

Non-Interference Compliance

Regarding Facility id 138825

Channel 228

Description of Exhibit 13 Contents

This exhibit demonstrates that the proposed facility complies with contour overlap and interference protection provisions in all of the applicable rule sections and that this application for a construction permit is in full compliance with 47 C.F.R. § 74.1204.

Let it be noted that should any actual real world interference occur, the applicant acknowledges that it will promptly suspend operation of this translator in accordance with 47 C.F.R. § 74.1203.

Page 2 of this exhibit is an explanation of the method used to demonstrate compliance with contour overlap and interference provisions based on 47 C.F.R. § 74.1204(d), which states:

[A]n application otherwise precluded by this section will be accepted if it can be demonstrated that no actual interference will occur due to intervening terrain, lack of population or such other factors as may be applicable.

Page 3 contains a tabulation of the vertical radiation pattern of the proposed antenna and the minimum ground clearance of the interfering contour based on this pattern.

Pages 4 through 6 include a tabulation of the vertical radiation pattern for the proposed antenna provided by the antenna manufacturer.

Page 7 of this exhibit contains the tabulated data from the interference analysis, which shows all stations whose protected contours come within 50 km of the 34 dBμ F(50,10) contour of the proposed translator. These tabulated values were calculated using data from the FCC's CDBS files and 30 arc second terrain data. The column labeled "Adj" shows the number of channels difference between the entry and the proposed translator. The column labeled "Dist" shows the distance in km. The column labeled "Overlap" shows the area of contour overlap in square kilometers.

Page 8 of this exhibit is a portion of a USGS 1:24,000 scale 7.5 minute quadrangle at full scale with the calculated area of interference overlaid. The sheet includes the quadrangle name and measurement scale at the bottom-left corner (note: "Mt" refers to meters). The area of interference was calculated using the free space equation and 120 radials.

Page 9 of this exhibit is an aerial photo of the vicinity surrounding the proposed translator's tower site.

Note: The tallest building within the zone of predicted interference is 15ft (4.6m) in height. This application provides 5.7m (18.7ft) ground clearance so a lack of population has been demonstrated within the area of interference and this application is therefore in full compliance with 47 C.F.R. § 74.1204.

Compliance with 47 C.F.R. § 74.1204(d)

All authorized second and third adjacent stations with which the proposed translator has contour overlap are tabulated below. Column four show the station's signal level at the proposed translator's tower site, and column five gives the minimum value within the entire standard interfering contour of the proposed translator (100 dBμ for most classes, 94 for class B, 97 for class B1). The minimum second or third adjacent F(50,50) contour within the proposed translator's standard interfering contour was used to calculate the proposed translator's actual "worst-case" interfering contour.

Application id	File Number	Callsign	Contour at Tower	Min. Contour
234100	BLH19961009KC	KKXK	92.4	91.7
Minimum F(50,50) Contour of Adjacent Station within Proposed Translator's Standard Interfering Contour				91.7

FCC 02-244 at Section II.A.5 states that "when demonstrating that 'no actual interference will occur due to . . . other factors,' pursuant to Section 74.1204(d), an applicant may use the undesired-to-desired signal ratio method." The undesired-to-desired ratio for second and third adjacent stations required by § 74.1204(a) is 40 dBμ. Since the minimum protected contour strength within the proposed translator's standard interference contour is **91.7 dBμ**, this makes the proposed translator's worst-case interfering contour **131.7 dBμ**. By the free-space equation, this contour is calculated to extend a maximum of **28.8m** from the transmit antenna.

The maximum horizontal plane of the interfering contour was calculated for 120 radials and plotted on the pertinent portion of a USGS quadrangle (page 8 of this exhibit). However, the field strength of the proposed translator's antenna varies with angle of depression from horizontal. The antenna relative fields are tabulated on the following page at 5 degree increments, starting at 5 degrees below horizontal. Antenna relative field strength data was provided and certified by the manufacturer of the proposed antenna. Using a free-space calculation that neglects any loss due to reflection, the vertical ground clearance of the proposed translator's interference contour has been tabulated. As shown on the following page, the area of interference clears the tower ground level (TGL) by **5.7 m** at the lowest point. The applicant has taken into account USGS quadrangles and relevant aerial photography in stating that no structures, except possibly tower support structures, puncture the area of interference.

Note: The tallest building within the zone of predicted interference is 15ft (4.6m) in height. This application provides 5.7m (18.7ft) ground clearance so a lack of population has been demonstrated within the area of interference and this application is therefore in full compliance with 47 C.F.R. § 74.1204.

Antenna Manufacturer: SIR
Antenna Model: FMC-01-2
CORAGL: 11 m
Maximum ERP: 0.25 kW
Interfering Contour: 131.7 dBμ
Max Int. Contour Distance: 28.8 m
Min Ground Clearance: 5.7 m

The following table shows how the interfering contour ground clearance was calculated.

The formula used to calculate the vertical radiation pattern for the multi-bay antenna array is the exact formula used by the FCC's Office of Engineering and Technology in the FM Model program used to calculate ground-level power density for multi-bay antenna arrays for purposes of compliance with OET65. According to the source code of FM Model, this formula was "derived from Kraus (eqn 4-51 & 5-52), Gailey and Tell, and material from Ben Dawson, Hatfield and Dawson."

- The *Depression Angle* is the angle below horizontal for the radial.
- The *Single-Bay Relative Field* value is the relative field value for the depression angle either provided by the antenna manufacturer or interpolated from the values provided by the manufacturer.
- The *Relative Field Multiplier* is equal to $\text{Sin}(N * S\pi\text{Sin}\phi) / (N * \text{Sin}(S\pi\text{Sin}\phi))$, where N is the number of antenna elements in the array, S is the spacing between elements, π is the ratio of a circle's circumference to its diameter, and ϕ is the Depression Angle.
- The *Relative Field Value for the Array* is the absolute value of the product of the Relative Field Factor and the Single-Bay Relative Field value for that radial.
- The *ERP on the Radial* is the square of the *Relative Field Value for the Array* multiplied by the maximum ERP.
- The *Contour Direct Distance* is found by using the free space equation.
- The *Horizontal and Vertical Contour Distances* are calculated from the *Direct Distance* using trigonometry.
- The *Contour Ground Clearance* is the *Vertical Contour Distance* subtracted from the overall antenna height above the ground.

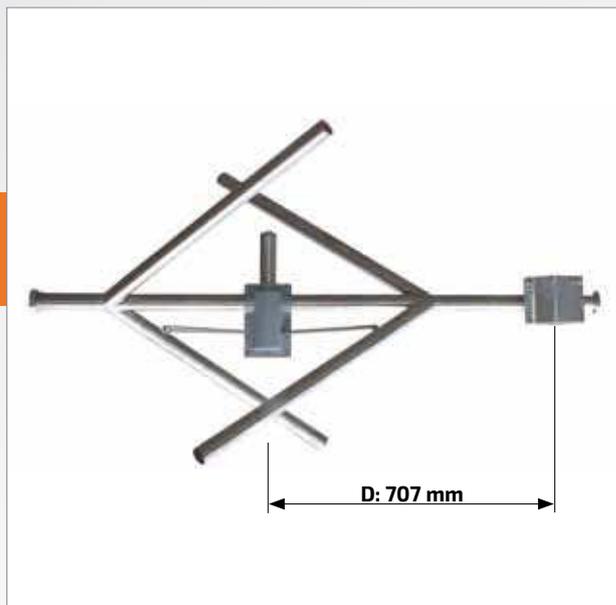
Depression Angle (degree)	Single-Bay Relative Field	Relative Field (hor)	$S\pi\text{Sin}\phi$	Relative Field Multiplier	Relative Field for Array	ERP on Radial (W)	Contour Direct Distance (m)	Contour Horizontal Distance (m)	Contour Vertical Distance (m)	Contour Ground Clearance (m)
5	0.820	0.998	0.2054	0.9790	0.803	161.1	23.2	23.1	2.0	9.0
10	0.810	0.997	0.4091	0.9175	0.743	138.1	21.4	21.1	3.7	7.3
15	0.800	0.997	0.6098	0.8197	0.656	107.5	18.9	18.3	4.9	6.1
20	0.770	0.995	0.8059	0.6925	0.533	71.1	15.4	14.4	5.3	5.7
25	0.740	0.994	0.9958	0.5439	0.402	40.5	11.6	10.5	4.9	6.1
30	0.710	0.992	1.1781	0.3827	0.272	18.5	7.8	6.8	3.9	7.1
35	0.620	0.99	1.3515	0.2176	0.135	4.5	3.9	3.2	2.2	8.8
40	0.620	0.987	1.5145	0.0562	0.035	0.3	1.0	0.8	0.6	10.4
45	0.570	0.983	1.6661	-0.0951	0.054	0.7	1.6	1.1	1.1	9.9
50	0.520	0.981	1.8049	-0.2320	0.121	3.6	3.5	2.2	2.7	8.3
55	0.460	0.978	1.9301	-0.3516	0.162	6.5	4.7	2.7	3.8	7.2
60	0.400	0.973	2.0405	-0.4526	0.181	8.2	5.2	2.6	4.5	6.5
65	0.330	0.97	2.1354	-0.5351	0.177	7.8	5.1	2.2	4.6	6.4
70	0.270	0.965	2.2141	-0.5998	0.162	6.6	4.7	1.6	4.4	6.6
75	0.200	0.961	2.2759	-0.6481	0.130	4.2	3.7	1.0	3.6	7.4
80	0.130	0.956	2.3204	-0.6813	0.089	2.0	2.6	0.4	2.5	8.5
85	0.070	0.952	2.3472	-0.7007	0.049	0.6	1.4	0.1	1.4	9.6
90	0.000	0.947	2.3562	-0.7071	0.000	0.0	0.0	0.0	0.0	11.0
Min Ground Clearance (m):										5.7

FMC-01

FM TOP OR SIDEMOUNT DIPOLE

FEATURES

- circular/elliptical polarization
- broadband 87.5 ÷ 104 MHz
92 ÷ 108 MHz



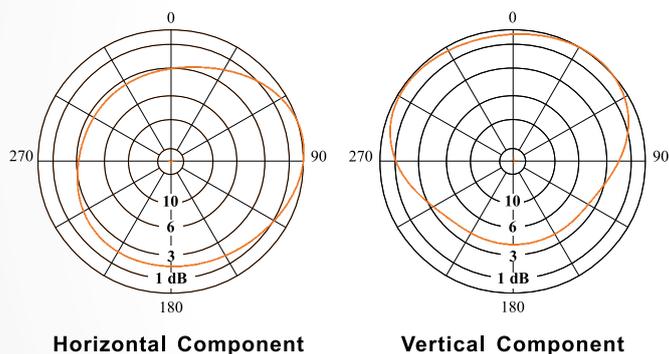
ELECTRICAL DATA

ANTENNA TYPE	FMC-01
FREQUENCY RANGE	87.5 ÷ 104 MHz 92 ÷ 108 MHz
IMPEDANCE	50 ohm
CONNECTOR	NF or 7/16 F or 7/8" EIA or 7/8" EIA 90°
MAX POWER	0.75 kW (NF), 1.5 kW (7/16 F, 7/8" EIA, 7/8" EIA 90°)
VSWR	≤ 1.4
POLARIZATION	Circular/Elliptical
GAIN (referred to half wave dipole)	-1.5 dB
HALF POWER BEAMWIDTH	Omnidirectional ± 1.5 dB in free space Omnidirectional ± 2 dB with ø 100 pole
LIGHTNING PROTECTION	All metal parts DC grounded

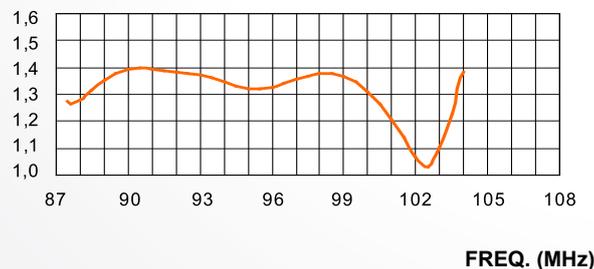
MECHANICAL DATA

DIMENSIONS	1447 x 801 x 801 mm 1447 x 767 x 767 mm
WEIGHT	10 Kg
WIND SURFACE	0.23 m ²
WIND LOAD (at 150km/h)	0.27 kN
MAX WIND VELOCITY	220 km/h
MATERIALS	brass, aluminium, stainless steel, hot dip galvanized steel (bracket) teflon, fiberglass (radome)
ICING PROTECTION	Feed point radome
RADOME COLOUR	Grey (standard)
MOUNTING	With special pipe clamps ø 60 ÷ 114 mm

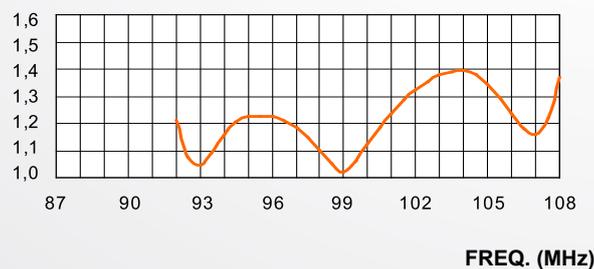
RADIATION PATTERNS (Mid Band)



VSWR



VSWR



FMC-01

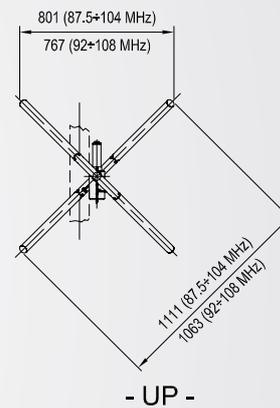
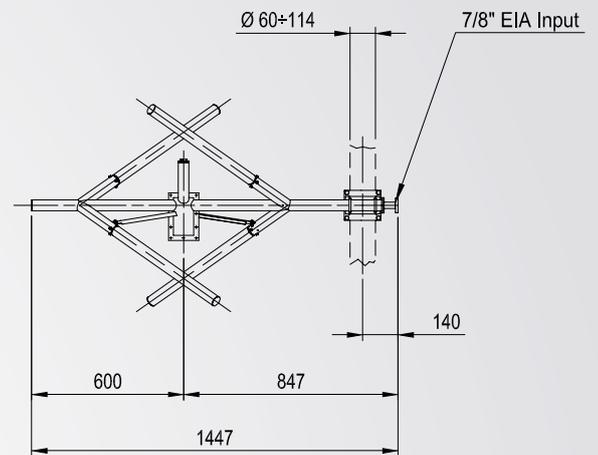
FM TOP OR SIDEMOUNT DIPOLE

FEATURES

- radiating systems with FMC-01 dipole
- omnidirectional patterns

ELECTRICAL DATA

FREQUENCY RANGE	87.5 ÷ 108 MHz
IMPEDANCE	50 ohm
CONNECTOR	EIA flange according to system power rating
POWER RATING	The antenna system can accept any power according to requirements
VSWR (in the operating frequency)	≤ 1.35 without fine matcher ≤ 1.25 with one fine matcher ≤ 1.1 with two fine matchers
POLARIZATION	Circular/Elliptical
GAIN	Refer to table
VERTICAL PATTERN	Null fill, beam tilt and special requirements to order
OTHER FEATURES	The antenna system can be supplied in split feed configuration (two equal halves). Each half can accept full power.



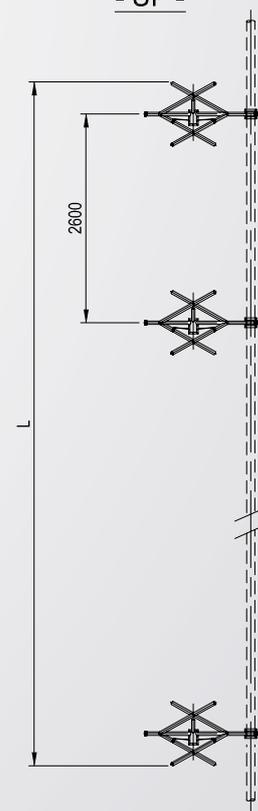
MECHANICAL DATA

HEIGHT OF ARRAY	Subject to number of bays
TOTAL NET WEIGHT	Refer to table
WIND LOAD	Refer to table
PRESSURIZABLE	Yes
RADOME COLOUR	Grey (standard)
MOUNTING HARDWARE	One clamp for pole, supplied

TECHNICAL DATA

NUMBER OF BAYS	PANELS PER BAY	GAIN (1)	GAIN TIMES (1)	WEIGHT (2)	ANTENNA HEIGHT L (3)	WIND LOAD (3)
2	1	1.5	1.41	30	3.4	0.54
4	1	4.5	2.82	55	8.6	1.08
6	1	6.2	4.17	80	13.8	1.62
8	1	7.5	5.62	120	19.0	2.16
12	1	9.2	8.32	180	29.4	3.24

(1) referred to half wave dipole. Losses of power distribution network not included.
 (2) without mounting hardware, for FMC-01 dipole
 (3) v= 150 km/h



FMC-01

FM TOP OR SIDEMOUNT DIPOLE

FEATURES

Elevation	Relative	Elevation	Relative
Azimuth	Voltage	Azimuth	Voltage
0	0.829	185	0.610
5	0.824	190	0.600
10	0.813	195	0.584
15	0.795	200	0.564
20	0.772	205	0.539
25	0.743	210	0.511
30	0.708	215	0.481
35	0.668	220	0.450
40	0.623	225	0.417
45	0.572	230	0.382
50	0.517	235	0.346
55	0.458	240	0.307
60	0.396	245	0.265
65	0.332	250	0.220
70	0.266	255	0.171
75	0.198	260	0.117
80	0.131	265	0.061
85	0.065	270	0.000
90	0.000	275	0.064
95	0.063	280	0.130
100	0.122	285	0.198
105	0.179	290	0.267
110	0.231	295	0.335
115	0.279	300	0.403
120	0.324	305	0.468
125	0.364	310	0.530
130	0.400	315	0.588
135	0.434	320	0.640
140	0.465	325	0.687
145	0.493	330	0.727
150	0.520	335	0.761
155	0.545	340	0.788
160	0.568	345	0.808
165	0.586	350	0.822
170	0.601	355	0.829
175	0.610		
180	0.613		



Specifications are subject to change without prior notice

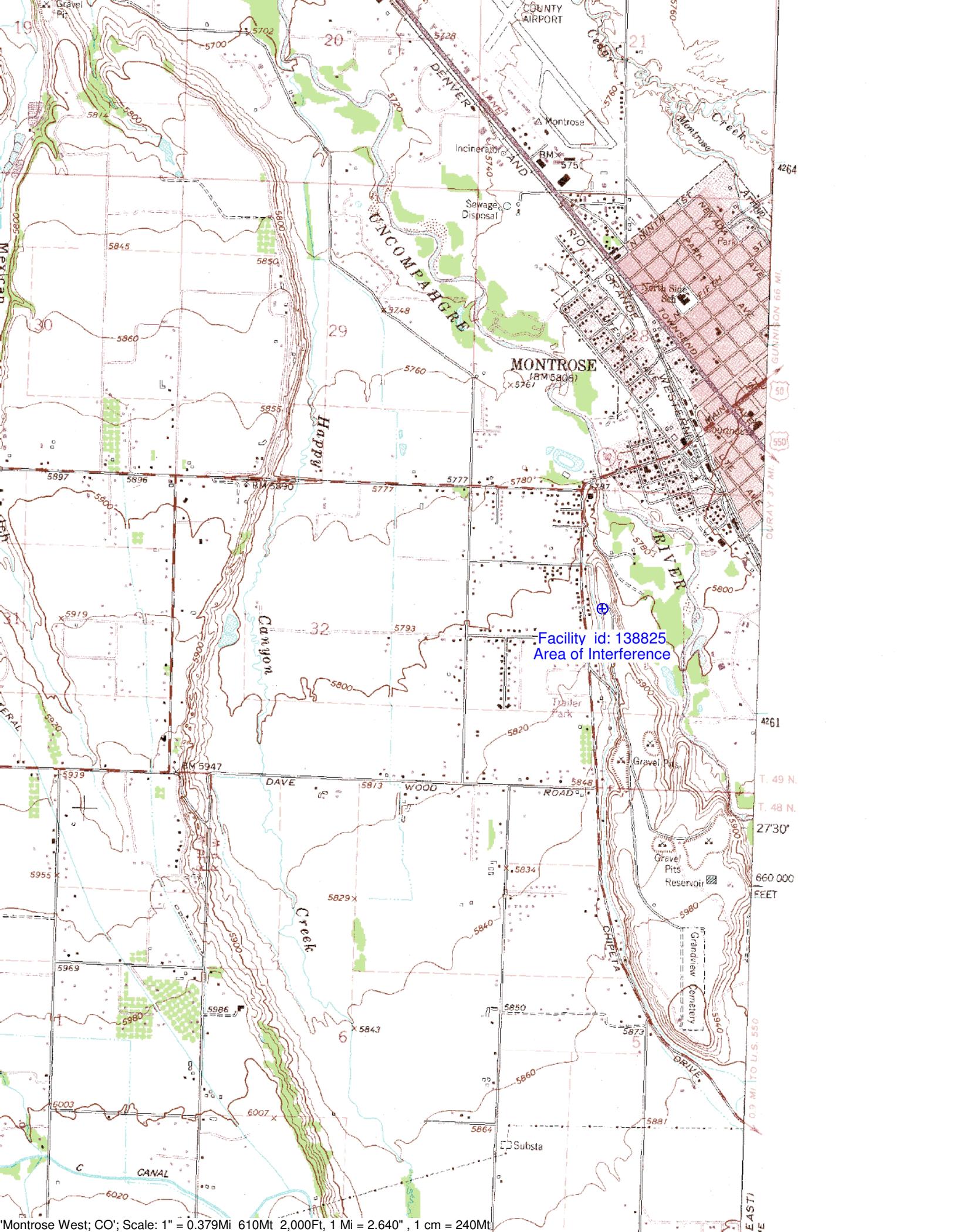
**Adjacent Channel Study
For Station K228EV, Facility_id: 138825**

Co-channel through third adjacent:

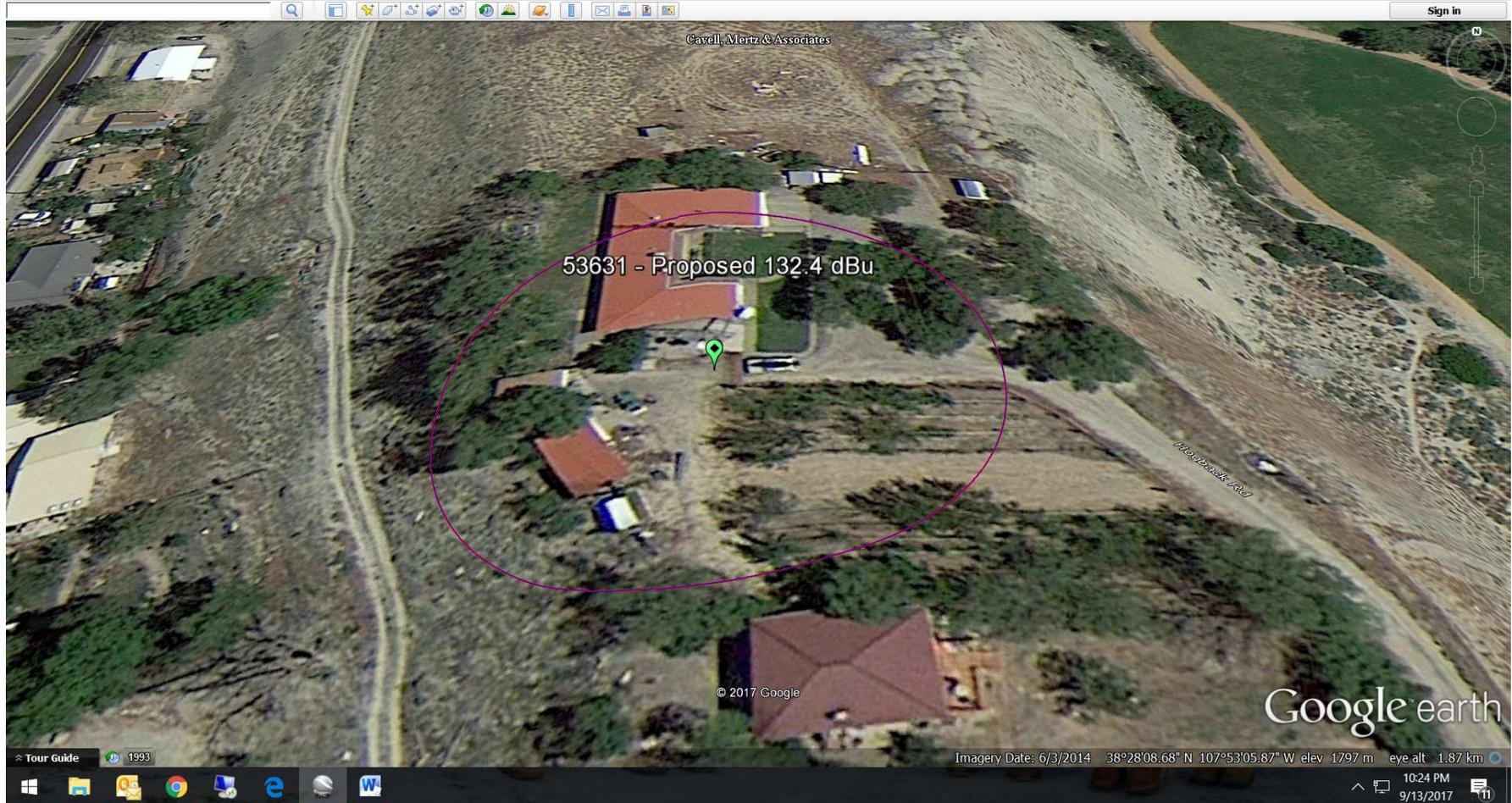
App_id	Fac_id	File_Number	Call	Licensee	Class	City	State	Status	ERP	RCAMSL	Char	Adj	Dist	Overlap
234100	73624	BLH-19961009KC	KKXK	CCR-MONTROSE IV, LLC	C	MONTROSE	CO	LIC	90	3094	231	3	25.8	1.4918
617408	47115	BLH-20021115AAD	KMGJ	MBC GRAND BROADCASTING, IN	C0	GRAND JUNCTIOI	CO	LIC	100	2214	226	2	99.9	0
1045569	138496	BLFT-20050207AAA	K229AH	EDUCATIONAL COMMUNICATION	D	GRAND JUNCTIOI	CO	LIC	0.01	2215	229	1	100	0
1398882	170489	BLH-20100816ABF	KTND	BS&T WIRELESS, INC.	C3	ASPEN	CO	LIC	21	2682	228	0	123.6	0
1634655	164121	BLH-20140528AEV	KPTE	WINTON ROAD BROADCASTING	C2	BAYFIELD	CO	LIC	9.2	2757	225	3	125.7	0

Intermediate Frequencies (53 and 54 channels difference):

App_id	Fac_id	File_Number	Call	Licensee	Class	City	State	Status	ERP	RCAMSL	Channel	Adj	Dist	Clr
1753067	189487	BLH-20170314AAW	KRDS	MT COMMUNICATIONS LLC	A	SILVERTON	CO	LIC	0.1	2861	281	53	75.5	65.5



Facility id: 138825
Area of Interference



Cavell, Mertz & Associates

53631 - Proposed 132.4 dBu

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Google earth

Imagery Date: 6/3/2014 38°28'08.68" N 107°53'05.87" W elev 1797 m eye alt 1.87 km

10:24 PM
9/13/2017