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TECHNICAL REPORT

Station: **KMYU**

Dates of Visit: On Site July 7TH 2015

Persons Present: Rick Houfley of KUTV

Equipment: **Harris HTEL 5000D CH9 Serial number S2DT226C2**

Purpose of Visit: To replace the CD1A with a new M2X exciter.

07-08-2015

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Installed the exciter into the control cabinet. Ran the sample lines and optimized the feedback sample levels. Checked TX operation with the ETL analyzer and collected data. Measured the reflected power into the antenna which was less than 1W. Measured the attenuation of the mask filter which was 0.2dB. Checked the operation of the transmitter VSWR protection circuits, which operated correctly. The M2X has less output capability than the CD1A, 100mW average digital power. To achieve TPO the exciter indicated 100mW. This level was checked with the power meter and the actual power measured was 95.7mW. This would equate to a reading on a CD1A exciter of 383mW. I was unable to find any place in software to calibrate the output power in order to gain 4% of headroom.

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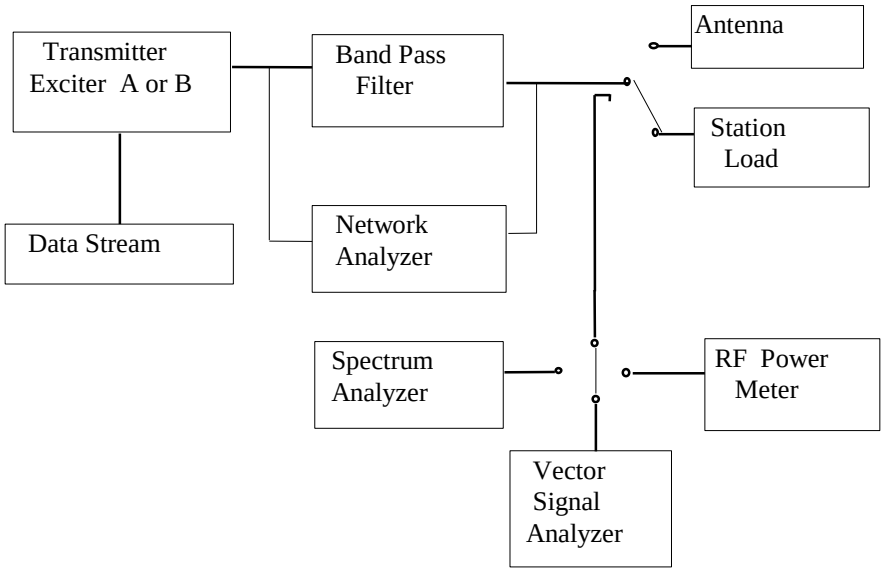
SIGNAL BLOCK DIAGRAM



Test Equipment List:

Test equipment	Make	Model	S/N
Spectrum Analyzer	Rhode & Schwarz	ETL	100897
8VSB Analyzer	Rhode & Schwarz	ETL	100897
Power meter	HP	E4418B	MY 40512085
Power Sensor	HP	8482H	MY41090827

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METHOD OF DETERMINING POWER OUTPUT

DIGITAL TRANSMITTER [Section 73.663(b)]

This describes the method of power output determination as described in the FCC rules and Regulations.

With the transmitter adjusted to produce 100% RMS. Power, the following data was recorded.

The test equipment was set up as shown on the block diagram.

A calibrated Agilent RF Power meter was used to measure the RF Power from a precision directional coupler designated to measure the transmitter power at the output of the DTV mask filter.

The RF power meter was operated with an offset equal to the coupling value of this coupler.

Average digital power was then displayed at 290W

DC TO RF Efficiency:

$$\text{Efficiency} = \frac{\text{(Avg. power out x 100)}}{\text{input power}} = \%$$

Input Power = 50.2V 66.1A

Avg. Power = 290W

Efficiency = 9%

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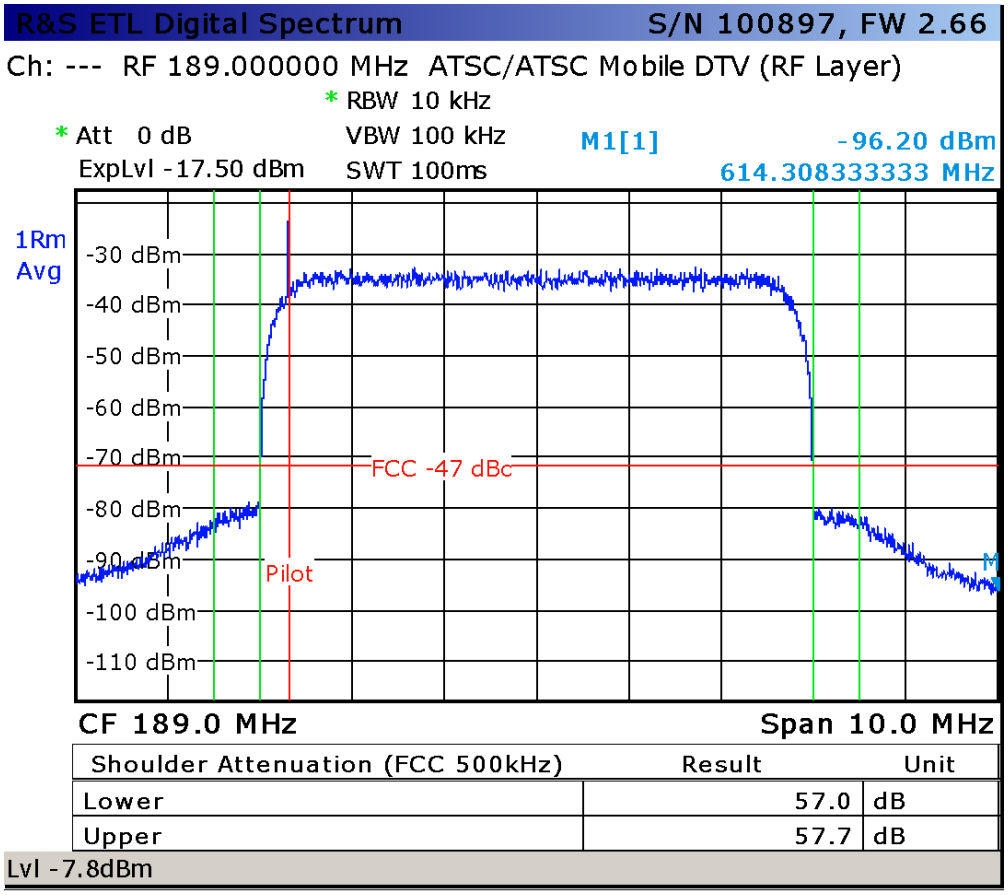
DIGITAL SPECTRUM **EXCITER A**

The shoulder attenuation was measured using the Rohde & Schwarz ETL Analyzer, serial number 100897.



Shoulder Attenuation (FCC 500kHz)	Result	Unit
Lower	57.0	dB
Upper	57.7	dB

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Data recorded at operational power.

FCC Specification: > -47dB

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DIGITAL OVERVIEW **EXCITER A**

These measurements were made in real time using the Rohde and Schwarz ETL Analyzer; serial number; 100897.

R&S ETL Digital Overview S/N 100897, FW 2.66

Ch: --- RF 189.000000 MHz ATSC/ATSC Mobile DTV (RF Layer)

* Att 0 dB
ExpLvl -17.50 dBm

ATSC Parameters

	Pass	Limit	<	Results	<	Limit	Unit
	Level	-60.0		-7.9		10.0	dBm
	Constellation			8VSB / Normal			
	MER (rms)	24.0		39.0		-----	dB
	MER (peak)	10.0		18.8		-----	dB
	EVM (rms)	-----		0.74		4.40	%
	EVM (peak)	-----		7.48		22.00	%
OLim	BER before RS			0.0e-9(41%/1e10)		2.0e-4	
	BER after RS			0.0e-8(24%/1e7)		1.0e-10	
	Packet Error Ratio			0.0e-6(24%/1e7)		1.0e-8	
	Packet Errors			0		1	/s
	Carrier Freq Offset	-30000.0		-7.5		30000.0	Hz
	Symbol Rate Offset	-10000.0		-36.1		10000.0	Symb/s
	MPEG Ts Bitrate			19.392593			MBit/s

Lvl -7.9dBm | BER 0.0e-9 | MER 39.0dB DEMOD MPEG

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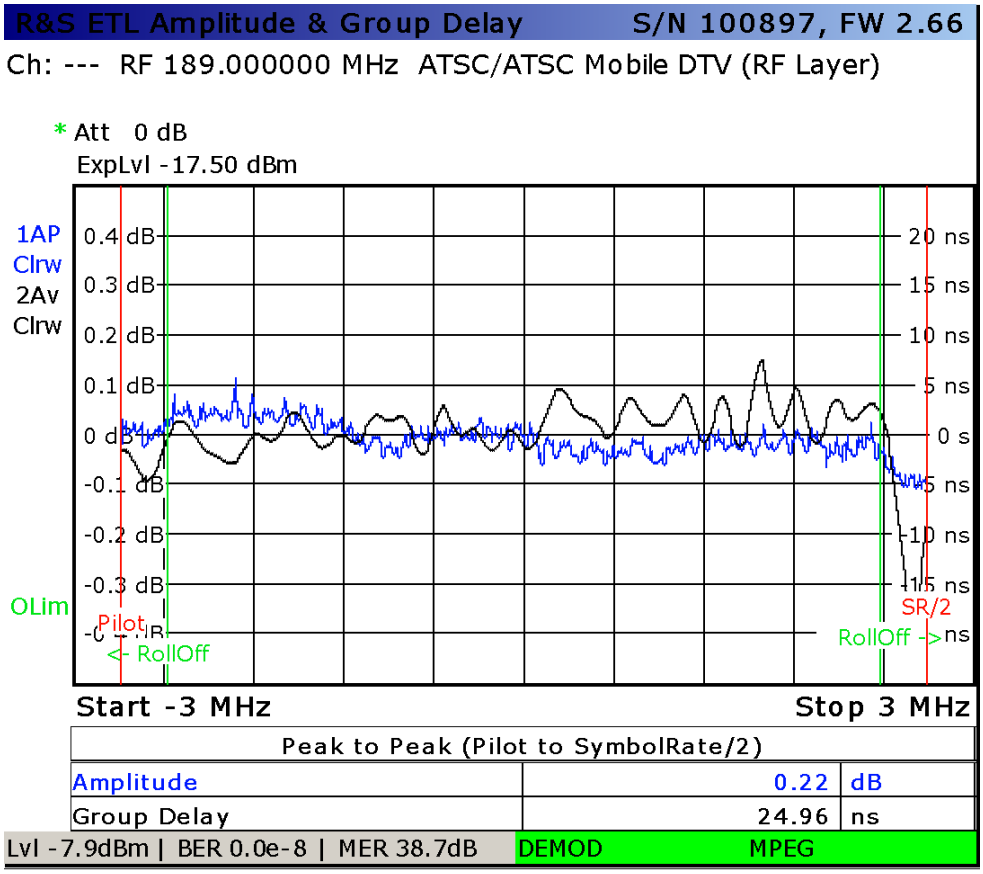
RESPONSE AND GROUP DELAY **EXCITER A**

The System Amplitude Response and Group Delay were measured using the Rohde and Schwarz ETL; Serial number; 100897



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MODULATION ERRORS **EXCITER A**

Modulation errors were measured in real time using the Rohde and Schwarz ETL; Serial number; 100897

R&S ETL Modulation Errors S/N 100897, FW 2.66

Ch: --- RF 189.000000 MHz ATSC/ATSC Mobile DTV (RF Layer)

* Att 0 dB
ExpLvl -17.50 dBm

	Pass	Limit <	Results	< Limit	Unit
	Level	-60.0	-7.9	10.0	dBm
	Pilot value	1.20	1.26	1.30	
	Data Signal/Pilot	11.0	11.2	11.6	dB
OLim	Pilot Amplitude Error	-0.3	0.1	0.3	dB
	MER (rms)	24.0	39.3	-----	dB
	MER (peak)	10.0	17.9	-----	dB
	EVM (rms)	-----	0.71	4.40	%
	EVM (peak)	-----	8.37	22.00	%
	Signal/Noise Ratio (Low Q)	24.0	39.4		dB

Lvl -7.9dBm | BER 0.0e-9 | MER 39.3dB DEMOD MPEG

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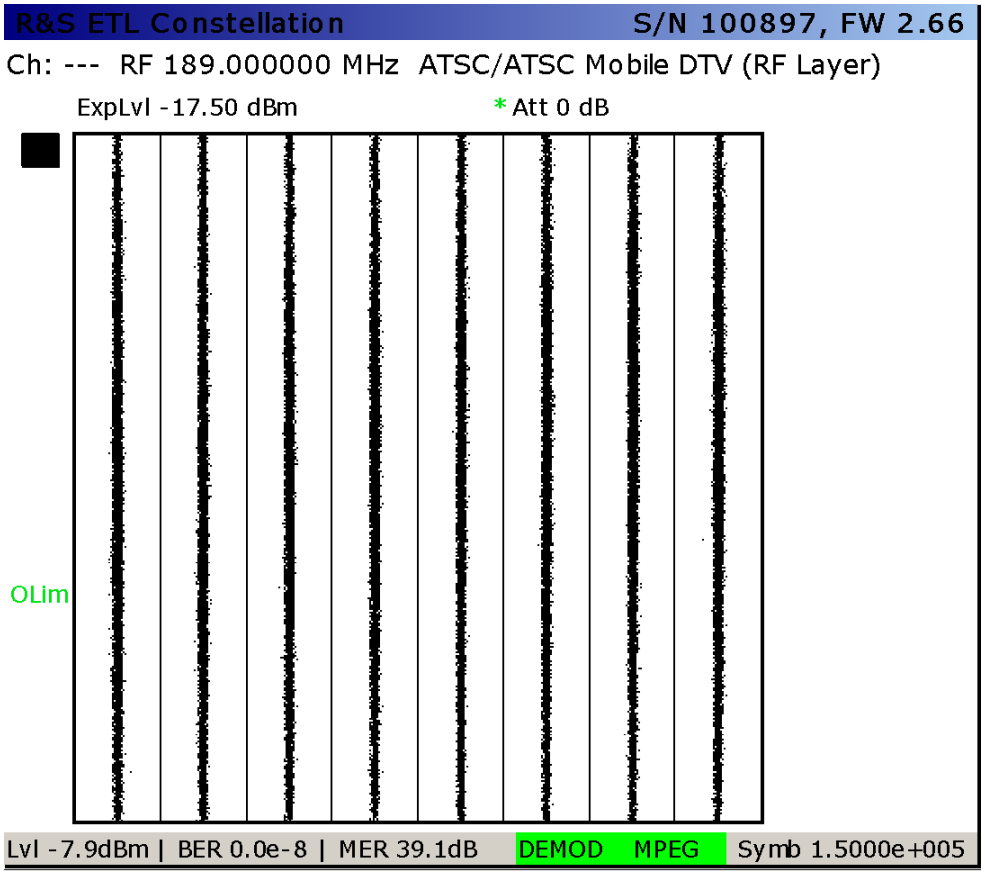
8VSB CONSTELLATION **EXCITER A**

The constellation was measured using the Rohde and Schwarz ETL; serial number; 100897



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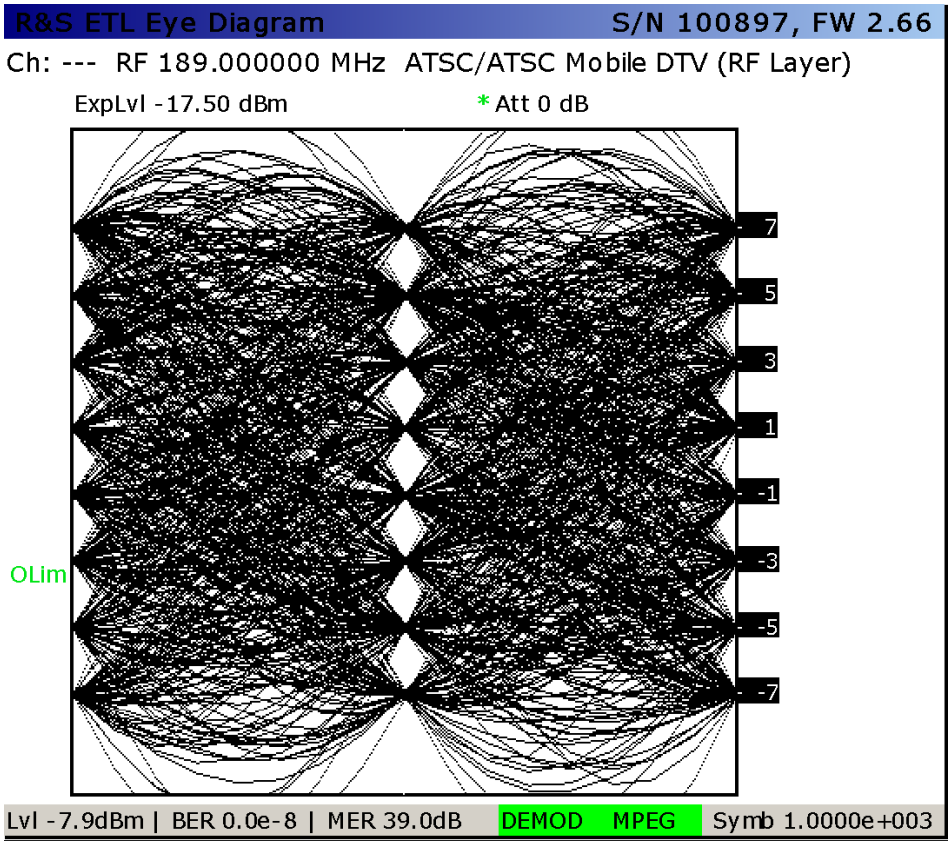
EYE DIAGRAM **EXCITER A**

The eye diagram was measured using the Rohde and Schwarz ETL; serial number; 100897



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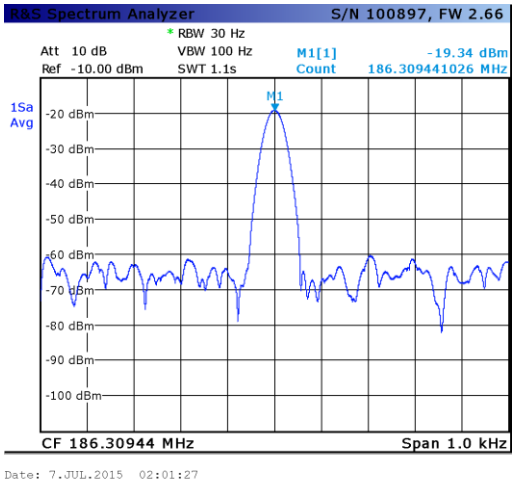
FREQUENCY MEASUREMENTS OF THE DIGITAL CARRIER
[Section 73.1545(c)(1) and (2)]

Frequency measurements of the pilot carrier frequency were made using the Rohde & Schwarz TV analyzer fitted with a precision frequency reference; serial # 100897.



EXCITER A
186,309,441Hz

FCC limit: +/-3Hz from assigned carrier frequency. (N+1)
FCC limit +/- 10Hz from assigned carrier frequency (DTV to DTV)
FCC limit +/- 1000Hz from assigned carrier frequency. (N -1)