Datasheet

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CableFree
Wireless Excellence

Emerald Cellular Product Range (4G & 5G LTE)

Advanced Software-Defined 4G & 5G LTE Small Cell Indoor Version

Overview

About Wireless Excellence

Founded in 1996 and with headquarters in Oxford UK, Wireless Excellence Limited is a leading designer and supplier of outdoor and indoor Broadband Wireless communication products

With a complete range of solutions including Radio, Microwave, Millimeter-Wave, Free Space Optics, WiFi and 4G/5G/LTE, customers in over 80 countries have chosen Wireless Excellence as the "one stop shop" solution of choice for dependable wireless networking

About 4G & 5G Base Stations

Using the latest Software Defined Radio and RF technology, our cellular Base Station products operate in all the common cellular bands from 380MHz-4400MHz, distances over 20km and high net throughput to subscriber devices.
Our advanced 4G & 5G Cellular Base Station platform with IP/Ethernet interfaces supports LTE Release 16/17 software updates for future features. Flexibility, performance and low cost of ownership are ensured

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Advanced 4G & 5G LTE Software Defined Radio Small Cell Base Station

CableFree: Wireless Excellence offers high performance 4G & 5G LTE Small Cell Base stations solutions for a wide variety of applications. Covering all common 4G & 5G LTE bands the base stations feature Software Defined Radio (SDR) which enables great flexibility of operation and future upgrade path.

4G & 5G LTE networks using CableFree Emerald 4G & 5G LTE SDR Small Cell base stations enjoy great flexibility, high performance as well as very low cost of operation and ownership. "Stand Alone" operation is possible which enables the 4G/5G Base station to connect remote terminals without need for external network elements.. This is ideal for closed network type applications such as CCTV, campus sites and disaster recovery scenarios, where there is no centralised infrastructure or Network Operations Centre.

System Features

- Compact, Software-Defined 4G & 5G LTE Base Station
- Small Cell: Compact, indoor installation
- Desk/wall/Ceiling-mount design
- Spectrally Efficient, Software-Defined Radio
- "Stand Alone" mode capable
- Supports FDD or TDD modes
- Supports MIMO 2x2 as standard
- Options for 4x4 MIMO and Dual 2x2 MIMO
- Transmit Power from 2x250mW to 500mW per Tx
- Channel Widths up to 100MHz bandwidth for 5G
- Supports LTE release 15-17 (4G & 5G LTE)
- Supports NB-IoT (Internet of Things) Modes
- 4G migration to 5G with software updates
- Support for LTE in 5GHz Unlicensed Bands
- Time Synchronisation using flexible choice of GPS, Galileo, GLONASS and BeiDou Satellite networks

Applications

- Telecom Service Providers & ISPs
- Cellular Network operators
- Point-to-Multipoint Point Wireless networking
- CCTV connection for multiple cameras
- Oil & Gas Utilities
- Fast Roll-out & Temporary Deployment

Enhanced Performance, Flexibility & Features

The CableFree: Wireless Excellence Emerald Small Cell platform is an integrated advanced system capable of handling 4G or 5G LTE wireless network waveforms. Provided in a sealed carrier grade unit for outdoor installation, or with an optional indoor version for wall or ceiling mount, the Emerald RF platform is at the forefront in terms of digital pre-distortion technology and signal processing associated to advanced PA architecture. The Emerald platform is ideal for implementation of cellular and advanced wireless communications market.

The Emerald RF platform is suitable as a multicarrier power amplifier either in the Base station or aggregated within the deployment To achieve maximum flexibility in terms of utilisation, units can support:

- TDD or FDD Modes
- 4G (eNodeB) & 5G (gNodeB) Modes
- Additional Customer specific frequencies

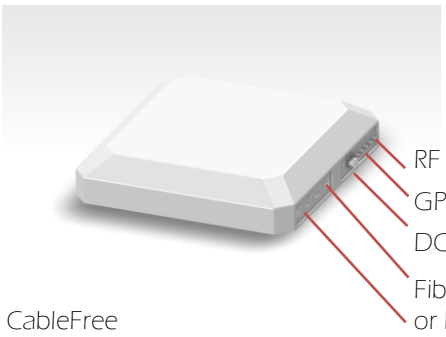
The duplexer used for TDD modes ensures compliance with the ETSI TS136 104 specifications.

The Emerald RF platform allows management through the Ethernet based connection. This allows for the transceiver to be managed or upgraded either via local connection or via secure remote protocols.

CableFree Small Cell platform allows for the Rx inputs to operate in high or low sensitivity modes for NF receiver performance.

The Small Cell Unit carries Ethernet 1Gbps (optional 2.5 & 10Gbps) Copper and Optical network connections to allow for the latest generation of LTE architecture to be implemented.

CableFree LTE SDR Small Cell Indoor Base Station Overview



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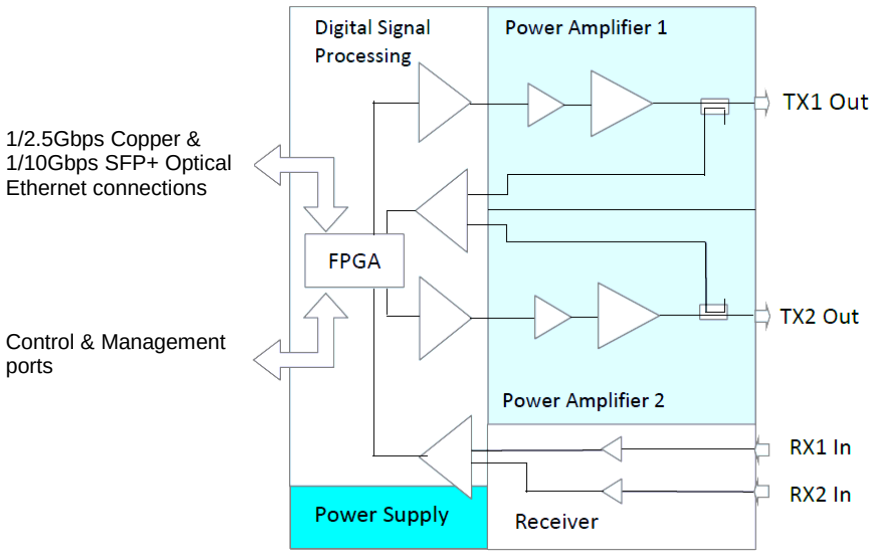
CableFree Emerald Platform eNodeB & gNodeB Small Cell Radio Unit block diagram:



Emerald Small Cell Platform Specifications

gNodeb Features (5G)

- 3GPP NR release 16/17 compliant
- FDD/TDD FR1 (< 6 GHz) and FR2 (>= 6 GHz). (Note. FR2 ranges are for future product support)
- Data subcarrier spacing: 15, 30, 60 or 120 kHz. SSB subcarrier spacing: 15, 30, 120 or 240 kHz. All SSB/data subcarrier spacing combinations are supported
- Up to 8×8 downlink MIMO
- 256QAM
- All PUCCH and PRACH formats
- PUSCH with and without transform precoding. PUSCH and PDSCH with user configurable DMRS and number of symbols
- User configurable TDD UL/DL pattern and k0, k1 and k2 values
- PDCCH with DCI 0 0, 0 1, 1 0 and 1 1.
- Scheduling Request support
- PHY test mode: support for continuous PDSCH and PUSCH transmission
- EN-DC support
- Dynamic LTE/NR DRB configuration
- User selectable DRB configuration for each QCI
- DRX support
- RRC measurement with measurement gap support
- PScell change support
- Standalone support

eNodeb Features (4G)

PHY layer:

- LTE release 12, 13, 14 compliant.
- Supports FDD and TDD configuration.
- Available bandwidths: 1.4, 3, 5, 10, 15 and 20 MHz.
- Handle several cells sharing the same antenna on identical or different frequencies.
- Transmission mode: 1 (single antenna) and 2 to 10 (MIMO 4x4).
- Wideband CQI/PMI reports.
- All DL channels are supported: PSS, SSS, PBCH, PCFICH, PHICH, PDCCH, PDSCH.
- All UL channels are supported: PRACH, PUSCH, PUCCH, SRS.
- HARQ support.
- Timing measurement thru the PRACH.
- Closed-loop UE power control.
- Frequency based MMSE equalizer.

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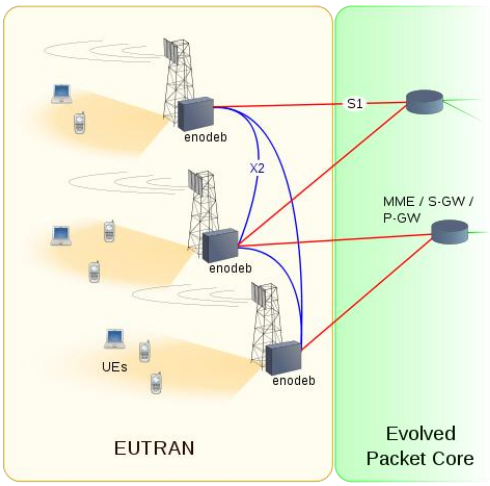
- Highly optimized turbo decoder.
- PAPR reduction support.
- Positioning Reference Signals (PRS) support.
- CSI-RS support
- Multi-cluster PUSCH allocation
- PUCCH 3 and PUCCH channel selection support
- Carrier Aggregation support with cross-carrier scheduling (tested with 3 DL channels, supports up to 8 DL channels)
- CoMP testing features (DMRS scrambling identity and QCL parameters can be selected)
- 256QAM DL support for PDSCH and MBMS
- 1024QAM support for PDSCH
- Support of release 11 TDD special subframe configurations 7 and 9

Protocol Layer:

- LTE release 12, 13, 14 compliant.
- Implements the MAC, RLC, PDCP and RRC layers.
- Round-robin MAC scheduler with dynamic MCS selection.
- Support of full and half duplex UEs.
- Number of active users only limited by the available time/frequency resources.
- Fully configurable System Information Blocks.
- Integrity check and encryption using the AES and Snow3G algorithms.
- Support of RRC measurement with measurement gap.
- Supports intra eNodeB, S1 or X2 handovers.
- QoS support with user selectable DRB configuration for each QCI.
- ROHC support(RTP, UDP and IP v1 profiles).
- Public Warning System (CMAS/ETWS) support.
- MBMS support
- Category 0 UE support
- eDRX support
- EN-DC support



LTE-M

- Release 14 compliant
- Category M1 UE support
- TM6 and TM9 support
- FDD only (FDD and HD-FDD UEs are supported)
- Support of multiple CE levels (Note: only CE-Mode A is supported).
- Support of message repetition for MPDCCH, PDSCH and PUSCH in full duplex.
- Support of localized MPDCCH transmission
- EPDCCH support for Category M1
- No frequency hopping
- Bandwidth must be >= 5 MHz

NB-IoT (Internet of Things)

- NB-IoT release 14 compliant
- Single-tone and multi-tone category NB1 and NB2 UE support
- 15 kHz and 3.75 kHz subcarrier spacing are supported
- All operation modes (in-band, guard band and standalone) are supported
- Multiple NB-IoT and LTE cells can be used at the same time in the same eNodeB
- Support of multiple coverage levels
- Support of all NPDCCH, NPDSCH, NPUSCH and NPRACH configurations
- Support of control plane CIoT optimization
- Support of multi-DRB mode
- Support of non-anchor carriers (Release 14 NPRACH on non-anchor carriers is not supported)
- Support of two HARQ processes
- DRX support

Network interface:

- 1Gbps and 10Gbps options available. Copper RJ45 and Fibre Optic Options.

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- Standard S1AP and GTP-U interfaces to the Core

Network:

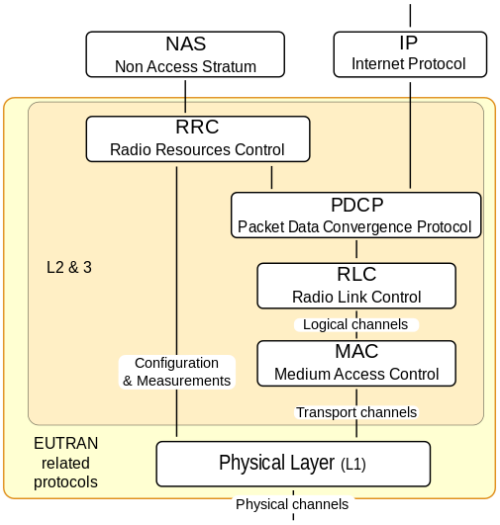
- Standard S1AP and GTP-U interfaces to the Core Network. Several PLMNs and S1 interfaces can be used simultaneously.
- X2AP interface between eNodeBs.
- M1 and M2 interfaces for MBMS
- IPv6 support

User interface:

- Configurable logging system for all channels with built-in text decoders.
- Wireshark MAC-LTE capture.
- Plots for QAM constellations and channel response
- Command line monitor.
- Test commands to initiate handover and to dynamically change the power level of each cell.

Core Network (EPC) Features

- Implements one MME with built-in SGW, PGW and HSS.
- Supports several eNodeBs with standard S1 interface (S1AP and GTP-U protocols).
- NAS integrity check and encryption using the AES and Snow3G algorithms.
- Support of USIM cards using the XOR or Milenage authentication algorithm.
- Handling of UE procedures: attach, authentication, detach, tracking area update, service access, radio bearer establishment, paging.
- Multi-PDN support and built-in dynamic ERAB setup for easy VoLTE/IMS testing.
- Transparent access to the IP network (no external Serving Gateway nor PDN Gateway are necessary).
- Configurable access point name, IP range, DNS and E-RAB QoS.
- Configurable user database. No external HSS is needed.
- IPv6 support.
- Support sending of Public Warning System messages (ETWS/CMAS)
- Configurable logging system for all channels with built-in text decoders.
- Command line monitor.



Upcoming features in future software releases:

- SON (eNB/MME)
- HSS or database support for UE provisioning (MME)
- Updated MAC scheduler

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Available in versions to cover all 4G & 5G LTE Bands

The CableFree Emerald range is available in versions to cover all commonly used LTE bands.

Frequency Bands used worldwide for 4G LTE networks:

E-UTRA Band	Duplex-Mode	*f* (MHz)	Common name	Included in (subset of) Band	Uplink (UL) BS receive UE transmit (MHz)	Downlink (DL) BS transmit UE receive (MHz)	Duplex spacing (MHz)	Channel bandwidths (MHz)
1	FDD	2100	IMT	*65*	1920 – 1980	2110 – 2170	190	5, 10, 15, 20
2	FDD	1900	PCS blocks A-F	*25*	1850 – 1910	1930 – 1990	80	1.4, 3, 5, 10, 15, 20
3	FDD	1800	DCS		1710 – 1785	1805 – 1880	95	1.4, 3, 5, 10, 15, 20
4	FDD	1700	AWS blocks A-F (AWS-1)	*66*	1710 – 1755	2110 – 2155	400	1.4, 3, 5, 10, 15, 20
5	FDD	850	CLR	*26*	824 – 849	869 – 894	45	1.4, 3, 5, 10
7	FDD	2600	IMT-E		2500 – 2570	2620 – 2690	120	5, 10, 15, 20
8	FDD	900	E-GSM		880 – 915	925 – 960	45	1.4, 3, 5, 10
10	FDD	1700	Extended AWS blocks A-I	*66*	1710 – 1770	2110 – 2170	400	5, 10, 15, 20
11	FDD	1500	Lower PDC		1427.9 – 1447.9	1475.9 – 1495.9	48	5, 10
12	FDD	700	Lower SMH blocks A/B/C		699 – 716	729 – 746	30	1.4, 3, 5, 10
13	FDD	700	Upper SMH block C		777 – 787	746 – 756	−31	5, 10
14	FDD	700	Upper SMH block D		788 – 798	758 – 768	−30	5, 10
17	FDD	700	Lower SMH blocks B/C	*12*	704 – 716	734 – 746	30	5, 10
18	FDD	850	Japan lower 800	*26*	815 – 830	860 – 875	45	5, 10, 15
19	FDD	850	Japan upper 800	*26*	830 – 845	875 – 890	45	5, 10, 15
20	FDD	800	EU Digital Dividend		832 – 862	791 – 821	−41	5, 10, 15, 20
21	FDD	1500	Upper PDC		1447.9 – 1462.9	1495.9 – 1510.9	48	5, 10, 15
22	FDD	3500			3410 – 3490	3510 – 3590	100	5, 10, 15, 20
24	FDD	1600	L-Band 1600 (US)		1626.5 – 1660.5	1525 – 1559	−101.5	5, 10
25	FDD	1900	Extended PCS blocks A-G		1850 – 1915	1930 – 1995	80	1.4, 3, 5, 10, 15, 20
26	FDD	850	Extended CLR		814 – 849	859 – 894	45	1.4, 3, 5, 10, 15
27	FDD	800	SMR *(adjacent to band 5)*		807 – 824	852 – 869	45	1.4, 3, 5, 10
28	FDD	700	APT		703 – 748	758 – 803	55	3, 5, 10, 15, 20
29	FDD	700	Lower SMH blocks D/E		*N/A*	717 – 728	*N/A*	3, 5, 10
30	FDD	2300	WCS blocks A/B		2305 – 2315	2350 – 2360	45	5, 10
31	FDD		450		452.5 – 457.5	462.5 – 467.5	10	1.4, 3, 5
32	FDD	1500	L-Band (EU)	*50, 75*	*N/A*	1452 – 1496	*N/A*	5, 10, 15, 20
33	TDD	2100	IMT	*39*	1900 – 1920		*N/A*	5, 10, 15, 20
34	TDD	2100	IMT		2010 – 2025		*N/A*	5, 10, 15
35	TDD	1900	PCS (Uplink)		1850 – 1910		*N/A*	1.4, 3, 5, 10, 15, 20
36	TDD	1900	PCS (Downlink)		1930 – 1990		*N/A*	1.4, 3, 5, 10, 15, 20
37	TDD		PCS (Duplex spacing)		1910 – 1930		*N/A*	5, 10, 15, 20
38	TDD	2600	IMT-E (Duplex Spacing)	*41*	2570 – 2620		*N/A*	5, 10, 15, 20
39	TDD	1900	DCS-IMT gap		1880 – 1920		*N/A*	5, 10, 15, 20
40	TDD	2300			2300 – 2400		*N/A*	5, 10, 15, 20
41	TDD	2500	BRS / EBS		2496 – 2690		*N/A*	5, 10, 15, 20
42	TDD	3500			3400 – 3600		*N/A*	5, 10, 15, 20
43	TDD	3700			3600 – 3800		*N/A*	5, 10, 15, 20
44	TDD	700	APT		703 – 803		*N/A*	3, 5, 10, 15, 20
45	TDD	1500	L-Band (China)	50	1447 – 1467		*N/A*	5, 10, 15, 20
46	TDD	5200	U-NII		5150 – 5925		*N/A*	10, 20
47	TDD	5900	U-NII-4 (V2X)		5855 – 5925		*N/A*	10, 20
48	TDD	3600	CBRS		3550 – 3700		*N/A*	5, 10, 15, 20

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50	TDD	1500	L-Band (EU)	1432 – 1517		*N/A*	3, 5, 10, 15, 20
51	TDD	1500	Extended L-Band (EU)	1427 – 1432		*N/A*	3, 5
65	FDD	2100	Extended IMT	1920 – 2010	2110 – 2200	190	5, 10, 15, 20
66	FDD	1700	Extended AWS blocks A-J (AWS-1/AWS-3)	1710 – 1780	2110 – 2200	400	1.4, 3, 5, 10, 15, 20
67	FDD	700		*N/A*	738 – 758	*N/A*	5, 10, 15, 20
68	FDD	700	ME 700	698 – 728	753 – 783	55	5, 10, 15
69	FDD	2600	IMT-E (Duplex spacing)	*N/A*	2570 – 2620	*N/A*	5
70	FDD	2000	AWS-4	1695 – 1710	1995 – 2020	295 – 300	5, 10, 15
71	FDD	600	US Digital Dividend	663 – 698	617 – 652	−46	5, 10, 15, 20
72	FDD	450	PMR/PAMR Europe	451 – 456	461 – 466	10	1.4, 3, 5
73	FDD	450		450 – 455	460 – 465	10	1.4, 3, 5
74	FDD	1500	L-Band 1500 (US)	1427 – 1470	1475 – 1518	48	1.4, 3, 5, 10, 15, 20
75	FDD	1500	L-Band (EU)	*N/A*	1432 – 1517	*N/A*	5, 10, 15, 20
76	FDD	1500	Extended L-Band (EU)	*N/A*	1427 – 1432	*N/A*	5
85	FDD	700	Extended Lower SMH	698 – 716	728 – 746	30	5, 10
87	FDD	410	PMR (APT)	410 – 415	420 – 425	10	1.4, 3, 5
88	FDD	410	PMR (EU)	412 – 417	422 – 427	10	1.4, 3, 5

5G NR Frequency Bands: Frequency Range 1 (FR1)

Band	Duplex mode	*ƒ* (MHz)	Common name	Subset of band	Uplink (MHz)	Downlink (MHz)	Duplex spacing (MHz)	Channel bandwidths (MHz)
n1	FDD	2100	IMT	n65	1920 – 1980	2110 – 2170	190	5, 10, 15, 20, 25, 30, 40, 45, 50
n2	FDD	1900	PCS	n25	1850 – 1910	1930 – 1990	80	5, 10, 15, 20, 25, 30, 35, 40
n3	FDD	1800	DCS		1710 – 1785	1805 – 1880	95	5, 10, 15, 20, 25, 30
n5	FDD	850	CLR		824 – 849	869 – 894	45	5, 10, 15, 20
n7	FDD	2600	IMT-E		2500 – 2570	2620 – 2690	120	5, 10, 15, 20, 25, 30, 40, 50
n8	FDD	900	Extended GSM		880 – 915	925 – 960	45	5, 10, 15, 20, 25, 35
n12	FDD	700	Lower SMH		699 – 716	729 – 746	30	5, 10, 15
n14	FDD	700	Upper SMH		788 – 798	758 – 768	−30	5, 10
n18	FDD	850	Lower 800 (Japan)		815 – 830	860 – 875	45	5, 10, 15
n20	FDD	800	Digital Dividend (EU)		832 – 862	791 – 821	−41	5, 10, 15, 20
n25	FDD	1900	Extended PCS		1850 – 1915	1930 – 1995	80	5, 10, 15, 20, 25, 30, 35, 40, 45
n28	FDD	700	APT		703 – 748	758 – 803	55	5, 10, 15, 20, 25, 30
n29	SDL	700	Lower SMH		N/A	717 – 728	N/A	5, 10
n30	FDD	2300	WCS		2305 – 2315	2350 – 2360	45	5, 10
n34	TDD	2100	IMT		2010 – 2025	N/A	N/A	5, 10, 15
n38	TDD	2600	IMT-E		2570 – 2620	N/A	N/A	5, 10, 15, 20
n39	TDD	1900	DCS–IMT Gap		1880 – 1920	N/A	N/A	5, 10, 15, 20, 25, 30, 40
n40	TDD	2300	S-Band		2300 – 2400	N/A	N/A	5, 10, 15, 20, 25, 30, 40, 50, 60, 80
n41	TDD	2500	BRS	n90	2496 – 2690	N/A	N/A	10, 15, 20, 30, 40, 50, 60, 80, 90, 100
n48	TDD	3500	CBRS (US)		3550 – 3700	N/A	N/A	5, 10, 15, 20, 40, 50, 60, 80, 90, 100
n50	TDD	1500	L-Band (EU)		1432 – 1517	N/A	N/A	5, 10, 15, 20, 30, 40, 50, 60, 80
n51	TDD	1500	L-Band Extension (EU)		1427 – 1432	N/A	N/A	5
n65	FDD	2100	Extended IMT		1920 – 2010	2110 – 2200	190	5, 10, 15, 20
n66	FDD	1700	Extended AWS		1710 – 1780	2110 – 2200	400	5, 10, 15, 20, 25, 30, 35, 40, 45
n70	FDD	2000	AWS-4		1695 – 1710	1995 – 2020	300	5, 10, 15, 20, 25
n71	FDD	600	Digital Dividend (US)		663 – 698	617 – 652	−46	5, 10, 15, 20, 25, 30, 35
n74	FDD	1500	Lower L-Band (US)		1427 – 1470	1475 – 1518	48	5, 10, 15, 20
n75	SDL	1500	L-Band (EU)		N/A	1432 – 1517	N/A	5, 10, 15, 20

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Band	Duplex mode	ƒ (MHz)	Common name	Subset of band	Uplink (MHz)	Downlink (MHz)	Duplex spacing (MHz)	Channel bandwidths (MHz)
n76	SDL	1500	Extended L-Band (EU)		N/A	1427 – 1432	N/A	5
n77	TDD	3700	C-Band		3300 – 4200	N/A	N/A	10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100
n78	TDD	3500	C-Band	n77	3300 – 3800	N/A	N/A	10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100
n79	TDD	4700	C-Band		4400 – 5000	N/A	N/A	10, 20, 30, 40, 50, 60, 70, 80, 90, 100
n80	SUL	1800	DCS		1710 – 1785	N/A	N/A	5, 10, 15, 20, 25, 30, 40
n81	SUL	900	Extended GSM		880 – 915	N/A	N/A	5, 10, 15, 20
n82	SUL	800	Digital Dividend (EU)		832 – 862	N/A	N/A	5, 10, 15, 20
n83	SUL	700	APT		703 – 748	N/A	N/A	5, 10, 15, 20
n84	SUL	2100	IMT		1920 – 1980	N/A	N/A	5, 10, 15, 20
n85	FDD	700	Extended Lower SMH		698 – 716	728 – 746	30	5, 10, 15
n86	SUL	1700	Extended AWS		1710 – 1780	N/A	N/A	5, 10, 15, 20, 40
n89	SUL	850	CLR		824 – 849	N/A	N/A	5, 10, 15, 20
n90	TDD	2500	BRS		2496 – 2690	N/A	N/A	5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100
n91	FDD	800 1500	DD (EU) L-Band (EU)		832 – 862	1427 – 1432	570 – 595	5, 10
n92	FDD	800 1500	DD (EU) L-Band (EU)		832 – 862	1432 – 1517	600 – 660	5, 10, 15, 20
n93	FDD	900 1500	Extended GSM L-Band (EU)		880 – 915	1427 – 1432	527 – 547	5, 10
n94	FDD	900 1500	Extended GSM L-Band (EU)		880 – 915	1432 – 1517	532 – 632	5, 10, 15, 20
n95	SUL	2100	IMT		2010 – 2025	N/A	N/A	5, 10, 15
n96	TDD	6000	U-NII-5–9		5925 – 7125	N/A	N/A	20, 40, 60, 80
n100	FDD	900	Rail Mobile Radio (RMR)		874.4 – 880	919.4 – 925	45	5
n101	TDD	1900	Rail Mobile Radio (RMR)	n39	1900 – 1910	N/A	N/A	5, 10
n105	FDD	600	Digital Dividend (APT)		663 – 703	612 – 652	-51	5, 10, 15, 20, 25, 30, 35

These bands Include Frequency division duplexing (FDD); time division duplexing (TDD); FDD supplemental downlink (SDL); FDD supplemental uplink (SUL)

FDD 4G & 5G LTE Bands & Frequencies

Many of the allocations of radio spectrum that has been reserved for FDD (frequency division duplex) 4G & 5G LTE use. FDD bands use separate frequencies for Uplink (UL) and Downlink (DL) between the base station and user device with simultaneous signal transmission and reception.

TDD 4G & 5G LTE frequency band allocations

TDD uses unpaired frequency allocations that are allocated and used for 4G & 5G LTE. The TDD LTE bands are unpaired because the uplink and downlink share the same frequency, being time multiplexed. TDD is popular for 5G, Wireless ISPs and data-centric networks with no legacy of 2G or 3G due to higher spectral utilisation.

Custom Bands and Frequencies

CableFree 4G & 5G LTE Base stations can be supplied for custom bands and frequencies if/as required.

Product Features and Performance options

Please check carefully with CableFree Technical Support that the specific combinations of frequency, bandwidth, modulation, power and capacity you desire are available before confirming any orders. The advanced reconfigurable technology used in CableFree 4G & 5G base stations is highly flexible but certain combinations of bands and modes may require extra hardware, have certain restrictions in use or in very unusual cases be unavailable. We will be very happy to advise on most suitable configurations to ensure you have the best performing network available.

4G & 5G-SA supported

Please note that current models of Small Cells feature a single radio interface which can be configured for 4G or 5G-SA modes. Currently the Small Cell radio does not support 5G-NSA modes internally, which is a future roadmap plan.

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System Variant	CF-Emerald-SC-ID-X-X
System Parameters	
Max. No Carriers per TX/RX	4G: (1.4,3,5,10,15,20 MHz channel widths: depends on band) 5G: (5,10,15,20,25,30,40,50,60,70,80,90,100MHz channel widths: depends on band) (note: factory option to support 100MHz)
4G/5G Small Cell Transmitter	
2 ports (2x2 MIMO) Note: Options for 4x4 MIMO	
Tx Max Pout per port	Usually hardware limited in factory to 2x250mW to meet regulations
Tx Frequency range*	380MHz to 5925MHz (hardware factory options, one band per radio)
4G/5G Small Cell Receiver	
2 ports (2x2 MIMO) Note: Options for 4x4 MIMO	
Rx frequency range*	380MHz to 5925MHz (hardware factory options, one band per radio)
Rx input level	-28dBm Max
LTE sensitivity (5,10,20 MHz)	<-101.5dBm
4G/5G Network Synchronisation	
Time Synchronisation	Flexible choice of GPS, Galileo, GLONASS and BeiDou Satellite networks
Regulatory	
LTE Compliancy	ETSI TS 136 104 cat B Opt2
Electrical safety	UL 60950 - Ed.3 2000, EN 60950 Ed.2001, CSA C22.2 No 60950
Environmental Conditions	ETSI EN 300 019-1, ETSI EN 300 019-1, ETSI EN 300 019-3, IP67
Mechanical	IEC 60297-3 - Standard definition for 19" modules
Inflammability	UL94
Physical Interfaces	
RF Connectors	2x SMA connectors to external antennas. Options for internal patch antennas. 1x SMA connector for GPS/GNSS Sync
Ethernet	1x RJ45 1Gbps Copper Interface (factory option for 2.5Gbps) 1x SFP 1Gbps Optical SFP cage (factory option for 10Gbps SFP+)
Local Management & Debugging	HDMI + 2x USB ports for factory/lab initial setup
Physical Parameters	
Operational Temperature	-20°C to 55°C ETS 300 019-2-4 Class 4M5
Humidity	0 to 95%, non-condensing (outdoor version)
Power Supply	DC 36-60 V
Overall Efficiency	>20% (with duplexer*)
Power Consumption	<100 W (depends on version: note 4x4 is higher)
Weights and Dimensions	(2x2 MIMO model Small Cell 2x250mW Version:)
Dimensions	370mm x 370mm x 50mm* (indoor 2x2 version) Note: 4x4 is larger
Weight	<5Kg (indoor 2x2 version) Note: 4x4 is larger

Product codes

Product Code	Description
CF-Emerald-SC-2x2-ID-X-X-X	Emerald 4G/5G BS Indoor Grade Small Cell Unit 2x2 MIMO
CF-Emerald-SC-4x4-ID-X-X-X	Emerald 4G/5G BS Indoor Grade Small Cell Unit 4x4 MIMO
CF-Emerald-SC-EPC-X	Emerald 4G/5G BS EPC (various options, including "on radio" core)
CF-Emerald-SC-5GC-X	Emerald 4G/5G BS 5G Core (various options , including "on radio" core)

Note – precise product code depends on frequency, band, antennas, resilience and other options. Please contact Wireless Excellence for more information

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