

NRSC-2 MEASUREMENTS REPORT

KFTI-AM

1070 KHZ

PREPARED BY: Normand R. Laramée

SURVEY CONDUCTED ON: 9/12/2020

To demonstrate compliance with FCC RULE 73.1590,
“EQUIPMENT PERFORMANCE MEASUREMENTS”,

as detailed in FCC RULE 73.44,
“AM TRANSMISSION SYSTEM EMISSION LIMITATIONS”.

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TECHNICAL QUALIFICATIONS

Be it here known:

That NORMAND R. LARAMEE has been contracted to perform the measurements and report contained herein.

That he is experienced in the field of Broadcast Engineering and has performed this type of work on a professional basis in the capacities of Chief Engineer, Contract Engineer, and Consultant.

That he has held an FCC First-Class Radiotelephone license since 1981.

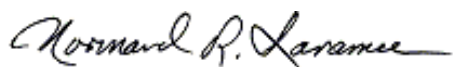
That he currently holds an FCC General Radiotelephone Operator License PG-10-14519 issued January 2, 1985.

That he is currently an active member of the Society of Broadcast Engineers.

That his work is a matter of record with the Federal Communications Commission.

Be it further attested that the information contained within this report is true and factual to the best of my knowledge.

Signed this 2nd day of November, 2020.

A handwritten signature in cursive script, reading "Normand R. Laramee", written in black ink.

Normand R. Laramee

TEST PROCEDURE

All tests were conducted using equipment suitable for this purpose and calibrated to internal standards prior to commencement of measurements.

Good engineering practices were observed during the course of the measurements and the results are believed to be accurate.

All tests were conducted in the field using a 2012 Nissan Xterra as a platform and its onboard battery to provide power for the test equipment.

The measurements were conducted at a sufficient distance from the center of the antenna system as necessary to provide enough RF input level to the analyzer to meet the resolution requirements for the stations licensed power level. Measurements were made using a suitable swept-frequency RF spectrum analyzer, employing a peak-hold duration of at least 10 minutes; with no video filtering and a 300 Hz resolution bandwidth as required by FCC rules. The tests were made employing a shielded directional-loop type antenna with an approximate diameter of 4 feet. The antenna was deployed at 10 ft. above ground elevation.

Tests were conducted with the station operating on the main transmitter, into the specified antenna system and output power set for normal operation. Normal program material and audio processing were employed.

Measurements were made at span settings of 50 kHz, 100 kHz, and 200 kHz to yield horizontal divisions of 5 kHz, 10 kHz, and 20 kHz as recommended by the NRSC Committee. The system employed a vertical graticule of 10dB per division, with a range greater than the required 80dB.

The results were printed graphically and are included as exhibits to demonstrate compliance. The hard copy printouts were marked to show FCC limits as specified in 73.44(b) a.k.a. the NRSC mask.

Measurements were also made with a Potomac Instruments FIM-41 at the second and third harmonic frequency and the results noted on the Site Log.

TEST EQUIPMENT SETUP

EQUIPMENT LIST

ANALYZER: IFR A-7550

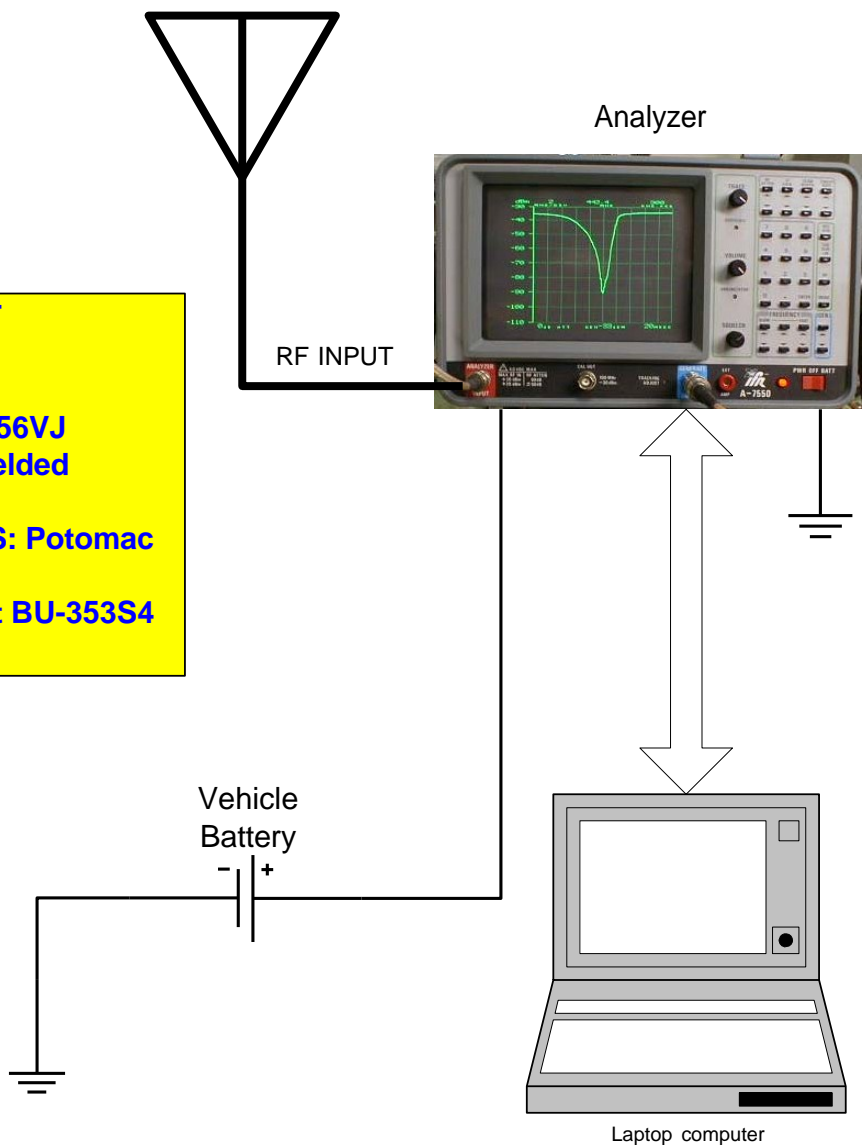
COMPUTER: ASUS Model: N56VJ

ANTENNA: 4 ft. diameter shielded
broadband loop

HARMONIC MEASUREMENTS: Potomac
Instruments FIM-41

GEOPOSITIONING: GlobalSat BU-353S4

GPS Receiver



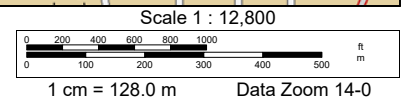
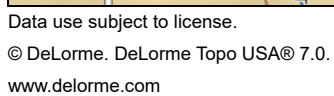
SITE LOG

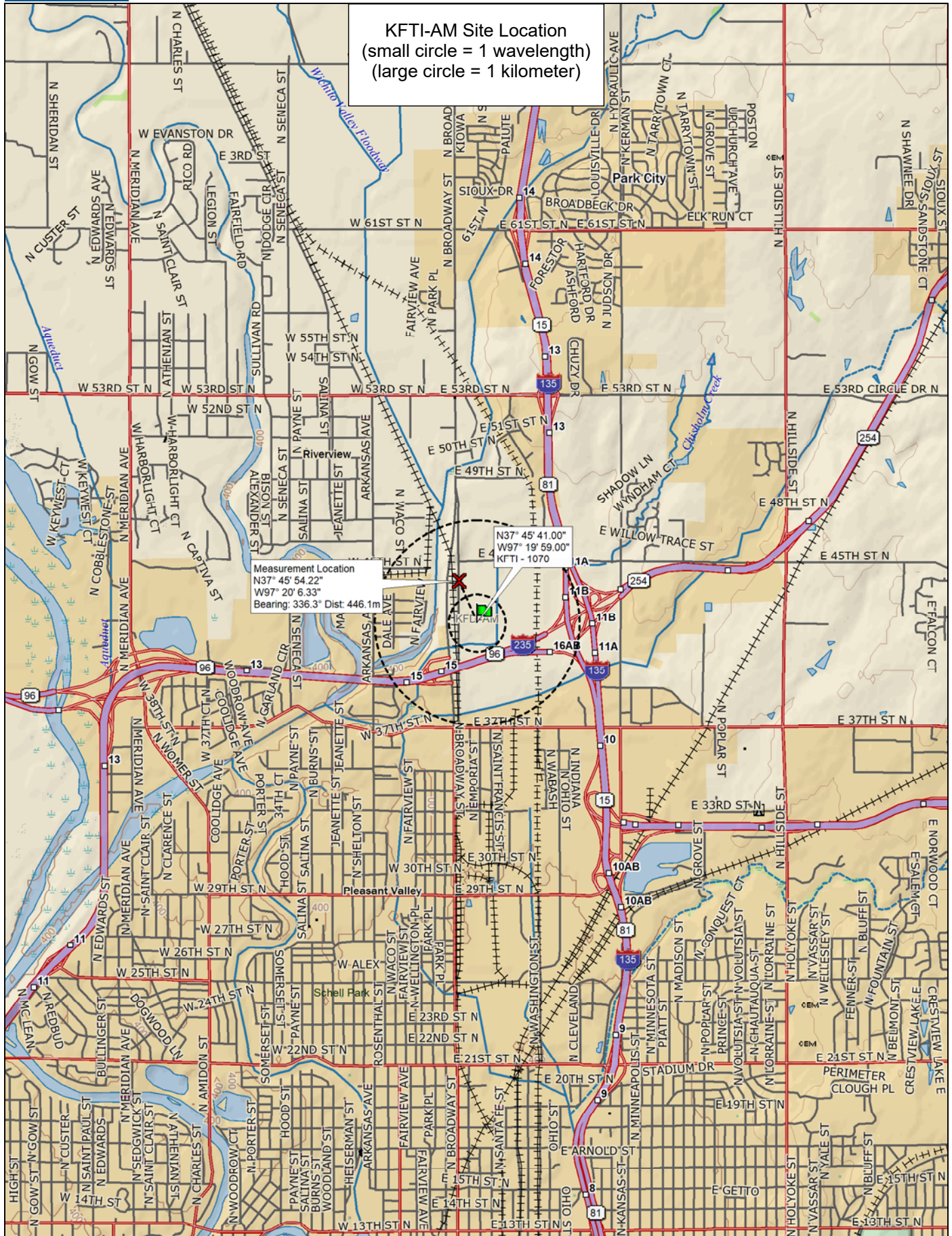
STATION: KFTI-AM
CITY OF LICENSE: Wichita, KS.
FREQUENCY: 1070 kHz
ANT. MODE/CLASS: DAN/B
POWER D/N: 10000w / 1000w
DATE MEASURED: 9/12/2020
LOCATION: Approximately 446.1m NNW of the array, bearing 336.3° True on the east side of N Old Lawrence Road.
(See site maps attached.)

EXHIBIT	TIME	SPAN	BANDWIDTH	REF. LEVEL
KFTI-1D	15:09 15:19	50 kHz	300 Hz	-20.17 dBm
KFTI-2D	14:59 15:09	100 kHz	300 Hz	-20.33 dBm
KFTI-3D	14:49 14:59	200 kHz	300 Hz	-20.67 dBm
KFTI-1N	14:34 14:44	50 kHz	300 Hz	-28.67 dBm
KFTI-2N	14:24 14:34	100 kHz	300 Hz	-28.83 dBm
KFTI-3N	14:14 14:24	200 kHz	300 Hz	-29 dBm

(All times listed are CDT)

HARMONICS	FREQ.	LEVEL BELOW CARRIER
Fundamental	1070 kHz	0 dB ref.
2 nd Harmonic	2140 kHz	-82db dB
3 rd Harmonic	3210 kHz	-78db dB





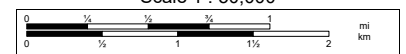
Data use subject to license.

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www.delorme.com



Scale 1 : 50,000



1 cm = 500.0 m Data Zoom 12-0

DIPRO Engineering Services

A-7550

5.0

1.07

300

KFTI-1D

09/12/2020 15:19:02

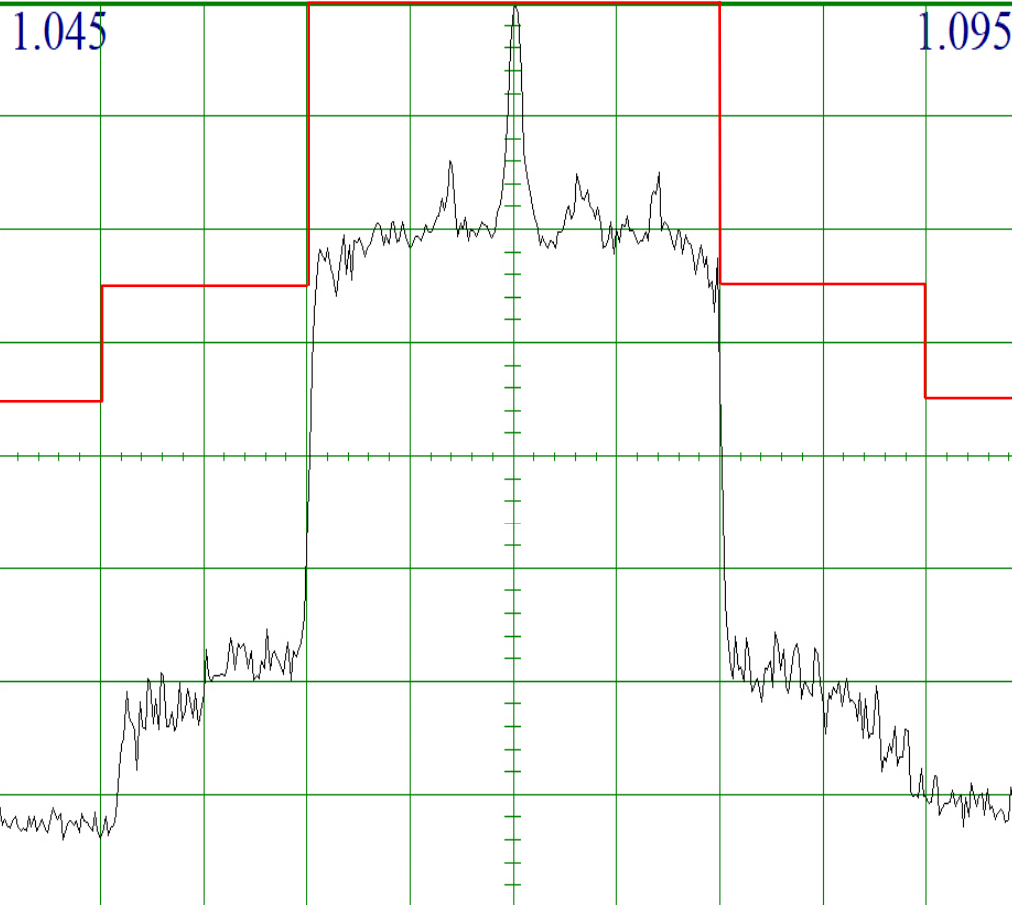
dBm

kHz/Div

MHz

Hz Res

0



Excerpt, FCC Rules Sec 73.44
AM transmission system
emission limitations.
(NRSC Mask)

"Emissions 10.2 kHz to 20 kHz removed from the carrier must be attenuated at least 25 dB below the unmodulated carrier level. Emissions 20 kHz to 30 kHz removed from the carrier must be attenuated at least 35 dB below the unmodulated carrier level."

10 dB Attn

Gen --- dBm

200 mSecs

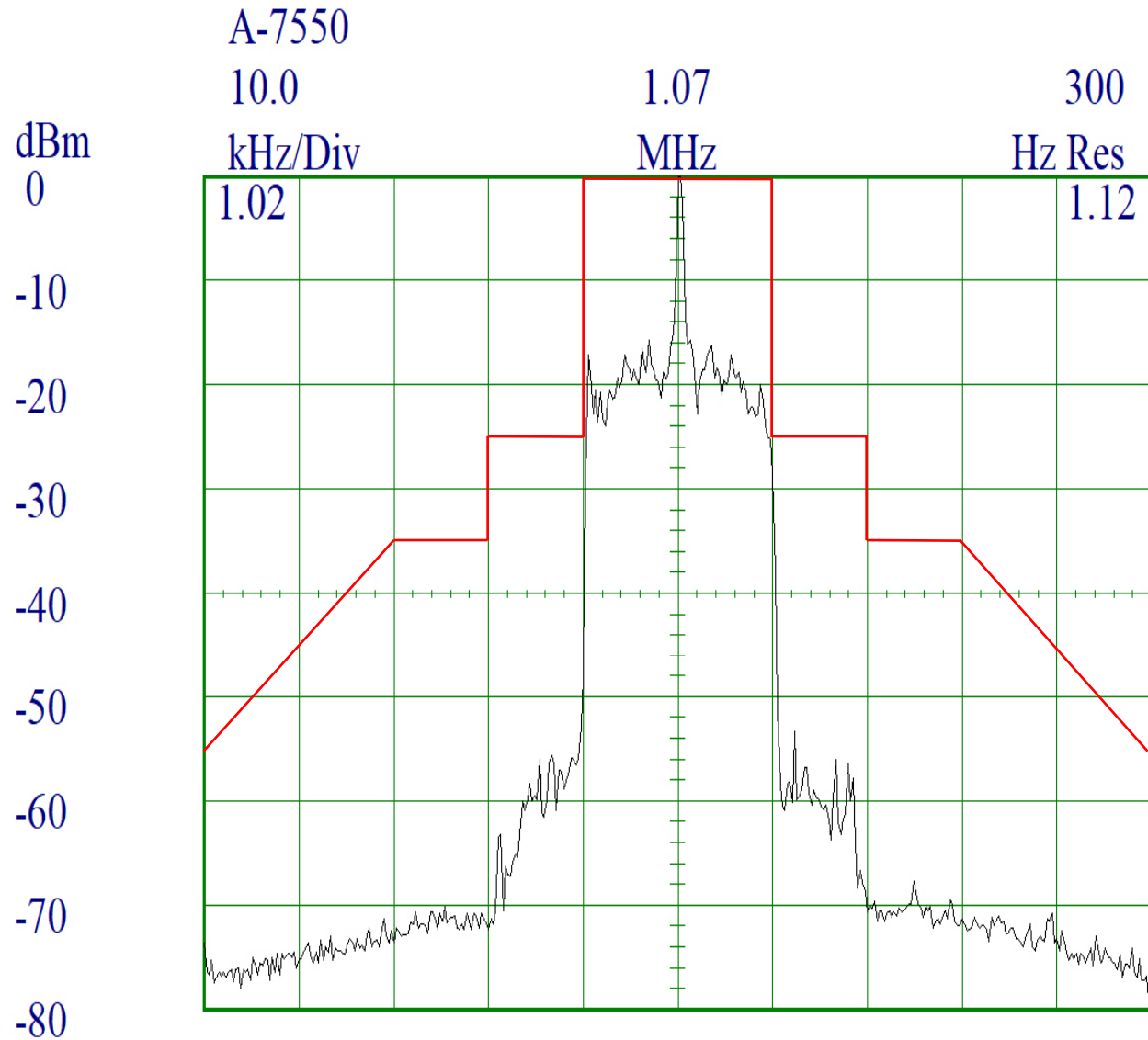
3 dB IF Gain

Video Filter: 0 kHz

Peak Freq: 1.0702

Peak Level: -20.17

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KFTI-2D

09/12/2020 15:09:01

Excerpt, FCC Rules Sec 73.44
AM transmission system
emission limitations.
(NRSC Mask)

"Emissions 10.2 kHz to 20 kHz removed from the carrier must be attenuated at least 25 dB below the unmodulated carrier level. Emissions 20 kHz to 30 kHz removed from the carrier must be attenuated at least 35 dB below the unmodulated carrier level. Emissions 30 kHz to 60 kHz removed from the carrier must be attenuated at least [5 + 1 dB/kHz] below the unmodulated carrier level."

10 dB Attn

Gen --- dBm

500 mSecs

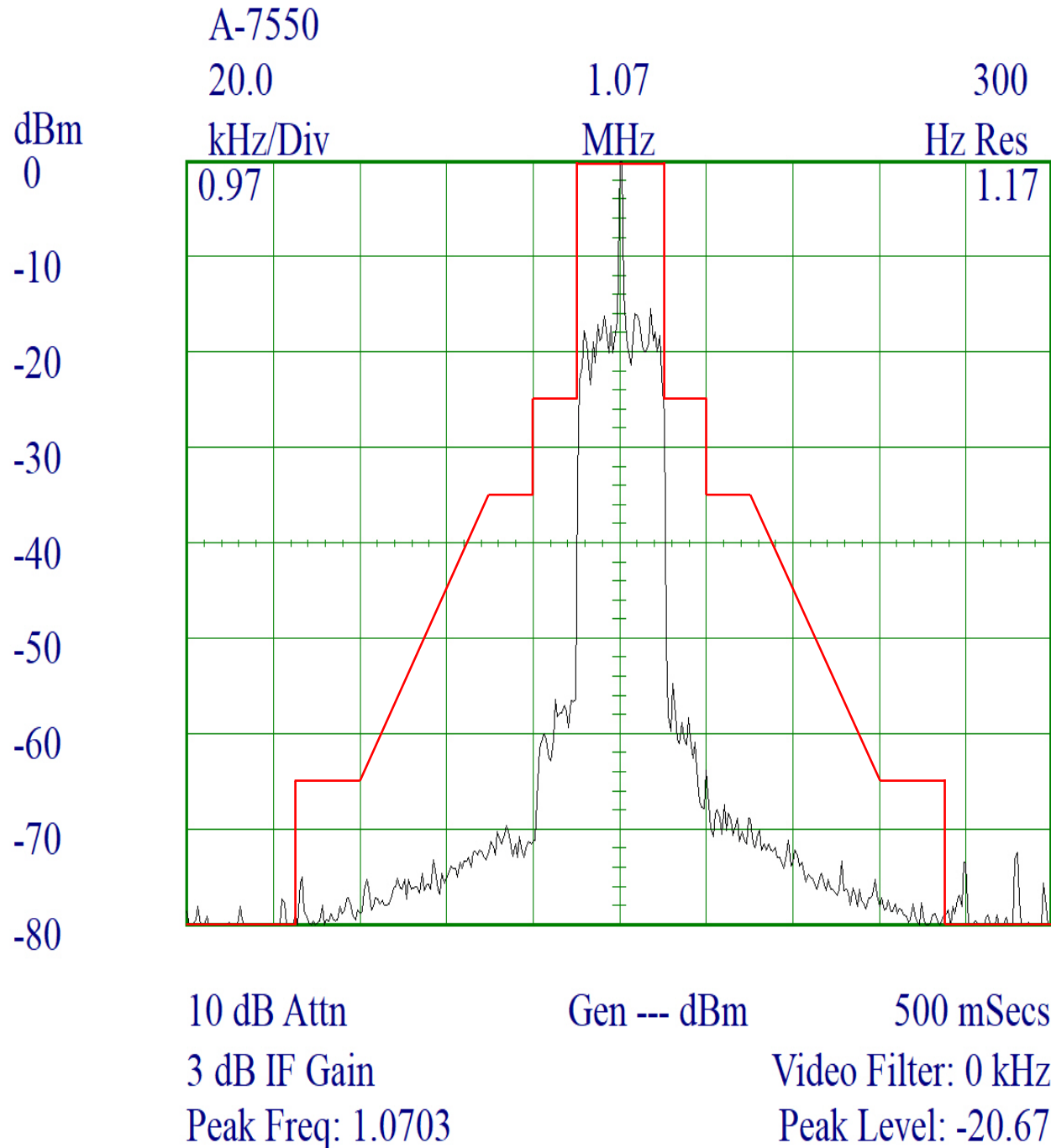
3 dB IF Gain

Video Filter: 0 kHz

Peak Freq: 1.0704

Peak Level: -20.33

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KFTI-3D

09/12/2020 14:59:01

Excerpt, FCC Rules Sec 73.44
AM transmission system
emission limitations.
(NRSC Mask)

“Emissions 10.2 kHz to 20 kHz removed from the carrier must be attenuated at least 25 dB below the unmodulated carrier level. Emissions 20 kHz to 30 kHz removed from the carrier must be attenuated at least 35 dB below the unmodulated carrier level. Emissions 30 kHz to 60 kHz removed from the carrier must be attenuated at least $[5 + 1 \text{ dB/kHz}]$ below the unmodulated carrier level. Emissions between 60 kHz and 75 kHz of the carrier frequency must be attenuated at least 65 dB below the unmodulated carrier level. Emissions removed by more than 75 kHz must be attenuated at least $43 + 10 \text{ Log (Power in watts)}$ or 80 dB below the unmodulated carrier level, whichever is the lesser attenuation, except for transmitters having power less than 158 watts, where the attenuation must be at least 65 dB below carrier level.”

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A-7550

5.0

1.07

300

KFTI-1N

09/12/2020 14:44:02

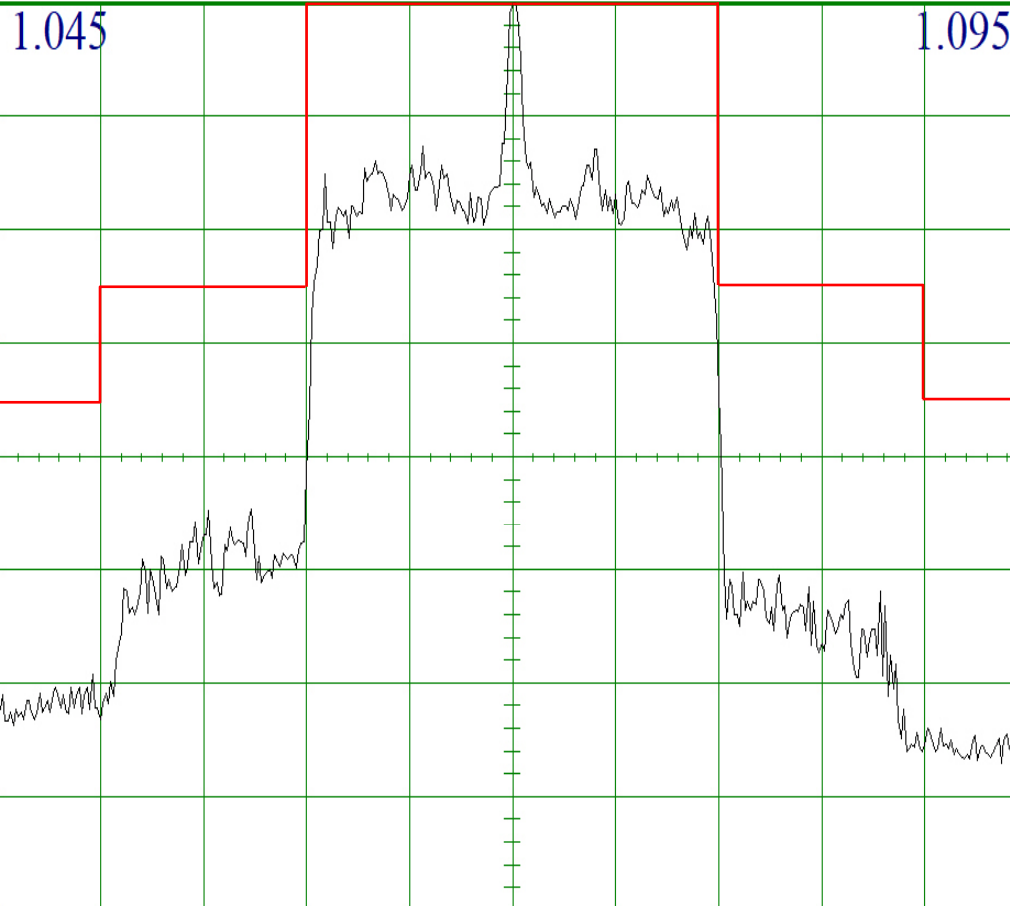
dBm

kHz/Div

MHz

Hz Res

0



Excerpt, FCC Rules Sec 73.44
AM transmission system
emission limitations.
(NRSC Mask)

"Emissions 10.2 kHz to 20 kHz removed from the carrier must be attenuated at least 25 dB below the unmodulated carrier level. Emissions 20 kHz to 30 kHz removed from the carrier must be attenuated at least 35 dB below the unmodulated carrier level."

0 dB Attn

Gen --- dBm

200 mSecs

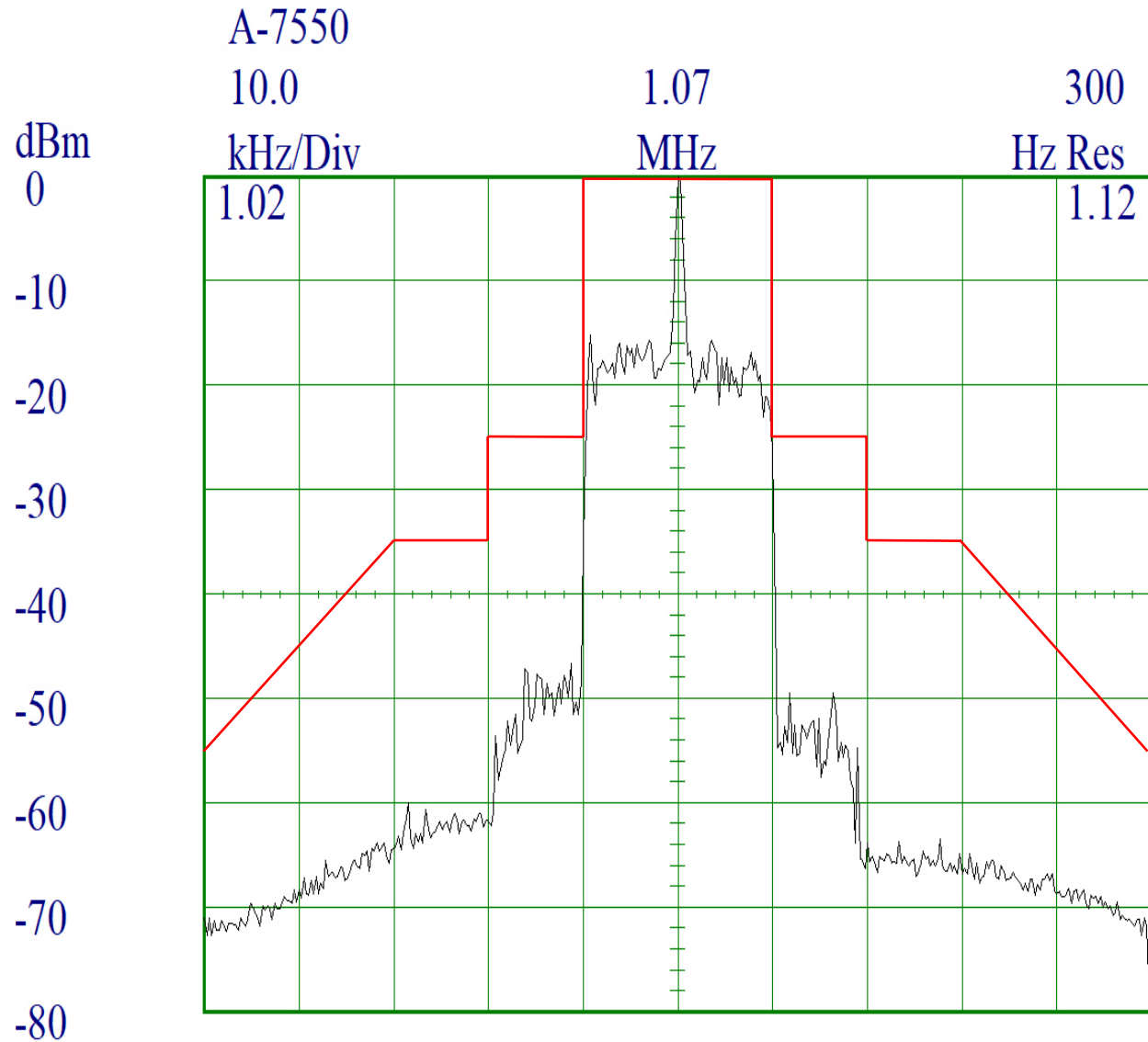
0 dB IF Gain

Video Filter: 0 kHz

Peak Freq: 1.0701

Peak Level: -28.67

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KFTI-2N

09/12/2020 14:34:02

Excerpt, FCC Rules Sec 73.44
AM transmission system
emission limitations.
(NRSC Mask)

"Emissions 10.2 kHz to 20 kHz removed from the carrier must be attenuated at least 25 dB below the unmodulated carrier level. Emissions 20 kHz to 30 kHz removed from the carrier must be attenuated at least 35 dB below the unmodulated carrier level. Emissions 30 kHz to 60 kHz removed from the carrier must be attenuated at least [5 + 1 dB/kHz] below the unmodulated carrier level."

0 dB Attn

Gen --- dBm

500 mSecs

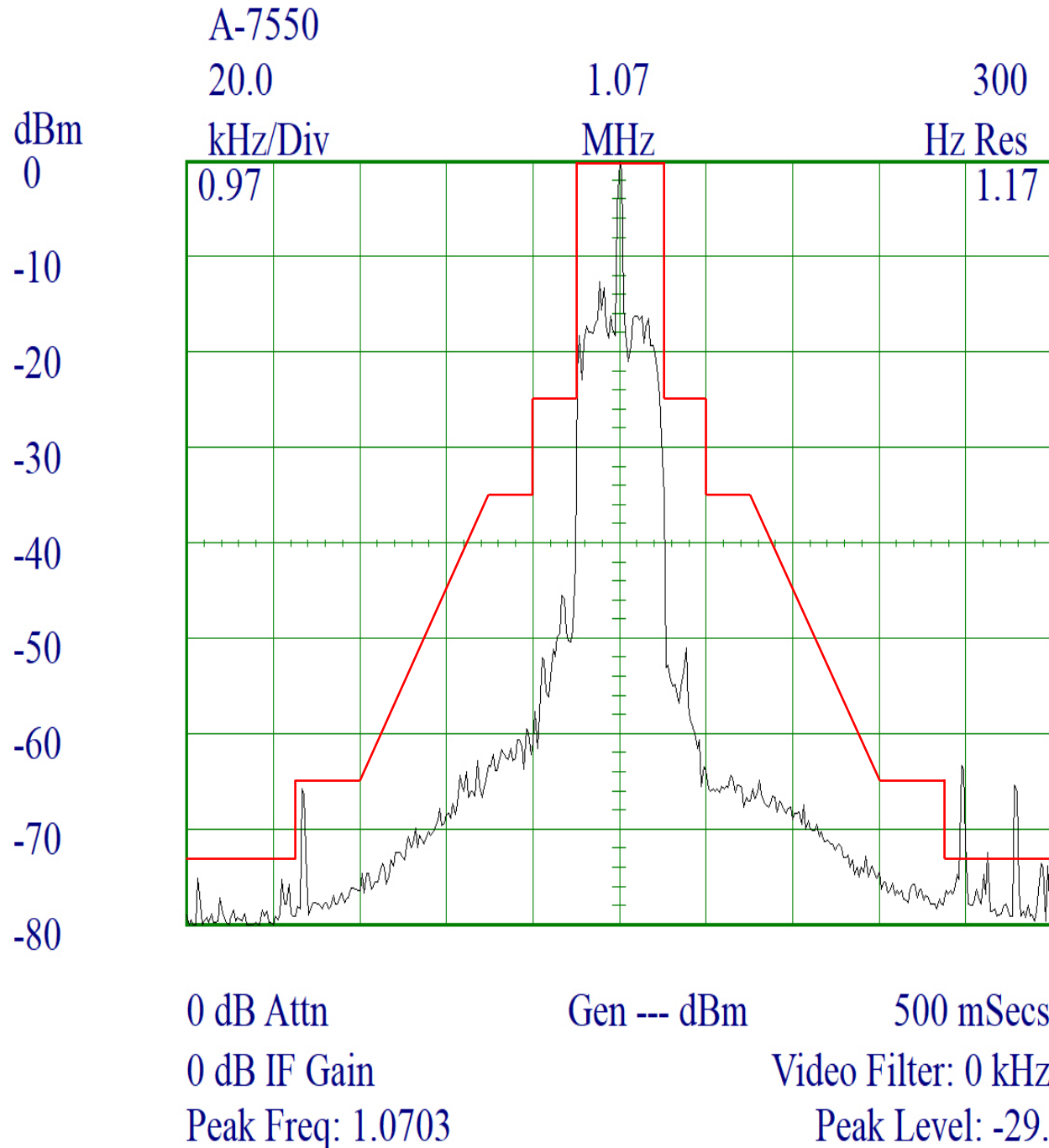
0 dB IF Gain

Video Filter: 0 kHz

Peak Freq: 1.0701

Peak Level: -28.83

DIPRO Engineering Services



KFTI-3N

09/12/2020 14:24:03

Excerpt, FCC Rules Sec 73.44
AM transmission system
emission limitations.
(NRSC Mask)

“Emissions 10.2 kHz to 20 kHz removed from the carrier must be attenuated at least 25 dB below the unmodulated carrier level. Emissions 20 kHz to 30 kHz removed from the carrier must be attenuated at least 35 dB below the unmodulated carrier level. Emissions 30 kHz to 60 kHz removed from the carrier must be attenuated at least $[5 + 1 \text{ dB/kHz}]$ below the unmodulated carrier level. Emissions between 60 kHz and 75 kHz of the carrier frequency must be attenuated at least 65 dB below the unmodulated carrier level. Emissions removed by more than 75 kHz must be attenuated at least $43 + 10 \text{ Log (Power in watts)}$ or 80 dB below the unmodulated carrier level, whichever is the lesser attenuation, except for transmitters having power less than 158 watts, where the attenuation must be at least 65 dB below carrier level.”

ANALYSIS

EXHIBIT KFTI-1D:

Shows the spectrum 25 kHz above and below the carrier frequency. (*Emissions 10.2 kHz to 20 kHz removed from the carrier must be attenuated at least 25 dB below the unmodulated carrier level. Emissions 20 kHz to 30 kHz removed from the carrier must be attenuated at least 35 dB below the unmodulated carrier level.*)

Narrow band performance is within acceptable limits.

EXHIBIT KFTI-2D:

Shows the spectrum 50 kHz above and below the carrier frequency. (In addition to the above: *Emissions 30 kHz to 60 kHz removed from the carrier must be attenuated at least $[5 + 1 \text{ dB/kHz}]$ below the unmodulated carrier level.*)

Mid band performance is within acceptable limits.

EXHIBIT KFTI-3D:

Shows the spectrum 100 kHz above and below the carrier frequency and indicates the full NRSC mask which additionally requires that emissions 60 kHz to 75 kHz removed from the carrier be at least 65 dB below the carrier. (In addition to all of the above: *Emissions between 60 kHz and 75 kHz of the carrier frequency must be attenuated at least 65 dB below the unmodulated carrier level. Emissions removed by more than 75 kHz must be attenuated at least $43 + 10 \text{ Log (Power in watts)}$ or 80 dB below the unmodulated carrier level, whichever is the lesser attenuation, except for transmitters having power less than 158 watts, where the attenuation must be at least 65 dB below carrier level..*)

In this case, at 10000w, emissions removed by more than 75 kHz must be attenuated at least - 80 below the carrier level.

All excursions above the mask were determined NOT related to the KFTI signal.

Wide band performance is within acceptable limits.

EXHIBIT KFTI-1N:

Shows the spectrum 25 kHz above and below the carrier frequency. (*Emissions 10.2 kHz to 20 kHz removed from the carrier must be attenuated at least 25 dB below the unmodulated carrier level. Emissions 20 kHz to 30 kHz removed from the carrier must be attenuated at least 35 dB below the unmodulated carrier level.*)

Narrow band performance is within acceptable limits.

EXHIBIT KFTI-2N:

Shows the spectrum 50 kHz above and below the carrier frequency. (In addition to the above: *Emissions 30 kHz to 60 kHz removed from the carrier must be attenuated at least $[5 + 1 \text{ dB/kHz}]$ below the unmodulated carrier level.*)

Mid band performance is within acceptable limits.

EXHIBIT KFTI-3N:

Shows the spectrum 100 kHz above and below the carrier frequency and indicates the full NRSC mask which additionally requires that emissions 60 kHz to 75 kHz removed from the carrier be at least 65 dB below the carrier. (In addition to all of the above: *"Emissions between 60 kHz and 75 kHz of the carrier frequency must be attenuated at least 65 dB below the unmodulated carrier level. Emissions removed by more than 75 kHz must be attenuated at least $43 + 10 \log(\text{Power in watts})$ or 80 dB below the unmodulated carrier level, whichever is the lesser attenuation, except for transmitters having power less than 158 watts, where the attenuation must be at least 65 dB below carrier level.."*)

In this case, at 1000w, emissions removed by more than 75 kHz must be attenuated at least -73db below the carrier level.

All excursions above the mask were determined NOT related to the KFTI signal.

Wide band performance is within acceptable limits.

CONCLUSION:

The measurement results confirm that KFTI emissions are within NRSC limits and there appear to be no transient problems.

Harmonic measurements confirmed that the emissions at the second harmonic is less than the required -80 below the carrier and therefore in compliance. The third harmonic however is at -78db which is 2db above the required limit.

It is believed that KFTI is in compliance with FCC 73.44.

MODULATION INFO

STATION:	KFTI-AM
Date Measured:	9/12/2020
Positive Peak/Avg Mod:	123%
Negative Peak/Avg Mod:	-95%
Absolute Legal Limits:	+125% / -100%

(See the full **KFTI** modulation analysis on the next page.)

MODULATION - GENERAL TECHNICAL NOTES

- ♦ Most transmitters and audio processors today are capable of asymmetrical modulation. Legal limits are 125% positive peak and 100% negative peak modulation. Technically it is not possible to modulate more than -100% since it would result in a 100% reduction of the carrier (no signal). It is usually best practice to shoot for about -97% and never hit -100%. Depending on the transmitter and antenna system, all kinds of distortive effects usually result beyond -100%.
- ♦ It's ok to modulate evenly at 100% positive & negative. But to do so means losing potential coverage since full non-symmetrical modulation will increase your output power 1.5 times.
- ♦ 125% is the absolute legal limit for positive modulation. Most stations shoot for 120% or so and leave a little headroom so they don't exceed 125%. Going beyond 125% can generate some serious spurious signals above and below your licensed frequency with some transmitters. This could cause some interference to other stations, and possibly a hefty fine if the FCC were to discover it.
- ♦ Special attention should be paid to making sure that the wiring between the output of the peak limiter and the input of the transmitter is properly polarized. If the positive and negative wire connections are reversed you will never do better than an even 100% positive/negative modulation. Any attempt at that point to modulate non-symmetrically will only get you increasingly less and less positive modulation relative to the negative. I have seen a number of stations operating in this manner and when possible, have helped them correct the situation.

Note: FCC rules do not require modulation measurements as part of NRSC compliance.
The data presented here is for informational purposes only.

MODULATION ANALYSIS

Meter History - KFTI Day Mode Modulation

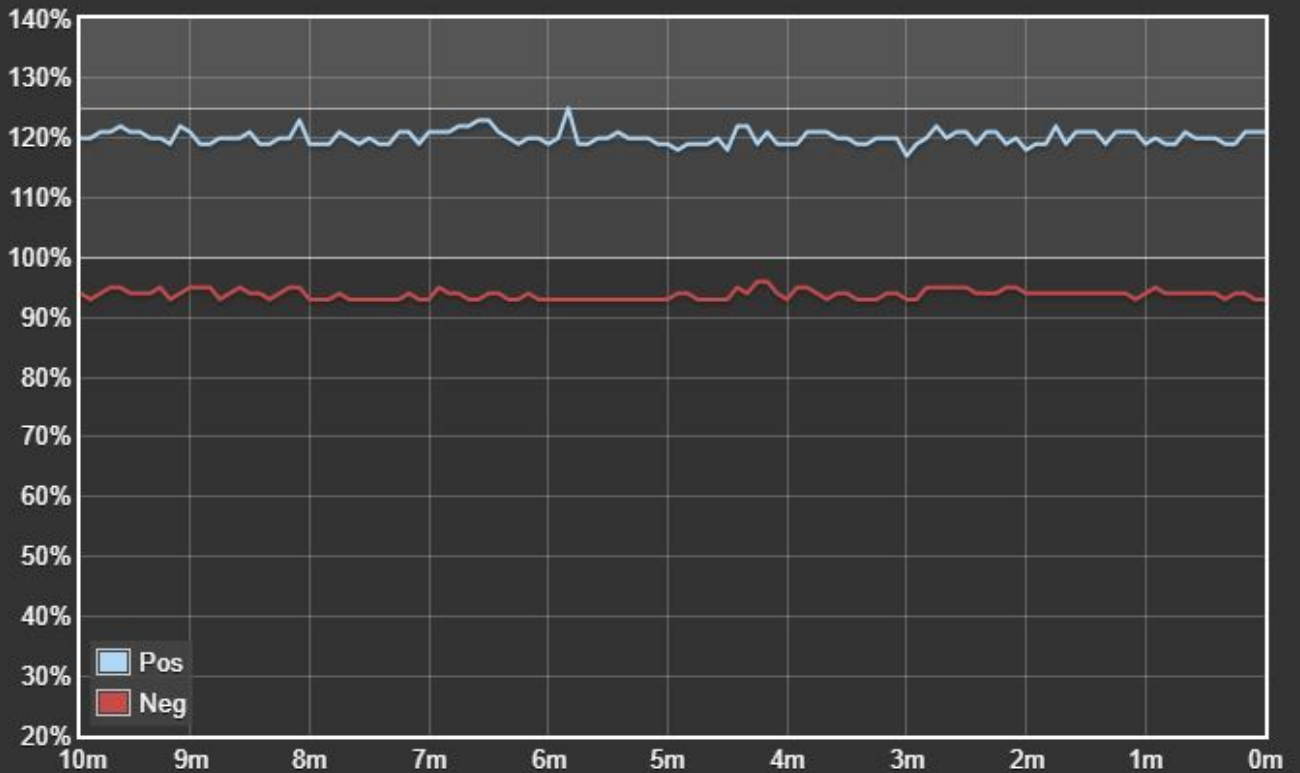


COMMENTARY:

- Positive Peak Levels - Acceptable.
- Negative Peak Levels - Acceptable.
- Dynamic Range - Minimal.
- Compression - High.
- Polarity - Normal

MODULATION ANALYSIS

Meter History - KFTI Night Mode Modulation



COMMENTARY:

- Positive Peak Levels - Acceptable.
- Negative Peak Levels - Acceptable.
- Dynamic Range - Minimal.
- Compression - High.
- Polarity - Normal

ABOUT MODULATION

Modulation levels oftentimes can have negative effects on the outcome of the required annual NRSC measurements. The FCC rules contain very specific limits regarding the modulation levels of AM & FM stations. Interestingly though, the rules for AM NRSC measurements do not contain requirements for checking modulation levels. In my travels I have discovered that a sizable number of my client stations were not passing the NRSC measurements due to spurious emissions being generated beyond their licensed frequencies. Ultimately, after careful measurements with precision test equipment, I determined that some of the NRSC measurement failures were being caused by **excessive** modulation.

In a continuing effort to find ways to enhance and bring added value to the services that I provide to my clients, I decided to include a modulation level check and analysis for each of my clients stations. The modulation analysis report includes a graphical display of a 10-minute segment of on-air audio at the time of measurement. There is much useful information that can be derived from this analysis including peak modulation, average modulation, dynamic range, modulation density, etc. There is **no additional charge** for this service.

In addition to enabling a more complete understanding of the NRSC measurement data for each station, there are other benefits to be derived by knowing exactly what's going on with your modulation. **Over modulation** has been shown to produce some rather nasty audible side effects, and potential interference to other stations. On the other hand, **under modulation** can cost you coverage, listeners, and ultimately money. I have discovered that many stations are over modulated and surprisingly, a near equal percentage of stations that are under modulated, some severely.

If you don't know this already, AM modulation translates into power. A fully legally modulated transmitter will emit up to 1.5 times its licensed power. If you are not utilizing that power, you are not reaching out as far as you could otherwise. Audio processing density is also another important factor to consider. Suffice it to say that I have found many stations that are at a coverage disadvantage simply because they are poorly processed. For all of my clients, I include measurements for modulation and follow-up analysis with each annual NRSC report.

If you would like to discuss this (or any other) matter and possible solutions in greater detail, I can be reached at any time at (918) 521-8693. Additional information, including a list of the other services that I provide, please go to my web site:

www.diproservices.com

Norm Laramee