

ENGINEERING REPORT

Spurious Emissions Measurement Study Pursuant to 47 C.F.R. §73.317(b)

associated with the di-plexing of

**WOXL-FM.C (Fac ID: 37242)
Biltmore Forest, NC
BPH-20131220HHF**

**WTMT(FM).L (Fac ID: 72070)
Weaverville, NC
BLH-20101130AJK**

September, 2016

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RF Signal Spurious Emissions Study for the Combined Master Antenna of WOXL-FM.C - Biltmore Forest, NC & WTMT(FM).L - Weaverville, NC

This firm has been retained to prepare the required engineering report in support of this Spurious Emissions Measurement Study for the di-plexed operation of FM Station(s) WOXL-FM.C - Biltmore Forest, NC and WTMT(FM).L - Weaverville, NC onto the tower identified by Antenna Structure Registration Number #1033392. This study has been conducted pursuant to 47 C.F.R. §73.317(b) and is associated with, and a condition of licensing for WOXL-FM.C Construction Permit BPH-20131220HHF. FM Translator(s) W220CD.L - Enka, NC and W251AO.L - Asheville, NC are also co-located at this site but operate independently from the di-plexed WOXL-FM.C / WTMT(FM).L antenna.

WOXL-FM.C operates on 96.5 MHz with a maximum effective radiated power (ERP) of 9.5 kW circular (H&V) polarization. WTMT(FM).L operates on 105.9 MHz with a maximum effective radiated power (ERP) of 9.5 kW (H&V) circular (H&V) polarization. As stated before, the common antenna is mounted on ASR #1033392. The common FM antenna is a three (3) bay, Shively 6014-3/3-SS-DA "Three Panel" antenna mounted with a Center of Radiation 54 meters above ground level (AGL). The antenna is matched with a Shively Labs, Model 2530-2A Branched Combiner (di-plexer). Factory settings were matched employing information from the FCC database concerning the WOXL-FM.C and WTMT(FM).L operating parameters; and manufacturer specifications for the combiner.

RF signal purity measurements were conducted on September 14, 2016 during the equipment test operations associated with WOXL-FM.C Construction Permit BPH-20131220HHF. Measurements were conducted by Mr. Matthew Smith, an engineer in the employ of Shively Labs. Mr. Smith conducted his measurements utilizing a Agilent Field Fox N9912a RF Analyzer, Serial Number MY50023094 with the FM transmitters in full operation employing the Shively di-plexer for the common FM operations. A broad spectral sweep found no obvious products above the analyzer noise floor. Using a computer generated mixing product chart, high resolution, low noise floor measurements were also made out to the 1st, 2nd and 3rd order. With the exception of noted carrier frequencies, nothing was observed over the noise floor of the analyzer as reported in the **Exhibit A** attachment.

Attached as **Exhibit A** is a copy of the 1st, 2nd and 3rd order potential mixing product measurement results for the harmonic relationships associated with the 96.5 MHz and 105.9 MHz di-plexed operations. As a result of these studies, it has been concluded the proposed di-plexed operation of WOXL-FM.C and WTMT(FM).L meets or exceeds the requirements of 47 C.F.R. §73.317(b) and the special condition of licensing associated with WOXL-FM.C Construction Permit BPH-20131220HHF.

CERTIFICATION OF ENGINEER

The data utilized in this report was taken from the FCC Secondary Database and data on file. While this information is believed accurate, errors or omissions in the database and file data are possible. This firm may not be held liable for damages as a result of such data errors or omissions.

The report has been prepared by properly trained electronics specialists under the direction of the undersigned whose qualifications are a matter of record before the Federal Communications Commission. I declare under penalty of the laws of perjury that the contents of this report are true and accurate to the best of my knowledge and belief.

September 19, 2016

By 
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Exhibit A - Tabulation of Potential Mixing Products

WOXL-FM.C (96.5 MHz) & WTMT(FM).L (105.9 MHz)

Frequency (MHz)	Measured Level (dBc)	Frequency (MHz)	Measured Level (dBc)	Frequency (MHz)	Measured Level (dBc)	Frequency (MHz)	Measured Level (dBc)
9.40 MHz	-91.44 dBc	193.00 MHz	-93.21 dBc	317.70 MHz	-93.22 dBc		
18.80 MHz	-93.77 dBc	202.40 MHz	-90.84 dBc	386.00 MHz	-92.46 dBc		
87.10 MHz	-93.62 dBc	211.80 MHz	-93.98 dBc	404.80 MHz	-91.47 dBc		
96.50 MHz	<i>WOXL-FM Carrier*</i>	289.50 MHz	-93.12 dBc	423.60 MHz	-92.95 dBc		
105.90 MHz	<i>WTMT(FM) Carrier*</i>	298.90 MHz	-92.90 dBc				
115.30 MHz	-94.07 dBc	308.30 MHz	-93.14 dBc				

***No intermodulation mixing was noted on any carrier frequencies.**

WOXL-FM.C minimum attenuation Level: -80 dBc (9,500 watts ERP)

WTMT(FM).L minimum attenuation Level: -80 dBc (9,500 watts ERP)

Title 47: Telecommunication: PART 73—RADIO BROADCAST SERVICES
Subpart B—FM Broadcast Stations § 73.317 FM transmission system requirements.

(a) FM broadcast stations employing transmitters authorized after January 1, 1960, must maintain the bandwidth occupied by their emissions in accordance with the specification detailed below. FM broadcast stations employing transmitters installed or type accepted before January 1, 1960, must achieve the highest degree of compliance with these specifications practicable with their existing equipment. In either case, should harmful interference to other authorized stations occur, the licensee shall correct the problem promptly or cease operation.

(b) Any emission appearing on a frequency removed from the carrier by between 120 kHz and 240 kHz inclusive must be attenuated at least 25 dB below the level of the unmodulated carrier. Compliance with this requirement will be deemed to show the occupied bandwidth to be 240 kHz or less.

(c) Any emission appearing on a frequency removed from the carrier by more than 240 kHz and up to and including 600 kHz must be attenuated at least 35 dB below the level of the unmodulated carrier.

(d) Any emission appearing on a frequency removed from the carrier by more than 600 kHz must be attenuated at least $43 + 10 \log_{10}(\text{Power, in watts})$ dB below the level of the unmodulated carrier, or 80 dB, whichever is the lesser attenuation.

(e) Preemphasis shall not be greater than the impedance-frequency characteristics of a series inductance resistance network having a time constant of 75 microseconds. (See upper curve of Figure 2 of §73.333.) [51 FR 17028, May 8, 1986]

Title 47: Telecommunication: PART 74—EXPERIMENTAL RADIO, AUXILIARY, SPECIAL BROADCAST AND OTHER SERVICES
Subpart L—FM Broadcast Translator Stations and FM Broadcast Booster Stations: § 74.1236 Emission and bandwidth.

(a) The license of a station authorized under this subpart allows the transmission of either F3 or other types of frequency modulation (see §2.201 of this chapter) upon a showing of need, as long as the emission complies with the following:

(1) For transmitter output powers no greater than 10 watts, paragraphs (b), (c), and (d) of this section apply.

(2) For transmitter output powers greater than 10 watts, §73.317 (a), (b), (c), and (d) apply.

(b) Standard width FM channels will be assigned and the transmitting apparatus shall be operated so as to limit spurious emissions to the lowest practicable value. Any emissions including intermodulation products and radiofrequency harmonics which are not essential for the transmission of the desired aural information shall be considered to be spurious emissions.

(c) The power of emissions appearing outside the assigned channel shall be attenuated below the total power of the emission as follows:

Distance of emission from center frequency	Minimum attenuation below unmodulated carrier
120 to 240 kHz	25 dB
Over 240 and up to 600 kHz	35 dB
Over 600 kHz	60 dB

(d) Greater attenuation than that specified in paragraph (c) of this section may be required if interference results outside the assigned channel.

[35 FR 15388, Oct. 2, 1970, as amended at 52 FR 31406, Aug. 20, 1987; 55 FR 50698, Dec. 10, 1990]

FIELD SERVICE VERIFICATION
SHIVELY LABS SERVICE

Date: 9/16/16

Customer: Saga Communications Incorporated

Customer Location: Asheville NC

Customer Order No.: _____

HLI S/O No. 33946

Service Tech: Matt Smith

TPOC: Gary Robinson

Description of Work Performed: Measured new 16" filter tuned to 96.5 MHz. arrived within spec. but made minor tweaks to achieve best match. Briefed tower crew on work to be performed up on the tower and provided line sections. Explained that the section with red markings was to be installed on the NW face power divider and that all cables off this power divider should be connected to the NW face. Once shut down, assisted Mark Spalding with removing the existing 6" filter and installation of the new 16" filter including running the new line from the switch to the filter. Cut and adjusted the output network of the combiner until we achieved best match for both filters. Once the tower crew was finished I measured the antenna and it looked very similar to previously taken data.(see attached) Next we connected the system into the antenna and tuned both filters into the antenna load.(see attached) Connected everything back up and applied power. The 105.9 MHz filter had an increase in reflected power of 1.15:1 vswr or 58 W which was previously 1.04:1 or 6 W. upon further troubleshooting it was realized that this was also the case when patched directly into the dummy load and when the standby transmitter was into both the combiner and the dummy load. It seems to be that the Dielectric switch is the common denominator. The 96.5 MHz transmitter while briefly at the new full power rating showed 0 W reflected. Once all stations were at full power the spurious emmisions measurement was taken. With approximately -20dB of attenuation applied to the forward port of the -41dB Shively precision coupler a carrier reference level of 5 dB was noted. All measured frequencies were greater than -90dbc.(see attached)

Time Log: _____

HLI Signature:  Date: 9/16/16

Customer Signature: _____ Date: _____

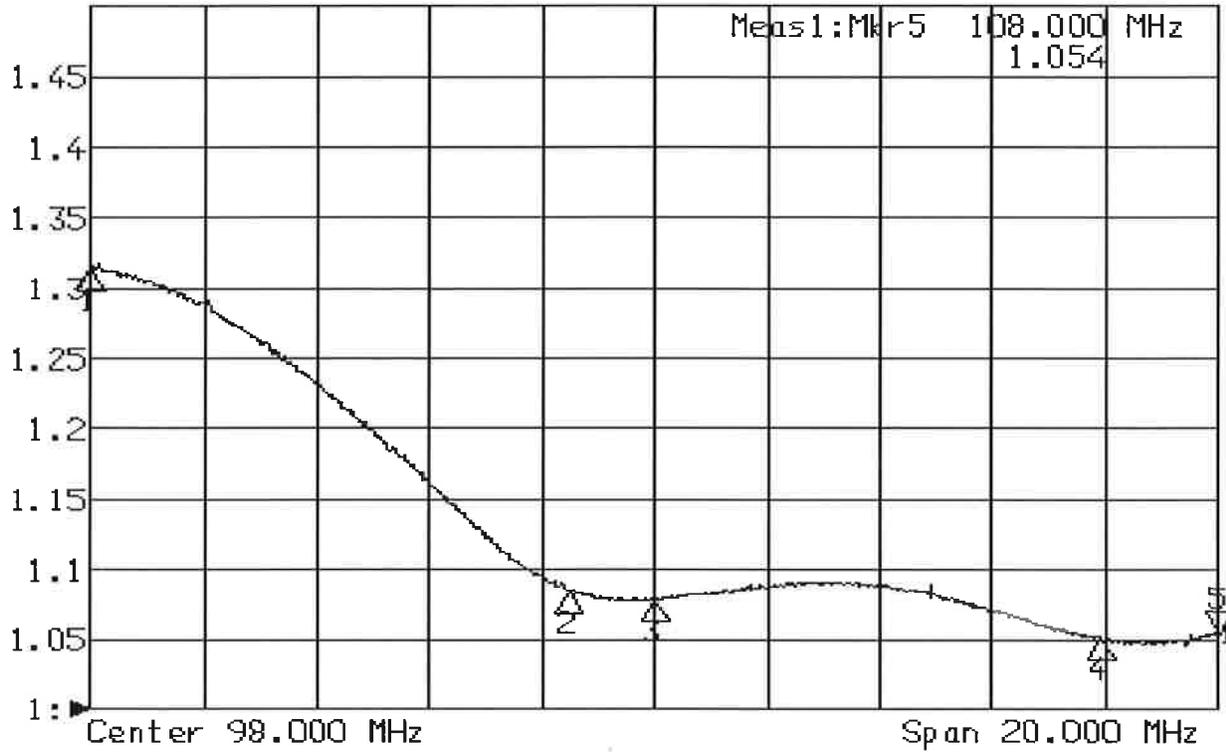
Instructions:

- 1. 'Save As' to new location. Fill out blanks on-screen. Print.
- 2. Sign as indicated.
- 3. Forward to service coordinator for filing.

6014-3/3-SS-DA

antenna original factory data

►1:Reflection SWR 0.05 / Ref 1.000 C
►2:Off

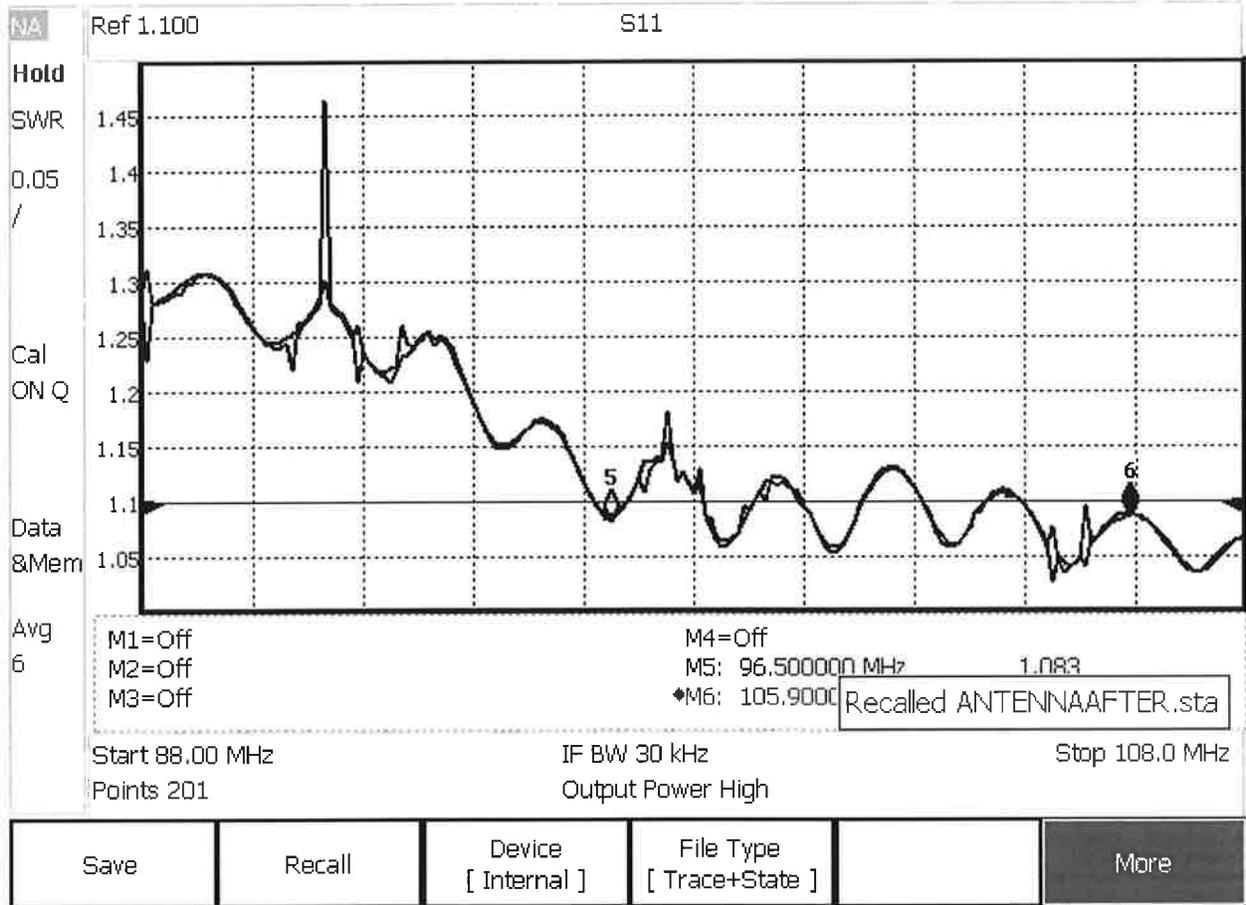


1:Mkr (MHz)	2:Mkr (MHz)	dB
1: 88.0000		1.316
2: 96.5000		1.085
3: 98.0000		1.079
4: 105.9000		1.052
5: 108.0000		1.054

6014-3/3-SS-DA

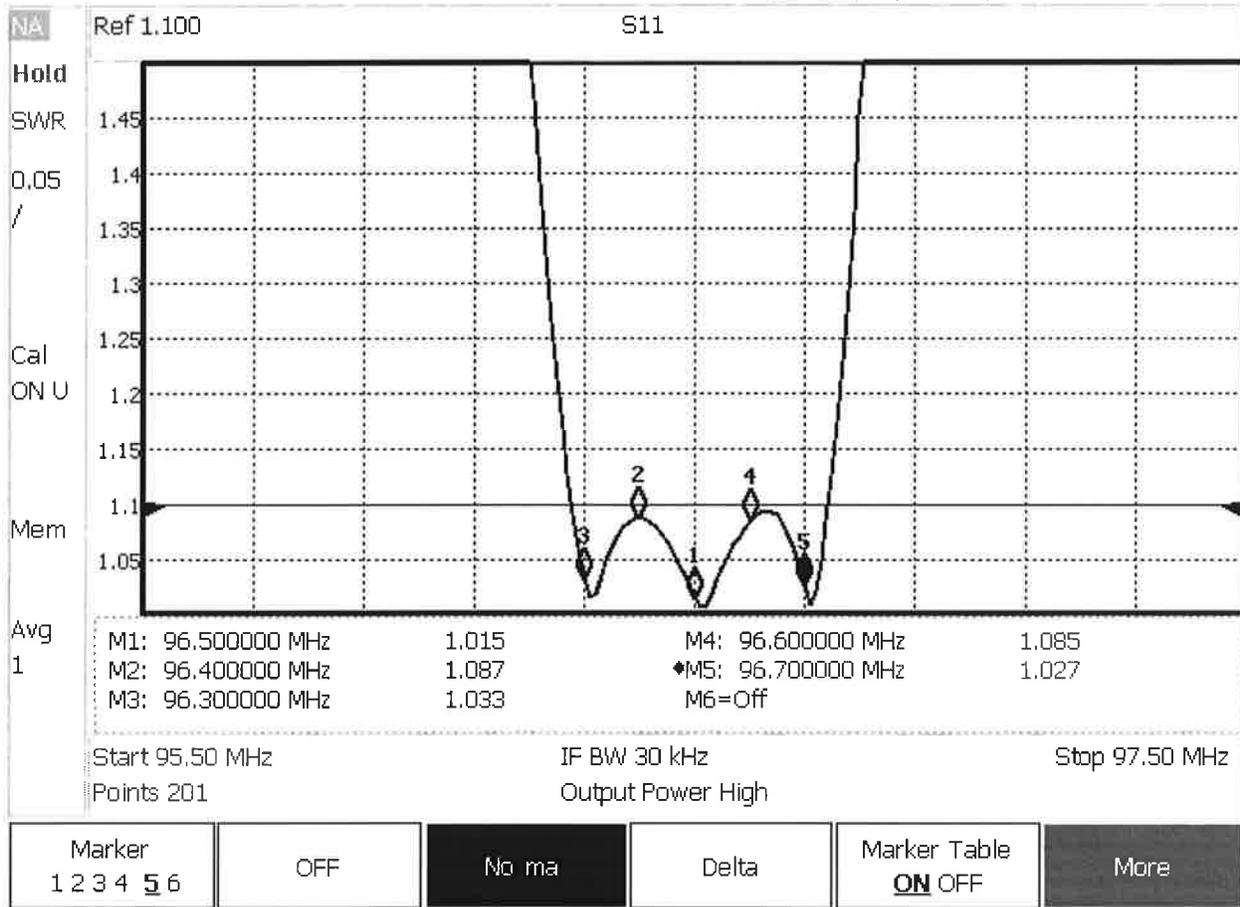
Antenna measured on site after Attenuated line sections added.

Fri, 16 Sep 2016 11:06:19 AM



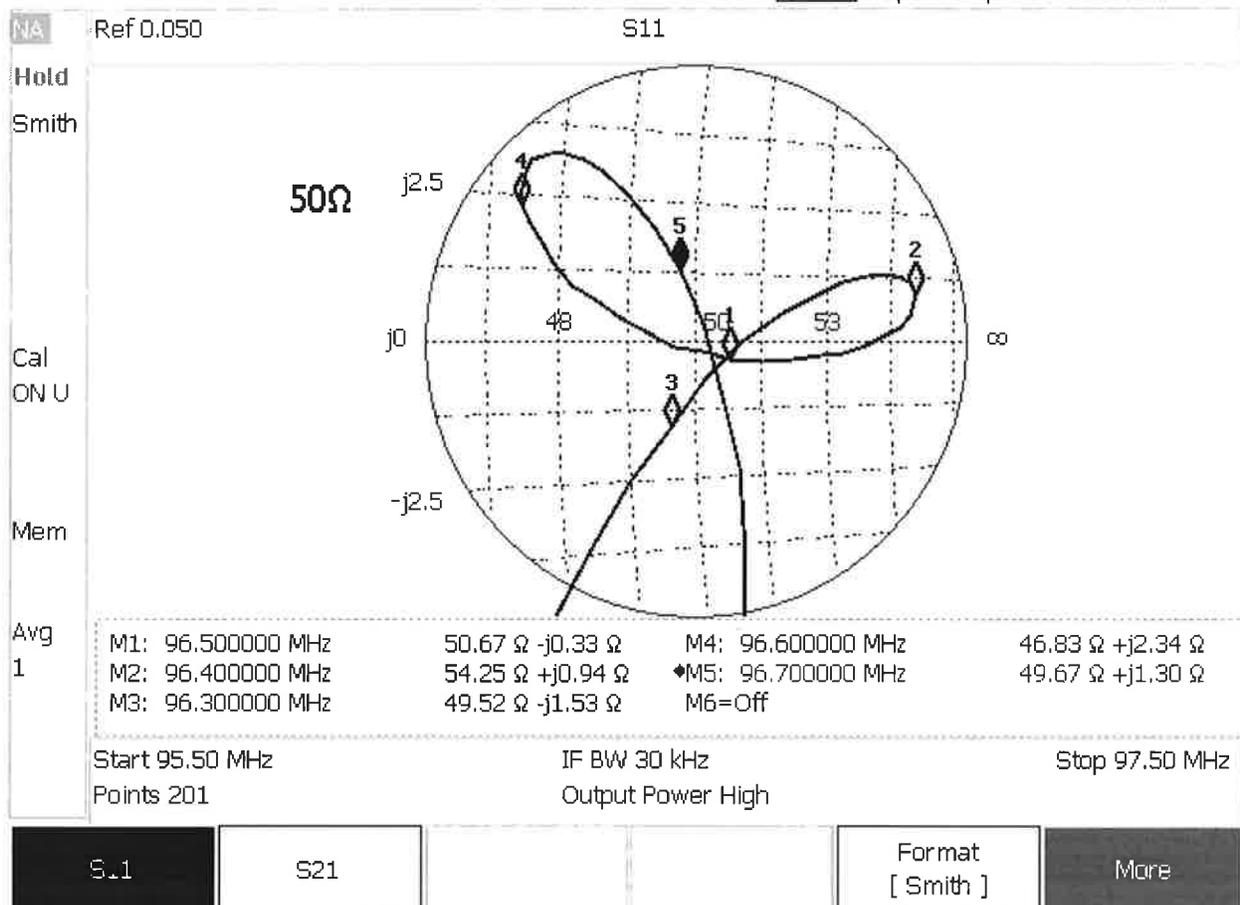
96.5 MHz filter into antenna after new output

Fri, 16 Sep 2016 11:18:48 AM



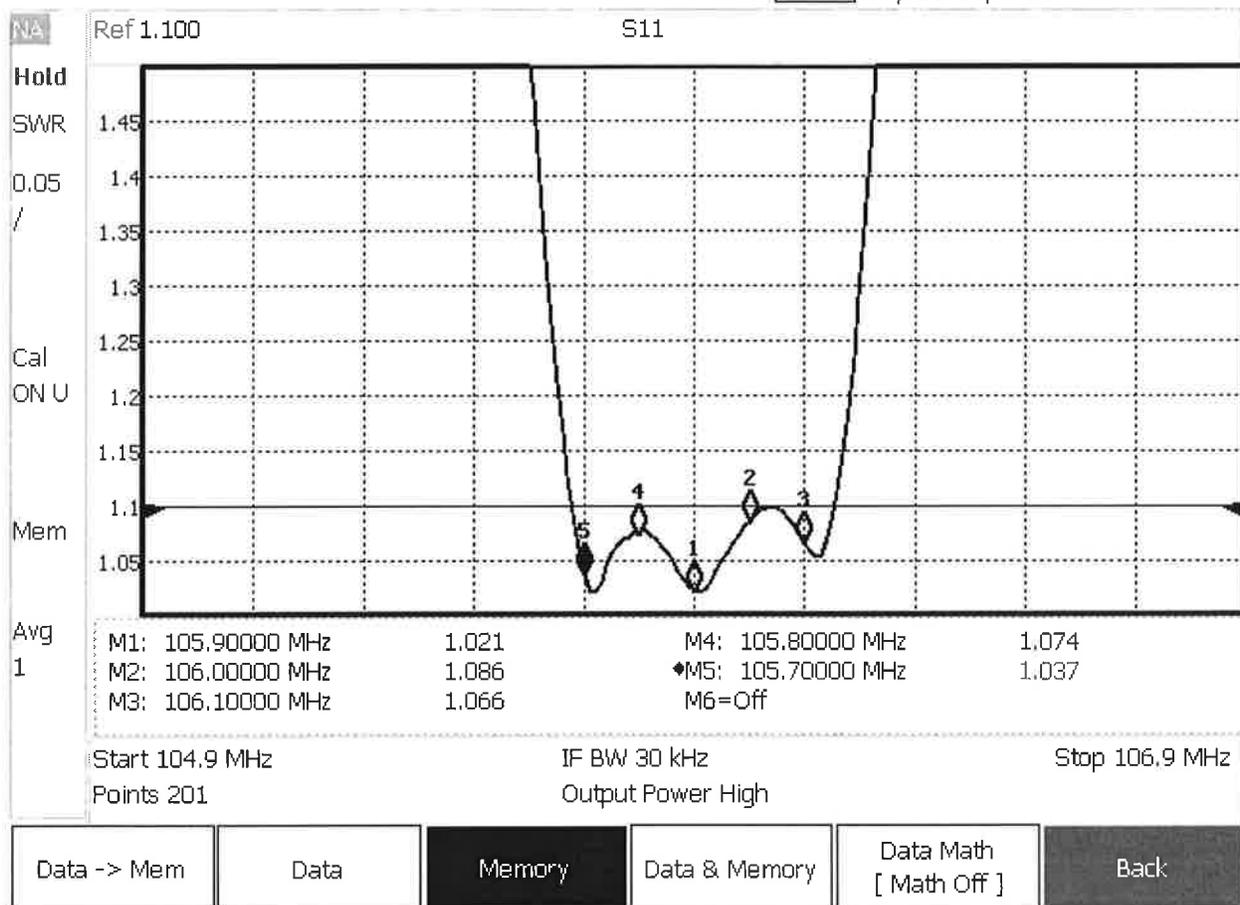
96.5 MHz filter into antenna after new output

Fri, 16 Sep 2016 11:19:32 AM



105.9 MHz filter into antenna

Fri, 16 Sep 2016 11:20:43 AM



105.9 MHz filter into antenna

Fri, 16 Sep 2016 11:28:50 AM

