

F5521gw Technical Description

DESCRIPTION



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Abstract

This document presents the technical specifications, operational and regulatory information as well as environmental declaration of the F5521gw mobile broadband module from Ericsson.

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1 Technical Specifications

1.1 General

Attribute	Data Standard variant
Product name	F5521gw
Card type	PCI Express Full-Mini Card type F2
System	GSM 850 E-GSM 900 GSM 1800 GSM 1900 UMTS 800 UMTS 850 UMTS 900 UMTS 1900 UMTS 2100 GPS
Services supported	GSM: Packet-Switched data GPRS/EDGE, SMS, UMTS: Packet-Switched data, HSPA, HSPA Evolution, SMS, GPS: Stand alone, PGPS™, A-GPS SUPL 1.0, GPS data output format NMEA-0183 4.0, Windows® 7 Microsoft Sensor Class
SIM Card	USIM, GPRS-aware and Regular (non-GPRS-aware) supported 3 V and 1.8 V type
Certification and Type Approval	CE R&TTE FCC IC PTCRB GCF UL Microsoft WHQL
Speech services	Speech services are not supported

Attribute	Data Standard variant
Modes	PDP type IP
IP Allocation	Dynamic
Type Number	KRD 131 18/1
FCC ID	VV7-MBMF5521GW1
IC	287AG-MBMF5521GW1

1.1.1

Exterior Description

Attribute	Data
Size	PCI Express Full Mini Card type F2
Weight	<12 g
System connector	52-pin card edge type connector
Antenna connector	U.FL connectors, 50 ohm nominal impedance Main: Main TX/RX GSM/UMTS antenna connector Aux: GPS and UMTS RX diversity antenna connector

1.1.2

Environment

Attribute	Data
Ambient Temperature: Operating	-10°C to 65°C
Ambient Temperature: Storage	-30°C to 85°C
Directives	WEEE (Waste Electrical and Electronic Equipment Directive) RoHS (Restriction of use of certain Hazardous Substances)

1.1.3

Electrical Interfaces

Attribute	Data
Main communication and data	USB 2.0
Auxiliary communication	SMBus 2.0
Radio status	LED
Radio control	Wireless Disable
UICC interface	User Identity Module (UIM) – SIM

1.1.4

Power Supply

Attribute	Data
Supported Voltage Range	3.0 V – 3.6 V (3.3 V \pm 9%)
Nominal Operating Voltage	3.3 V
Average Standby Power (Radio off)	< 10 mW
Average Idle Power (Attached to network)	< 10 mW

1.1.5

Host Specification

Attribute	Data
Minimum Host Specification	CPU & Memory as recommended by operating system PCI Express Mini Card compatible slot (USB) with GSM/UMTS/GPS two-port antenna system UICC reader

1.2 UMTS Technical Data

Attribute	Data				
Power Class	Class 3 (24dBm)				
Frequency bands	Band V (850)	Band VI (800)	Band VIII (900)	Band II (1900)	Band I (2100)
Frequency Range (MHz)	TX: 824-849	TX: 830-840	TX: 880 - 915	TX: 1850-1910	TX: 1920-1980
	RX: 869-894	RX: 875-885	RX: 925 - 960	RX: 1930-1990	RX: 2110-2170
Duplex spacing	45 MHz	45 MHz	45 MHz	80 MHz	190 MHz
Advanced Receiver	Type I, Type II, Type III, Type 3i				
Features	Inter-Mode Handover (UMTS/EDGE/GPRS) Inter-Mode Reselection (UMTS/EDGE/GPRS)				
Quality Of Service	UMTS classes supported via AT Command (Wireless Manager selects default)				

1.2.1 WCDMA Technical Data

Attribute	Data
Maximum Downlink speed ¹	384 kbps (Packet-Switched)
Maximum Uplink speed ¹	384 kbps (Packet-Switched)

1.2.2 HSPA Technical Data

Attribute	Data
Maximum Downlink Speed ²	14.4 Mbps
Maximum Uplink Speed ²	5.76 Mbps
HSDPA Categories	Categories up to 14.4 Mbps (Category 1-12)
HSUPA Categories	Categories up to 5.76 Mbps (Category 1-6)

¹ Speed achieved depends on the UMTS Network providing the service. The speed in the table includes header and data.

² Speed achieved depends on the UMTS Network providing the service. The speed in the table includes header and data.

1.2.3

HSPA Evolution Technical Data

Attribute	Data
Maximum Downlink Speed ²	21 Mbps
HSDPA Categories	Categories up to 21 Mbps (Category 13-14)

1.3

GSM Technical Data

Attribute	Data			
Frequency Bands	GSM 850	E-GSM 900	GSM 1800	GSM 1900
Frequency range (MHz)	TX: 824-849	TX: 880-914	TX: 1710-1785	TX: 1850-1910
	RX: 869-894	RX: 925-959	RX: 1805-1880	RX: 1930-1990
Duplex spacing	45 MHz	45 MHz	95 MHz	80 MHz
Channel Spacing	200kHz	200kHz	200kHz	200kHz
Number of channels	123 Carriers x 8 (TDMA)	175 Carriers x 8 (TDMA)	374 Carriers x 8 (TDMA)	299 Carriers x 8 (TDMA)
Modulation	GMSK 8-PSK	GMSK 8-PSK	GMSK 8-PSK	GMSK 8-PSK
Power Class GSM/GPRS; EGPRS MCS1-4 (GMSK)	Class 4	Class 4	Class 1	Class 1
	2 W	2 W	1 W	1 W
	33 dBm	33 dBm	30 dBm	30 dBm
Power Class EGPRS MCS5-9 (8-PSK)	Class E2	Class E2	Class E2	Class E2
	0.5 W	0.5 W	0.4 W	0.4 W
	27 dBm	27 dBm	26 dBm	26 dBm

1.3.1

GPRS Technical Data

Attribute	Data
Device Class	GPRS Multi-slot class 12 supported (see table below for data rates): (Maximum 4 slots uplink, maximum 4 slots downlink, maximum 5 slots concurrent)
Modulation Coding Schemes	CS-1 to CS-4
Mode of Operation	Class B (attaches to both GSM and GPRS at the same time)

1.3.2

GPRS Maximum Data Rates³

Coding Scheme	Data Rate per slot	4 + 1		3 + 2	
		Rx	Tx	Rx	Tx
CS-1	9.05	36.2	9.05	27.15	18.1
CS-2	13.4	53.6	13.4	40.2	26.8
CS-3	15.6	62.4	15.6	46.8	31.2
CS-4	21.4	85.6	21.4	64.2	42.8
Coding Scheme	Data Rate per slot	2 + 3		1 + 4	
		Rx	Tx	Rx	Tx
CS-1	9.05	18.1	27.15	9.05	36.2
CS-2	13.4	26.8	40.2	13.4	53.6
CS-3	15.6	31.2	46.8	15.6	62.4
CS-4	21.4	42.8	64.2	21.4	85.6

1.3.3

EDGE Technical Data

Attribute	Data
Device Class	EDGE Multi-slot Class 12 (see table below for data rates): (Maximum 4 slots uplink, maximum 4 slots downlink, maximum 5 slots concurrent)
Modulation Coding Schemes	MCS-1 to MCS-9
EDGE features	Link Adaptation Incremental Redundancy Extended Uplink TBF Network Assisted Cell Change (NACC)

³ Speed achieved depends on the Coding Scheme supported by the GSM Network. Data rate is the payload per slot, headers plus data.

1.3.4

EDGE Maximum Data Rates⁴

Coding Scheme	Type of coding	Data Rate per slot	4 + 1		3 + 2	
			Rx	Tx	Rx	Tx
MCS-1	GMSK	10.60	42.40	10.60	31.80	21.20
MCS-2	GMSK	13.00	52.00	13.00	39.00	26.00
MCS-3	GMSK	16.60	66.40	16.60	49.80	33.20
MCS-4	GMSK	19.40	77.60	19.40	58.20	38.80
MCS-5	8-PSK	24.05	96.20	24.05	72.15	48.10
MCS-6	8-PSK	31.25	125.00	31.25	93.75	62.50
MCS-7	8-PSK	47.45	189.80	47.45	142.35	94.90
MCS-8	8-PSK	57.05	228.20	57.05	171.15	114.10
MCS-9	8-PSK	61.85	247.40	61.85	185.55	123.70
Coding Scheme	Type of coding	Data Rate per slot	2 + 3		1 + 4	
			Rx	Tx	Rx	Tx
MCS-1	GMSK	10.60	21.20	31.80	10.60	42.40
MCS-2	GMSK	13.00	26.00	39.00	13.00	52.00
MCS-3	GMSK	16.60	33.20	49.80	16.60	66.40
MCS-4	GMSK	19.40	38.80	58.20	19.40	77.60
MCS-5	8-PSK	24.05	48.10	72.15	24.05	96.20
MCS-6	8-PSK	31.25	62.50	93.75	31.25	125.00
MCS-7	8-PSK	47.45	94.90	142.35	47.45	189.80
MCS-8	8-PSK	57.05	114.10	171.15	57.05	228.20
MCS-9	8-PSK	61.85	123.70	185.55	61.85	247.40

⁴ Speed achieved depends on the Coding Schemes supported by the GSM/EDGE Network. Data rate is the payload per slot (headers plus data).

1.4 Features

Attribute	Data
Start-up	USB Quick Enumeration
Always on	Attached to the network if the host provides power to the module in S3 and S4 states
Anti-Theft	Compatible with Intel® Anti-Theft Technology (Intel® AT)for S0 and S3 states
Power Management	USB selective suspend (Windows® OS) and USB autosuspend (Linux®) Continuous Packet Connectivity (network feature)
Over-temperature protection	GPS and PA Thermal Throttling

1.4.1 SMS Technical Data

Attribute	Data
SMS over GPRS	Mobile Originated and Mobile Terminated
Concatenated SMS	Yes, up to 10 messages
SMS Cell Broadcast	Supported by AT Command
SMS Immediate Display	Supported in Wireless Manager and by AT Command

1.4.2 GPS Technical Data

Attribute	Data
Receiver Sensitivity	-143 dBm (Acquisition standalone) -147 dBm (Acquisition assisted) -160 dBm (Tracking)
Cold TTFF at -130 dBm	< 40 seconds (Standalone) < 20 seconds (Assisted)
Hot TTFF at -130 dBm	< 2 seconds
Accuracy (Tracking) at -130 dBm	< 10 meters (CEP95)

1.4.3

SIM-Based Features

Attribute	Data
SIM Personalization Locks	Supports restricting SIM/USIM card use according to 3GPP standard TS 22.022 v8.0.0
SIM Application Toolkit	Supported by AT commands (Release 5)
USIM Application Toolkit	Supported by AT commands (Release 5)
USSD	Supported by AT commands (Release 7)
Secure Logical Channels	Supported by AT commands (Release 7)
Smartcard Authentication	EAP-SIM supported by AT commands or the smartcard driver. The smartcard driver is available for Windows® OS only
SIM Hot Swap	Automated firmware solution
Network Dependent Firmware Update	Automated firmware solution that can be customized by AT commands as well as in production

1.5

Host Software

1.5.1

Operating Systems

Attribute	Data
Microsoft Windows® Products	Windows® 7 (32-bit and 64-bit) Windows® Vista™ (SP1) (32-bit and 64-bit) Windows® XP (SP2) (32-bit and 64-bit)
Open Source Projects ⁵	Linux® Vanilla kernel Ubuntu® (10.04) (32-bit and 64-bit) Chromium™ MeeGo® Android™ (1.6, 2.0 and 2.1)

⁵ Support for Linux®, Ubuntu®, Android™, Chromium™ and MeeGo® is provided by the open source community

1.5.2

Languages for Windows®

Products	Languages
Wireless Manager	Arabic
SMS Utility	Chinese Simplified
GPS Utility	Chinese Traditional
Help files	Croatian
	Czech
	Danish
	Dutch
	English
	Finnish
	French
	German
	Greek
	Hebrew
	Hungarian
	Italian
	Japanese
	Korean
	Norwegian
	Polish
	Portuguese-Portugal
	Portuguese-Brazil
	Romanian
	Russian
	Slovakian
	Slovenian
	Spanish
	Swedish
	Thai
	Turkish

1.5.3 Communication Interfaces

Attribute	Data
Ericsson Mobile Broadband C++ API	C++ Application Programming Interface designed by Ericsson for third party applications for Windows® OS
Microsoft Mobile Broadband API	C++ Application Programming Interface designed by Microsoft for third party applications for Windows® 7
Wireless Modem	Serial modem interface that can be used to send/receive AT commands or establish internet connection through dial-up. Port type ACM available in Windows® and open source OS
Device Management Port	Serial interface that can be used to send/receive AT commands. Port type WDM available in Windows® and open source OS

2 Operational and Regulatory information

Please read this information before using your Wireless Mobile Broadband Module.

2.1 Operational Information

2.1.1 Wireless Interoperability

The Wireless Mobile Broadband Module is designed to be interoperable with the specific wireless service providers and their roaming partners.

2.1.2 Safety

The Mobile Broadband Module, like other radio devices, emits radio frequency electromagnetic energy. The level of energy emitted by this device, however, is less than the electromagnetic energy emitted by other wireless devices such as mobile phones. The Mobile Broadband module operates within the guidelines found in radio frequency safety and recommendations. These standards and recommendations reflect the consensus of the scientific community and result from deliberations of panels and committees of scientists who continually review and interpret the extensive research literature. In some situations or environments, the use of the Mobile Broadband module may be restricted by the proprietor of the building or responsible representatives of the applicable organization.

Examples of such situations include the following:

- Using the Mobile Broadband equipment on board airplanes, or

- Using the Mobile Broadband equipment in any other environment where the risk of interference with other devices or services is perceived or identified as being harmful.

If you are uncertain of the policy that applies to the use of wireless devices in a specific organization or environment (an airport, for example), you are encouraged to ask for authorization to use the Mobile Broadband device before you turn it on.

WARNING: Explosive Device Proximity Warning – Do not operate a portable transmitter (such as a wireless network device) near unshielded blasting caps or in an explosive environment unless the device has been modified to be qualified for such use.

CAUTION: Use on Aircraft – Regulations of the FCC and FAA prohibit airborne operation of radio-frequency wireless devices because their signals could interfere with critical aircraft instruments.

2.1.3 Recommendations

- Always treat your product with care and keep it in a clean and dust-free place.
- Do not expose your product to liquid, moisture or humidity.
- Do not expose your product to extreme high or low temperatures.
- Do not expose your product to open flames or lit tobacco products.
- Do not drop, throw or try to bend your product.
- Do not paint your product.
- Do not use your product near medical equipment without requesting permission from your treating physician or authorized medical staff.
- Do not use your product when in or around aircraft or in areas displaying a “turn off two-way radio” sign.
- Do not use your product in an area where a potentially explosive atmosphere exists.
- Do not place your product or install wireless equipment in the area above your car’s airbag.
- Do not attempt to disassemble your product. Only authorized personnel should perform service.

2.1.4 Children

Do not allow children to play with your Mobile Broadband Module. They could hurt themselves or others, or could accidentally damage the Mobile Broadband Module. Your Mobile Broadband Module may contain small parts that could be detached and create a choking hazard.

2.1.5 Disposal of old electrical & electronic equipment

All electrical and electronic equipment included should not be treated as household waste. It should instead be left at the appropriate collection point for the recycling of electrical and electronic equipment. By ensuring this product is disposed of correctly, you will help prevent potential negative consequences for the environment and human health, which could otherwise be caused by inappropriate waste handling of this product. The recycling of materials will help to conserve natural resources. For more detailed information about the recycling of this product, please contact your local city office, your household waste disposal service or the store where you purchased your Mobile Broadband Module.

2.1.6 Emergency calls

This Mobile Broadband Modules do not support voice calls or serviced, nor emergency calls and should not be relied upon for essential communications.

2.2 Regulatory Information

The Mobile Broadband module must be installed and used in strict accordance with the manufacturer's instructions as described in the user documentation that comes with the product. The device manufacturer is not responsible for any radio or television interference caused by unauthorized modification of the devices included with the Mobile Broadband, or the substitution or attachment of connecting cables and equipment other than that specified by the device manufacturer. The correction of interference caused by such unauthorized modification, substitution or attachment is the responsibility of the user. The device manufacturer and its authorized resellers or distributors are not liable for any damage or violation of government regulations that may arise from the user failing to comply with these guidelines.

2.2.1 European Union, EU Declaration of Conformity

European Union, R&TTE Compliance Statement

Hereby, the device manufacturer declares that this Mobile Broadband device is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC.

2.2.2 United States, FCC Notices

Instructions to the user:

If using a permanently affixed label, the modular transmitter must be labeled with its own FCC identification number, and, if the FCC identification number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording such as the following: "Contains Transmitter Module FCC ID: VV7-MBMF5521GW1" or "Contains FCC ID: VV7-MBMF5521GW1." Any similar wording that expresses the same meaning may be used.

FCC Radiation Exposure Statement:

CAUTION: The radiated output power of the Wireless Mobile Broadband module is far below the FCC radio frequency exposure limits. Nevertheless, the Wireless Mobile Broadband module should be used in such a manner that the potential for human contact during normal operation is minimized. Details of the authorized configurations can be found at <https://fjallfoss.fcc.gov/oetcf/eas/reports/GenericSearch.cfm> by entering the FCC ID number on the device.

CAUTION: This device has been evaluated for and shown compliant with the FCC RF exposure limits under portable exposure conditions (antennas are within 20 cm of a person's body) when installed in certain specific OEM configurations. This device has also been evaluated and shown compliant with the FCC RF Exposure limits under mobile exposure conditions (antennas are further than 20cm from a person's body). Details of the authorized configurations can be found at <https://fjallfoss.fcc.gov/oetcf/eas/reports/GenericSearch.cfm> by entering the FCC ID number on the device.

Interference Statement:

This device complies with Part 15 of the Federal Communications Commission (FCC) Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) This device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested to, and found to be within the acceptable limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential environment. This equipment generates radio frequency energy and is designed for use in accordance with the manufacturer's user manual. However, there is no guarantee that interference will not occur in any particular installation. If this equipment causes harmful interference to radio or television reception, which can be determined by turning the equipment off and on, you are encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna

- Increase the separation between the equipment and the receiver
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected
- Consult the dealer or an experienced radio/television technician for help

Note: This Mobile Broadband device must be installed and used in strict accordance with the manufacturer's instructions as described in the user documentation that comes with the product. Any other installation or use will violate FCC Part 15 regulations. Modifications not expressly approved by the device manufacturer could void your authority to operate the equipment.

3 Environmental Declaration

Ericsson has a responsibility to the community to provide products which are safe to use and which have minimal impact upon the environment. The Ericsson Design for Environment program is designed to meet legislative and market requirements in the countries where Ericsson sells F5521gw.

The Ericsson Design for Environment program lists chemical substances that are banned or restricted for use in Ericsson products and manufacturing operations. Ericsson works with its suppliers to eliminate such substances in procured material.

Restrictions on the use of substances in Ericsson products are divided into two categories; banned substances and restricted substances.

Banned substances are prohibited for use in specified applications in Ericsson products in accordance with relevant legislation.

Restricted substances may only be used where no technically and/or economically acceptable alternatives exist and will be replaced as soon as possible.

The ban or restriction does not apply where the presence of a substance is unintentional and in the form very small concentrations derived from natural impurities.

Note: Legislation regulating the use of banned substances includes exemptions allowing limited use where no technically acceptable alternatives exist. Ericsson makes use of some of these exemptions in order to maintain product quality.

4 Terminology and Abbreviations

3GPP	The 3rd Generation Partnership Project
ACM	Abstract Control Model USB communications device class
A-GPS	Assisted GPS
API	Application programming interface
AT	Attention Command
C	Celsius
CE	Conformité Européenne
CEP95	Circular Error Probability 95%
CPU	Central Processing Unit
CS-1 to CS-4	Coding Scheme, it determines the data rate per timeslot in GPRS.
E-GSM	Extended GSM
EAP	Extensible Authentication Protocol
EDGE	Enhanced Data Rates for Global Evolution.
ES	Engineering Sample
EU	European Union
FAA	Federal Aviation Administration
FCC	Federal Communications Commission
GCF	Global Certification Forum
GMSK	Gaussian Minimum Shift Keying
GPRS	General Packet Radio Services
GPS	Global Positioning System
GSM	Global System for Mobile Communications
GSM 850	GSM network operating in the 850MHz band, used in the USA.

GSM 900	GSM network operating in the 900MHz band, used mainly in Europe, Australia and South Africa.
GSM 1800	Also known as DCS 1800 or PCN, GSM network operating in the 1800 MHz band, used in Europe and Asia-Pacific.
GSM 1900	Also known as PCS, GSM network operating in the 1900MHz band, used in the USA and Canada.
HSPA	High Speed Packet Access, term for HSDPA and HSUPA.
HSDPA	High Speed Downlink Packet Access
HSUPA	High Speed Uplink Packet Access
IC	Industry Canada
ID	Identification
IP	Internet Protocol
kbps	Kilobits per second – rate of data flow.
kHz	Kilohertz
LED	Light Emitting Diode
Mbps	Megabits per second – rate of data flow
MCS	Modulation Coding Scheme, MCS-1 to MCS-9 are used in EDGE.
MHz	Megahertz
mW	Milliwatt
NACC	Network Assisted Cell Change. This feature reduces the time taken to perform a cell reselection
NMEA-0183	Electrical and data specification for communication between marine electronic devices
OEM	Original Equipment Manufacturer
OS	Operating System
PA	Power Amplifier
PCS	See GSM 1900
PCI	Peripheral Component Interconnect
PDP	Packet Data Protocol

PGPS	Predicted GPS, Extended Ephemeris Solution
PSK	Phase Shift Keying
PTCRB	PCS Type Certification Review Board
QS	Quality Sample
RF	Radio Frequency
RoHS	Restriction of use of certain Hazardous Substances
R&TTE	Radio and Telecommunications Terminal Equipment Directive
Rx	Receiver
SIM card	Subscriber Identity Module card – a card that must be inserted in any GSM-based mobile terminal. It contains subscriber details, security information and memory for a personal directory of numbers.
SMBus	System Management Bus
SMS	Short Message Service
SUPL	Secure User Plane
TBF	Temporary Block Flow
TDMA	Time Division Multiple Access
TS	Technical Specification
TTFF	Time to First Fix
Tx	Transmitter
U-FL	Miniature coaxial RF connector for high-frequency signals up to 6 GHz
UICC	Universal Integrated Circuit Card
UIM	User Identity Module
UL	Underwriters Laboratories
UMTS	Universal Mobile Telecommunications System
US	United States
USB	Universal Serial Bus
USIM	UMTS Subscriber Identity Module

USSD	Unstructured Supplementary Service Data
V	Volt
W	Watt
WCDMA	Wideband Code Division Multiple Access
WDM	Wireless Mobile Communications Device Management USB communications device class
WEEE	Waste Electrical and Electronic Equipment Directive.
WHQL	Windows Hardware Quality Labs, this is a Microsoft test and approval process. The Device Drivers for Ericsson Mobile Broadband Modules are signed by WHQL so that the Windows operating system does not warn the user of unknown or untested software.