



Recommendation ITU-R M.1797
(03/2007)

Vocabulary of terms for the land mobile service

M Series
**Mobile, radiodetermination, amateur
and related satellite services**



International
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Foreword

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RA	Radio astronomy
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S	Fixed-satellite service
SA	Space applications and meteorology
SF	Frequency sharing and coordination between fixed-satellite and fixed service systems
SM	Spectrum management
SNG	Satellite news gathering
TF	Time signals and frequency standards emissions
V	Vocabulary and related subjects

Note: This ITU-R Recommendation was approved in English under the procedure detailed in Resolution ITU-R 1.

Electronic Publication
Geneva, 2010

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RECOMMENDATION ITU-R M.1797*

Vocabulary of terms for the land mobile service

(2007)

Scope

This Recommendation provides a vocabulary of terms and definitions for the land mobile service which may also be applicable to other radiocommunication services.

The ITU Radiocommunication Assembly,

considering

- a) that the terrestrial mobile service applications are growing at a rapid rate;
- b) that new vocabulary of terms is being introduced to accommodate this growth;
- c) that there is a need for clear definition of terminology, used in ITU-R Recommendations and other texts in order to use them in an unambiguous way,

noting

- a) that Recommendation ITU-R M.1224 contains vocabulary of terms for the international mobile telecommunications-2000 (IMT-2000);
- b) that Recommendation ITU-R F.1399 contains vocabulary of terms for wireless access;
- c) that Recommendation ITU-R F.592-2 contains vocabulary of terms for the fixed service;
- d) that Recommendation ITU-R V.573 contains terms of radiocommunications vocabulary;
- e) that Recommendation ITU-R V.662 contains general terms and definitions used in the International Electrotechnical Vocabulary (IEV);
- f) that Recommendation ITU-R V.666 contains abbreviations and initials used in telecommunications,

recommends

- 1** that the vocabulary of terms and definitions in Annex 1 should be used in texts relating to the land mobile service.

NOTE 1 – This vocabulary may also be applicable to other radiocommunication services.

* This Recommendation should be brought to the attention of the Coordination Committee for vocabulary (CCV).

Annex 1

Vocabulary of terms for the land mobile service

1 Terms related to antennas

Antenna

F:	<i>antenne</i>
S:	<i>antena</i>
A:	هوائي
C:	天线
R:	антенна

Any structure or device used to collect or radiate electromagnetic power.

Radiation pattern, antenna radiation pattern

F:	<i>diagramme de rayonnement, diagramme de rayonnement de l'antenne</i>
S:	<i>diagrama de radiación de la antena</i>
A:	مخطط الإشعاع، مخطط إشعاع الهوائي
C:	辐射方向图, 天线辐射方向图
R:	диаграмма направленности, диаграмма направленности антенны

The variation of the transmitted power of an *antenna* in three-dimensional space, usually expressed as an angular function with respect to a reference direction.

NOTE 1 – A radiation pattern is usually represented graphically for the far-field conditions in either horizontal or vertical plane.

Main-lobe, antenna main-lobe

F:	<i>lobe principal, lobe principal d'une antenne</i>
S:	<i>lóbulo principal, lóbulo principal de una antena</i>
A:	فص رئيسي، فص رئيسي لهوائي
C:	主瓣, 天线主瓣
R:	главный лепесток, главный лепесток диаграммы направленности антенны

The part of an *antenna radiation pattern* containing the direction of maximum radiation (exhibiting the greatest field strength), which is referred to as the direction of the main-lobe.

NOTE 1 – For a receive antenna it is the part of the receive pattern containing the direction of maximum sensitivity. The width of the main-lobe is usually specified as the angle encompassed between the points where the power has fallen 3 dB below the maximum value. The horizontal radiation pattern, i.e. that which is plotted as a function of azimuth about the antenna, is usually specified. The vertical radiation pattern, i.e. that which is plotted as a function of elevation from a specified azimuth, is also of interest and may be similarly specified.

Antenna downtilt

F:	<i>inclinaison de l'antenne vers le bas</i>
S:	<i>inclinación de la antena hacia abajo</i>
A:	ميل تدريجي للهوائي نحو الأسفل
C:	天线下倾
R:	наклон антенны вниз

Direction of the *main-lobe* of an *antenna* in the downward direction with respect to the horizontal plane.

NOTE 1 – The antenna downtilt can be accomplished either mechanically or electrically, and if both are implemented their effect is additive.

Downtilt angle, antenna downtilt angle

F:	<i>angle d'inclinaison vers le bas, angle d'inclinaison de l'antenne vers le bas</i>
S:	<i>ángulo de inclinación hacia abajo, ángulo de inclinación de la antena hacia abajo</i>
A:	زاوية الميل التدريجي للهوائي نحو الأسفل، زاوية الميل التدريجي نحو الأسفل
C:	下倾角度, 天线下倾角
R:	угол наклона вниз, угол наклона антенны вниз

The angle between the direction of the *main-lobe* and the horizontal plane.

NOTE 1 – It is a positive number for downtilt and a negative number for uptilt.

Mechanical downtilt, mechanical antenna downtilt

F:	<i>inclinaison mécanique vers le bas, inclinaison mécanique de l'antenne vers le bas</i>
S:	<i>inclinación mecánica hacia abajo, inclinación mecánica de la antena hacia abajo</i>
A:	ميل تدريجي ميكانيكي نحو الأسفل، ميل تدريجي ميكانيكي للهوائي نحو الأسفل
C:	机械下倾, 机械天线下倾
R:	механический наклон вниз, механический наклон антенны вниз

An *antenna downtilt* that is accomplished by physically adjusting the mounting of the antenna structure.

Electrical downtilt, electrical antenna downtilt

F:	<i>inclinaison électrique vers le bas, inclinaison électrique de l'antenne vers le bas</i>
S:	<i>inclinación eléctrica hacia abajo, inclinación eléctrica de la antena hacia abajo</i>
A:	ميل تدريجي كهربائي للهوائي نحو الأسفل، ميل تدريجي كهربائي نحو الأسفل
C:	电调下倾, 电调天线下倾
R:	электрический наклон вниз, электрический наклон антенны вниз

An *antenna downtilt* that is accomplished by adjusting the phasing of the antenna elements, or by similar electrical means.

Adaptive antenna system (AAS)

F:	<i>système d'antenne adaptative (AAS)</i>
S:	<i>sistema de antena adaptativa (AAS)</i>
A:	نظام هوائي تكيفي
C:	自适应天线系统
R:	адаптивная антенная система

An array of antennas and associated signal processing that together is able to change its antenna radiation pattern dynamically to adjust to noise environment, interference and multipath.

NOTE 1 – Adaptive arrays form an infinite number of patterns (scenario-based) that are adjusted in real-time. Adaptive antennas are one kind of smart antennas.

Adaptive spatial processing

F:	<i>traitement spatial adaptatif</i>
S:	<i>tratamiento espacial adaptativo</i>
A:	معالجة فضائية تكيفية
C:	自适应空间处理
R:	адаптивная пространственная обработка

An advanced signal processing technique that integrates a higher level of measurement and analysis of the scattering aspects of the RF environment to maximize the use of multiple antennas, combining signals in space in a method that transcends a one user-one beam methodology.

Antenna diversity combining

F:	<i>combinaison par diversité d'antennes</i>
S:	<i>combinación por diversidad de antenas</i>
A:	تجميع من مختلف الهوائيات
C:	天线分集合并
R:	сложение разнесённых сигналов от антенн

A technique of coherently combining the signals from multiple antennas to produce an increase of the desired signal strength.

NOTE 1 – Diversity combining uses all antenna elements at all times for each user, creating an antenna pattern that dynamically adjusts to the propagation environment.

Multibeam antenna

F:	<i>antenne multi-faisceaux</i>
S:	<i>antena de haces múltiples</i>
A:	هوائي متعدد الحزم
C:	多波束天线
R:	многолучевая антенна

An antenna system that uses multiple beams at an antenna site for transmission and/or reception.

NOTE 1 – Multibeam systems may or may not be adaptive.

Multiple-input multiple-output (MIMO)

F:	<i>entrées multiples et sorties multiples (MIMO) ou systèmes multi antennes</i>
S:	<i>entradas múltiples y salidas múltiples (MIMO) en un sistema de antenas múltiples</i>
A:	تعدد الدخول والخرج في نظام متعدد الهوائيات
C:	多端入多端出
R:	система с многими входами и многими выходами (MIMO)

A technique that utilizes multiple antennas on both ends of the transmit-receive channel, e.g. at both the base station and the terminal(s) in a wireless network, to provide significant improvements in the capacity or reliability of the system.

NOTE 1 – This is accomplished by exploiting the complex multipath propagation channels typically found in terrestrial mobile communications.

NOTE 2 – There are many alternative solutions within this family of techniques, but they are all based on using the same time and frequency (or code) resource(s) by using multiple antenna elements at both ends of the transmit-receive channel.

Single-user MIMO

<i>F:</i>	<i>système multi-antennes dédié à un usager unique</i>
<i>S:</i>	<i>sistema de antenas múltiples dedicado a un usuario único</i>
<i>A:</i>	نظام متعدد الهوائيات مكرس لمستخدم واحد
<i>C:</i>	单用户多端入多端出
<i>R:</i>	система MIMO для обслуживания одного пользователя

A MIMO technique in which a MIMO channel is used by multiple antennas at both a base station and a terminal in a wireless network and this MIMO resource is solely assigned to this particular terminal.

Multi-user MIMO

<i>F:</i>	<i>système multi-antennes dédié à de multiples usagers</i>
<i>S:</i>	<i>sistema de antenas múltiples dedicado a múltiples usuarios</i>
<i>A:</i>	نظام متعدد الهوائيات مكرس لعدة مستعملين
<i>C:</i>	多用户多端入多端出
<i>R:</i>	система MIMO для обслуживания многих пользователей

A MIMO technique in which a MIMO channel is used by multiple antennas at both a base station and more than one terminal in a wireless network and this MIMO resource is shared by every terminal that takes part in this MIMO channel.

Closed-loop MIMO

<i>F:</i>	<i>système multi-antennes avec boucle fermée d'asservissement</i>
<i>S:</i>	<i>sistema de antenas múltiples con control de bucle cerrado</i>
<i>A:</i>	نظام متعدد الهوائيات مغلق العروة
<i>C:</i>	闭环多端入多端出
<i>R:</i>	система MIMO с обратной связью

A MIMO technique in which a MIMO transmitter uses receiver feedback to adapt its MIMO transmission to the channel condition.

Smart antenna signal gain

<i>F:</i>	<i>gain de signal d'antenne intelligente</i>
<i>S:</i>	<i>ganancia de señal de antena inteligente</i>
<i>A:</i>	كسب في إشارة هوائي نكي
<i>C:</i>	智能天线信号增益
<i>R:</i>	коэффициент усиления интеллектуальной антенны

The increase in the desired signal strength resulting from combining inputs from multiple antennas to optimize available power required to establish given level of coverage.

Smart antenna

<i>F:</i>	<i>antenne intelligente</i>
<i>S:</i>	<i>antena inteligente</i>
<i>A:</i>	هوائي نكي
<i>C:</i>	智能天线
<i>R:</i>	интеллектуальная антенна

A system of antennas that combines multiple antenna elements with a signal-processing capability to optimize its radiation and/or reception pattern automatically in response to the signal environment.

NOTE 1 – The two major categories of smart antennas, based on the choice of transmit strategy, are *adaptive antennas* and *switched-beam antennas*.

Space-time coding

F:	<i>codage spatio-temporel</i>
S:	<i>codificación espacio-temporal</i>
A:	تشفير فضائي زمني
C:	时空编码
R:	<i>пространственно-временное кодирование</i>

A transmit diversity technique that takes advantage of the spatial dimension by transmitting a number of data streams using multiple co-located antennas and uses various coding structures and different time-slots that exploit multipath effects in order to achieve very high spectral efficiencies.

Spatial diversity

F:	<i>diversité d'espace</i>
S:	<i>diversidad espacial</i>
A:	تنوع فضائي
C:	空间分集
R:	<i>пространственное разнесение</i>

A technique in which the received composite signal strength from the antenna array is used to minimize fading and other undesirable effects of multipath propagation.

Spatial division multiple access (SDMA)

F:	<i>accès multiple par répartition dans l'espace (SDMA)</i>
S:	<i>acceso múltiple por división en el espacio (AMDF)</i>
A:	نفاذ متعدد بتقسيم فضائي
C:	空分多址接入
R:	<i>множественный доступ с пространственным разнесением (SDMA)</i>

The use of *adaptive spatial processing* techniques to create independent spatial channels for multiple access, either through smart antenna technology or multi-user MIMO.

NOTE 1 – This scheme can adapt the frequency allocations to where the most users are located and achieves superior levels of interference suppression, making possible more efficient reuse of frequencies than the standard fixed hexagonal reuse patterns.

Steered-beam antenna system

F:	<i>système d'antennes à faisceaux orientables</i>
S:	<i>sistema de antenas de haces dirigibles</i>
A:	نظام هوائيات بحزم موجهة
C:	可控波束天线系统
R:	<i>антенна с управляемым положением диаграммы направленности</i>

An approach that utilizes phased-array antennas, with multiple antenna elements in pairs or equally spaced, to create a narrower main beam directed only to the intended mobile on the forward link and steered towards the mobile as it moves.

NOTE 1 – Steered-beam antenna systems are one kind of smart antenna systems.

Switched-beam antenna system

F:	<i>système d'antennes à faisceaux commutés</i>
S:	<i>sistema de antenas de haces conmutados</i>
A:	نظام هوائيات بتبديل الحزم
C:	波束转换天线系统
R:	антенна с переключением лепестков диаграммы направленности

An antenna system that creates a number of fixed beams at an antenna site, allowing the receiver to select the beam that provides the greatest signal enhancement and interference reduction.

NOTE 1 – Switched beam systems form a finite number of fixed, predefined patterns or combining strategies (sectors).

NOTE 2 – Switched beam systems can be thought of as a “micro-sectorization” strategy.

Switched diversity

F:	<i>diversité par commutation</i>
S:	<i>diversidad por conmutación</i>
A:	تنوع التبديل
C:	交换分集
R:	разнесение с переключением сигнала

A technique of switching the receive channel to one of multiple antennas to select the antenna with the maximum signal strength.

2 Terms related to public protection and disaster relief

Public protection (PP) radiocommunication

F:	<i>radiocommunications pour la protection du public (PP)</i>
S:	<i>radiocomunicaciones para la protección pública (PP)</i>
A:	الاتصالات الراديوية لحماية الجمهور
C:	公共保护无线电通信
R:	связь для целей общественной безопасности

Radiocommunication used by responsible agencies and organizations dealing with maintenance of law and order, protection of life and property, and emergency situations.

Disaster relief (DR) radiocommunication

F:	<i>radiocommunications pour les secours en cas de catastrophe (DR)</i>
S:	<i>radiocomunicaciones para operaciones de socorro (DR)</i>
A:	الاتصالات الراديوية للإغاثة وقت الكوارث
C:	灾害防护无线电通信
R:	связь в случаях чрезвычайных ситуаций

Radiocommunication used by agencies and organizations dealing with a serious disruption of the functioning of society, posing a significant, widespread threat to human life, health, property or the environment, whether caused by accident, nature or human activity, and whether developing suddenly or as a result of unexpected complex, long-term process.

3 Terms related to intelligent transport systems

Intelligent transport systems (ITS)

F:	<i>systèmes de transport intelligents (STI)</i>
S:	<i>sistemas de transporte inteligentes (ITS)</i>
A:	أنظمة النقل الذكية
C:	智能交通系统
R:	интеллектуальные транспортные системы

Systems utilizing the combination of computers, communications, positioning, and automation technologies to improve the safety, management, and efficiency of terrestrial transportation.

Dedicated short-range communications (DSRC)

F:	<i>communications spécialisées à courte distance (DSRC)</i>
S:	<i>comunicaciones especializadas de corto alcance (DSRC)</i>
A:	الاتصالات المكرسة قصيرة المدى
C:	专用短距离通信
R:	специализированная связь малого радиуса действия

Wireless techniques to transfer data over short distances between roadside and mobile radio units, between mobile units, and between portable and mobile units to perform operations related to the improvement of traffic flow, and traffic safety.

Vehicle information and communication system (VICS)

F:	<i>système d'information et de communication du véhicule (VICS)</i>
S:	<i>sistema de información y de comunicación del vehículo (VICS)</i>
A:	نظام المعلومات والاتصالات على متن المركبة
C:	车载信息和通信系统
R:	система сбора и обмена информацией на транспорте

One-way dedicated short-range communication (DSRC) that links a roadside infrastructure to travelling vehicles or mobile platforms.

NOTE 1 – The system is intended to provide information on traffic conditions and other route guidance messages over intermittent zones in anticipation of adverse travel conditions.

Vehicular telematics

F:	<i>télématique véhiculaire or télématique embarquée</i>
S:	<i>telemática vehicular</i>
A:	الاتصالات المعلوماتية على متن المركبة
C:	车载信息服务系统
R:	системы телематики на транспорте

The range of “telecommunications” and “informatics” consumer products, services and supporting systems appearing in vehicles, from global positioning systems (GPS) to real-time traffic maps.

Collision avoidance radar

F:	<i>radar anti-collision</i>
S:	<i>radar anticollisión</i>
A:	رادار تجنب الاصطدام
C:	防撞雷达
R:	радары предупреждения столкновения

A system used to detect the presence of objects in the surrounding area of vehicles to determine their positions and ultimately follow their movements to avoid collision.

Electronic toll collection (ETC)

F:	<i>péage électronique (ETC)</i>
S:	<i>peaje electrónico (ETC)</i>
A:	تحصيل رسوم العبور إلكترونياً
C:	电子收费系统
R:	электронная система сбора платежей

A technique using wireless means to read a unique electronic tag on vehicles for the purpose of toll collection. The toll will then be debited automatically to the driver's bank account, or deducted from a prepurchased package of electronic credits stored in a chip on the driver's personal toll card.

On-board equipment (OBE)

F:	<i>équipement de bord</i>
S:	<i>equipo a bordo</i>
A:	المعدات على متن المركبة
C:	车载设备
R:	оборудование, размещаемое на подвижных объектах

OBE is attached near the dashboard or on the windscreen of the vehicle, and consists of radiocommunication circuits, an application processing circuit and so on. It usually has a human-machine interface including switches, displays and buzzer.

Roadside equipment (RSE)

F:	<i>équipement de bord de route</i>
S:	<i>equipo al borde de la carretera</i>
A:	المعدات على جانب الطريق
C:	路边设备
R:	оборудование, размещаемое вдоль дороги

RSE is installed above or alongside the road and communicates with passing OBE by the use of radio signals. RSE consists of radiocommunication circuits, an application processing circuit and so on. It usually has a link to the roadside system to exchange data.

4 Terms related to mesh/relay networks

Ad hoc network, wireless ad hoc network

F:	<i>réseau ad hoc, réseau ad hoc sans fil</i>
S:	<i>red ad hoc, red inalámbrica ad hoc</i>
A:	شبكة مخصصة، شبكة مخصصة لاسلكية
C:	自组织网络, 无线自组织网络
R:	специальная сеть, беспроводная специальная сеть

A network in which all stations can communicate directly with all stations which are part of the network.

NOTE 1 – An ad hoc network does not require an *infrastructure*.

Peer-to-peer network, wireless peer-to-peer network

F:	<i>réseau d'entités homologues, réseau d'entités homologues sans fil</i>
S:	<i>red entre entidades semejantes, red inalámbrica entre entidades semejantes</i>
A:	شبكة نظير لنظير، شبكة نظير لنظير لاسلكية
C:	对等网络, 无线对等网络
R:	одноранговая сеть, беспроводная одноранговая сеть

See: Ad hoc network, wireless ad hoc network.

Mesh network, wireless mesh network

F:	<i>réseau maillé, réseau maillé sans fil</i>
S:	<i>red en malla, red inalámbrica en malla</i>
A:	شبكة متشابكة، شبكة متشابكة لاسلكية
C:	网状网络, 无线网状网
R:	ячеистая сеть, беспроводная ячеистая сеть

A network in which there are two or more paths to any node.

NOTE 1 – There are two types of mesh networks: full mesh and partial mesh. In a full mesh every node is connected to every other node in the network. In a partial mesh some nodes may be organized in a full mesh scheme but others can only connect to some nodes in the network.

Relay, relay station, wireless relay

F:	<i>relais, station de relais, relais sans fil</i>
S:	<i>repetidor, estación repetidora, repetidor inalámbrico</i>
A:	مرحل، محطة مرحلات، مرهل لاسلكي
C:	中继, 中继站, 无线中继
R:	релейная станция, ретрансляционная станция, беспроводная релейная станция

A station that performs message/signal transfer without any reference to a user application.

Relay network, wireless relay network

F:	<i>réseau de relais, réseau de relais sans fil</i>
S:	<i>red de repetidores, red inalámbrica de repetidores</i>
A:	شبكة مرحلات، شبكة مرحلات لاسلكية
C:	中继网, 无线中继网
R:	релейная сеть, беспроводная релейная сеть

A network of *relay stations*.

NOTE 1 – Relay networks can be one-hop or multi-hop. One-hop relays are implemented with P-P and/or P-MP techniques. Multi-hop relays are implemented using MP-MP techniques to form a mesh.

NOTE 2 – The *relay stations* in a network can be fixed, nomadic or mobile.

Infrastructure, network infrastructure

F:	<i>infrastructure, infrastructure du réseau</i>
S:	<i>infraestructura, infraestructura de la red</i>
A:	البنية التحتية، البنية التحتية للشبكة
C:	基础设施, 网络基础设施
R:	инфраструктура, инфраструктура сети

A set of interconnected network elements that support telecommunications.

NOTE 1 – The network infrastructure is generally understood as the fixed network excluding the terminals, and may include both the access network and the core network.

Ancillary infrastructure, ancillary network infrastructure

<i>F:</i>	<i>infrastructure auxiliaire, infrastructure auxiliaire du réseau</i>
<i>S:</i>	<i>infraestructura auxiliar, infraestructura auxiliar de la red</i>
<i>A:</i>	بنية تحتية مساعدة، البنية التحتية المساعدة للشبكة
<i>C:</i>	辅助基础设施, 辅助网络基础设施
<i>R:</i>	вспомогательная инфраструктура, вспомогательная инфраструктура сети

A set of interconnected nomadic and mobile network elements, providing subsidiary support to telecommunications.

Client relay, client relay station, client wireless relay

<i>F:</i>	<i>relais client, station relais client, relais client sans fil</i>
<i>S:</i>	<i>repetidor de cliente, estación repetidora de cliente, repetidor inalámbrico de cliente</i>
<i>A:</i>	مرحل العميل، محطة مرحدات العميل، مرحدات العميل اللاسلكية
<i>C:</i>	客户中继, 客户中继站, 无线客户中继
<i>R:</i>	клиентская релейная станция, клиентская ретрансляционная станция, клиентская беспроводная релейная станция

A relay station implemented on a client device.

Client relay network, client wireless relay network

<i>F:</i>	<i>réseau de relais client, réseau sans fil de relais client</i>
<i>S:</i>	<i>red de repetidores de cliente, red inalámbrica de repetidores de cliente</i>
<i>A:</i>	شبكة مرحدات العميل، شبكة مرحدات العميل اللاسلكية
<i>C:</i>	客户中继网, 无线客户中继网
<i>R:</i>	клиентская релейная сеть, клиентская беспроводная релейная сеть

A network of relay stations implemented on client devices.

NOTE 1 – The relay stations in a client relay network can be fixed or nomadic.

5 Terms related to the use of technology**Software defined radio (SDR)**

<i>F:</i>	<i>radio définie par logiciel (SDR)</i>
<i>S:</i>	<i>radio definida por soporte lógico (SDR)</i>
<i>A:</i>	راديو معرف برمجيا
<i>C:</i>	软件定义无线电
<i>R:</i>	радиооборудование с программно определяемыми параметрами

A radio in which the RF operating parameters including, but not limited to, frequency range, modulation type, or output power can be set or altered by software, and/or the technique by which this is achieved.

NOTE 1 – Excludes changes to operating parameters which occur during the normal pre-installed and predetermined operation of a radio according to a system specification or standard.

NOTE 2 – SDR is an implementation technique applicable to many radio technologies and standards.

NOTE 3 – Within the mobile service, SDR techniques are applicable to both transmitters and receivers.

6 Acronyms and abbreviations used in mobile systems

AA	Adaptive antenna
AAS	Adaptive antenna system
CSI	Channel status information
DR	Disaster relief
DSRC	Dedicated short-range communications
ETC	Electronic toll collection
GPS	Global positioning system
ITS	Intelligent transport systems
MIMO	Multiple-input multiple-output
PP	Public protection
PPDR	Public protection and disaster relief
SDMA	Spatial division multiple access
SDR	Software defined radio
TICS	Transport information and control systems (TICS is now referred to as ITS)
UWB	Ultra-wide band
VICS	Vehicle information and communication system
