

Report on Test Measurements**Specification Requirement § 90.221(d) Emission Limits – “ACP-Mask”:****§90.221 Adjacent channel power limits.**

(a) For the frequency bands indicated below, operations using equipment designed to operate with a 25 kHz channel bandwidth may be authorized up to a 22 kHz bandwidth if the equipment meets the adjacent channel power (ACP) limits below. The table specifies a value for the ACP as a function of the displacement from the channel center frequency and a measurement bandwidth of 18 kHz.

(b)(1) Maximum adjacent power levels for frequencies in the 450-470 MHz band:

Frequency offset	Maximum ACP (dBc) for devices 1 watt and less	Maximum ACP (dBc) for devices above 1 watt
25 kHz	-55 dBc	-60 dBc
50 kHz	-70 dBc	-70 dBc
75 kHz	-70 dBc	-70 dBc

(2) In any case, no requirement in excess of -36 dBm shall apply.

(c)(1) Maximum adjacent power levels for frequencies in the 809-824/854-869 MHz band:

Frequency offset	Maximum ACP (dBc) for devices less than 15 watts	Maximum ACP (dBc) for devices 15 watts and above
25 kHz	-55 dBc	-55 dBc
50 kHz	-65 dBc	-65 dBc
75 kHz	-65 dBc	-70 dBc

(2) In any case, no requirement in excess of -36 dBm shall apply.

(d) On any frequency removed from the assigned frequency by more than 75 kHz, the attenuation of any emission must be at least $43 + 10 \log (P_{\text{watts}})$ dB.

[77 FR 61538, Oct. 10, 2012]

Occupied Bandwidth – DMR TDMA Digital Modulation, 25 kHz Channel Spacing – 90.221 ACP-Mask Compliance

The occupied bandwidth charts reference the following setup and specification requirements.

Modulation Types: 4 Level FSK Dual Carrier Two-Slot TDMA Digital Modulation
Emission Designator: 21K70D7E, 21K70D7D, 21K70D7W
Channelization: 25 kHz
Power Setting: 100 Watts, Average

Necessary Bandwidth Calculation:

47CFR90.221 sets forth an alternate method of establishing compliance with out of band emission (OOBE) limits. An Adjacent Channel Power mask and associated limits replace the standard OOBE mask sets. These are measured and recorded per 47CFR90.221. In addition, per-carrier emissions do not exceed previously stated and filed limitations currently authorized for use by equipment designated **ABZ89FC5817**. Refer to information provided in the associated full filing package or change packages for necessary bandwidth information for these modulations.

Measurement Procedure and Instrument Settings:*Emission Measurement Analyzer Settings:*

Horizontal:	20 kHz per Division	Resolution Bandwidth:	300 Hz
Vertical:	10 dB per Division	Video Bandwidth:	10 kHz
Sweep Time:	140 Seconds (<2000 Hz / Second)	Span:	200 kHz
Detector Mode:	RMS Power, 99%		

Test Procedure:

- 1) Adjust the spectrum analyzer per the values specified in the Emission Measurement Analyzer Settings (Measure ACP).
- 2) Modulate the transmitter with the appropriate signaling pattern, (pseudorandom data) and key the transmitter at the full power rating on offset Channel A. Use the analyzer controls to set this signal to maximize dynamic range of the instrument and include noise floor into the plotted data. In this case, 34.85 dB of external attenuation was utilized ahead of the spectrum analyzer. This was added into the measurements as an offset entered into the spectrum analyzer measurement criteria. The spectrum analyzer then, automatically, presented the corrected (actual) power level from the device and corrected the limit lines as appropriate. Next, allow the analyzer to sweep fully and store the sweep; allow analyzer to calculate channel power and mask ACP values.
- 3) Sweep each carrier, sum the data and utilize the band power marker function of the spectrum analyzer to measure the power of the carrier pair in a 22 kHz bandwidth utilizing an 18 kHz filter criteria for ACP as stated in 90.221. Also, specify mask limits per 90.221 for stepped ACP limitations.
- 4) Use the carrier pair power value from the previous step to generate the ACP reference.
- 5) Plot the resulting analyzer trace and the emission mask limit; add text and labeling as appropriate.

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E1-1 Occupied Bandwidth Plot – Dual carrier, DMR 2 Slot TDMA Modulation (4 Level Frequency Shift Keying)

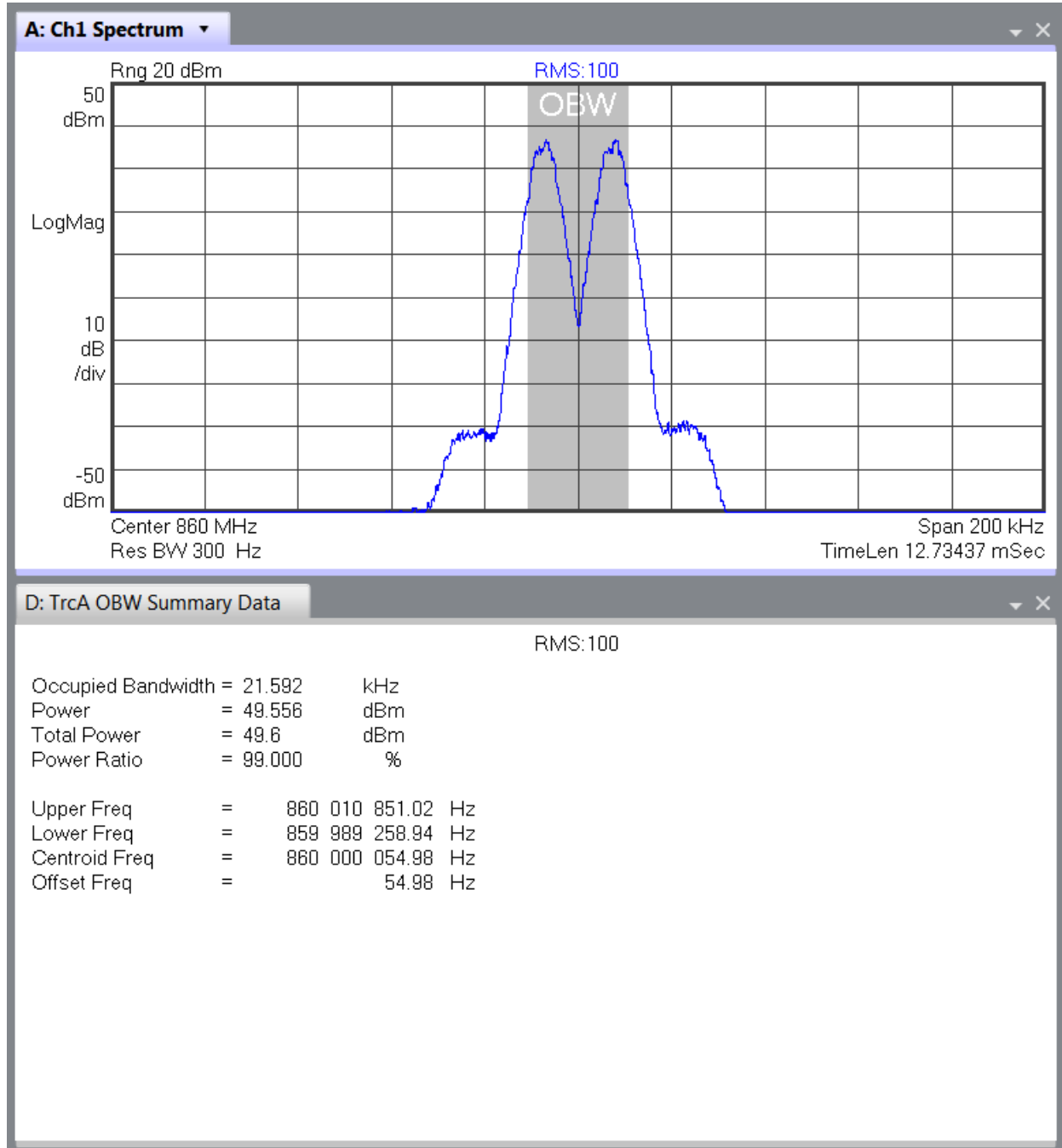
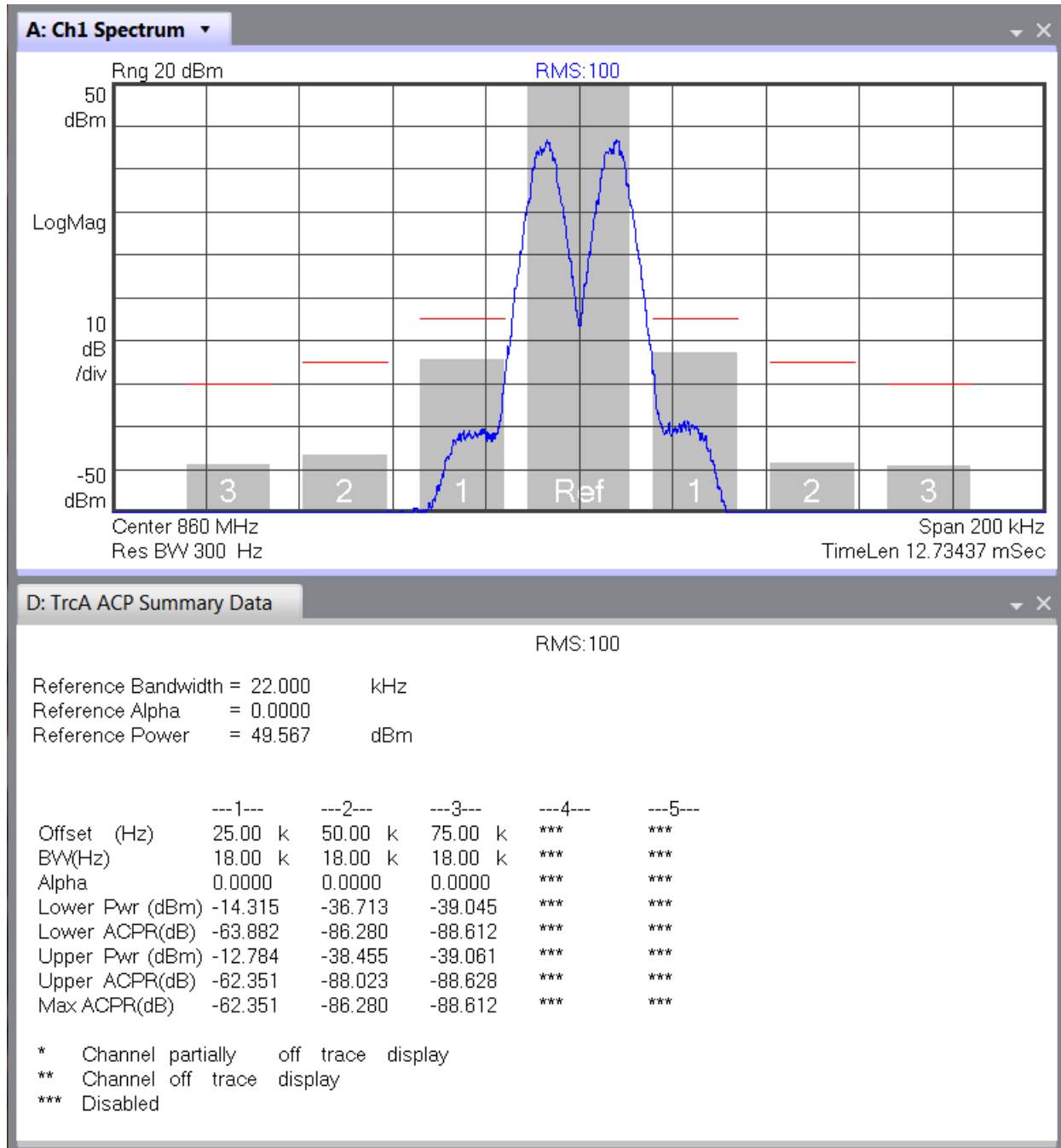


Exhibit E1-1
(Permissive Change)

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E1-2 Adjacent Channel Power Plot – Dual carrier, DMR 2 Slot TDMA Modulation (4 Level Frequency Shift Keying), 90.221 ACP Mask



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In the test setup (figure E1-3A), two ABZ89FC5817 MTR3000 devices are combined to produce the emission that meets the limits defined per § 90.221. The characteristics of the Hybrid Combining equipment used are shown in E1-3C.

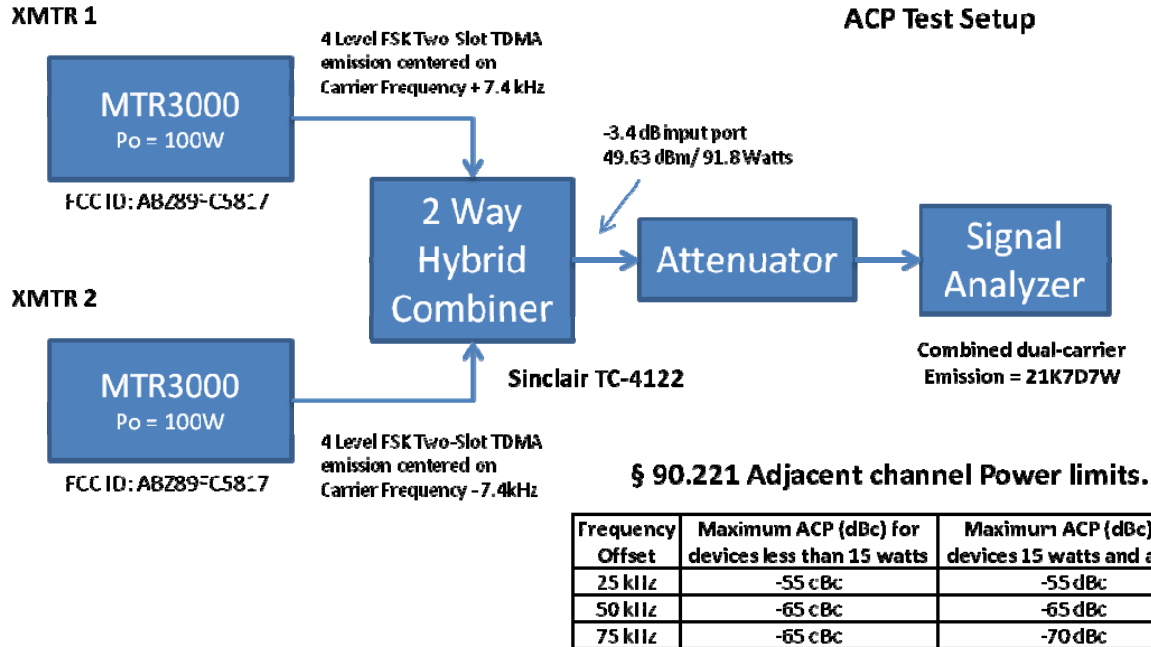


Figure E1-3A – ACP Test setup

In the case of multiple physical transmitters, additional site filtering equipment can be used to achieve further isolation. (See Figure E1-3B)

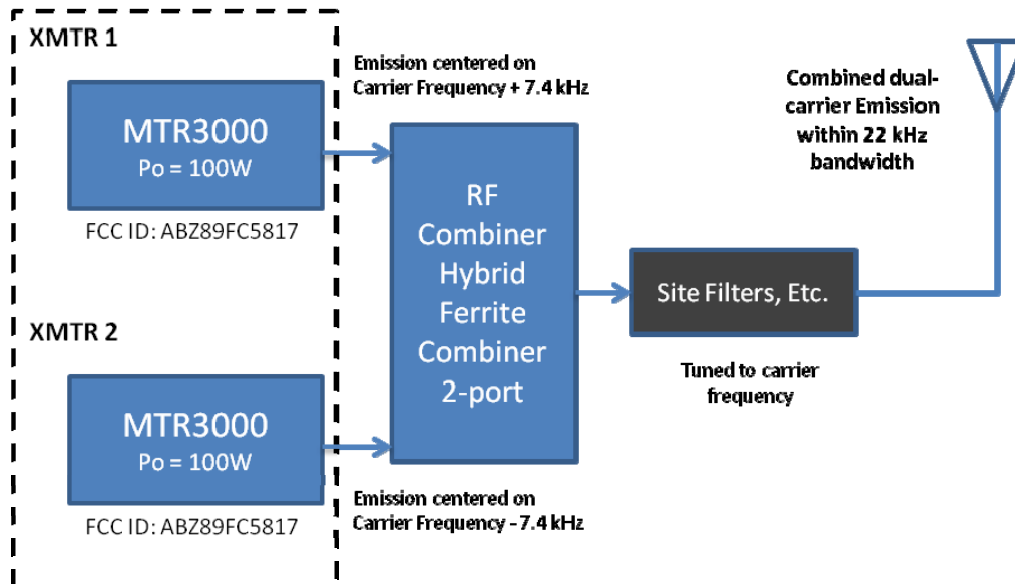


Figure E1-3B –Alternate site setup

Sinclair Technologies Inc.

TEST DATA
Customer Order No. DS13906627RP **Job No.** CC65846

Customer MOTOROLA ISPO

Model TC4112 **Serial No.** CC65846 1 - 1

☒ **New** ☐ **Repair** ☐ **Warranty**

	Frequency (MHz)	Insertion Loss (dB)	Return Loss (dB)	Isolation (dB)	Notes
TX1	854.0000	3.4	>35		
TX2	862.0000	3.3	>35		
				>50	TX-TX
				>28	ANT-TX

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LIMITED WARRANTY

Supplier's antenna products are warranted against defects in materials and workmanship under normal use and service for a period of five years from date of shipment for all mechanical and electrical performance rating with the exception of antenna products which are warranted for a period of two years from date of shipment. Antenna products which are warranted for a period of two years from date of shipment are not to be affected over time by exposure to harsh environmental conditions. Antenna products do not include clamps which have a two year warranty from date of shipment under normal use and service and proper installation by purchaser. Supplier's filter products, power supplies, converters, and systems are warranted against defects in materials and workmanship under normal use and service for a period of two years from date of shipment. This warranty does not extend to any products that have been subjected to misuse, neglect, accident, improper installation or application, nor shall it extend to products which have been repaired or altered outside supplier's factory. In the event of a defect covered by this limited warranty, supplier's sole obligation and purchaser's sole remedy shall be that supplier, upon receipt of the defective product, shall either repair or replace it, at its option, with a new or reworked product and return it to the purchaser. Supplier shall not be liable under any circumstances for consequential, incidental, punitive or exemplary damages arising out of or in any way connected with its lost profits, loss of use, lost data or for any damages or sums paid by purchaser to third parties, even if supplier has been advised of the possibility of such damages. The foregoing limitation of liability shall apply whether any claim is based upon breach of contract, warranty, negligence or other tort. Supplier's obligation to provide a replacement product shall be subject to the failure of any limited or exclusive remedy to achieve its essential purpose, or otherwise. Supplier is not liable for replacement of any product damaged by lightning, wind or any other act of God or other event beyond the supplier's reasonable control. No product may be accepted for replacement or repair without written prior authorization from supplier. All shipping charges on returned product and any product replacement are the responsibility of purchaser. Product replacement or repair is subject to an examination by supplier concluding the product was defective at the time of manufacture. Except for the limited warranty set out above, supplier does not make, and hereby expressly disclaims, any and all other express and implied warranties, including, but not limited to warranties of merchantability, fitness for a particular purpose and any and all warranties arising from trade practice, custom or any other legal theory.

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Date: 01-Nov-13

Figure 3 - Sinclair Hybrid Ferrite Combiner Test Data