6-liter turbocharged engines	—	Jan Kopecký/ Pavek Dresler		
		WRC-3 class	13 rounds on general roads (held at same venues as the WRC class)	2 WD cars based on commercially available vehicles Max. 1.6-liter turbocharged engines Max. 2.0-liter NA engines	—	Enrico Brazzoli/ Luca Beltrame		Canceled in 2018
		JWRC class	5 rounds on general roads (Turkey, Portugal, France, etc.)	In 2018, this class used a standardized Ford Fiesta R2.		Emil Bergkvist/ Johan Johansson		
	Touring cars	30 races at 10 venues (circuits: Marrakech, Hungaroring, Nürburgring, Zandvoort, Ningbo, Suzuka, Macao, etc.)	Cars based on commercially available vehicles 2 WD (FWD) Max. 2.0-liter 4-cylinder turbocharged engines	Honda	Gabriele Tarquini			
	International series	Super GT	GT500 class	8 rounds (circuits: Okayama, Fuji, Autopolis, Sugo, Suzuka, Thailand, Motegi)	Cars based on commercially available vehicles Front-engine RWD (Honda: mid-engine RWD) 2.0-liter inline 4-cylinder engines Standardized body dimensions (ground height, width, wheelbase, etc.) and main components	Toyota Nissan Honda	Naoki Yamamoto Jenson Button	
GT300 class				Cars based on commercially available vehicles Open specifications, including engine conversion, displacement, turbocharging, and driving wheels FIA GT3 vehicles	Toyota Nissan Honda Subaru	Haruki Kurosawa Naoya Gamou		
DTM		9 rounds (circuits: Hockenheim, Nürburgring, Brands Hatch, Shanghai, etc.)	Cars based on commercially available vehicles Front-engine RWD, 4.0-liter V8 NA engines					
IndyCar		17 rounds on oval circuits (Indianapolis, Phoenix, Toronto, Long Beach, etc.)	Dedicated race cars (formula) 2.2-liter V6 twin-turbocharged engines, ethanol fuel	Honda				
FIA Formula E		12 rounds on specially designed courses in cities (Hong Kong, Morocco, Mexico, Rome, Paris, Berlin, New York, etc.)	Dedicated race EVs Power units: motor-generator unit (MGU) (linked to rear axle), batteries: standardized		Jean-Eric Vergne			
Super Formula	7 rounds (circuits: Suzuka, Fuji, Motegi, etc.)	Dedicated race cars (formula) 2.0-liter inline 4-cylinder direct-injection turbocharged engines	Toyota Honda	Naoki Yamamoto		Second round canceled due to adverse weather. Sixth round changed to 200 km		

Table 1 Details and Results of Major Car Racing Categories in 2018 (Continued).

Category	Outline of races	Outline of vehicles	Participating Japanese manufacturers	2018 champions		Remarks
				Drivers	Manufacturers	
Japanese championships	F3	Dedicated race cars (formula) 2.0-liter inline 4-cylinder direct-injection NA engines 2.0-liter port injection NA engines	Toyota Tomei Engine Toda Racing	Sho Tsuboi		
	JRC	Commercially available vehicles Divided into 6 classes (JN1 to JN6) based on displacement and layout (4 WD, 2 WD).		JN6: Toshihiro Arai/ Naoya Tanaka JN5: Yuki Kohama/ Yuichi Baba JN4: Masato Sekine/ Kohei Kusaka JN3: Tomoyuki Amano/ Yukiko Inoue JN2: Masashi Nagasaki/ Noriaki Akita JN1: Hiroshi Furukawa/ Sachiko Hirota		
Others	Dakar Rally	Cars based on commercially available vehicles, dedicated racing trucks NA gasoline engines or turbo-charged diesel engines	Toyota Toyota Auto Body Co., Ltd. Hino	Nasser Al-Attiyah/ Matthieu Baumel	Toyota	



Fig. 1 Super GT: Car number 100 (Honda RAYBRIG NSX-GT)<sup>(1)</sup>



Fig. 2 Naoki Yamamoto of Team Mugen Driving Car No. 16, a Honda HR-417E, in Super Formula<sup>(1)</sup>

NRE engine also used in the GT500 series. In 2018, the first race of the season at Suzuka was extended from 250 to 300 km. This season saw the full-scale adoption of the dual-specification tire system that had been trialed in some races from 2016. In 2018, teams were required to use both soft and medium tires in all races. Super Formula intends to introduce the new SF19 chassis in 2019.

### 2. 1. 3. Formula 3 (F3)

The 2018 season was the final year of the global regulations requiring a direct-injection 2.0-liter engine and a standardized chassis from a single manufacturer. The 2018 Japanese Formula 3 Championship attracted sixteen entries with twenty-five drivers and five different engine suppliers. The series was fought over nineteen races in eight rounds, five of which were held in conjunction with Super Formula events and one as a supporting event for the 2018 6 Hours of Fuji FIA World Endurance Championship race.

In 2019, Formula 3 in Europe (the FIA Formula 3 Championship) will transition to cars designed under new specifications (including a standardized engine supplied by Mecachrome SAS and a new standardized chassis equipped with the “halo” cockpit protection system). In contrast, although the Japanese Formula 3 Championship intends to use the same specifications as 2018, there are plans to switch to new halo-equipped cars in 2020.

### 2. 1. 4. Japanese Rally Championship (Fig. 3)

Carrying over from 2017, the Japanese Rally Championship featured a total of ten rounds with entries in six classes (JN1 to JN6). In 2018, three races (one in Hokkaido and two races in Gunma Prefecture) were held under international rules. This year, five out of the ten rounds were held on gravel, with an average of around fifty cars participating in each. The 2018 season saw a wide variety of racing, with the JN5 class attracting cars entered



Fig. 3 Subaru WRX STI Driven by Toshihiro Arai and Naoya Tanaka in the JRC<sup>(4)</sup>



Fig. 4 Toyota Yaris in the WRC<sup>(2)</sup>



Fig. 5 Car No. 8 in the WEC, a Toyota TS050 Hybrid<sup>(2)</sup>

under the international Group R regulations.

There were no major changes to the regulations in 2018. Cars equipped with sport-rated continuously variable transmissions (CVTs) featured again in 2018, taking podium places in two consecutive races and providing new talking points.

The succession of events on gravel with only short intervals between races placed a major burden on teams and entrants, and will be a topic of discussion from next year. The events of the Japanese Rally Championship are held in regions around Japan. With the support of local authorities, various strategies were employed to create exciting spectacles for fans, including holding races in conjunction with other events, organizing ceremonial starts and special stages (SS), and arranging free admission.

The final round in Shinshiro, Aichi Prefecture was a particular standout with the presence of representatives from the International Automobile Federation (FIA) studying the potential to stage a WRC event in 2020 and demonstration runs from WRC cars. Thanks to developments like these, this should continue to be an exciting race series in the future.

## 2. 2. Trends outside Japan (Table 1)

Continuing on from 2017, the major World Championships saw engrossing battles in Formula 1 (F1), the World Endurance Championship (WEC), the WRC, and the World Touring Car Cup. Teams in F1 compete using dedicated turbocharged 1.6-liter V6 engines, energy recovery, and aerodynamics technologies. In the WEC, 2018 was a notable year in which Toyota took its long-awaited first victory at the 24 Hours of Le Mans, becoming the second victorious Japanese manufacturer after Mazda in 1991. In touring cars, the World Touring Car Championship (WTCC) was replaced by the World Touring Car Cup (WTCR) in 2018. This new series features

no manufacturers' title, and instead focuses on privateer-based drivers' and teams' titles.

### 2. 2. 1. FIA Formula One World Championship (F1)

Starting in 2014, 2018 was the fourth season in which F1 adopted a hybrid powertrain combining a 1.6-liter V6 engine with a single turbocharger and an energy recovery system (ERS). The halo cockpit protection system was introduced and the minimum weight of the cars was raised by 6 kg to 734 kg. The number of power units permitted to be used by each driver over the course of the year was lowered from four in 2017 to three in 2018, and the introduction timing of new specification parts was limited to twice a season. Lewis Hamilton took the Drivers' Championship for the second consecutive year, his fifth title in total.

### 2. 2. 2. FIA World Rally Championship (WRC) (Fig. 4)

In 2018, the WRC received entries from four works' teams: Toyota, Citroen, Hyundai, and Ford. Although Hyundai led the standings until midway through the season, Toyota won five races, with three coming over the closing stages, to take the Manufacturers' Championship in only its second year after returning to the sport. This was Toyota's fourth manufacturers' title and first since 1999. The battle for the Drivers' Championship remained tight until the end, with the pairing of Sébastien Ogier and Julien Ingrassia taking their sixth successive title driving for Ford.

### 2. 2. 3. FIA World Endurance Championship (WEC) (Fig. 5)

In 2018, with Toyota remaining the sole works' team,

the top LMP1 category was expanded to include non-hybrid privateer teams and performance-adjusted cars entering under the Equivalence of Technology (EoT) rules. This year featured a so-called super season, starting in the summer of 2018 and ending at the 24 Hours of Le Mans in 2019. In the early races of the season, Toyota demonstrated its superiority over the non-hybrid cars, which were permitted to utilize maximum power under the EoT rules, thanks to the boost from its hybrid system out of the corners. By the end of 2018, Toyota was first and second in the drivers' rankings, and top of the team rankings. The 2018 24 Hours of Le Mans was the second round of the season. In its twentieth attempt, Toyota finally won its first victory, becoming the second Japanese manufacturer to take the title since Mazda in 1991. However, 2018 was the first victory by a Japanese team/driver combination.

#### 2.2.4. World Touring Car Cup (WTCR)

The WTCR replace the WTCC in 2018. Under this change, the TCI technical regulations were replaced by the updated TCR regulations. The manufacturers' title was abolished in favor of Drivers' and Teams' Titles, with works' teams giving way to privateers. WTCR cars are front-wheel drive 4- or 5-door saloons or hatchbacks equipped with production turbocharged engines with a capacity between 1,750 and 2,000 cc and power of around 350 hp. Ten rounds were held at circuits around the world, with the Japanese event being held at Suzuka from October 26 to 28.

#### 2.2.5. FIA Intercontinental Drifting Cup (IDC) 2018

The second FIA IDC was held on a specially arranged circuit in the Daiba district of Tokyo between November 2 and 4, and featured twenty top drivers from thirteen countries and regions. Competitive drifting is reported to have started in Japan and events are now staged in over forty countries worldwide under various rules. The FIA created a set of uniform rules and decided to stage international competitions. The inaugural FIA IDC was held in Japan, the birthplace of drifting, in 2017.

Masato Kawabata of Japan took the first title, followed by a Russian driver in second and another Japanese driver in third. For the second event in 2018, the course layout and scoring system were radically changed, placing greater emphasis on human judging. This year, the event was won by Georgy Chivchyan of Russia, followed by a Swiss driver in second, and a driver from Thailand in third, demonstrating the growing international flavor

of the event. (This section was guest-written by Kanae Fukushima, the FIA Intercontinental Drifting Cup Media Officer.)

#### 2.2.6. FIA Formula E Championship

This, the fourth season of Formula E was held between December 2017 and July 2018. A total of twelve races were held at ten circuits around the world. This season of Formula E attracted twenty entries with growing participation from manufacturers, including Audi, Renault, Citroen, and Jaguar. Races last a maximum of 60 minutes with drivers switching cars mid-race since the current energy density of the batteries cannot offset the weight of the cars. However, from next season, Formula E plans to introduce new specifications enabling the cars to run the full race distance under almost the same weight regulations, mainly due to improvements in battery energy density.

### 3 Motorcycle Racing Trends

Table 2 lists the main categories of motorcycle races held inside and outside Japan, and the results of each competition.

As usual, 2018 saw many exciting races, but was also a year in which champion riders showed their strength in every category of motorcycle racing.

The various Grand Prix motorcycle racing series took place over nineteen rounds, including a new round at the Chang International Circuit, Buriram in Thailand. One race was canceled due to poor track conditions. Moves were made to unify the length of races at all circuits and in all classes, resulting in the number of laps per race being reduced.

Although MotoGP, the pinnacle of motorcycle racing, saw no major changes in regulations, the number of private test days was restricted for factory teams not receiving concessions under rules of MotoGP. The objective of this decision was to improve the competitive balance between teams by limiting the number of pre-race tests by the top teams. Although the maximum number of test days was left unchanged at five, the number of pre-race test days at Grand Prix circuits was capped at three. A number of other restrictions were also applied, but these also did not affect teams receiving concessions under the rules.

The MotoGP title race was dominated from the start by the consistent pace of Marc Márquez (Honda), who won nine races (Fig. 6). He clinched the title at the Grand

Table 2 Details and Results of Major Motorcycle Racing Categories in 2018

Category		Outline of races	Outline of motorcycles	Participating Japanese motorcycle manufacturers	2018 champions		
					Riders	Manufacturers	
World championships	Road races	MotoGP	19 rounds (1 round canceled). Competition for position by racing around a circuit (approximately 40 minutes). Races are held in different countries and the total of points awarded at each race determines the annual standings. MotoGP is the highest class.	Dedicated race bikes (prototypes), 4-cylinder max. 1,000 cc engines, minimum weight of 157 kg (max. 800 cc: 150 kg)	Honda Yamaha Suzuki	Marc Márquez	Honda
		Moto2	Dedicated race bikes combining a commercially available engine (4-cylinder, 600 cc) with frames developed by each constructor and minimum weight of 217 kg (including rider)	Honda (engine supplier)	Francesco Bagnaia	Kalex	
		Moto3	Dedicated race bikes, single cylinder max. 250 cc engines, minimum weight of 152 kg (including rider)	Honda	Jorge Martín	Honda	
	Superbikes	26 races in 13 rounds (1 race was canceled). Same competition style as road racing, but uses a two-heat system of two races in each round.	Based on commercially available bikes, 4-cylinder max. 1,000 cc engines (or 2-cylinder max. 1,200 cc), minimum weight of 168 kg	Honda Yamaha Kawasaki	Jonathan Rea	Kawasaki	
	Endurance	5 rounds. Road races in which teams compete for position with two or three riders alternating stints on a single bike over an extended period of time (8 or 24 hours).	Based on commercially available bikes, 4-cylinder max. 1,000 cc engines (or 2-cylinder max. 1,200 cc), minimum weight of 175 kg	Honda Yamaha Suzuki Kawasaki	Freddy Foray Josh Hook Alan Techer	Honda	
	Motocross	MXGP	40 races in 20 rounds. Competition for position on a motocross (unpaved dirt or sand) track that lasts for 30 minutes + 2 laps (two-heat system). Races are held in different countries and the total of points over a year determines the standings.	Dedicated motocross bikes, 4-stroke max. 450 cc engines (or 2-stroke max. 250 cc), minimum weight of 99 kg (4-stroke) or 98 kg (2-stroke)	Honda Yamaha Kawasaki	Jeffrey Herlings	KTM
		MX2	Dedicated motocross bikes, 4-stroke max. 250 cc engines (or 2-stroke max. 125 cc), minimum weight of 95 kg (4-stroke) or 88 kg (2-stroke)	Honda Yamaha Kawasaki	Jorge Prado	KTM	
	Trials	9 rounds. Competition to complete set courses within a time limit without touching the ground.	Dedicated trials bikes, no displacement restrictions, minimum weight of 69 kg	Honda	Toni Bou	Honda	
	Japanese championships	JSB1000 (road races)	12 races in 8 rounds. Competition for position by racing around a circuit (2-heat system). Highest class of the All Japan Road Race Championship.	Based on commercially available bikes, 4-cylinder max. 1,000 cc engines (or 2-cylinder max. 1,200 cc), minimum weight of 165 kg (2-stroke: 170 kg)	Honda Yamaha Suzuki Kawasaki	Katsuyuki Nakasuga	Yamaha
		IA1 (motocross)	18 races in 9 rounds (1 round was canceled). Competition for position on a motocross track lasting for roughly 30 minutes (2-heat system). Highest class of the All Japan Motocross Championship.	Dedicated motocross bikes, 4-stroke max. 450 cc engines (or 2-stroke max. 250 cc), minimum weight of 99 kg (4-stroke) or 98 kg (2-stroke)	Honda Yamaha Kawasaki	Akira Narita	Honda
IA super (trials)		7 rounds. Highest class of the All Japan Trial Championship.	Dedicated trials bikes, no displacement restrictions, minimum weight of 69 kg	Honda Yamaha	Tomoyuki Ogawa	Honda	
Others	Dakar Rally	Held in South America (Peru, Bolivia, Argentina) over total distance of approx. 8,000 km.	Dedicated rally models (prototypes), 2-cylinder max. 450 cc engines	Honda Yamaha	Matthias Walkner	KTM	



Fig. 6 MotoGP No. 93 (RC213V) Ridden by Marc Márquez<sup>(1)</sup>

Prix of Japan (the sixteenth round) with three races left. This was his fifth Riders' Championship, and third in succession. Márquez was followed by factory riders Andrea Dovizioso (Ducati), Valentino Rossi (Yamaha), Maverick Viñales (Yamaha), and Alex Rins (Suzuki), with Johann Zarco (Yamaha) in sixth duplicating last year's feat of being the top rider from a satellite team.

In Moto2, Francesco Bagnaia (Kalex) won the Riders' Championship with eight wins. Miguel Oliveira (KTM) was second with three wins. In 2019, these two riders

will step up to MotoGP alongside Joan Mir (Kalex, sixth place in 2018) and Fabio Quartararo (Speed Up, tenth place in 2018). From 2019, the 4-cylinder, 600cc Honda engine that has been used since the start of Moto2 in 2010 will be replaced by a 3-cylinder, 765cc Triumph engine.

In Moto3, Jorge Martín (Honda) won the Riders' Championship with eight wins before deciding to ride for KTM in Moto2 in 2019.

The Superbike World Championship (WSB) features bikes based on mass-market models. In 2018, seven manufacturers took part with twenty-six races scheduled over thirteen rounds (one race was canceled due to track conditions). The dominant rider in this racing category is Jonathan Rea (Kawasaki), who had won the previous three titles. To achieve competitive balance, the technical regulations for 2018 imposed rev limits according to results, forcing Kawasaki to race with a 600 rpm handicap to the other manufacturers. In fact, from the seventh race a further 250 rpm advantage was given to the other manufacturers for competitive reasons. Despite these unfavorable conditions, Rea dominated the series and repeated as champion, becoming the first rider to win four successive championships. The 2018 season saw Rea break a number of other records, including most wins in a season (17, tied for most ever), total wins (71), and consecutive wins (11). In 2019, any disappointment caused by Aprilia and MV Agusta leaving the championship was offset by new bikes from Ducati, Kawasaki, and BMW. The competitiveness of the Panigale V4 R, which features technology taken from MotoGP, is attracting particular interest. The series is also planning to expand its fan base through trials of three-race events and other innovations.

In the All Japan Road Race Championship, Katsuyuki Nakasuga won an unprecedented eighth championship racing for the Yamaha Factory Racing Team with a dominant eight wins out of eleven races. The final round of the 2018 FIM Endurance World Championship (EWC), the Suzuka 8 Hours Endurance Road Race, attracted attention due to the participation of World Champion Jonathan Rea and his Kawasaki Team Green. The race was won by the Yamaha Factory Racing Team after a solid performance saw them take their fourth victory in a row.

MXGP, the pinnacle of the FIM Motocross World Championship, was dominated by Jeffrey Herlings

(KTM), who won 33 races out of 40, including 17 in a row. He took his first Riders' Championship, unseating seven-time champion Tony Cairoli (KTM). In the All Japan Motocross Championship, the top IA1 class was won by Akira Narita (Honda), who became the champion for an unprecedented twelfth time.

Other series saw a number of new world records set as existing champions demonstrated their superiority, including the twelfth successive victory by Tony Bou in the FIM Trial World Championship, the sixth successive triumph by Tomoyuki Ogawa (Honda) in the All Japan Trial Championship, and the seventeenth successive win by a KTM ride in the bike class of the Dakar Rally.

## 4 Motor Sports Tire Trends

Most categories of motor sports inside and outside of Japan have come to use a sole tire supplier to reduce participation costs and create equally competitive conditions. Although F1 and MotoGP are the most famous examples, it is a strong trend in Japanese motor racing as well.

However, some race series still persist with competition between multiple tire manufacturers. In car racing, the most famous example is Super GT, joined by the top OK class of the All Japan Karting Championship. (Since this only occurred at one round of the championship, specially developed high-performance tires were brought in.) In bike racing, the EWC, which includes the Suzuka 8 Hours Endurance Road Race, also permits competition between tire manufacturers. Super GT is particularly notable as the series permitting the widest tire competition (Fig. 7), with tires being supplied by four manufacturers (Bridgestone, Dunlop, Yokohama, and Michelin). The 86/BRZ Race Series, which is attracting a growing number of participants, also allows tire competition. In 2018, up to five tire manufacturers participated across different classes. These series that encourage tire competition are



Fig. 7 Tire Used in Super GT<sup>®</sup>

particularly thrilling to watch and compete in, and it is hoped that this situation will continue in the future.

Another global trend is changes in tire sizes (rim diameter). It is hoped that adopting dedicated racing tire sizes closer to those found on normal passenger cars will facilitate the feedback of technology developed under extreme racing conditions to passenger car tires. One major development is the decision by F1, which has a long history of using 13-inch tires, to switch to 18-inch tires in 2021. This trend has also occurred in motorcycle racing. In 2016, MotoGP switched from 16.5-inch rims, which are

not used by ordinary road bikes, to 17-inch rims. The EWC series and Suzuka 8 Hours made the same switch in 2017.

#### References

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