Statement of Hammett & Edison, Inc., Consulting Engineers

The firm of Hammett & Edison, Inc., Consulting Engineers, has been retained by the Catholic Television Network (CTN) to prepare this engineering exhibit in support of a joint CTN and National ITFS Association (NIA) Petition for Reconsideration of the July 29, 2004, WT Docket 03-66 Report and Order (R&O).

Need For 20-km Upgraded Downconverter Trigger

Since the CTN/NIA/WCA White Paper was filed on October 7, 2002, it has become apparent that in some cases customer premises equipment (CPE) transmitters that employ an external, rooftop antenna could have communication ranges of up to 32 km (20 miles) from their respective base station. Because of this the upgraded downconverter trigger proposed in the Appendix B White Paper, namely any EBS receive site that is a) within its own Protected Service Area (PSA) and b) inside of or within 6 miles (9.6 km) of the Geographic Service Area (GSA) of an LBS or UBS two-way operator, may no longer be sufficient to ensure that fixed EBS receive sites are not subjected to brute force overload (BFO) by one or more nearby CPE devices. Unlike co-channel or adjacent-channel interference, where only base stations or CPE devices that transmit on a frequency that is co-channel or adjacent-channel to the protected EBS receive site are a threat, all transmissions in the 2,496–2,690 MHz band pose a BFO threat to EBS receive sites. Thus, for BFO, the threat universe is significantly greater than the co-channel or adjacent-channel threat universe. Accordingly, the criteria for whether an EBS receive site should be eligible for an upgraded, BFO-tolerant downconverter should be any EBS receive site within its own PSA, and within 32 km (20 miles) of an LBS or UBS base station.

Co-Channel KGG-38 GSA Study

The attached Figures 1 through 4 show a co-channel Geographic Service Area (GSA) interference study for grandfathered E-Group EBS Station KGG-38, licensed to Stanford University. This EBS station currently has 281 fixed receive sites. The transmitter is located at Black Mountain, on the San Francisco peninsula, and serves 281 receive sites scattered throughout the San Francisco Bay Area. KGG-38 employs a cardioid main transmitting antenna plus several spot-beam dishes to feed the most distant receive sites (some of which are then used to feed other channel group Stanford University EBS stations). Stanford University heavily programs all four of its E-Group channels; programming is primarily in support of post-graduate degree work for employees of businesses located in the San Francisco Bay Area, which includes "Silicon Valley."

Figure 1 shows the 35-mile (56.33-km) radius protected service areas (PSAs) of the three closest co-channel stations, WHT-653, a Broadband Radio Service (BRS) station located at San Bruno Mountain;

WMY-499, also a BRS station, but located at Monument Peak; and WHR-848, a Channel E1 EBS station located at Walnut Grove. As shown by this figure, only the San Bruno Mountain and Monument Peak BRS stations come into play when deriving the KGG-38 GSA.

Figure 2 shows the current KGG-38 universe of 281 fixed receive sites. Figure 3A shows the KGG-38 fixed receive sites, but centered on the KGG-38 GSA. Finally, Figure 3B shows just the 103 fixed receive sites that are inside the GSA, and entitled to protection.

Figure 4A shows a hypothetical Channel E4 base station at 37° 24' 59.8" N, 122° 10' 03.9" W, NAD83 (37° 25' 00" W, 122° 10' 00" W, NAD27). This location is 2.25 km from the WHT-653/KGG-38 GSA boundary. A Channel E4 base station with an equivalent isotropic radiated power (EIRP) of 3.19 watts towards the GSA boundary would be permissible at this distance (*i.e.*, an EIRP of 3.19 watts gives a PFD of -73.0 dBW/m^2 at a distance of 2.25 km). To get this EIRP, the hypothetical base station was modeled using an Andrew HMD8VO vertically polarized transmitting antenna with a gain of 11.5 dBi, 1.5 dB of line loss, and a transmitter power output (TPO) of 0.319 watts, with a center-of-radiation (C.O.R.) height of 50 feet AGL/245 feet AMSL, and employing 1° of electrical beam tilt (ebt). Note that this makes the hypothetical base station cross-polarized to KGG-38.

Figure 4B-4E is an interference study for the protected Stanford fixed receive sites versus the hypothetical, PFD-at-the-GSA-boundary-compliant, Channel E4 base station. As can be seen from the summary at the end of the study, twenty of the fixed receive sites would fail to be protected based on a 45 dB co-channel desired-to-undesired (D/U) criteria. If the D/U criteria is lowered to 38 dB, corresponding to analog-into-analog with different precision frequency offsets, the number of failed receive sites decreases to twelve. If the D/U criteria is lowered to 32 dB, corresponding to a digital-into-analog or digital-into-digital situation, the number of failed receive sites drops to just three.

However, the point is that if there is only a geographic licensing test, and no D/U ratio test, an adjacent GSA operator would have no obligation to worry about D/U ratios, and so could make the hypothetical base station HPOL, thus becoming parallel-polarized to KGG-38, in which case the number of failed receive sites, even using a relaxed 32 dB D/U criteria, increases to eleven.

For adjacent-channel situations with overlapping PSAs, a base station could be placed next to a fixed receive site, resulting in an adjacent-channel D/U ratio of far worse than 0 dB. This is the same "near/far" problem that has forced the FCC to de-interleave the 800 MHz Specialized Mobile Radio (SMR) band, to resolve a serious interference problem between "big stick" high-power public safety channels and low-power, cellular-architecture, ESMR (Enhanced SMR) base stations (WT Docket 02-55). A responding public safety user loses communications because he/she is now perhaps only a half-block from a "low power" ESMR base station, but perhaps 10 miles from the high-power, big-stick

public safety transmitter. The proximity of the low-power ESMR base station overwhelms the signal of the high-power, high-elevation, but distant, public safety SMR transmitter.

Thus, it is clear that a geographic licensing only test is insufficient to guarantee protection of MBS fixed receive sites.

List of Figures

In carrying out these engineering studies, the following attached figures were prepared under my direct supervision:

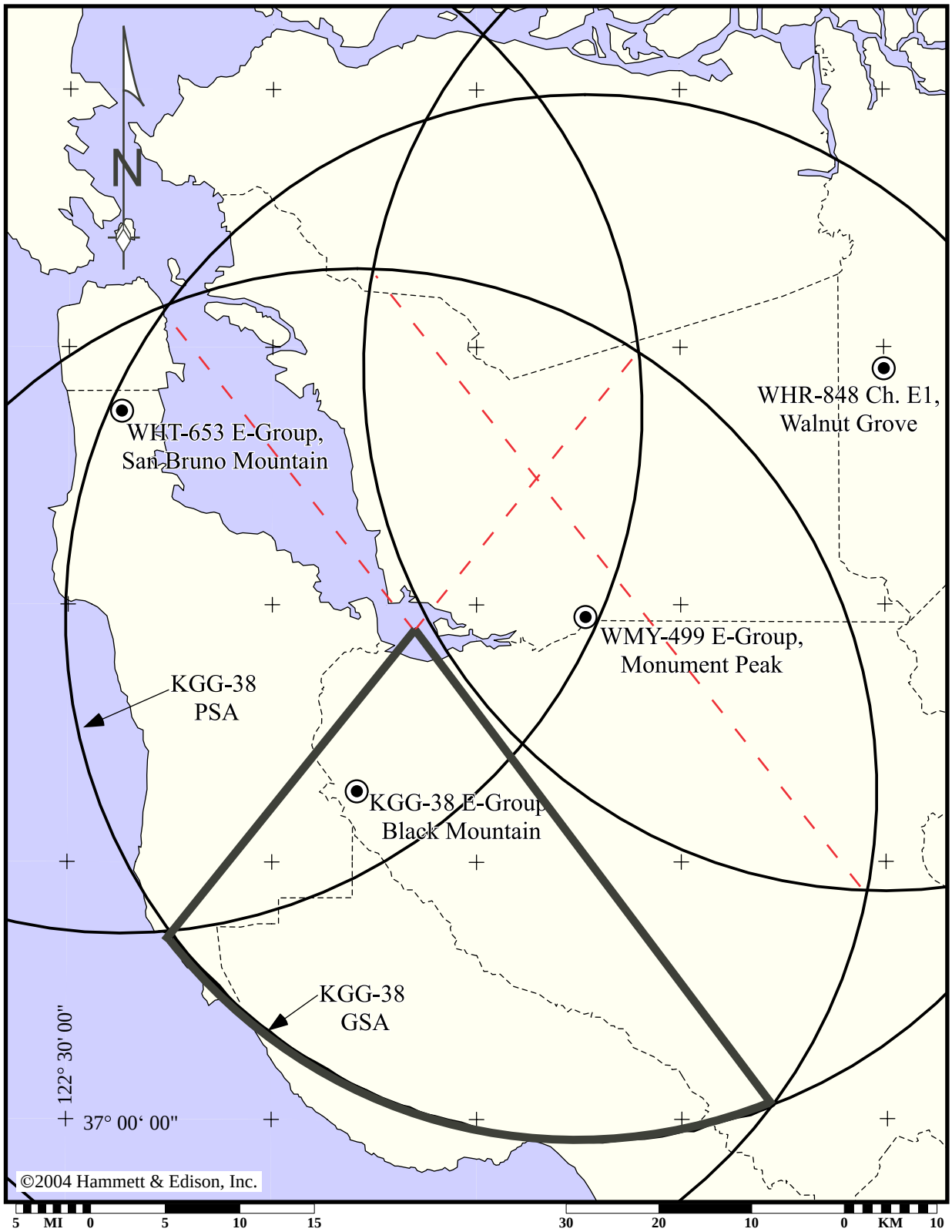
1. Figure showing the derivation of the KGG-38 GSA
2. Figure showing all KGG-38 fixed receive sites *vs* the GSA boundary
3. Increased resolution figures showing the KGG-38 GSA and nearby fixed receive sites
4. Interference study for the KGG-38 fixed receive sites that are inside the GSA boundary.

REGISTERED PROFESSIONAL ENGINEER
DANE E. ERICKSEN
No. 11654
Exp. 9-30-06
ELECTRICAL
STATE OF CALIFORNIA

Dane E. Ericksen, P.E.

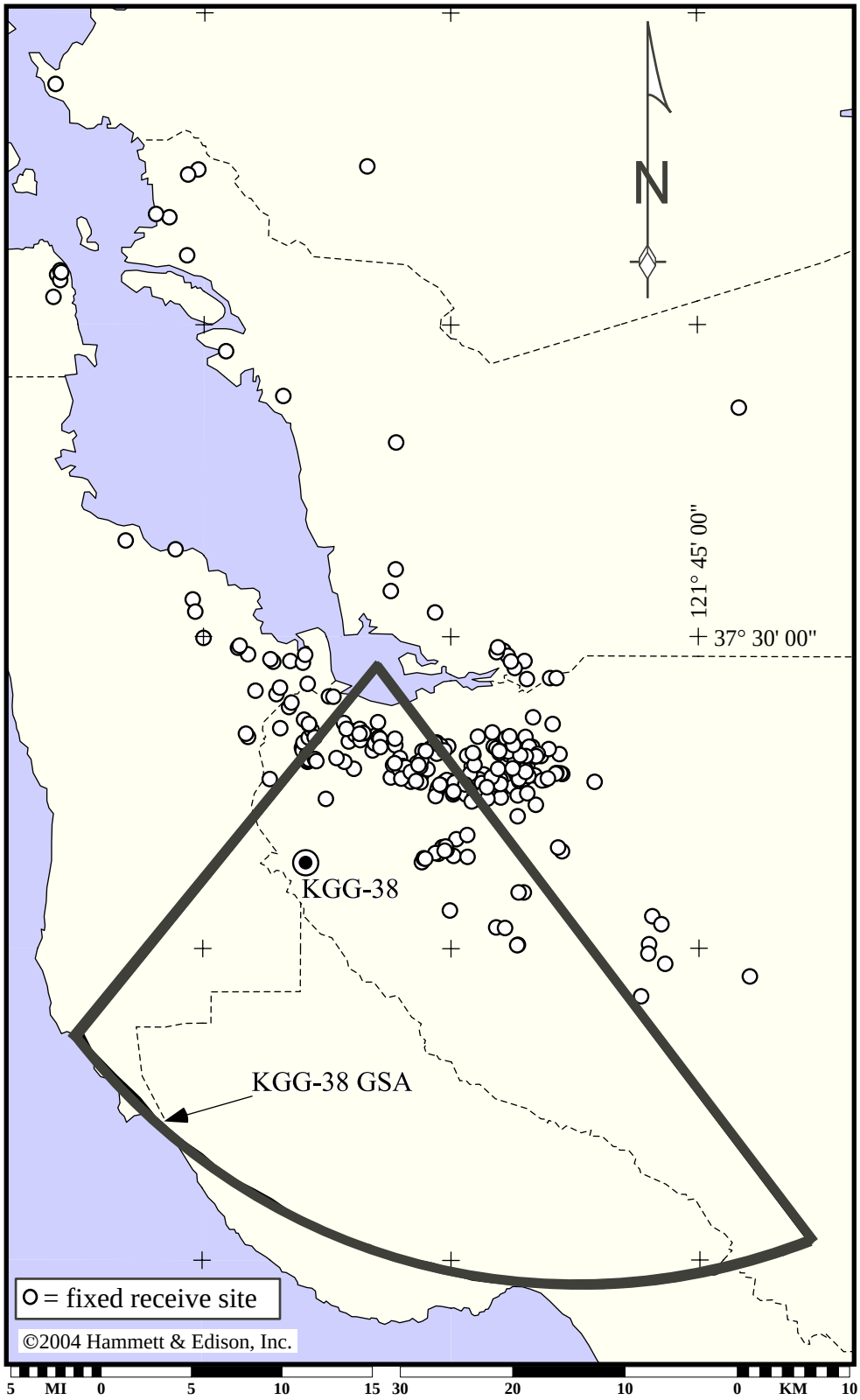
January 9, 2005

KGG-38 GSA



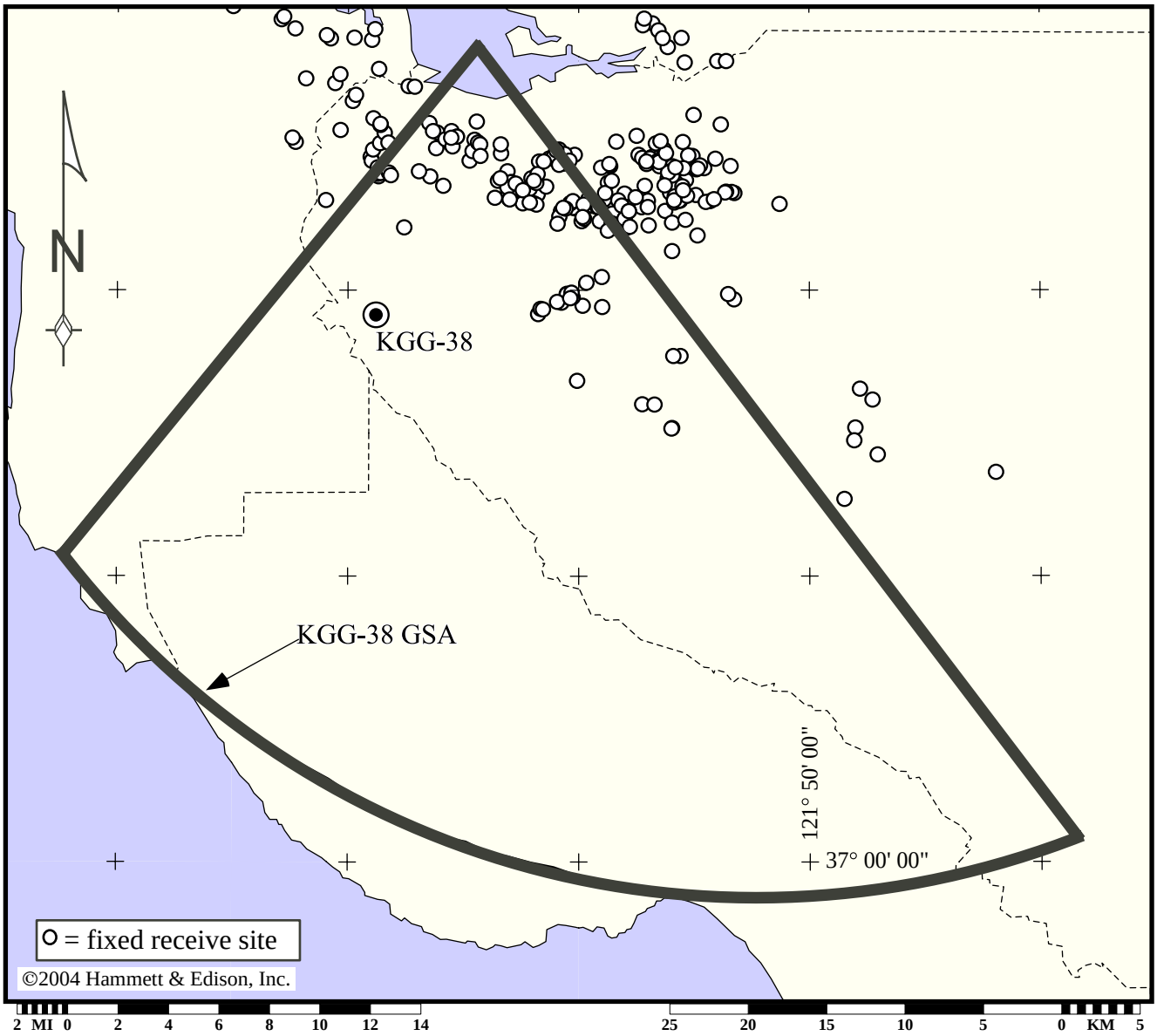
Lambert conformal conic map projection. Map data taken from Sectional Aeronautical Charts, published by the National Ocean Survey. Geographic coordinate marks shown at 15-minute increments.

All 281 KGG-38 Fixed Receive Sites



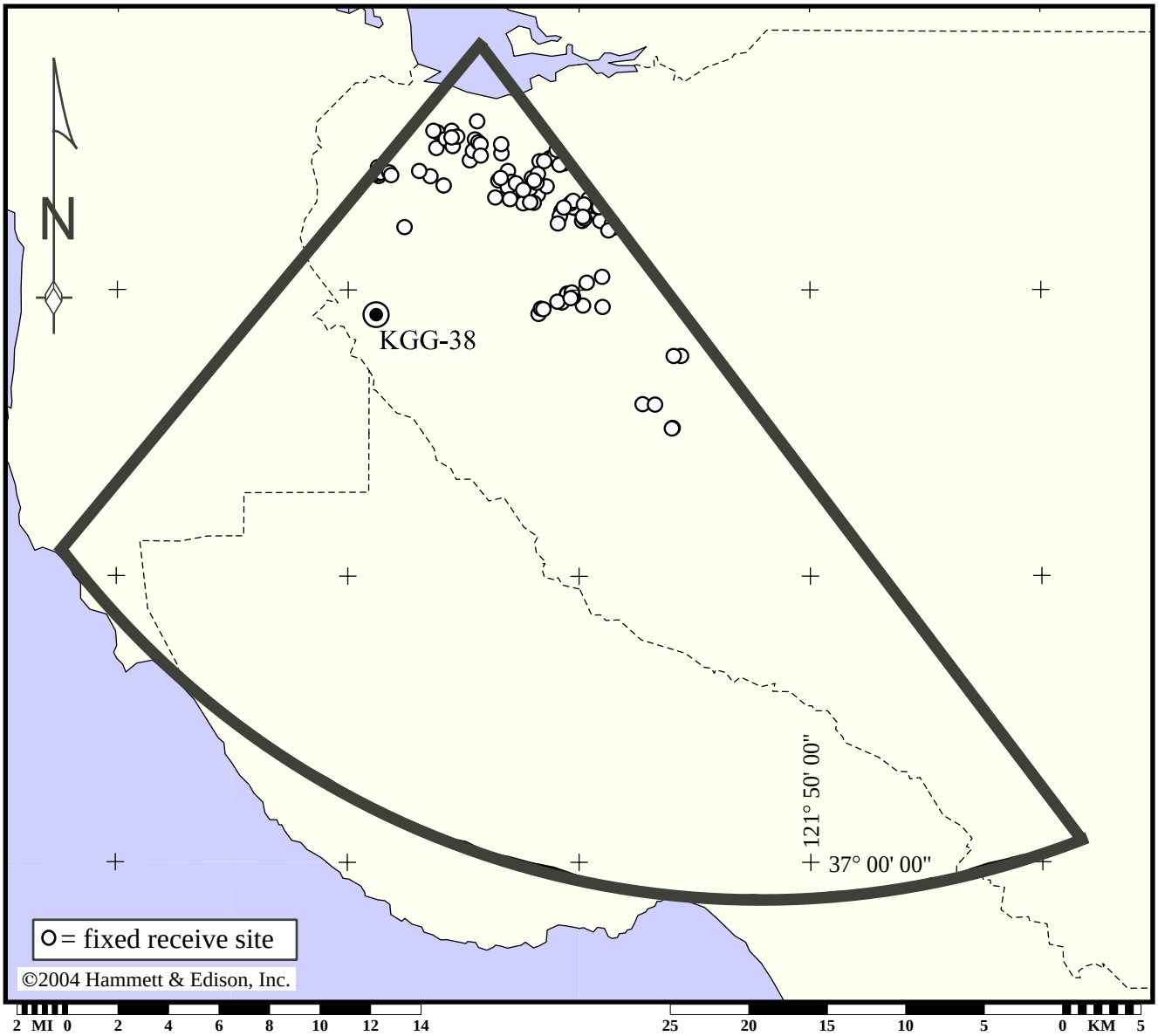
Lambert conformal conic map projection. Map data taken from Sectional Aeronautical Charts, published by the National Ocean Survey. Geographic coordinate marks shown at 15-minute increments.

KGG-38 GSA



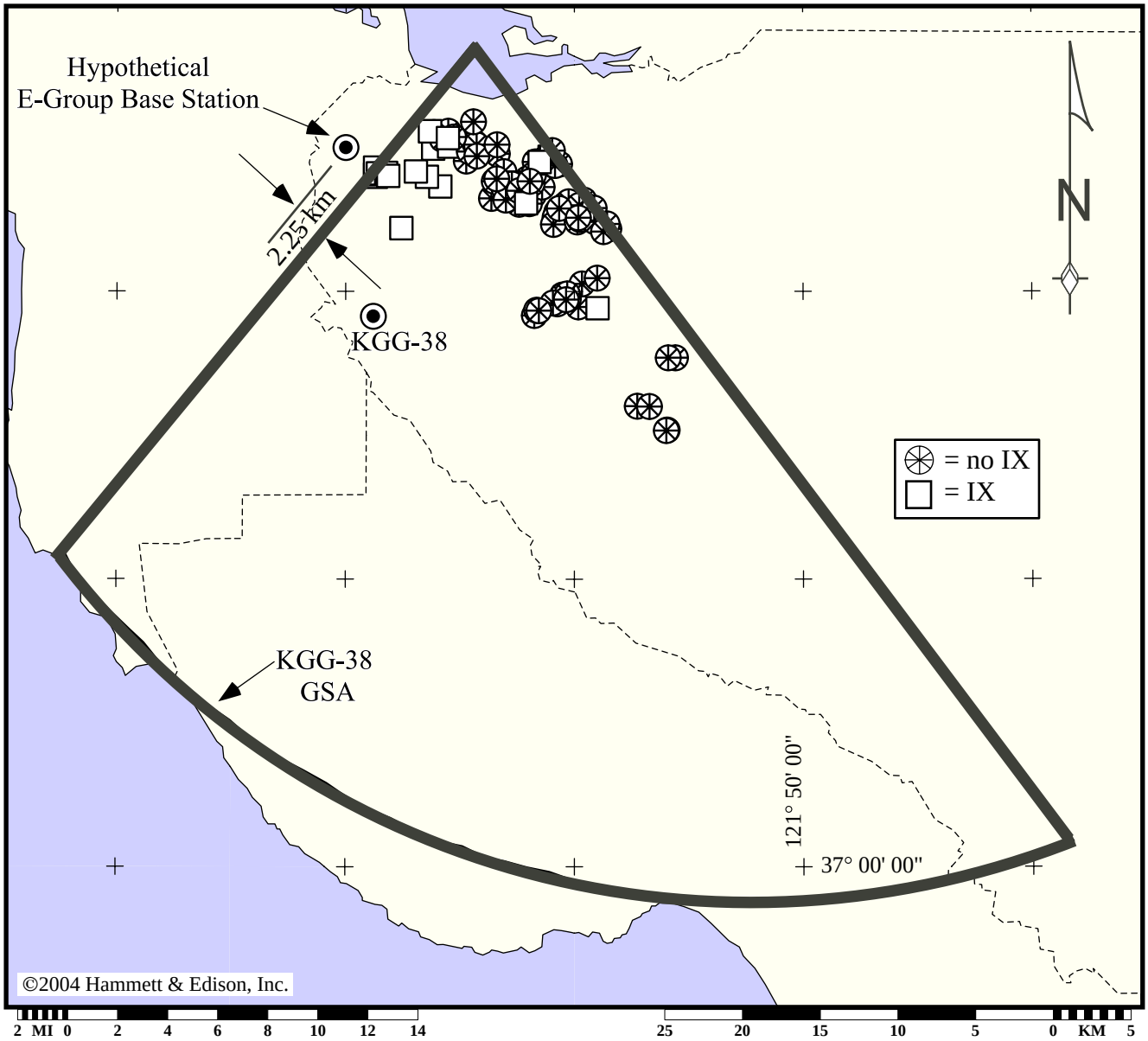
Lambert conformal conic map projection. Map data taken from Sectional Aeronautical Charts, published by the National Ocean Survey. Geographic coordinate marks shown at 10-minute increments.

KGG-38 Inside-GSA Protected Receive Sites



Lambert conformal conic map projection. Map data taken from Sectional Aeronautical Charts, published by the National Ocean Survey. Geographic coordinate marks shown at 10-minute increments.

Interference Study for Hypothetical E-Group Base Station Located 2.25 km Outside KGG-38 GSA
3.19 W EIRP OMNI
C.O.R. = 50 ft AGL, 245 ft AMSL



Lambert conformal conic map projection. Map data taken from Sectional Aeronautical Charts, published by the National Ocean Survey. Geographic coordinate marks shown at 10-minute increments.

Interference Study for Hypothetical E-Group Base Station Located 2.25 km Outside the KGG-38 GSA

Tx ID	Licensee	Location	Type
ST1	Stanford, main cardioid KGG-38 ITFS E-Group	Black Mtn.	ITFS
ST2	Stanford, 10 ft/Livermore RT-30 dish	Black Mtn.	ITFS
ST3	Stanford, 8 ft/Gilroy RRT-1 dish	Black Mtn.	ITFS
ST4	Stanford, 10 ft/SF R-16/R-44 dish	Black Mtn.	ITFS
ST5	Stanford, 10 ft/Richmond RT-29	Black Mtn.	ITFS
HYPO_E	Hypothetical E Group base stn	2.25 km from GS	MMDS

Tx ID	Latitude	Longitude	Ofs	Pol	Power	Loss	Antenna	Gain	Azim	Etilt	Mtilt
ST1	37-19-08	122-08-47	+	H	10.0	3.3	63020	16.0	30.0	0.0	2.0@ 30.0
ST2	37-19-08	122-08-47	+	H	10.0	13.1	P10F25	35.9	43.5	0.0	0.9@ 43.5
ST3	37-19-08	122-08-47	+	H	10.0	13.1	P8F25	33.9	111.2	0.0	0.8@111.2
ST4	37-19-08	122-08-47	+	H	10.0	12.1	P10F25	35.9	337.0	0.0	1.0@337.0
ST5	37-19-08	122-08-47	+	H	10.0	16.6	P10F25	35.9	342.1	0.0	0.8@342.1
HYPO_E	37-25-00	122-10-00	n	V	0.3	1.5	HMD8O	11.5	0.0	1.0	0.0@ 0.0

Receiver data								Undesired signals				
Tx ID	Rx ID	Antenna	Bear	Dist	FSpace	TLoss	St	Tx ID	FSpace	TLoss	D/U	Rq
ST1	R1	P25A48GH	37.3	8.2	-46.8		OK	HYPO_E	-97.8		51.0	45
ST1	R8	P25A48GH	46.3	8.9	-46.1		OK	HYPO_E	-99.8		53.6	45
ST1	R9	P25A48GH	18.1	7.7	-46.5		OK	HYPO_E	-93.2		46.7	45
ST1	R24	P25A48GH	0.9	5.6	-47.5		IX	HYPO_E	-87.5		39.9	45
ST1	R38	P25A48GH	87.3	8.2	-49.0		OK	HYPO_E	-103.3		54.2	45
ST1	R53	P25A48GH	60.3	8.5	-45.7		OK	HYPO_E	-101.1		55.4	45
ST1	R54	P25A48GH	59.7	8.9	-45.7		OK	HYPO_E	-101.4		55.7	45
ST1	R55	P25A48GH	81.1	8.5	-47.8		OK	HYPO_E	-103.0		55.2	45
ST1	R60	P25A48GH	61.3	8.3	-45.7		OK	HYPO_E	-101.1		55.4	45
ST1	R64	P25A48GH	62.4	9.3	-45.9		OK	HYPO_E	-101.9		55.9	45
ST1	R68	P25A48GH	61.4	9.0	-45.8		OK	HYPO_E	-101.6		55.8	45
ST1	R71	P25A48GH	47.4	9.3	-46.1		OK	HYPO_E	-100.2		54.1	45
ST1	R73	P25A48GH	86.1	7.4	-49.2		OK	HYPO_E	-102.7		53.4	45
ST1	R74	P25A48GH	30.8	7.2	-47.2		OK	HYPO_E	-95.9		48.7	45
ST1	R75	P25A48GH	48.4	7.1	-46.2		OK	HYPO_E	-98.7		52.6	45
ST1	R89	2536	48.2	8.3	-49.0		OK	HYPO_E	-100.2		51.3	45
ST1	R91	2536	0.6	5.7	-50.2		IX	HYPO_E	-87.1		36.9	45
ST1	R99	P25A48GH	83.4	7.6	-48.7		OK	HYPO_E	-102.6		54.0	45
ST1	R106	2536	23.1	7.5	-49.9		OK	HYPO_E	-95.5		45.5	45
ST1	R116	2536	89.6	6.5	-54.3		OK	HYPO_E	-102.6		48.3	45
ST1	R124	2536	27.2	5.8	-51.4		IX	HYPO_E	-95.5		44.1	45
ST1	R125	2536	83.6	7.6	-51.8		OK	HYPO_E	-102.9		51.1	45
ST1	R130	2536	19.5	7.1	-49.9		IX	HYPO_E	-94.5		44.6	45
ST1	R131	2536	21.2	7.6	-49.9		OK	HYPO_E	-95.0		45.2	45
ST1	R132	2536	22.0	8.0	-49.9		OK	HYPO_E	-95.4		45.5	45
ST1	R134	PT2521	23.9	7.4	-53.9		IX	HYPO_E	-84.7		30.8	45
ST1	R135	2536	28.9	8.1	-50.2		OK	HYPO_E	-97.0		46.8	45
ST1	R137	2536	30.1	7.6	-50.2		OK	HYPO_E	-97.0		46.8	45
ST1	R138	2536	30.2	8.0	-50.2		OK	HYPO_E	-97.2		47.0	45
ST1	R142	2536	46.7	7.2	-49.3		OK	HYPO_E	-99.5		50.2	45
ST1	R143	2536	47.4	7.4	-49.1		OK	HYPO_E	-99.7		50.5	45
ST1	R146	2536	52.8	8.0	-48.7		OK	HYPO_E	-100.7		51.9	45
ST1	R148	2536	54.1	7.7	-48.7		OK	HYPO_E	-100.7		51.9	45
ST1	R150	2536	59.9	8.6	-48.7		OK	HYPO_E	-101.7		52.9	45
ST1	R151	2536	61.0	9.6	-49.0		OK	HYPO_E	-102.2		53.2	45
ST1	R152	2536	61.0	8.9	-48.8		OK	HYPO_E	-101.9		53.1	45
ST1	R154	2	62.9	8.1	-53.8		OK	HYPO_E	-104.8		51.0	45
ST1	R169	2536	84.8	7.8	-52.0		OK	HYPO_E	-103.0		51.0	45
ST1	R170	2536	87.8	6.6	-53.6		OK	HYPO_E	-102.6		49.0	45
ST1	R171	2536	97.7	12.2	-54.7		OK	HYPO_E	-105.7		51.0	45
ST1	R190	2536	30.9	8.0	-50.2		OK	HYPO_E	-97.4		47.2	45

Interference Study for Hypothetical E-Group Base Station Located 2.25 km Outside the KGG-38 GSA

Receiver data								Undesired signals				
Tx ID	Rx ID	Antenna	Bear	Dist	FSpace	TLoss	St	Tx ID	FSpace	TLoss	D/U	Rq
ST1	R191	2536	24.0	7.9	-50.0		OK	HYPO_E	-95.8		45.8	45
ST1	R196	CAL24H	59.7	8.9	-49.7		OK	HYPO_E	-98.7		49.1	45
ST1	R210	2536	42.0	7.8	-49.6		OK	HYPO_E	-99.1		49.5	45
ST1	R213	PT2521	45.0	7.6	-53.2		IX	HYPO_E	-87.9		34.7	45
ST1	R217	2536	83.3	7.8	-51.7		OK	HYPO_E	-102.9		51.2	45
ST1	R226	PT2521	17.5	3.7	-65.2		IX	HYPO_E	-91.6		26.4	45
ST1	R230	2536	52.4	8.5	-48.8		OK	HYPO_E	-100.9		52.1	45
ST1	R231	PT2521	45.0	7.6	-53.2		IX	HYPO_E	-87.9		34.7	45
ST1	R236	4336	65.1	9.0	-49.8		OK	HYPO_E	-112.1		62.4	45
ST1	R238	2536	44.9	6.7	-49.8		OK	HYPO_E	-99.2		49.3	45
ST1	R240	PT2521	47.8	9.5	-53.1		IX	HYPO_E	-88.3		35.2	45
ST1	R243	2536	64.8	9.1	-49.2		OK	HYPO_E	-102.3		53.1	45
ST1	R247	2536	50.6	9.6	-49.0		OK	HYPO_E	-101.2		52.2	45
ST1	R248	4336	41.8	7.3	-50.3		OK	HYPO_E	-106.2		55.8	45
ST1	R250	2536	49.1	7.7	-48.9		OK	HYPO_E	-100.1		51.2	45
ST1	R252	2536	45.4	7.3	-49.4		OK	HYPO_E	-99.4		50.0	45
ST1	R253	P4F25	51.7	7.6	-45.7		OK	HYPO_E	-94.9		49.2	45
ST1	R254	2536	85.7	7.2	-52.3		OK	HYPO_E	-102.8		50.5	45
ST1	R257	PT2521	87.9	9.0	-55.9		IX	HYPO_E	-91.1		35.2	45
ST1	R258	2536	50.1	7.9	-48.8		OK	HYPO_E	-100.3		51.5	45
ST1	R263	2536	16.9	7.7	-49.5		IX	HYPO_E	-93.9		44.4	45
ST1	R274	2536	0.6	5.9	-50.0		IX	HYPO_E	-86.4		36.4	45
ST1	R279	2536	88.0	6.6	-53.4		OK	HYPO_E	-102.6		49.2	45
ST1	R282	2536	20.9	6.0	-51.0		IX	HYPO_E	-94.0		42.9	45
ST1	R283	2536	46.2	7.7	-49.2		OK	HYPO_E	-99.7		50.5	45
ST1	R285	2536	62.9	9.7	-49.1		OK	HYPO_E	-102.4		53.3	45
ST1	R301	CAL24H	59.5	9.1	-49.7		OK	HYPO_E	-98.8		49.1	45
ST1	R306	CAL24H	50.0	8.3	-49.7		OK	HYPO_E	-97.1		47.4	45
ST1	R310	CAL24H	1.7	5.7	-51.7		IX	HYPO_E	-84.1		32.5	45
ST1	R316	CAL24H	63.7	9.8	-50.1		OK	HYPO_E	-99.6		49.6	45
ST1	R322	CAL24H	61.6	9.4	-49.9		OK	HYPO_E	-99.2		49.3	45
ST1	R323	CAL24H	59.8	8.6	-49.6		OK	HYPO_E	-98.5		48.9	45
ST1	R326	CAL24H	48.4	8.6	-49.9		OK	HYPO_E	-97.1		47.2	45
ST1	R330	CAL24H	50.2	9.5	-49.9		OK	HYPO_E	-98.0		48.1	45
ST1	R331	CON	69.5	10.1	-50.6		OK	HYPO_E	-106.8		56.2	45
ST1	R332	CAL24H	97.9	11.9	-55.6		OK	HYPO_E	-103.2		47.7	45
ST1	R334	CAL24H	52.4	7.4	-49.8		OK	HYPO_E	-96.8		47.1	45
ST1	R336	CAL24H	48.6	7.1	-50.1		OK	HYPO_E	-96.1		46.0	45
ST1	R341	CON	66.9	9.7	-50.4		OK	HYPO_E	-106.1		55.7	45
ST1	R342	CON	32.8	7.6	-51.1		OK	HYPO_E	-100.6		49.6	45
ST1	R344	CON	27.1	8.7	-51.2		OK	HYPO_E	-100.3		49.1	45
ST1	R345	PT2521	22.6	7.7	-53.8		IX	HYPO_E	-84.2		30.4	45
ST1	R358	CON	5.0	5.7	-51.6		IX	HYPO_E	-91.9		40.4	45
ST1	R360	CON	16.3	6.0	-51.6		IX	HYPO_E	-95.9		44.2	45
ST1	R362	CAL24H	63.8	9.9	-50.1		OK	HYPO_E	-99.7		49.6	45
ST1	R365	CON	80.2	9.1	-51.7		OK	HYPO_E	-107.1		55.5	45
ST1	R366	CON	85.0	7.8	-53.0		OK	HYPO_E	-106.4		53.3	45
ST1	R368	CON	49.2	7.7	-49.9		OK	HYPO_E	-103.2		53.4	45
ST1	R369	CON	35.7	8.5	-51.0		OK	HYPO_E	-101.7		50.6	45
ST1	R370	CON	47.1	9.8	-50.3		OK	HYPO_E	-104.0		53.7	45
ST1	R371	PT2521	53.4	7.6	-52.6		IX	HYPO_E	-88.7		36.1	45
ST1	R372	CON	68.3	10.1	-50.5		OK	HYPO_E	-106.7		56.2	45
ST1	R376	CAL24H	69.7	9.8	-50.5		OK	HYPO_E	-100.2		49.7	45
ST1	R382	PT2521	47.1	9.1	-53.1		IX	HYPO_E	-88.2		35.1	45
ST1	R387	CAL24H	64.2	9.1	-50.0		OK	HYPO_E	-99.3		49.2	45
ST1	R390	CON	49.1	8.3	-49.9		OK	HYPO_E	-103.5		53.6	45
ST1	R391	CON	41.8	7.4	-50.7		OK	HYPO_E	-102.1		51.4	45
ST1	R392	CON	5.9	5.6	-52.0		IX	HYPO_E	-92.5		40.5	45
ST3	R275	2548H	108.7	11.2	-48.9		OK	HYPO_E	-104.6		55.6	45

Interference Study for Hypothetical E-Group Base Station Located 2.25 km Outside the KGG-38 GSA

Receiver data								Undesired signals				
Tx ID	Rx ID	Antenna	Bear	Dist	FSpace	TLoss	St	Tx ID	FSpace	TLoss	D/U	Rq
ST3	R287	2548H	111.1	12.6	-41.7		OK	HYPO_E	-105.3		63.6	45
ST3	R340	CON	108.0	11.7	-56.1		OK	HYPO_E	-106.5		50.5	45
ST3	R346	CON	111.2	12.6	-45.5		OK	HYPO_E	-108.5		63.0	45

Summary of fixed ITFS receivers for transmitter group ST:

Receivers with status OK: 83
Receivers with status OS: 0
Receivers with status IX: 20
Total: 103

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Definition of codes used in the preceding tabulation:

OK - All undesired signals meet the required D/U values.
OS - Same as OK but offset-frequency operation is required.
IX - One or more undesired signal(s) exceed the required D/U values.