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Test report

319516-1TRFWL

Date of issue: July 19, 2017

Applicant:

ACOM Ltd

Product:

External Radio Frequency Power Amplifier

Model:

ACOM 2100

FCC ID:

2AJXZ2100

Specifications:

- FCC 47 CFR Part 97

  Amateur Radio Service

Test location

Company name	Nemko Canada Inc.
Address	303 River Road
City	Ottawa
Province	Ontario
Postal code	K1V 1H2
Country	Canada
Telephone	+1 613 737 9680
Facsimile	+1 613 737 9691
Toll free	+1 800 563 6336
Website	www.nemko.com
Site number	FCC: CA2040; IC: 2040A-4 (3 m semi anechoic chamber)

Witnessed testing by	Kevin Rose, Wireless/EMC Specialist
Reviewed by	Andrey Adelberg, Senior Wireless/EMC Specialist
Date	July 19, 2017
Signature of reviewer	

Limits of responsibility

Note that the results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.
This test report has been completed in accordance with the requirements of ISO/IEC 17025. All results contain in this report are within Nemko Canada's ISO/IEC 17025 accreditation.

Copyright notification

Table of contents

Section 1. Report summary

1.1 Applicant and manufacturer

Company name	ACOM Ltd
Address	Nikola Mushannov 151
City	Sofia
Province/State	–
Postal/Zip code	1330
Country	Bulgaria

1.2 Test specifications

FCC 47 CFR Part 97	Amateur Radio Service

1.3 Statement of compliance

In the configuration tested, the EUT was found compliant.

Testing was completed against all relevant requirements of the test standard. Results obtained indicate that the product under test complies in full with the requirements tested. The test results relate only to the items tested.

See “Summary of test results” for full details.

1.4 Exclusions

As per TCB recommendation only spurious emissions and amplifier gain requirements were witnessed.

1.5 Test report revision history

Revision #	Details of changes made to test report
TRF	Original report issued

Section 2. Summary of test results

2.1 FCC Part 97 test results

Part	Test description	Verdict
§97.317 (a)(2)	Amplifier gain	Pass
§97.317 (a)(3)	Gain limitation within 26–28 MHz	Pass
§97.307 (d) and (e)	Spurious emissions	Pass

Notes: None

Section 3. Equipment under test (EUT) details

3.1 Sample information

Witnessed Test date:	July 11, 2017
Nemko sample ID number	NA

3.2 EUT information

Product name	External Radio FrequencyPower Amplifier
Model	ACOM 2100
Serial number	160102

3.3 Technical information

Frequency band	1.8–54 MHz
Frequency Min (MHz)	1.8
Frequency Max (MHz)	54
RF power Max (W)	1500
Field strength, Units @ distance	N/A
Type of modulation	SSB
Emission classification (F1D, G1D, D1D)	J3E
Antenna information	The EUT uses a unique antenna coupling/ non-detachable antenna to the intentional radiator.

3.4 Product description and theory of operation

The ACOM 2100 is a complete and self-contained linear amplifier that covers the amateur band 1.8–54 MHz and provides 1500 W-output power with 50 to 85 W exciter drive.

3.5 EUT exercise details

The EUT was manually tuned per band for 1.5 kW PEP

3.6 EUT setup diagram

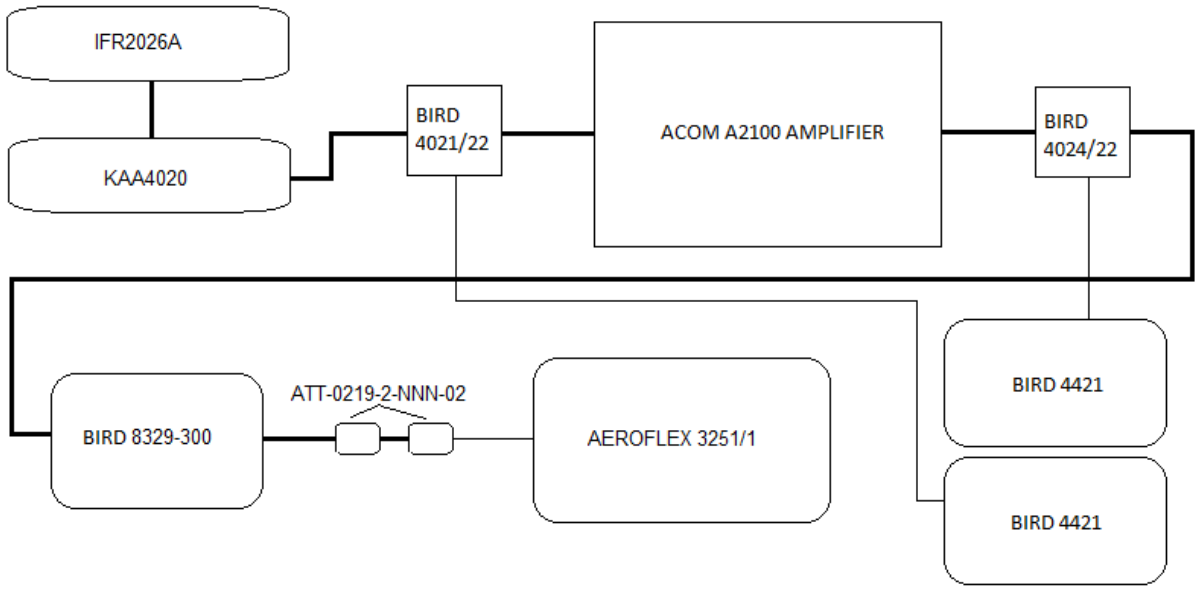

Figure 3.6-1: *Setup diagram*

Section 4. Engineering considerations

4.1 Modifications incorporated in the EUT

There were no modifications performed to the EUT during this assessment.

4.2 Technical judgment

As per TCB recommendation only spurious emissions and amplifier gain requirements were witnessed.

4.3 Deviations from laboratory tests procedures

No deviations were made from laboratory procedures.

Section 5. Test conditions

5.1 Atmospheric conditions

Temperature	15–30 °C
Relative humidity	20–75 %
Air pressure	860–1060 mbar

When it is impracticable to carry out tests under these conditions, a note to this effect stating the ambient temperature and relative humidity during the tests shall be recorded and stated.

5.2 Power supply range

The normal test voltage for equipment to be connected to the mains shall be the nominal mains voltage. For the purpose of the present document, the nominal voltage shall be the declared voltage, or any of the declared voltages ±5 %, for which the equipment was designed.

Section 6. Measurement uncertainty

6.1 Uncertainty of measurement

Measurement uncertainty budgets for the tests are detailed below. Measurement uncertainty calculations assume a coverage factor of K = 2 with 95% certainty.

Test name	Measurement uncertainty, dB
All antenna port measurements	0.55
Conducted spurious emissions	1.13
Radiated spurious emissions	3.78
AC power line conducted emissions	3.55

Section 7. Test equipment

7.1 Test equipment list

Table 7.1-1: *Equipment list*

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
Directional power sensor	Bird technologies	4021	0004	18.01.2017	18.01.2018
Directional power sensor	Bird technologies	4022	131201496	18.01.2017	18.01.2018
RF power meter	Bird technologies	4421	131201485	18.01.2017	18.01.2018
Directional power sensor	Bird technologies	4024	10494	18.01.2017	18.01.2018
Directional power sensor	Bird technologies	4022	3711	18.01.2017	18.01.2018
RF power meter	Bird technologies	4421	4328	18.01.2017	18.01.2018
Attenuator 2kW; 30dB; oil-cooled	Bird technologies	8329-300	842	18.01.2017	18.01.2018
Attenuator 2W; 20dB	Midwest Microwave	ATT-0219-2-NNN-02	-	-	-
Attenuator 2W; 20dB	Midwest Microwave	ATT-0219-2-NNN-02	-	-	-
Spectrum analyzer	Aeroflex	3251/1	I1203|004	21.03.2017	21.03.2018
Signal Generator	IFR	2026A	202601/915	23.02.2017	23.02.2019
Wideband RF PA	AR Modular	KAA4020	9458-1	25.01.2017	25.05.2018

Note: None

Section 8. Testing data

8.1 FCC §97.317 (a)(1),(2),(3) Standards for certification of external RF power amplifiers

8.1.1 Definitions and limits

(a) To receive a grant of certification, the amplifier must:

(1) Satisfy the spurious emission standards of §97.307 (d) or (e) of this part, as applicable, when the amplifier is operated at the lesser of 1.5 kW PEP or its full output power and when the amplifier is placed in the "standby" or "off" positions while connected to the transmitter.

(2) Not be capable of amplifying the input RF power (driving signal) by more than 15 dB gain. Gain is defined as the ratio of the input RF power to the output RF power of the amplifier where both power measurements are expressed in peak envelope power or mean power.

(3) Exhibit no amplification (0 dB gain) between 26 MHz and 28 MHz.

8.1.2 Test summary

Witnessed Test date	July 11, 2017	Temperature	NA
Test engineer	Kevin Rose	Air pressure	NA
Verdict	Pass	Relative humidity	NA

8.1.3 Observations, settings and special notes

Spectrum analyser settings:

Resolution bandwidth:	≥ OBW
Video bandwidth:	≥3 × RBW
Detector mode:	Peak
Trace mode:	Max Hold

8.1.4 Test data

Table 8.1-1: *Power Gain per 97.317-(a) (1) (2) (3)*

Frequency f_1, MHz	Input Power, W	Output Power, W	Amplifier Gain, dB	Limit, dB	Margin, dB
1.9	84.2	1500	12.51	15.00	2.49
3.75	84.2	1500	12.51	15.00	2.49
7.15	86	1500	12.41	15.00	2.59
10.125	90	1500	12.22	15.00	2.78
14.175	81	1500	12.68	15.00	2.32
18.118	75	1500	13.01	15.00	1.99
21.225	78	1500	12.84	15.00	2.16

Note: Amplifier was not capable of operation on any frequency or frequencies between 26 and 28MHz as measured at the points below per 97.317-(a) (3).
Data for: amplifier in Stand-by / amplifier in Operate

Table 8.1-2: *Power Gain per 97.317-(a) (1) (2) (3)*

Frequency f_1, MHz	Input Power, W	Output Power, W	Amplifier Gain, dB
26	50 / 4	48.3 / 0.031	-0.15 / -21
27	50 / 4	48.3 / 0.002	-0.15 / -33
28	50 / 4	48.3 / 0.008	-0.15 / -27

Table 8.1-3: *Power Gain per 97.317-(a) (1) (2) (3)*

Frequency f_1, MHz	Input Power, W	Output Power, W	Amplifier Gain, dB
24.930*	60.3	1500	13.96
28.500*	53.9	1500	14.44
52.000**	46.6	1500	14.56

Note: *Not usable as shipped; data applicable only after enabling of 24–28 MHz band.
** Not usable as shipped; data applicable only after enabling both 24–28 MHz and 50 MHz bands.

8.2 FCC §97.307 (d) and (e) Emission standards.

8.2.1 Definitions and limits

(d) For transmitters installed after January 1, 2003, the mean power of any spurious emission from a station transmitter or external RF power amplifier transmitting on a frequency below 30 MHz must be at least 43 dB below the mean power of the fundamental emission. For transmitters installed on or before January 1, 2003, the mean power of any spurious emission from a station transmitter or external RF power amplifier transmitting on a frequency below 30 MHz must not exceed 50 mW and must be at least 40 dB below the mean power of the fundamental emission. For a transmitter of mean power less than 5 W installed on or before January 1, 2003, the attenuation must be at least 30 dB. A transmitter built before April 15, 1977, or first marketed before January 1, 1978, is exempt from this requirement.

(e) The mean power of any spurious emission from a station transmitter or external RF power amplifier transmitting on a frequency between 30-225 MHz must be at least 60 dB below the mean power of the fundamental. For a transmitter having a mean power of 25 W or less, the mean power of any spurious emission supplied to the antenna transmission line must not exceed 25 µW and must be at least 40 dB below the mean power of the fundamental emission, but need not be reduced below the power of 10 µW. A transmitter built before April 15, 1977, or first marketed before January 1, 1978, is exempt from this requirement.

8.2.2 Test summary

Witnessed Test date	July 11, 2017	Temperature	NA
Test engineer	Kevin Rose	Air pressure	NA
Verdict	Pass	Relative humidity	NA

8.2.3 Observations, settings and special notes

None

8.2.4 Test data

Table 8.2-1: *Spurious emissions per 97.307 (d) and (e)*

Frequency f_1, MHz	2f1, dBc	3f1, dBc	(4–10)f1, dBc worst case
1.900	-50.52	-75.50	-80.17
3.750	-55.88	-68.41	-88.29
7.150	-58.19	-80.17	-80.61
10.125	-58.21	-68.90	-85.88
14.175	-54.78	-81.60	-78.61
18.118	-57.08	-79.71	-79.51
21.225	-56.64	-78.90	-90.52
24.930	-78.74	-82.46	-79.07
28.500	-75.39	-79.37	-72.68
52.000	-79.21	-74.94	-84.82

8.2.4 Test data, continued

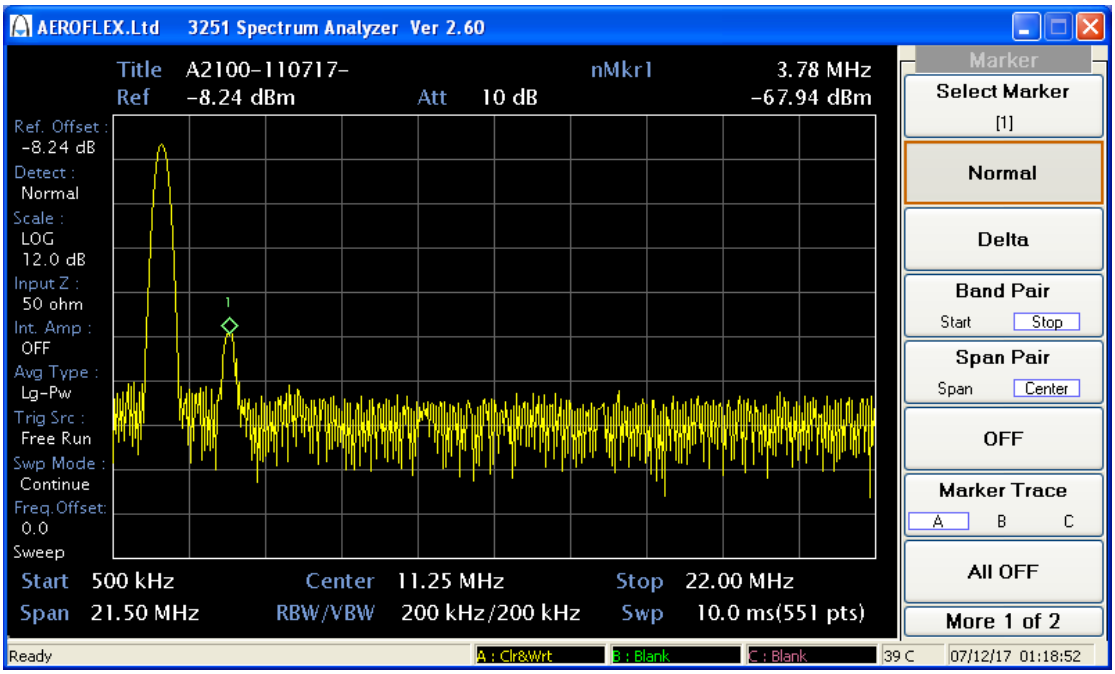

Figure 8.2-1: *1.9 MHz spurious*

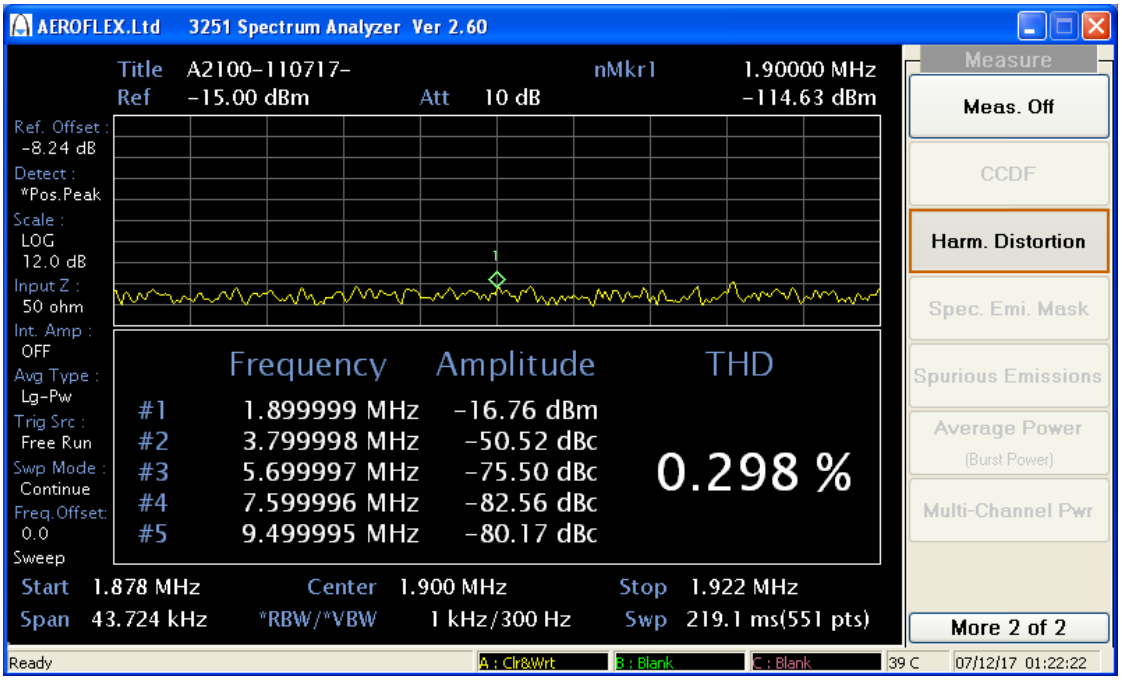

Figure 8.2-2: *1.9 MHz spurious*

8.2.4 Test data, continued

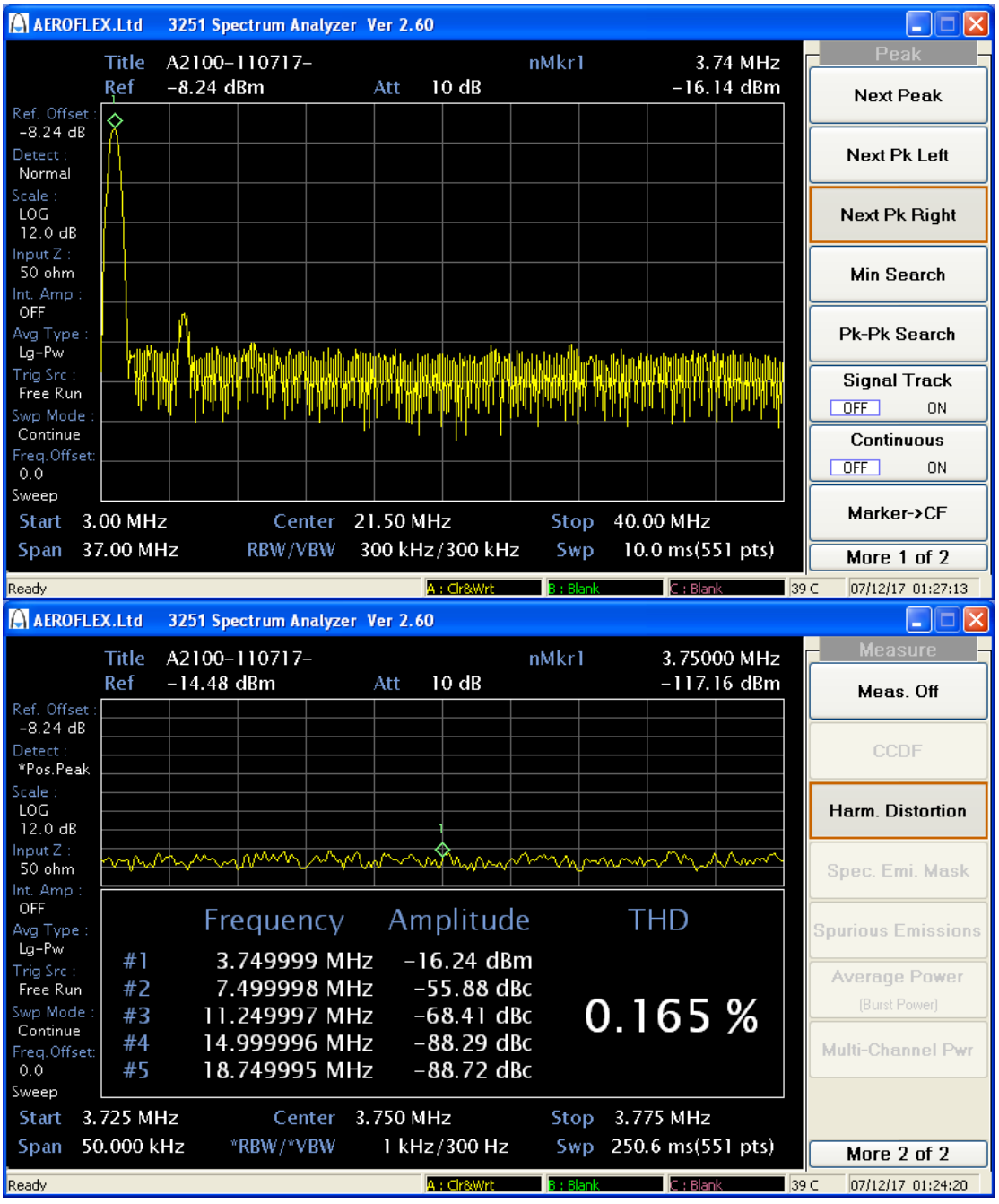

Figure 8.2-3: *3.75 MHz spurious*

8.2.4 Test data, continued

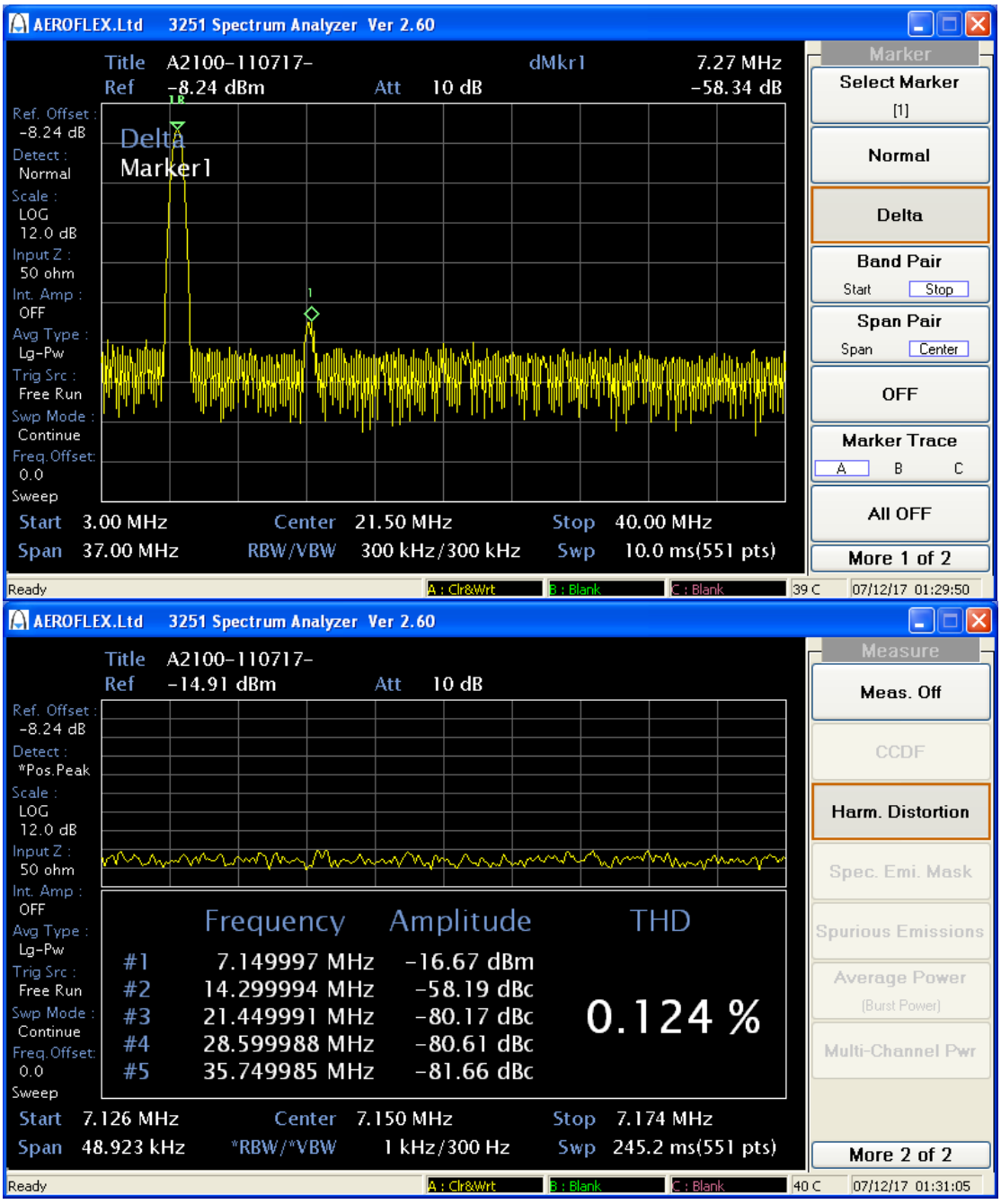

Figure 8.2-4: *7.15 MHz spurious*

8.2.4 Test data, continued

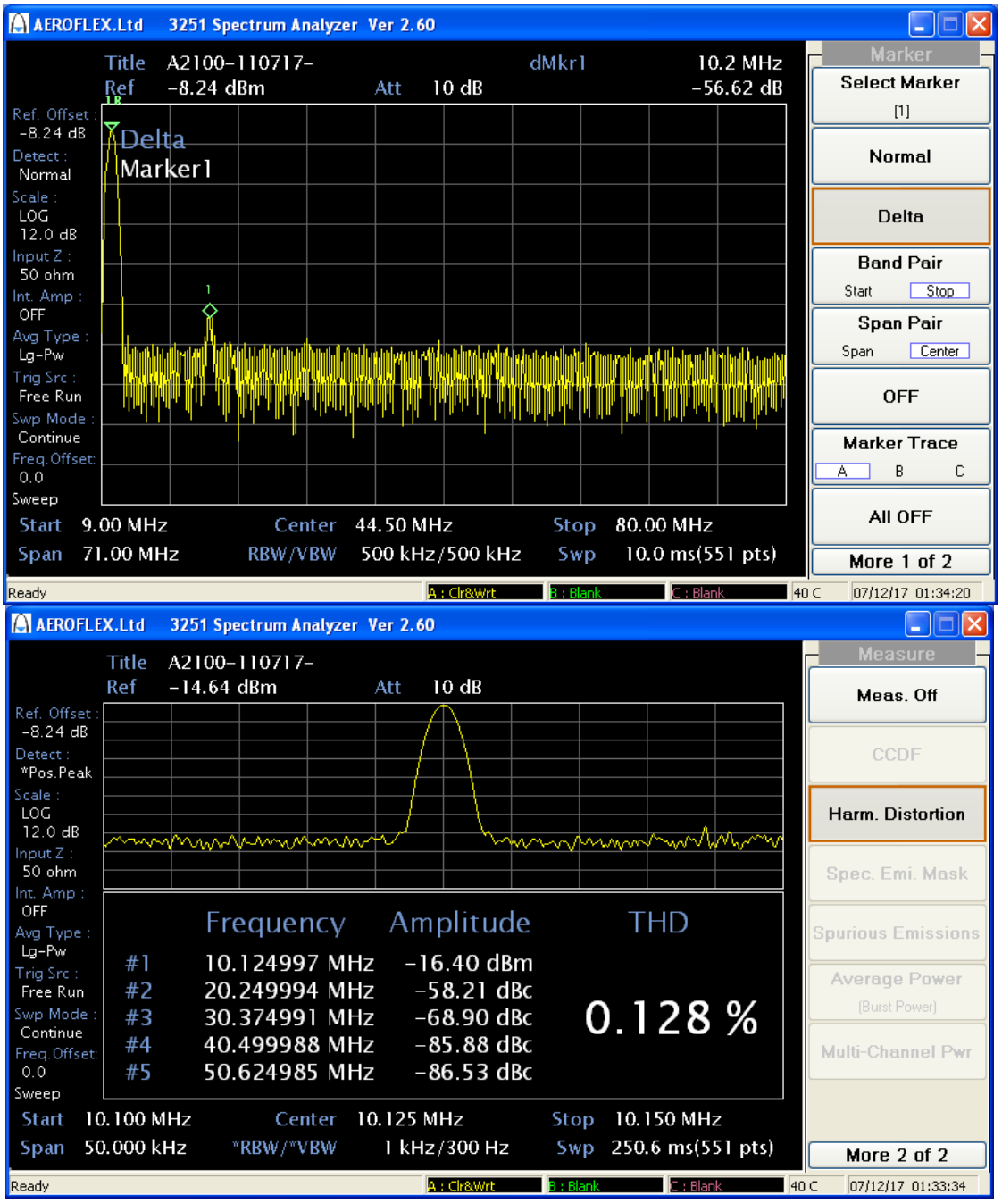

Figure 8.2-5: *10.125 MHz spurious*

8.2.4 Test data, continued

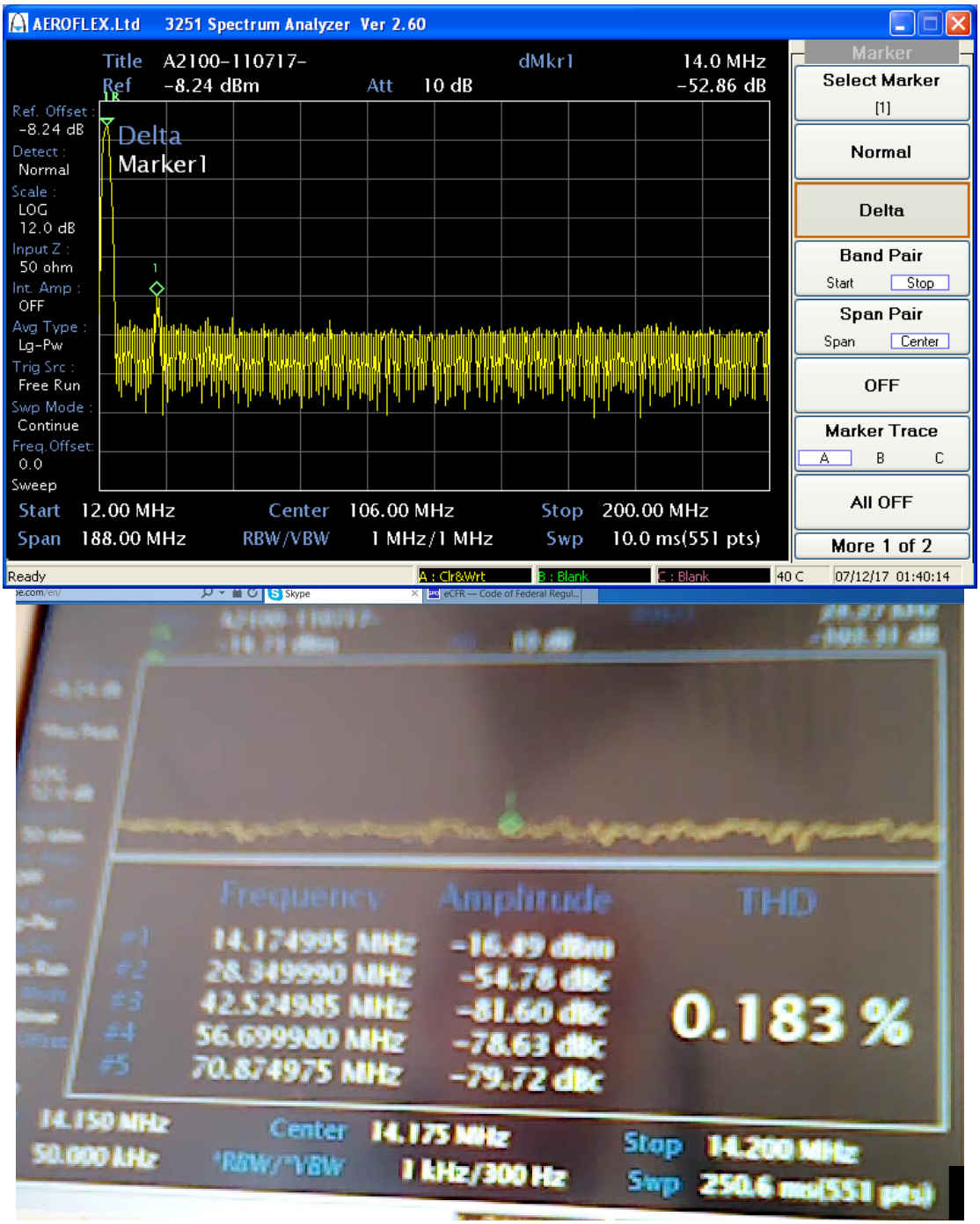

Figure 8.2-6: *14.175 MHz spurious*

8.2.4 Test data, continued

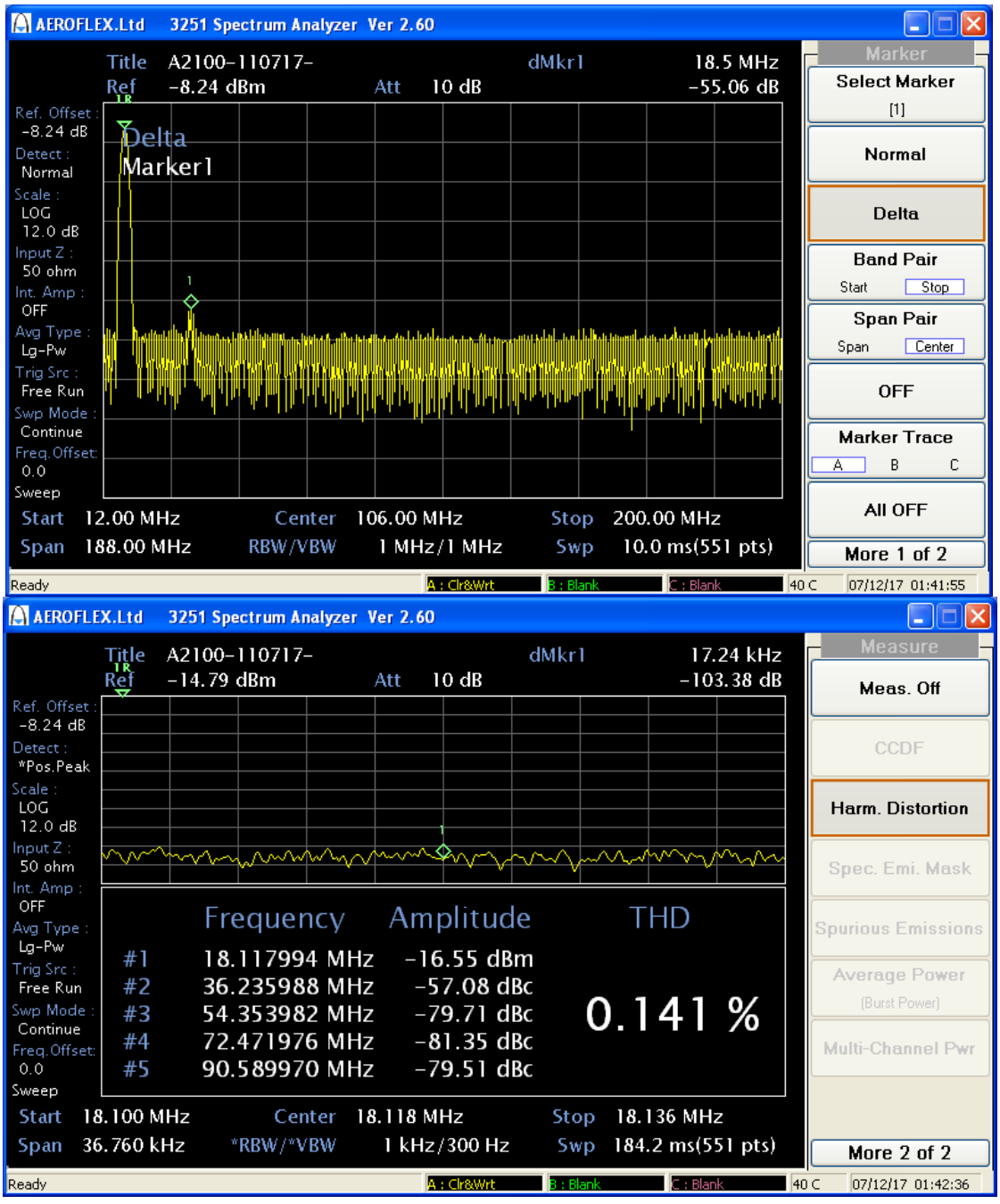

Figure 8.2-7: *18.118 MHz spurious*

8.2.4 Test data, continued

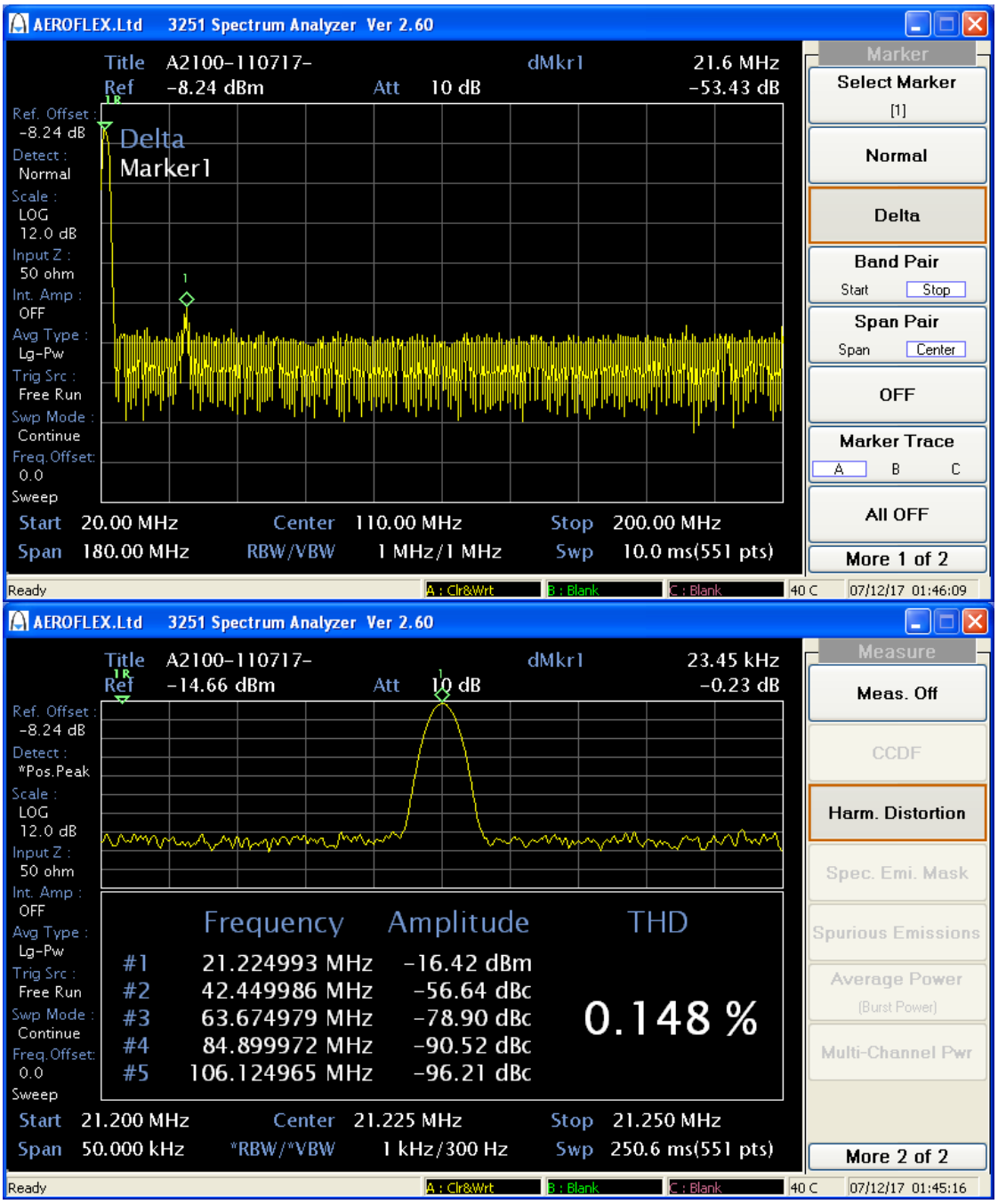

Figure 8.2-8: *21.225 MHz spurious*

8.2.4 Test data, continued

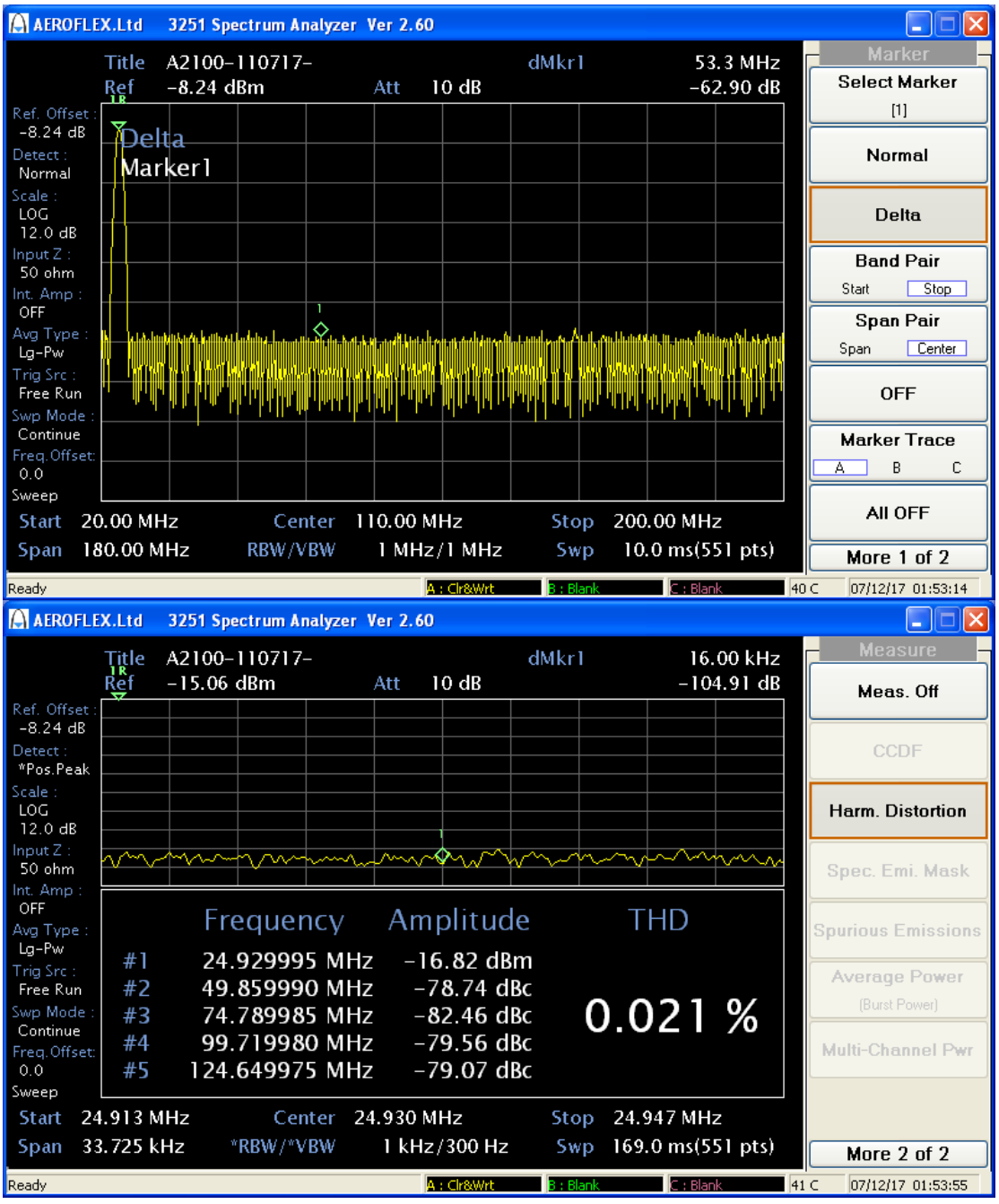

Figure 8.2-9: *24.93 MHz spurious*

8.2.4 Test data, continued

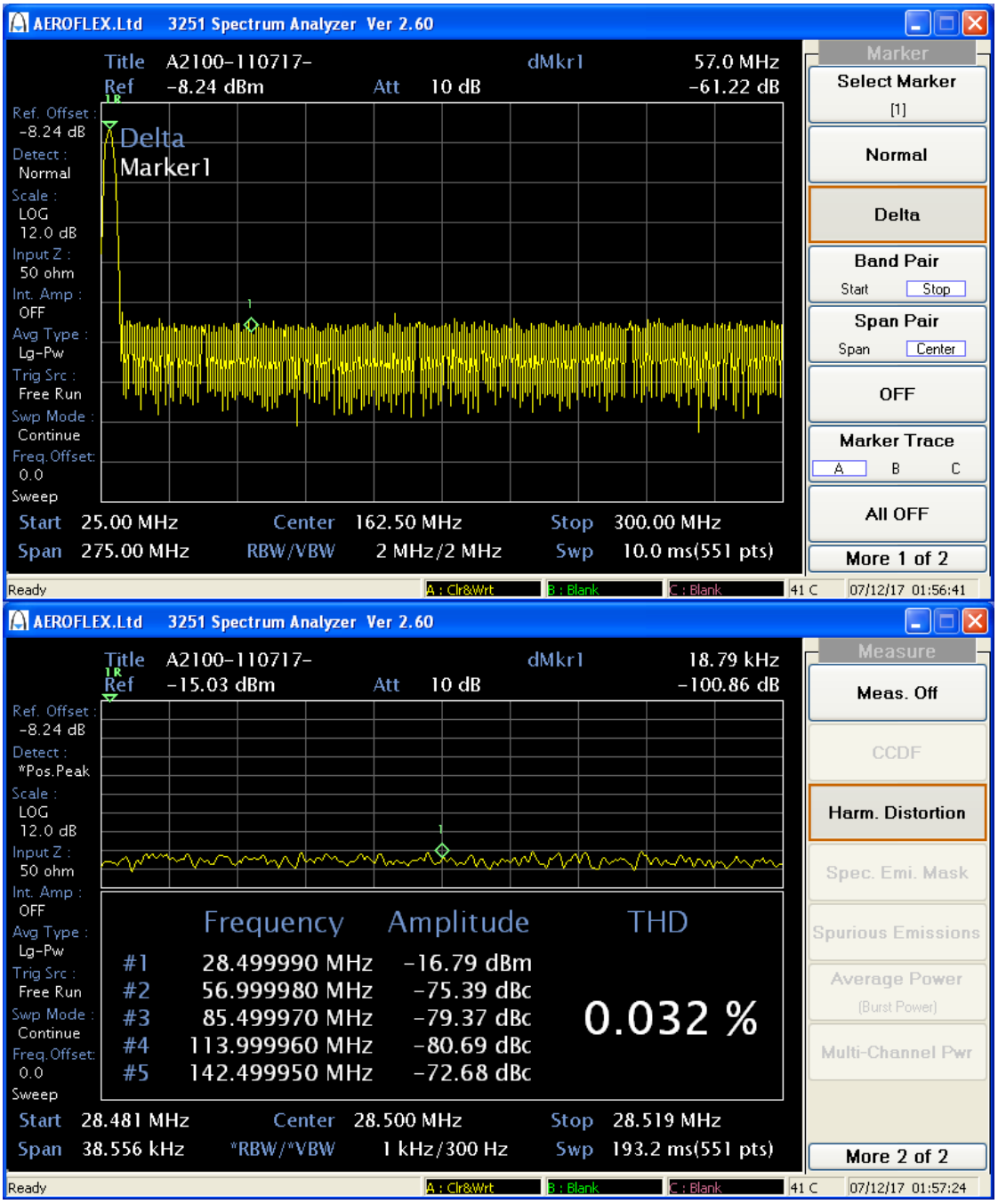

Figure 8.2-10: *28.5 MHz spurious*

8.2.4 Test data, continued

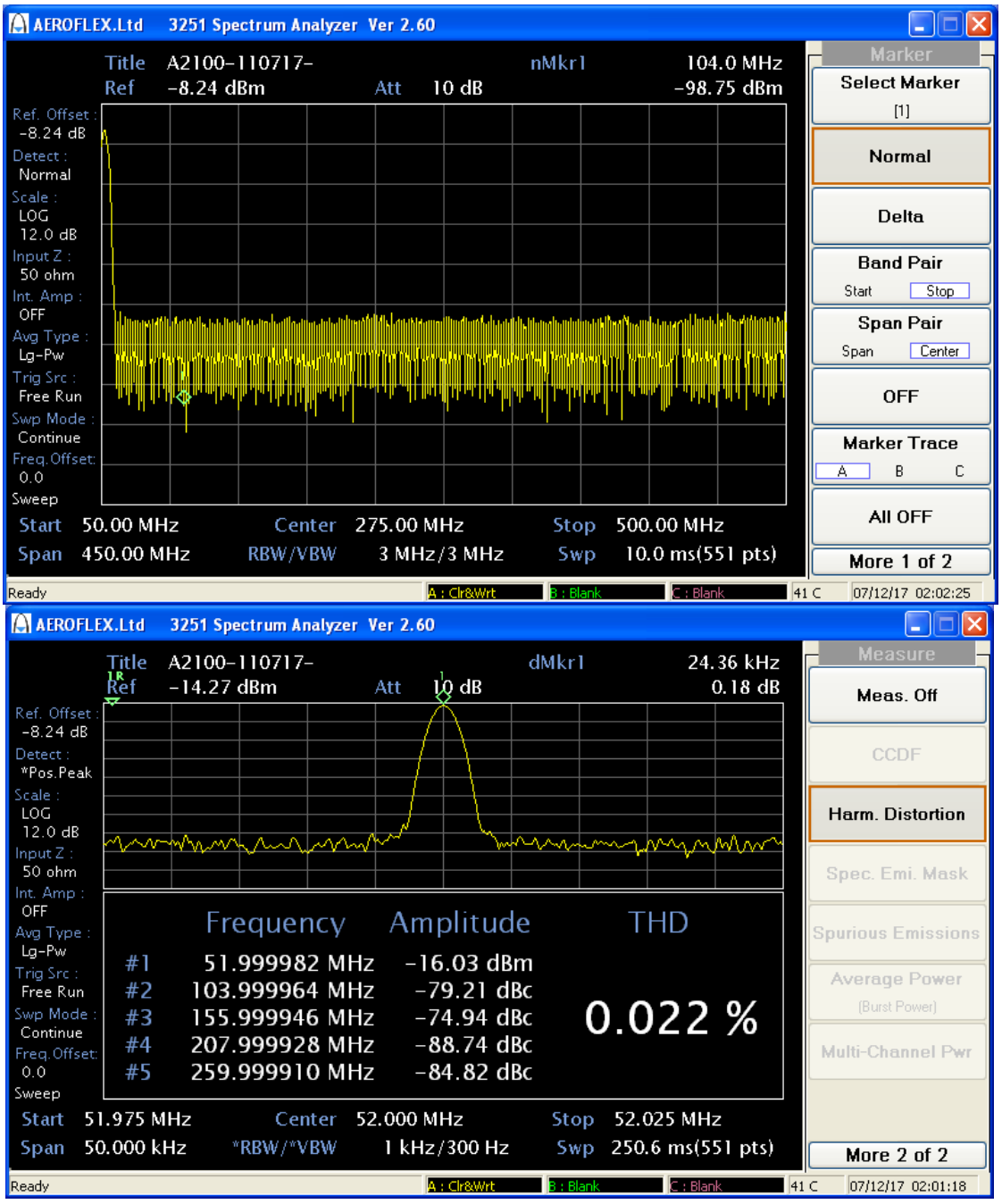

Figure 8.2-11: *52 MHz spurious*