CERAGON

Ficha de datos

IP-50C

Abril 2023 | Rev J.01

Nota: Para conocer la disponibilidad de las funciones, consulte las notas de la versión de CeraOS que esté utilizando.

Radio

Gama de frecuencias admitidas

6-42 GHz

Configuraciones de radio

1+0 hasta 4+0 Polarización simple/dual, 1+1/2+2 HSB, 1+1/2+2 HSB-SD, 2+0 XPIC, 2x2+0 Polarización simple/dual Este/Oeste

Nota: Las configuraciones HSB están preparadas para el hardware y están previstas para futuras versiones.

Funciones de radio

4+0 Enlace de capa 1

Vinculación con IP-20C e IP-20C-HP

Vinculación con IP-20N o IP-20A

ABC multiportadora mejorada (hasta 2+0)

Protección: 1+1 HSB/2+2 HSB, 1+1 HSB-SD*

Alto aprovechamiento espectral: BPSK a 4096 QAM con ACM

Ancho de banda del canal: de 14 a 224 MHz†

XPIC

2x2/4x4 LoS MIMO*

Reutilización avanzada de frecuencias (AFR)*

Diversidad espacial avanzada (ASD)*

Multibanda con enlace de capa 1 (con IP-50E)

Ethernet

Interfaces Ethernet

Puerto 1:

- Puerto CC

Puerto 2:

- RJ-45 - Interfaz eléctrica de tráfico MultiRate 1/2,5/10 Gbps/Puerto PoE

Puerto 3:

- SFP - Interfaz de tráfico 1/2,5G y puerto Dualband

Puerto 4:

- SFP - interfaz de tráfico 1/10GE/puerto de ampliación MIMO (SFP+)

Puerto 5:

- SFP - Interfaz de tráfico 1/10GE (SFP+)

Puerto 6:

- RJ-45 - Interfaz de gestión/protección - 100 Base-T

Notas: Los dispositivos SFP y SFP+ deben ser de grado industrial
(-40°C a +85°C, -40°F a +185°F).

Para obtener información sobre el uso de interfaces compatibles y la velocidad por versión de CeraOS, consulte las Notas de la versión o la Descripción técnica de la versión.

Funciones Ethernet

MTU - 9612 Bytes

Hasta 1024 servicios Ethernet, más un servicio de gestión predefinido

Aprendizaje de direcciones MAC con 64.000 direcciones MAC

Calidad de servicio:

- Múltiples criterios de clasificación (VLAN ID, bits P, IPv4 DSCP, IPv6 TC, MPLS EXP)
- 8 colas CoS por puerto
- Búfer profundo (configurable hasta 64 Mbit por cola)
- WRED
- Marcado/remarcado de bits P

Añadir/eliminar VLAN

MSTP, ERP (ITU-T G.8032)

Y.1731 Ethernet OAM

Y.1731 Notificación de ancho de banda Ethernet (ETH-BN)

Protocolos de gestión

SNMP

REST

Compatibilidad con SDN:

- NETCONF/YANG

Protocolos de sincronización

Especificación de reloj de equipo Ethernet mejorado (eEEC) (G.8262.1)

Especificación de PTP Telecom Boundary Clock (T-BC) y Time Slave Clock (T-TSC) (G.8273.2)

Especificación PTP de reloj transparente para telecomunicaciones (T-TC) (G.8273.3)

Límites de red SyncE mejorados (G.8261, cláusula 9.2.1)

Límites de red PTP mejorados (G.8271.1)

Canal de mensajería de sincronización Ethernet (ESMC) (G.8264, cláusula 11)

Perfil PTP Telecom para tiempo (soporte de temporización completa) (G.8275.1)

Protocolo de tiempo de precisión (versión 2, IEEE1588-2008)

* Previsto para un futuro lanzamiento.

† 224 MHz sólo es compatible con determinadas versiones de hardware. Para más detalles, consulte a su representante de Ceragon...

Normas

MEF

Ethernet portadora 2.0 (CE 2.0)

Estándares Ethernet compatibles

10/100/1000base-T/X (IEEE 802.3)

10GBase-LR (IEEE 802.3)

VLAN Ethernet (IEEE 802.3ac)

LAN virtual (VLAN, IEEE 802.1Q)

Clase de servicio (IEEE 802.1p)

Puentes de proveedor (QinQ - IEEE 802.1ad)

Agregación de enlaces (IEEE 802.1AX)

Auto MDI/MDIX para 1000baseT

RFC 1349: TOS de IPv4

RFC 2474: IPv4 DSCP

RFC 2460: Clases de tráfico IPv6

Seguridad

Cifrado de radio - AES 256

Protocolos seguros:

- HTTPS
- SNMPv3
- SSH
- SFTP

Autenticación y autorización RADIUS

Autenticación, autorización y contabilidad TACACS+ (basada en sesión)

Cumplimiento de las normas

Eficiencia espectral radioeléctrica: FCC Parte 101, EN 302 217-2

CEM: EN 301 489-4, EN 301 489-1, FCC 47 CFR, parte 15, subparte B, ICES-003, TEC/SD/DD/EMC-221/05/OCT-16, IEC 61000-4-29

~~EMC: EN 301 489-1, EN 301 489-4, Class B (Europe), FCC 47 CFR, part 15, class B (US), ICES-003, Class B (Canada), TEC/EMI/TEL-001/01, Class B (India)~~

Sobretensión: EN61000-4-5, Clase 4 (para puertos PWR y ETH1/PoE)

Seguridad: EN 62368-1, IEC 62368-1, UL 62368-1 CSA-C22.2 nº 62368-1

~~Safety: EN 60950-1, IEC 60950-1, UL 60950-1, CSA-C22.2 No.60950-1, EN 60950-22, UL 60950-22, CSA-C22.2.60950-22~~

Almacenamiento: ETSI EN 300 019-1-1 Clase 1.2

Transporte: ETSI EN 300 019-1-2 Clase 2.

Especificaciones técnicas

Especificaciones mecánicas

Dimensiones (montaje directo HW) - 322mm(H),~~227/~~ 270mm(W), ~~86mm~~85mm(D), 6.23kg 12.67"(H),~~8.93"/~~ 10.62"(W), 3. ~~38~~35"(D), 13. ~~2~~ 73 lbs.

Diámetro del mástil (para instalación remota) 8,89 cm - 11,43 cm; 3,5" - 4,5".

Especificaciones medioambientales

-33 C a +55°° C (-45° C a +60° C ampliado)
-27° F a +131° F (-49° F a +140° F ampliada)

Especificaciones de entrada de alimentación

Entrada estándar: -48 VCC

Rango de entrada CC: de -40,5 a -60 V CC

Especificaciones de consumo

Operación 2+0:

- 6-11 GHz: ~~73W~~96W
- 13-42 GHz: ~~63W~~85W

1+0 Funcionamiento (una portadora silenciada):

- 6-11 GHz: ~~63W~~76W
- 13-42 GHz: ~~55W~~71W

Ambos portadores enmudecieron:

- 6-11 GHz: ~~38W~~54W
- 13-42 GHz: ~~40W~~54W

Especificaciones mecánicas del inyector PoE

Dimensiones - 134 mm (alto), 190 mm (ancho), 62 mm (fondo), 1 kg

Especificaciones ambientales del inyector PoE

-33° C a +55° C (-45° C a +60° C ampliado)

Especificaciones de entrada de alimentación del inyector PoE

Entrada estándar: -48 o +24 V CC (opcional)

Rango de entrada de CC: ±(18/40,5 a 60) V CC (el rango ampliado de +18 V CC se admite como parte del soporte nominal de +24 V CC)

Interfaces de inyector PoE

Puerto de datos GbE compatible con 10/100/1000Base-T

Puerto Power-Over-Ethernet (PoE)

Puerto de alimentación de CC de -40 V a -60 V (hay disponible un PoE que admite dos alimentaciones de CC redundantes, cada una de las cuales admite ±(18-60)V)

Imagen del producto

Especificaciones de radio

Capacidad [Mbps]

Modulación	14 MHz	20 MHz	25 MHz	28/30 MHz	40 MHz	50 MHz	56/60 MHz
BPSK	-	10-13	14-17	18-22	25-31	33-40	40-49
QPSK	16-20	25-30	32-40	40-48	54-67	67-82	83-102
8 QAM	26-32	39-47	50-61	59-72	83-101	105-129	123-150
16 QAM	37-46	54-66	69-84	84-102	113-139	144-176	172-210
32 QAM	50-61	72-88	92-112	111-136	150-184	181-222	227-277
64 QAM	62-76	89-109	113-139	138-168	185-227	235-287	279-341
128 QAM	76-93	108-132	137-168	166-203	225-275	275-336	338-413
256 QAM	87-106	123-150	157-192	192-234	242-296	326-399	391-478
512 QAM	96-118	134-164	174-212	204-249	265-324	354-433	420-514
1024 QAM Fuerte	102-125	143-175	185-226	223-272	301-368	386-472	457-559
1024 QAM Luz	108-132	152-186	196-240	236-289	320-391	410-501	486-594
2048 QAM	113-138	162-198	211-258	258-315	346-423	442-541	527-644
4096 QAM	-	-	228-279	275-336	366-448	459-561	542-663

	70 MHz	80 MHz	112 MHz	140 MHz	160 MHz	224 MHz
BPSK	47-57	59-72	79-97	100-122	112-137	162-198
QPSK	96-118	122-149	162-198	204-249	229-280	328-401
8 QAM	138-168	174-213	242-296	304-371	341-417	489-597
16 QAM	198-242	245-299	330-404	414-506	464-567	665-812
32 QAM	261-318	325-398	435-532	545-666	611-747	875-1069
64 QAM	319-390	399-488	535-654	694-848	778-951	1111-1358
128 QAM	378-462	479-586	647-791	810-990	908-1109	1298-1587
256 QAM	436-532	550-673	740-905	926-1132	1037-1268	1484-1815
512 QAM	479-585	604-739	804-983	1047-1280	1173-1434	1678-2051
1024 QAM Fuerte	521-637	649-793	872-1066	1163-1422	1302-1591	1860-2274
1024 QAM Luz	553-676	691-844	926-1132	-	-	-
2048 QAM	586-716	731-894	999-1221	1280-1564	1431-1750	2009-2456
4096 QAM	618-756	769-940	1034-1264	-	-	-

Potencia de transmisión [dBm]

Notas: Los valores indicados en esta sección son típicos. Los valores reales pueden diferir en cualquier dirección hasta 2 dB.

Modulación	Frecuencia (GHz)	6	7-8	10-11	13	15	18	23	26	28	32	38	42
BPSK - QPSK		28	28	28	26	25	24	24	22~~23~~	22	22	22	15
8 QAM		28	28	28	26	25	24	24	22~~23~~	22	22	22	15
16 QAM		28	27	28	24	24	24	24	22~~23~~	21	21	21	15
32 QAM		28	27	28	24	24	24	24	22~~23~~	21	21	21	14
64 QAM		28	26	27	24	24	23	24	21~~23~~	20	20	20	13
128 QAM		27	26	26	24	24	23	24	21~~23~~	20	20	20	13
256 QAM		27	26	26	24	23	23	23	20~~21~~	19	19	19	13
512 QAM		27	25	26	23	22	22	22	20~~21~~	19	19	19	11
1024 QAM		26	24	25	22	21	21	21	20~~20~~	18	18	18	11
2048 QAM		25	23	24	21	21	20	20	19~~18~~	18	18	18	10
4096 QAM		24	21	22	20	20	19	19	18~~17~~	17	17	17	

Umbral de nivel de recepción [dBm@10E-6]

Nota: Los canales de 160 MHz y 224 MHz no son compatibles con 6 GHz. Para 7-8 GHz, es posible que se ofrezca compatibilidad con canales de 160 MHz y 224 MHz en futuras versiones.

14 MHz GHz	6	7	8	11	13	15	18	23	24	26	28-31	32	36	38	42
BPSK	-94.0	-94.0	-94.0	-93.5	-93.5	-93.5	-93.3	-92.5	-92.5	-93.0	-93.0	-93.0	-91.5	-91.5	-90.5
QPSK	-91.0	-91.0	-91.0	-90.5	-90.5	-90.5	-90.4	-90.0	-89.5	-90.0	-90.0	-90.0	-88.5	-88.5	-87.5
8 PSK	-87.0	-87.0	-87.0	-87.0	-87.0	-86.5	-86.5	-86.0	-85.5	-86.0	-86.0	-86.0	-84.5	-84.5	-83.5
16 QAM	-84.0	-84.0	-84.0	-83.5	-83.5	-83.5	-83.4	-83.0	-82.5	-83.0	-83.0	-83.0	-81.5	-81.5	-80.5
32 QAM	-80.5	-80.5	-80.5	-80.5	-80.5	-80.0	-80.1	-79.5	-79.0	-79.5	-79.5	-79.5	-78.5	-78.5	-77.5
64 QAM	-77.5	-77.5	-77.5	-77.0	-77.0	-77.0	-76.9	-76.5	-76.0	-76.5	-76.5	-76.5	-75.0	-75.0	-74.0
128 QAM	-74.5	-74.5	-74.5	-74.0	-74.0	-74.0	-73.8	-73.0	-73.0	-73.5	-73.5	-73.5	-72.0	-72.0	-71.0
256 QAM	-71.0	-71.0	-71.0	-70.5	-70.5	-70.5	-70.4	-70.0	-69.5	-70.0	-70.0	-70.0	-68.5	-68.5	-67.5
512 QAM	-68.0	-68.0	-68.0	-68.0	-68.0	-67.5	-67.5	-67.0	-66.5	-67.0	-67.0	-67.0	-65.5	-65.5	-64.5
1024 QAM Fuerte	-64.5	-64.5	-64.5	-64.5	-64.5	-64.0	-64.0	-63.5	-63.0	-63.5	-63.5	-63.5	-62.0	-62.0	-61.0
1024 QAM Luz	-63.5	-63.5	-63.5	-63.5	-63.5	-63.0	-63.1	-62.5	-62.0	-62.5	-62.5	-62.5	-61.5	-61.5	-60.5
2048 QAM	-60.5	-60.5	-60.5	-60.0	-60.0	-60.0	-59.9	-59.5	-59.0	-59.5	-59.5	-59.5	-58.0	-58.0	-57.0
20 MHz															
BPSK	-92.4	-92.4	-92.4	-92.2	-92.0	-92.0	-91.9	-91.5	-91.0	-91.5	-91.5	-91.5	-90.0	-90.0	
QPSK	-89.5	-89.5	-89.5	-89.3	-89.5	-89.0	-89.0	-88.5	-88.0	-88.5	-88.5	-88.5	-87.0	-87.0	
8 PSK	-85.5	-85.5	-85.5	-85.3	-85.5	-85.0	-85.0	-84.5	-84.0	-84.5	-84.5	-84.5	-83.0	-83.0	
16 QAM	-82.6	-82.6	-82.6	-82.4	-82.5	-82.0	-82.1	-81.5	-81.0	-81.5	-81.5	-81.5	-80.5	-80.5	
32 QAM	-79.2	-79.2	-79.2	-79.0	-79.0	-79.0	-78.7	-78.0	-77.5	-78.0	-78.0	-78.0	-77.0	-77.0	
64 QAM	-76.0	-76.0	-76.0	-75.8	-76.0	-75.5	-75.5	-75.0	-74.5	-75.0	-75.0	-75.0	-73.5	-73.5	
128 QAM	-73.0	-73.0	-73.0	-72.8	-73.0	-72.5	-72.5	-72.0	-71.5	-72.0	-72.0	-72.0	-70.5	-70.5	
256 QAM	-69.9	-69.9	-69.9	-69.7	-69.5	-69.5	-69.4	-69.0	-68.5	-69.0	-69.0	-69.0	-67.5	-67.5	
512 QAM	-67.1	-67.1	-67.1	-66.9	-67.0	-66.5	-66.6	-66.0	-65.5	-66.0	-66.0	-66.0	-65.0	-65.0	
1024 QAM Fuerte	-64.2	-64.2	-64.2	-64.0	-64.0	-64.0	-63.7	-63.0	-62.5	-63.0	-63.0	-63.0	-62.0	-62.0	
1024 QAM Luz	-63.5	-63.5	-63.5	-63.3	-63.5	-63.0	-63.0	-62.5	-62.0	-62.5	-62.5	-62.5	-61.0	-61.0	
2048 QAM	-61.0	-61.0	-61.0	-60.8	-61.0	-60.5	-60.5	-60.0	-59.5	-60.0	-60.0	-60.0	-58.5	-58.5	
25 MHz															
BPSK	-91.4	-91.4	-91.4	-91.2	-91.0	-91.0	-90.9	-90.5	-90.0	-90.5	-90.5	-90.5	-89.0	-89.0	
QPSK	-88.4	-88.4	-88.4	-88.2	-88.0	-88.0	-87.9	-87.5	-87.0	-87.5	-87.5	-87.5	-86.0	-86.0	
8 PSK	-84.4	-84.4	-84.4	-84.2	-84.0	-84.0	-83.9	-83.5	-83.0	-83.5	-83.5	-83.5	-82.0	-82.0	
16 QAM	-81.5	-81.5	-81.5	-81.3	-81.5	-81.0	-81.0	-80.5	-80.0	-80.5	-80.5	-80.5	-79.0	-79.0	
32 QAM	-78.2	-78.2	-78.2	-78.0	-78.0	-78.0	-77.7	-77.0	-76.5	-77.0	-77.0	-77.0	-76.0	-76.0	
64 QAM	-75.1	-75.1	-75.1	-74.9	-75.0	-74.5	-74.6	-74.0	-73.5	-74.0	-74.0	-74.0	-73.0	-73.0	
128 QAM	-72.0	-72.0	-72.0	-71.8	-72.0	-71.5	-71.5	-71.0	-70.5	-71.0	-71.0	-71.0	-69.5	-69.5	
256 QAM	-68.9	-68.9	-68.9	-68.7	-68.5	-68.5	-68.4	-68.0	-67.5	-68.0	-68.0	-68.0	-66.5	-66.5	
512 QAM	-66.0	-66.0	-66.0	-65.8	-66.0	-65.5	-65.5	-65.0	-64.5	-65.0	-65.0	-65.0	-63.5	-63.5	
1024 QAM Fuerte	-63.1	-63.1	-63.1	-62.9	-63.0	-62.5	-62.6	-62.0	-61.5	-62.0	-62.0	-62.0	-61.0	-61.0	
1024 QAM Luz	-62.2	-62.2	-62.2	-62.0	-62.0	-62.0	-61.7	-61.0	-60.5	-61.0	-61.0	-61.0	-60.0	-60.0	
2048 QAM	-60.1	-60.1	-60.1	-59.9	-60.0	-59.5	-59.6	-59.0	-58.5	-59.0	-59.0	-59.0	-58.0	-58.0	
4096 QAM	-56.0	-56.0	-56.0	-55.8	-56.0	-55.5	-55.5	-55.0	-54.5	-55.0	-55.0	-55.0			

28 MHz Frecu	6	7	8	11	13	15	18	23	24	26	28-31	32	36	38	42
BPSK	-90.8	-90.8	-90.8	-90.6	-90.5	-90.5	-90.3	-89.5	-89.5	-90.0	-90.0	-90.0	-88.5	-88.5	-87.5
QPSK	-87.8	-87.8	-87.8	-87.6	-87.5	-87.5	-87.3	-86.5	-86.5	-87.0	-87.0	-87.0	-85.5	-85.5	-84.5
8 PSK	-83.9	-83.9	-83.9	-83.7	-83.5	-83.5	-83.4	-83.0	-82.5	-83.0	-83.0	-83.0	-81.5	-81.5	-80.5
16 QAM	-80.9	-80.9	-80.9	-80.7	-80.5	-80.5	-80.4	-80.0	-79.5	-80.0	-80.0	-80.0	-78.5	-78.5	-77.5
32 QAM	-77.6	-77.6	-77.6	-77.4	-77.5	-77.0	-77.1	-76.5	-76.0	-76.5	-76.5	-76.5	-75.5	-75.5	-74.5
64 QAM	-74.6	-74.6	-74.6	-74.4	-74.5	-74.0	-74.1	-73.5	-73.0	-73.5	-73.5	-73.5	-72.5	-72.5	-71.5
128 QAM	-71.5	-71.5	-71.5	-71.3	-71.5	-71.0	-71.0	-70.5	-70.0	-70.5	-70.5	-70.5	-69.0	-69.0	-68.0
256 QAM	-68.4	-68.4	-68.4	-68.2	-68.0	-68.0	-67.9	-67.5	-67.0	-67.5	-67.5	-67.5	-66.0	-66.0	-65.0
512 QAM	-65.6	-65.6	-65.6	-65.4	-65.5	-65.0	-65.1	-64.5	-64.0	-64.5	-64.5	-64.5	-63.5	-63.5	-62.5
1024 QAM Fuerte	-62.7	-62.7	-62.7	-62.5	-62.5	-62.5	-62.2	-61.5	-61.0	-61.5	-61.5	-61.5	-60.5	-60.5	-59.5
1024 QAM Luz	-62.0	-62.0	-62.0	-61.8	-62.0	-61.5	-61.5	-61.0	-60.5	-61.0	-61.0	-61.0	-59.5	-59.5	-58.5
2048 QAM	-59.5	-59.5	-59.5	-59.3	-59.5	-59.0	-59.0	-58.5	-58.0	-58.5	-58.5	-58.5	-57.0	-57.0	-56.0
4096 QAM	-55.5	-55.5	-55.5	-55.3	-55.5	-55.0	-55.0	-54.5	-54.0	-54.5	-54.5	-54.5			
30 MHz															
BPSK	-90.7	-90.7	-90.7	-90.5	-90.5	-90.5	-90.2	-89.5	-89.0	-89.5	-89.5	-89.5	-88.5	-88.5	
QPSK	-87.7	-87.7	-87.7	-87.5	-87.5	-87.5	-87.2	-86.5	-86.0	-86.5	-86.5	-86.5	-85.5	-85.5	
8 PSK	-83.7	-83.7	-83.7	-83.5	-83.5	-83.5	-83.2	-82.5	-82.0	-82.5	-82.5	-82.5	-81.5	-81.5	
16 QAM	-80.7	-80.7	-80.7	-80.5	-80.5	-80.5	-80.2	-79.5	-79.0	-79.5	-79.5	-79.5	-78.5	-78.5	
32 QAM	-77.4	-77.4	-77.4	-77.2	-77.0	-77.0	-76.9	-76.5	-76.0	-76.5	-76.5	-76.5	-75.0	-75.0	
64 QAM	-74.3	-74.3	-74.3	-74.1	-74.0	-74.0	-73.8	-73.0	-73.0	-73.5	-73.5	-73.5	-72.0	-72.0	
128 QAM	-71.3	-71.3	-71.3	-71.1	-71.0	-71.0	-70.8	-70.0	-70.0	-70.5	-70.5	-70.5	-69.0	-69.0	
256 QAM	-68.1	-68.1	-68.1	-67.9	-68.0	-67.5	-67.6	-67.0	-66.5	-67.0	-67.0	-67.0	-66.0	-66.0	
512 QAM	-65.8	-65.8	-65.8	-65.6	-65.5	-65.5	-65.3	-64.5	-64.5	-65.0	-65.0	-65.0	-63.5	-63.5	
1024 QAM Fuerte	-62.5	-62.5	-62.5	-62.3	-62.5	-62.0	-62.0	-61.5	-61.0	-61.5	-61.5	-61.5	-60.0	-60.0	
1024 QAM Luz	-61.7	-61.7	-61.7	-61.5	-61.5	-61.5	-61.2	-60.5	-60.0	-60.5	-60.5	-60.5	-59.5	-59.5	
2048 QAM	-59.2	-59.2	-59.2	-59.0	-59.0	-59.0	-58.7	-58.0	-57.5	-58.0	-58.0	-58.0	-57.0	-57.0	
4096 QAM	-55.5	-55.5	-55.5	-55.3	-55.5	-55.0	-55.0	-54.5	-54.0	-54.5	-54.5	-54.5			
40 MHz															
BPSK	-89.6	-89.6	-89.6	-89.4	-89.5	-89.0	-89.1	-88.5	-88.0	-88.5	-88.5	-88.5	-87.5	-87.5	-86.5
QPSK	-86.4	-86.4	-86.4	-86.2	-86.0	-86.0	-85.9	-85.5	-85.0	-85.5	-85.5	-85.5	-84.0	-84.0	-83.0
8 PSK	-82.4	-82.4	-82.4	-82.2	-82.0	-82.0	-81.9	-81.5	-81.0	-81.5	-81.5	-81.5	-80.0	-80.0	-79.0
16 QAM	-79.5	-79.5	-79.5	-79.3	-79.5	-79.0	-79.0	-78.5	-78.0	-78.5	-78.5	-78.5	-77.0	-77.0	-76.0
32 QAM	-76.1	-76.1	-76.1	-75.9	-76.0	-75.5	-75.6	-75.0	-74.5	-75.0	-75.0	-75.0	-74.0	-74.0	-73.0
64 QAM	-73.0	-73.0	-73.0	-72.8	-73.0	-72.5	-72.5	-72.0	-71.5	-72.0	-72.0	-72.0	-70.5	-70.5	-69.5
128 QAM	-70.0	-70.0	-70.0	-69.8	-70.0	-69.5	-69.5	-69.0	-68.5	-69.0	-69.0	-69.0	-67.5	-67.5	-66.5
256 QAM	-67.7	-67.7	-67.7	-67.5	-67.5	-67.5	-67.2	-66.5	-66.0	-66.5	-66.5	-66.5	-65.5	-65.5	-64.5
512 QAM	-64.9	-64.9	-64.9	-64.7	-64.5	-64.5	-64.4	-64.0	-63.5	-64.0	-64.0	-64.0	-62.5	-62.5	-61.5
1024 QAM Fuerte	-61.4	-61.4	-61.4	-61.2	-61.0	-61.0	-60.9	-60.5	-60.0	-60.5	-60.5	-60.5	-59.0	-59.0	-58.0
1024 QAM Luz	-60.7	-60.7	-60.7	-60.5	-60.5	-60.5	-60.2	-59.5	-59.0	-59.5	-59.5	-59.5	-58.5	-58.5	-57.5
2048 QAM	-58.4	-58.4	-58.4	-58.2	-58.0	-58.0	-57.9	-57.5	-57.0	-57.5	-57.5	-57.5	-56.0	-56.0	-55.0
4096 QAM	-55.3	-55.3	-55.3	-55.1	-55.0	-55.0	-54.8	-54.0	-54.0	-54.5	-54.5	-54.5			

50 MHz Frecu	6	7	8	11	13	15	18	23	24	26	28-31	32	36	38	42
BPSK	-88.5	-88.5	-88.5	-88.3	-88.5	-88.0	-88.0	-87.5	-87.0	-87.5	-87.5	-87.5	-86.0	-86.0	
QPSK	-85.6	-85.6	-85.6	-85.4	-85.5	-85.0	-85.1	-84.5	-84.0	-84.5	-84.5	-84.5	-83.5	-83.5	
8 PSK	-81.3	-81.3	-81.3	-81.1	-81.0	-81.0	-80.8	-80.0	-80.0	-80.5	-80.5	-80.5	-79.0	-79.0	
16 QAM	-78.4	-78.4	-78.4	-78.2	-78.0	-78.0	-77.9	-77.5	-77.0	-77.5	-77.5	-77.5	-76.0	-76.0	
32 QAM	-75.4	-75.4	-75.4	-75.2	-75.0	-75.0	-74.9	-74.5	-74.0	-74.5	-74.5	-74.5	-73.0	-73.0	
64 QAM	-72.0	-72.0	-72.0	-71.8	-72.0	-71.5	-71.5	-71.0	-70.5	-71.0	-71.0	-71.0	-69.5	-69.5	
128 QAM	-69.5	-69.5	-69.5	-69.3	-69.5	-69.0	-69.0	-68.5	-68.0	-68.5	-68.5	-68.5	-67.0	-67.0	
256 QAM	-65.9	-65.9	-65.9	-65.7	-65.5	-65.5	-65.4	-65.0	-64.5	-65.0	-65.0	-65.0	-63.5	-63.5	
512 QAM	-63.4	-63.4	-63.4	-63.2	-63.0	-63.0	-62.9	-62.5	-62.0	-62.5	-62.5	-62.5	-61.0	-61.0	
1024 QAM Fuerte	-60.0	-60.0	-60.0	-59.8	-60.0	-59.5	-59.5	-59.0	-58.5	-59.0	-59.0	-59.0	-57.5	-57.5	
1024 QAM Luz	-59.2	-59.2	-59.2	-59.0	-59.0	-59.0	-58.7	-58.0	-57.5	-58.0	-58.0	-58.0	-57.0	-57.0	
2048 QAM	-56.9	-56.9	-56.9	-56.7	-56.5	-56.5	-56.4	-56.0	-55.5	-56.0	-56.0	-56.0	-54.5	-54.5	
4096 QAM	-53.4	-53.4	-53.4	-53.2	-53.0	-53.0	-52.9	-52.5	-52.0	-52.5					
56 MHz															
BPSK	-88.0	-88.0	-88.0	-87.8	-88.0	-87.5	-87.5	-87.0	-86.5	-87.0	-87.0	-87.0	-85.5	-85.5	-84.5
QPSK	-84.8	-84.8	-84.8	-84.6	-84.5	-84.5	-84.3	-83.5	-83.5	-84.0	-84.0	-84.0	-82.5	-82.5	-81.5
8 PSK	-80.7	-80.7	-80.7	-80.5	-80.5	-80.5	-80.2	-79.5	-79.0	-79.5	-79.5	-79.5	-78.5	-78.5	-77.5
16 QAM	-77.8	-77.8	-77.8	-77.6	-77.5	-77.5	-77.3	-76.5	-76.5	-77.0	-77.0	-77.0	-75.5	-75.5	-74.5
32 QAM	-74.5	-74.5	-74.5	-74.3	-74.5	-74.0	-74.0	-73.5	-73.0	-73.5	-73.5	-73.5	-72.0	-72.0	-71.0
64 QAM	-71.5	-71.5	-71.5	-71.3	-71.5	-71.0	-71.0	-70.5	-70.0	-70.5	-70.5	-70.5	-69.0	-69.0	-68.0
128 QAM	-68.6	-68.6	-68.6	-68.4	-68.5	-68.0	-68.1	-67.5	-67.0	-67.5	-67.5	-67.5	-66.5	-66.5	-65.5
256 QAM	-65.4	-65.4	-65.4	-65.2	-65.0	-65.0	-64.9	-64.5	-64.0	-64.5	-64.5	-64.5	-63.0	-63.0	-62.0
512 QAM	-62.8	-62.8	-62.8	-62.6	-62.5	-62.5	-62.3	-61.5	-61.5	-62.0	-62.0	-62.0	-60.5	-60.5	-59.5
1024 QAM Fuerte	-59.5	-59.5	-59.5	-59.3	-59.5	-59.0	-59.0	-58.5	-58.0	-58.5	-58.5	-58.5	-57.0	-57.0	-56.0
1024 QAM Luz	-58.6	-58.6	-58.6	-58.4	-58.5	-58.0	-58.1	-57.5	-57.0	-57.5	-57.5	-57.5	-56.5	-56.5	-55.5
2048 QAM	-56.8	-56.8	-56.8	-56.6	-56.5	-56.5	-56.3	-55.5	-55.5	-56.0	-56.0	-56.0	-54.5	-54.5	-53.5
4096 QAM	-52.9	-52.9	-52.9	-52.7	-52.5	-52.5	-52.4	-52.0	-51.5	-52.0					
60 MHz															
BPSK	-87.8	-87.8	-87.8	-87.6	-87.5	-87.5	-87.3	-86.5	-86.5	-87.0	-87.0	-87.0	-85.5	-85.5	
QPSK	-84.6	-84.6	-84.6	-84.4	-84.5	-84.0	-84.1	-83.5	-83.0	-83.5	-83.5	-83.5	-82.5	-82.5	
8 PSK	-80.8	-80.8	-80.8	-80.6	-80.5	-80.5	-80.3	-79.5	-79.5	-80.0	-80.0	-80.0	-78.5	-78.5	
16 QAM	-77.6	-77.6	-77.6	-77.4	-77.5	-77.0	-77.1	-76.5	-76.0	-76.5	-76.5	-76.5	-75.5	-75.5	
32 QAM	-74.3	-74.3	-74.3	-74.1	-74.0	-74.0	-73.8	-73.0	-73.0	-73.5	-73.5	-73.5	-72.0	-72.0	
64 QAM	-71.2	-71.2	-71.2	-71.0	-71.0	-71.0	-70.7	-70.0	-69.5	-70.0	-70.0	-70.0	-69.0	-69.0	
128 QAM	-68.4	-68.4	-68.4	-68.2	-68.0	-68.0	-67.9	-67.5	-67.0	-67.5	-67.5	-67.5	-66.0	-66.0	
256 QAM	-65.2	-65.2	-65.2	-65.0	-65.0	-65.0	-64.7	-64.0	-63.5	-64.0	-64.0	-64.0	-63.0	-63.0	
512 QAM	-62.7	-62.7	-62.7	-62.5	-62.5	-62.5	-62.2	-61.5	-61.0	-61.5	-61.5	-61.5	-60.5	-60.5	
1024 QAM Fuerte	-59.4	-59.4	-59.4	-59.2	-59.0	-59.0	-58.9	-58.5	-58.0	-58.5	-58.5	-58.5	-57.0	-57.0	
1024 QAM Luz	-58.6	-58.6	-58.6	-58.4	-58.5	-58.0	-58.1	-57.5	-57.0	-57.5	-57.5	-57.5	-56.5	-56.5	
2048 QAM	-56.3	-56.3	-56.3	-56.1	-56.0	-56.0	-55.8	-55.0	-55.0	-55.5	-55.5	-55.5	-54.0	-54.0	
4096 QAM	-52.5	-52.5	-52.5	-52.3	-52.5	-52.0	-52.0	-51.5	-51.0	-51.5					

70 MHz Frecu	6	7	8	11	13	15	18	23	24	26	28-31	32	36	38	42
BPSK	-86.5	-86.0	-85.9	-85.4	-85.4	-85.1	-86.4	-84.9	-83.9	-84.4	-84.4	-84.2	-84.2	-84.5	-83.5
QPSK	-83.7	-83.2	-83.1	-82.6	-82.6	-82.3	-83.6	-82.1	-81.1	-81.6	-81.6	-81.4	-81.4	-81.7	-80.7
8 PSK	-80.0	-79.5	-79.4	-78.9	-78.9	-78.6	-79.9	-78.4	-77.4	-77.9	-77.9	-77.7	-77.7	-78.0	-77.0
16 QAM	-77.0	-76.5	-76.4	-75.9	-75.9	-75.6	-76.9	-75.4	-74.4	-74.9	-74.9	-74.7	-74.7	-75.0	-74.0
32 QAM	-73.4	-72.9	-72.8	-72.3	-72.3	-72.0	-73.3	-71.8	-70.8	-71.3	-71.3	-71.1	-71.1	-71.4	-70.4
64 QAM	-70.5	-70.0	-69.9	-69.4	-69.4	-69.1	-70.4	-68.9	-67.9	-68.4	-68.4	-68.2	-68.2	-68.5	-67.5
128 QAM	-67.7	-67.2	-67.1	-66.6	-66.6	-66.3	-67.6	-66.1	-65.1	-65.6	-65.6	-65.4	-65.4	-65.7	-64.7
256 QAM	-64.9	-64.4	-64.3	-63.8	-63.8	-63.5	-64.8	-63.3	-62.3	-62.8	-62.8	-62.6	-62.6	-62.9	-61.9
512 QAM	-62.2	-61.7	-61.6	-61.1	-61.1	-60.8	-62.1	-60.6	-59.6	-60.1	-60.1	-59.9	-59.9	-60.2	-59.2
1024 QAM Fuerte	-59.3	-58.8	-58.7	-58.2	-58.2	-57.9	-59.2	-57.7	-56.7	-57.2	-57.2	-57.0	-57.0	-57.3	-56.3
1024 QAM Luz	-58.6	-58.1	-58.0	-57.5	-57.5	-57.2	-58.5	-57.0	-56.0	-56.5	-56.5	-56.3	-56.3	-56.6	-55.6
2048 QAM	-56.4	-55.9	-55.8	-55.3	-55.3	-55.0	-56.3	-54.8	-53.8	-54.3	-54.3	-54.1	-54.1	-54.4	-53.4
4096 QAM	-53.0	-52.5	-52.4	-51.9	-51.9	-51.6	-52.9	-51.4	-50.4	-50.9	-50.9	-50.7	-50.7	-51.0	-50.0
80 MHz															
BPSK	-85.9	-85.9	-85.9	-85.7	-85.5	-85.5	-85.4	-85.0	-84.5	-85.0	-85.0	-85.0	-83.5	-83.5	-82.5
QPSK	-83.6	-83.6	-83.6	-83.4	-83.5	-83.0	-83.1	-82.5	-82.0	-82.5	-82.5	-82.5	-81.5	-81.5	-80.5
8 PSK	-79.9	-79.9	-79.9	-79.7	-79.5	-79.5	-79.4	-79.0	-78.5	-79.0	-79.0	-79.0	-77.5	-77.5	-76.5
16 QAM	-76.9	-76.9	-76.9	-76.7	-76.5	-76.5	-76.4	-76.0	-75.5	-76.0	-76.0	-76.0	-74.5	-74.5	-73.5
32 QAM	-73.5	-73.5	-73.5	-73.3	-73.5	-73.0	-73.0	-72.5	-72.0	-72.5	-72.5	-72.5	-71.0	-71.0	-70.0
64 QAM	-70.6	-70.6	-70.6	-70.4	-70.5	-70.0	-70.1	-69.5	-69.0	-69.5	-69.5	-69.5	-68.5	-68.5	-67.5
128 QAM	-67.6	-67.6	-67.6	-67.4	-67.5	-67.0	-67.1	-66.5	-66.0	-66.5	-66.5	-66.5	-65.5	-65.5	-64.5
256 QAM	-64.9	-64.9	-64.9	-64.7	-64.5	-64.5	-64.4	-64.0	-63.5	-64.0	-64.0	-64.0	-62.5	-62.5	-61.5
512 QAM	-62.2	-62.2	-62.2	-62.0	-62.0	-62.0	-61.7	-61.0	-60.5	-61.0	-61.0	-61.0	-60.0	-60.0	-59.0
1024 QAM Fuerte	-59.0	-59.0	-59.0	-58.8	-59.0	-58.5	-58.5	-58.0	-57.5	-58.0	-58.0	-58.0	-56.5	-56.5	-55.5
1024 QAM Luz	-58.6	-58.6	-58.6	-58.4	-58.5	-58.0	-58.1	-57.5	-57.0	-57.5	-57.5	-57.5	-56.5	-56.5	-55.5
2048 QAM	-55.7	-55.7	-55.7	-55.5	-55.5	-55.5	-55.2	-54.5	-54.0	-54.5	-54.5	-54.5	-53.5	-53.5	-52.5
4096 QAM	-52.1	-52.1	-52.1	-51.9	-52.0	-51.5	-51.6	-51.0	-50.5	-51.0	-51.0	-51.0			
112 MHz															
BPSK	-84.3	-84.3	-84.3	-84.1	-84.0	-84.0	-83.8	-83.0	-83.0	-83.5	-83.5	-83.5	-82.0	-82.0	-81.0
QPSK	-81.9	-81.9	-81.9	-81.7	-81.5	-81.5	-81.4	-81.0	-80.5	-81.0	-81.0	-81.0	-79.5	-79.5	-78.5
8 PSK	-77.9	-77.9	-77.9	-77.7	-77.5	-77.5	-77.4	-77.0	-76.5	-77.0	-77.0	-77.0	-75.5	-75.5	-74.5
16 QAM	-75.0	-75.0	-75.0	-74.8	-75.0	-74.5	-74.5	-74.0	-73.5	-74.0	-74.0	-74.0	-72.5	-72.5	-71.5
32 QAM	-71.6	-71.6	-71.6	-71.4	-71.5	-71.0	-71.1	-70.5	-70.0	-70.5	-70.5	-70.5	-69.5	-69.5	-68.5
64 QAM	-68.6	-68.6	-68.6	-68.4	-68.5	-68.0	-68.1	-67.5	-67.0	-67.5	-67.5	-67.5	-66.5	-66.5	-65.5
128 QAM	-65.7	-65.7	-65.7	-65.5	-65.5	-65.5	-65.2	-64.5	-64.0	-64.5	-64.5	-64.5	-63.5	-63.5	-62.5
256 QAM	-62.7	-62.7	-62.7	-62.5	-62.5	-62.5	-62.2	-61.5	-61.0	-61.5	-61.5	-61.5	-60.5	-60.5	-59.5
512 QAM	-60.3	-60.3	-60.3	-60.1	-60.0	-60.0	-59.8	-59.0	-59.0	-59.5	-59.5	-59.5	-58.0	-58.0	-57.0
1024 QAM Fuerte	-57.3	-57.3	-57.3	-57.1	-57.0	-57.0	-56.8	-56.0	-56.0	-56.5	-56.5	-56.5	-55.0	-55.0	-54.0
1024 QAM Luz	-56.6	-56.6	-56.6	-56.4	-56.5	-56.0	-56.1	-55.5	-55.0	-55.5	-55.5	-55.5	-54.5	-54.5	-53.5
2048 QAM	-54.0	-54.0	-54.0	-53.8	-54.0	-53.5	-53.5	-53.0	-52.5	-53.0	-53.0	-53.0	-51.5	-51.5	-50.5
4096 QAM	-51.3	-51.3	-51.3	-51.1	-51.0	-51.0	-50.8	-50.0	-50.0	-50.5	-50.5	-50.5			

140 MHz	Frecu	6	7	8	10-11	13	15	18	23	24	26	28-31	32	36	38	42
BPSK			-83.3	-83.2	-82.7	-82.7	-82.4	-83.7	-82.2	-81.2	-81.7	-81.7	-81.5	-81.5	-81.7	-80.7
QPSK			-80.0	-79.9	-79.4	-79.4	-79.1	-80.4	-78.9	-77.9	-78.4	-78.4	-78.2	-78.2	-78.4	-77.4
8 PSK			-76.4	-76.3	-75.8	-75.8	-75.5	-76.8	-75.3	-74.3	-74.8	-74.8	-74.6	-74.6	-74.8	-73.8
16 QAM			-73.3	-73.2	-72.7	-72.7	-72.4	-73.7	-72.2	-71.2	-71.7	-71.7	-71.5	-71.5	-71.7	-70.7
32 QAM			-69.7	-69.6	-69.1	-69.1	-68.8	-70.1	-68.6	-67.6	-68.1	-68.1	-67.9	-67.9	-68.1	-67.1
64 QAM			-66.3	-66.2	-65.7	-65.7	-65.4	-66.7	-65.2	-64.2	-64.7	-64.7	-64.5	-64.5	-64.7	-63.7
128 QAM			-63.8	-63.7	-63.2	-63.2	-62.9	-64.2	-62.7	-61.7	-62.2	-62.2	-62.0	-62.0	-62.2	-61.2
256 QAM			-60.8	-60.7	-60.2	-60.2	-59.9	-61.2	-59.7	-58.7	-59.2	-59.2	-59.0	-59.0	-59.2	-58.2
512 QAM			-57.9	-57.8	-57.3	-57.3	-57.0	-58.3	-56.8	-55.8	-56.3	-56.3	-56.1	-56.1	-56.3	-55.3
1024 QAM			-54.8	-54.7	-54.2	-54.2	-53.9	-55.2	-53.7	-52.7	-53.2	-53.2	-53.0	-53.0	-53.2	-52.2
2048 QAM			-51.7	-51.6	-51.1	-51.1	-50.8	-52.1	-50.6	-49.6	-50.1	-50.1	-49.9	-49.9	-50.1	-49.1
160 MHz																
BPSK			-82.7	-82.6	-82.1	-82.1	-81.8	-83.2	-81.6	-80.6	-81.1	-81.1	-80.9	-80.9	-81.2	-80.2
QPSK			-79.6	-79.5	-79.0	-79.0	-78.7	-80.1	-78.5	-77.5	-78.0	-78.0	-77.8	-77.8	-78.1	-77.1
8 PSK			-75.8	-75.7	-75.2	-75.2	-74.9	-76.3	-74.7	-73.7	-74.2	-74.2	-74.0	-74.0	-74.3	-73.3
16 QAM			-72.8	-72.7	-72.2	-72.2	-71.9	-73.3	-71.7	-70.7	-71.2	-71.2	-71.0	-71.0	-71.3	-70.3
32 QAM			-69.2	-69.1	-68.6	-68.6	-68.3	-69.7	-68.1	-67.1	-67.6	-67.6	-67.4	-67.4	-67.7	-66.7
64 QAM			-65.9	-65.8	-65.3	-65.3	-65.0	-66.4	-64.8	-63.8	-64.3	-64.3	-64.1	-64.1	-64.4	-63.4
128 QAM			-63.3	-63.2	-62.7	-62.7	-62.4	-63.8	-62.2	-61.2	-61.7	-61.7	-61.5	-61.5	-61.8	-60.8
256 QAM			-60.4	-60.3	-59.8	-59.8	-59.5	-60.9	-59.3	-58.3	-58.8	-58.8	-58.6	-58.6	-58.9	-57.9
512 QAM			-57.4	-57.3	-56.8	-56.8	-56.5	-57.9	-56.3	-55.3	-55.8	-55.8	-55.6	-55.6	-55.9	-54.9
1024 QAM			-54.3	-54.2	-53.7	-53.7	-53.4	-54.8	-53.2	-52.2	-52.7	-52.7	-52.5	-52.5	-52.8	-51.8
2048 QAM			-50.8	-50.7	-50.2	-50.2	-49.9	-51.3	-49.7	-48.7	-49.2	-49.2	-49.0	-49.0	-49.3	-48.3
224 MHz																
BPSK			-81.1	-81.1	-80.5	-80.6	-80.2	-81.6	-81.0	-80.5	-81.0	-81.0	-81.0	-80.0	-80.0	-79.0
QPSK			-78.0	-78.0	-77.4	-77.5	-77.1	-78.5	-78.0	-77.5	-78.0	-78.0	-78.0	-76.5	-76.5	-75.5
8 PSK			-74.2	-74.2	-73.6	-73.7	-73.3	-74.7	-74.0	-73.5	-74.0	-74.0	-74.0	-73.0	-73.0	-72.0
16 QAM			-71.2	-71.2	-70.6	-70.7	-70.3	-71.7	-71.0	-70.5	-71.0	-71.0	-71.0	-70.0	-70.0	-69.0
32 QAM			-67.6	-67.6	-67.0	-67.1	-66.7	-68.1	-67.5	-67.0	-67.5	-67.5	-67.5	-66.5	-66.5	-65.5
64 QAM			-64.3	-64.3	-63.7	-63.8	-63.4	-64.8	-64.0	-64.0	-64.5	-64.5	-64.5	-63.0	-63.0	-62.0
128 QAM			-61.7	-61.7	-61.1	-61.2	-60.8	-62.2	-61.5	-61.0	-61.5	-61.5	-61.5	-60.5	-60.5	-59.5
256 QAM			-58.7	-58.7	-58.1	-58.2	-57.8	-59.2	-58.5	-58.0	-58.5	-58.5	-58.5	-57.5	-57.5	-56.5
512 QAM			-55.8	-55.8	-55.2	-55.3	-54.9	-56.3	-55.5	-55.5	-56.0	-56.0	-56.0	-54.5	-54.5	-53.5
1024 QAM			-52.7	-52.7	-52.1	-52.2	-51.8	-53.2	-52.5	-52.0	-52.5	-52.5	-52.5	-51.5	-51.5	-50.5
2048 QAM			-49.5	-49.5	-48.9	-49.0	-48.6	-50.0	-48.5	-47.4	-47.9	-47.9	-47.7	-47.7	-48.0	-47.0