Technical Report

W235CY(CP MOD)

Facility ID 201309

and

W278BM(CP)

Facility ID 139568

Intermodulation Performance Analysis of the Transmission System at WPOL Tower Site, Winston-Salem, NC

27 July 2018

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This report outlines the results of an intermodulation distortion (IMD) study conducted on a combined station antenna system located in Winston-Salem, NC, on the tower at WPOL(AM).

An Aeroflex / IFR service monitor, Model 2945A, SN 294501-922, equipped with a spectrum analyzer and tracking generator, was used to conduct this study. The instrument was factory calibrated on 15 February 2018. The analyzer's antenna input port was connected to a sample port of a coupler section placed on the combiner network's output port.

The transmitters were operated at their respective 100% power output to achieve construction permit ERP, based on combiner and antenna system loss calculations.

Measurements were made using a 2MHz span for each target intercept, at a RBW of 3kHz, averaged over one minute. The instrument's noise floor was observed at -128.5dBm.

Care was taken to avoid IMD products from being produced within the instrument's front end. Notch filters (MFC B-6367-2) tuned to the two fundamentals were placed in line between the coupler and the analyzer to reduce internally-generated IMD products on frequencies of interest outside the FM band. Coupler and filter corrections were measured using the instrument's internal tracking generator.

An additional FM diplex (W244CC and W249BZ) operates on an antenna immediately above that of the two stations referenced in this document. Measurements were made at the intercept frequencies of the the instant stations with these two additional stations to ensure no IMD products result from antenna system coupling. In instances (2IM4.1, 3IM4.1, and F1+F4), it was necessary to re-tune the notch filters to reduce signal coupled from W249BZ, 97.7MHz, in order to eliminate observed instrument mix products. For case IM4.1 (97.7MHz), W249BZ was taken off air to observe the resultant mix product from the instant translators.

The measurements were made on 26 July 2018, at approximately 1500 EDT. Temperature was 85F, fair skies, and no wind.

W235CY's transmitter is a BW Broadcast TX1000 S/N 15294.
W278BM's transmitter is a BW Broadcast TX1000 S/N 15246.

Each transmitter was connected to the combiner network with a fifteen-foot coaxial jumper constructed Commscope FSJ4-50B cable.

The system's combiner network is a Shivley Labs, 6914-3 multi-cavity filter set. This is coupled to a Nicom BKG-77 two-bay antenna by way of Commscope LDF5-50A cable, with a Polyphasor TVSS block and Kintronic Labs Isocoupler in that line.

Detailed tabulated findings follow on the subsequent pages of this report.

Intermodulation Study for W235CY and W278BM
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W235CY

F1 94.9 MHz

Fund. Harmonics	Result(F)	Cplr Corr.(dB)	Measured(dBm)	<-80dBc	$dB_{(F1)}$
2F1	189.8	-2.0	-81.5	TRUE	91.0
3F1	284.7	-2.0	-93.0	TRUE	102.5
4F1	379.6	-2.0	-114.0	TRUE	123.5
5F1	474.5	-2.0	-118.5	TRUE	128.0
6F1	569.4	-2.0	-122.5	TRUE	132.0
7F1	664.3	-5.0	-126.5	TRUE	133.0
8F1	759.2	-6.0	-123.5	TRUE	129.0
F1 IMD	Result(F)			<-80dBc	$dB_{(F1)}$
IM2.1 (F2-F1)+F2	112.1	-2.0	-98.0	TRUE	107.5
IM1.2 (F2-F1)-F1	86.3	-2.0	-90.5	TRUE	100.0
IM3.1 (F3-F1)+F3	100.5	-2.0	-86.0	TRUE	95.5
IM1.3 (F3-F1)-F1	92.1	-2.0	-90.5	TRUE	100.0
IM4.1 (F4-F1)+F4 **	97.7	-2.0	-87.5	TRUE	97.0
IM1.4 (F4-F1)-F1	93.5	-2.0	-81.0	TRUE	90.5
F1 IMD Harmonics	Result(F)			<-80dBc	$dB_{(F1)}$
2IM2.1	224.2	-2.0	-127.5	TRUE	137.0
2IM1.2	172.6	-2.0	-124.5	TRUE	134.0
2IM3.1	201	-2.0	-102.5	TRUE	112.0
2IM1.3	184.2	-2.0	-114.0	TRUE	123.5
2IM4.1	195.4	-2.0	-127.5	TRUE	137.0
2IM1.4	187	-2.0	-104.5	TRUE	114.0
3IM2.1	336.3	-2.0	-122.5	TRUE	132.0
3IM1.2	258.9	-2.0	-119.0	TRUE	128.5
3IM3.1	301.5	-2.0	-120.0	TRUE	129.5
3IM1.3	276.3	-2.0	-127.0	TRUE	136.5
3IM4.1	293.1	-2.0	-127.5	TRUE	137.0
3IM1.4	280.5	-2.0	-115.0	TRUE	124.5
F1 Summaries	Result(F)			<-80dBc	$dB_{(F1)}$
F1+F2	198.4	-2.0	-98.5	TRUE	108.0
F1+F3	192.6	-2.0	-124.0	TRUE	133.5
F1+F4	191.2	-2.0	-127.5	TRUE	137.0

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W249BM

F2	103.5 MHz				
Fund. Harmonics	*Result(F)*	*Cplr Corr.(dB)*	**Measured(dBm)**	***<-80dBc***	$dB_{(F1)}$
2F2	207	-2.0	-122.5	*TRUE*	130.5
3F2	310.5	-2.0	-89.5	*TRUE*	97.5
4F2	414	-2.0	-128.5	*TRUE*	136.5
5F2	517.5	-2.0	-126.5	*TRUE*	134.5
6F2	621	-2.0	-127.5	*TRUE*	135.5
7F2	724.5	-6.0	-126.5	*TRUE*	130.5
8F2	828	-6.0	-126.0	*TRUE*	130.0
F2 IMD	*Result(F)*			***<-80dBc***	$dB_{(F1)}$
IM3.2 *(F3-F2)+F3*	91.9	-2.0	-95.5	*TRUE*	103.5
IM2.3 *(F3-F2)-F2*	109.3	-2.0	-125.0	*TRUE*	133.0
IM4.2 *(F4-F2)+F4*	89.1	-2.0	-99.0	*TRUE*	107.0
IM1.4 *(F4-F2)-F2*	110.7	-2.0	-124.0	*TRUE*	132.0
F2 IMD Harmonics	*Result(F)*			***<-80dBc***	$dB_{(F1)}$
2IM3.2	183.8	-2.0	-118.0	*TRUE*	126.0
2IM2.3	218.6	-2.0	-126.0	*TRUE*	134.0
2IM4.2	178.2	-2.0	-127.5	*TRUE*	135.5
2IM2.4	221.4	-2.0	-126.5	*TRUE*	134.5
3IM3.2	275.7	-2.0	-127.5	*TRUE*	135.5
3IM2.3	327.9	-2.0	-128.5	*TRUE*	136.5
3IM4.2	267.3	-2.0	-128.5	*TRUE*	136.5
3IM2.4	332.1	-2.0	-126.5	*TRUE*	134.5
F2 Summaries	*Result(F)*			***<-80dBc***	$dB_{(F1)}$
F2+F3	193.5	-2.0	-121.0	*TRUE*	129.0
F2+F4	214.5	-2.0	-126.5	*TRUE*	134.5

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As demonstrated, this system's emissions comply with 47CFR 73.317 (a) thru (d).

The preceding statements and data contained herein were prepared by me and are true and accurate to the best of my knowledge and belief.

Respectfully,

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27 July 2018