

8.1.4 Engineering Change: Addition of Anti-Spurious Filter

SMA Inc.**ENGINEERING NOTICE**# 280-9A-001DATE: 99.1.2☒ RUSH

INDICATE TYPE OF NOTICE

Check One: ☐ RELEASE☒ CHANGE☐ DEVIATIONSCOPE: ☒ Products Listed ☐ Parts Where UsedKaval OFR-P300FTitle: Addition of Input Harmonic FilterOriginator: S. MarkkForm Ref #: N/A ☐ NCR ☐ CARControl Class: ☒ Class (A) ☐ Class (B) ☐ Class C (Draft)Engineer: S. MarkkSignature: [Signature]

Reason for Change:

Unit failed FCC Part 15 Antenna Conducted Spurious Emission
Bring design into compliance.**Part Number****Complete Description Of Change**☒ Drawing Chg. ☒ BOM Chg. ☐ Initial Release00M1C030.DWGTo add filter to schematicBOM FE9MAdd 8n2 0603 Inductor, 2pcs 2p7 0603 ceramic capProcess InstructionAdd components on underside of PCB near input to preselectorCut trace and expose groundplane for connectionAdvise to keep center conductor exposure to a minimum**CRITICAL ISSUE**☐ Product Safety☒ Cost Change☐ General Improvement☐ Legal Issues Involved☒ Manufacturing Change☐ Software Change☒ Product Regulatory☐ Marketing Features/Product Specs/Manuals☐ MFG Process or Test Equipment☒ Technical Evaluation Required:

T.E. #:

Done - Verbal Report

SIGNED:

[Signature]**Change Type:**☒ Rework all Products (Customer Recall)☒ Immediate Running Change☒ Rework Products in Plant, (Finished Goods)☐ Documents Only☒ Work in Progress☐ Special: _____**Deviations:**☒ Effective Dates:99.1.3☐ Part use up**Disposition of Inventory:**☐ No effect - use as is☐ Use until (Date) _____☒ Re-work☐ Scrap☐ Use until new parts available☐ Use on other product☐ Other

Parts in Inventory _____

Parts on Order _____

Engineering Cost Estimate:\$0.20 cost increase + labor**Implementation Notes:**Hand modify existing stock
Update layout when reordered.See report and drawings attached.

Authorization	Signature	Date	Authorization	Signature	Date
Eng. Mgmt. (A/B/C)	<u>[Signature]</u>	<u>99.1.4</u>	O.A. (A)		
Purchasing (A/B/C)			Manufacturing (A)		
Test Eng (A/B)			Material Cntrl (A)		
Marketing CI (A/B/C)			Sales CI (A)		

Documents Verified By:

DATE:

Total Pages (including cover): _____

☐ EN Cancelled:

SIGN:

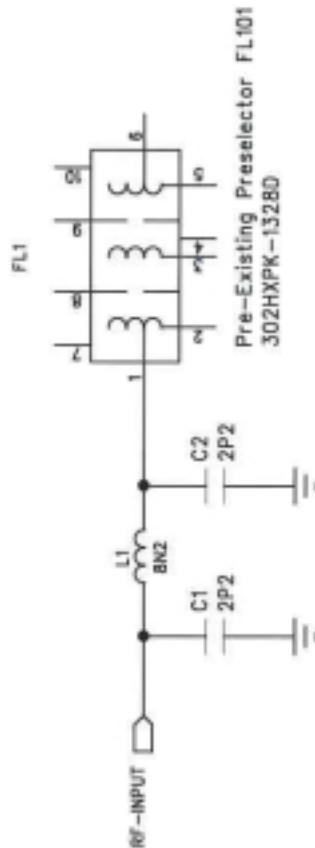
DATE:

☐ Explanation Attached

Page: _____

REVISION RECORD

LTR	ECO NO	BY	APPRVD	DATE
??	?????	???	???	??,??,??



NOTES: COMPONENTS TO BE HAND SOLDERED
ON UNDERSIDE OF PCB
RF INPUT TRACE TO BE CUT AND GROUNDS EXPOSED AS NEEDED
THIS AMENDS 00MIC030.DWG

RESTRICTION NOTICE

THIS DRAWING/DOCUMENT CONTAINS INFORMATION WHICH IS PROPRIETARY TO AND IS THE PROPERTY OF KAVAL TELECOM INC. AND MAY NOT BE USED, REPRODUCED OR DISCLOSED IN ANY MANNER WITHOUT EXPRESS WRITTEN PERMISSION FROM KAVAL TELECOM INC

DRAWN: STM
DATED: 99.1.3

CHECKED:
DATED:

RELEASED:
DATED:

KAVAL TELECOM

TITLE: OFR-P300F FRONT END
DESIGN MODIFICATION
ECN 280-9A-001

CODE: SC
SIZE: A
DRAWING NO: E280-9A-001
REV: 00

SHEET: ? OF ?

Memo

To: David Quinn

From: Stephen T. Makk
President
Stephen Makk and Associates, Inc.
1015 Conyers Executive Park, Suite 200,
Conyers, GA, 30012, USA
Tel: (770) 388-0107, Fax: (770) 388-0702, Email: stephen@makk.com

CC: Scott Proffitt, US Tech, Mazen Jaafar, Kaval

Date: 09/12/98

Re: Skytel OFR RX Antenna Conducted Emissions

Dear David,

US Tech informed me that the Skytel OFR failed FCC Part 15.111 antenna conducted emissions tests. Any product must radiate less than 2 nW (-57 dBm) at any frequency up to 5 GHz. Some spurs between 2 GHz and 3 GHz violate this requirement or are uncomfortably close.

I have engineered a solution to this problem. The attached graphs show before and after plots of the emissions. My lab results were very similar to what US Tech reported, so I am confident this fix will work.

Two changes must be made. The first is a workmanship issue. Any excess exposed center conductor in the input RF connector pigtail acts as a pickup antenna at microwave frequencies. L.O. harmonics are easily picked up. You should use flexible semirigid cable for this application and trim the exposed center conductor at the PCB end of the cable to the absolute minimum length. You cannot allow production to get sloppy with this. The unit I got had over 1/2 inch of exposed wire.

Cable trimming made about 8 dB of difference at 2.3 GHz.

This still left too close a margin. I added a simple PI lowpass filter on the underside of the PCB. This involves a trace cut and removal of some solder mask. 0603 caps and inductors were used. You must implement an Engineering Change Order that adds this filter to all Skytel OFRs. We did not design the L.O. so our bills of materials will not reflect this change, as they call up the module as a single part. SMA can write up the ECO if you wish.

Final performance resulted in spurs so low they were hard to measure. We obtained at least a 20 dB improvement in my estimation. Also, the filter improved the input return loss and front end sensitivity. I postulate that the PI filter acts as a matching network between the connector and helical preselector.

I am sending David Vernon to US Tech to swap out the front end in the failed unit today. Testing should proceed with minimal delay.

Best Regards,

Stephen T. Makk

4 pages attached.

Best Regards,

Stephen T. Makk

08:11:45 DEC 09, 1998

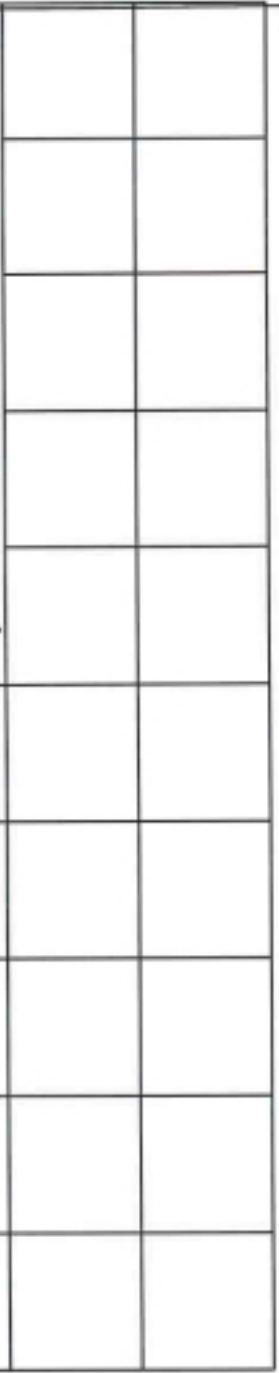
Skytel OFR Rx Antenna Conducted Emission
(Unmod'ed)

REF -30.0 dBm AT 10 dB

MKR 2.300 GHz
-53.59 dBm

HOLD

PEAK
LOG
10
dB/

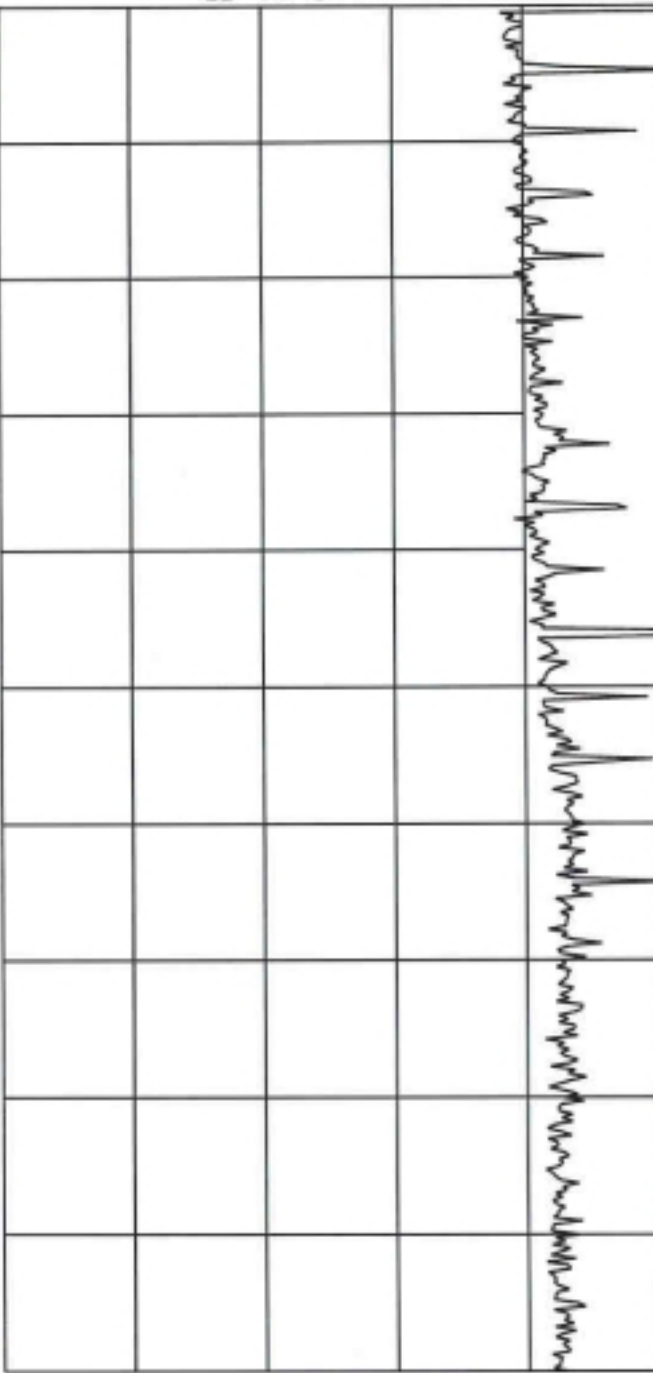


DISPLAY LINE

-57.0 dBm

DL
-57.0
dBm

WA SB
SC FC
CORR



DSP LINE
ON OFF

← 2nd 15.111

Change
Title

Limit
Lines

ANALOG+
ON OFF

More
1 of 2

START 0 Hz

FS BW 3.0 MHz

VBW 1 MHz

STOP 5.000 GHz

SWP 100 msec

08:54:38 DEC 09, 1998

HP

Skylot OFR Rx Antenna
Conducted Emissions
- Pigtail trimmed back.

REF -30.0 dBm AT 10 dB

MKR 2.300 GHz
-61.34 dBm

HOLD

PEAK
LOG
10
dB/

DSP LINE

ON OFF

DISPLAY LINE

-57.0 dBm

← 2mW 15.111

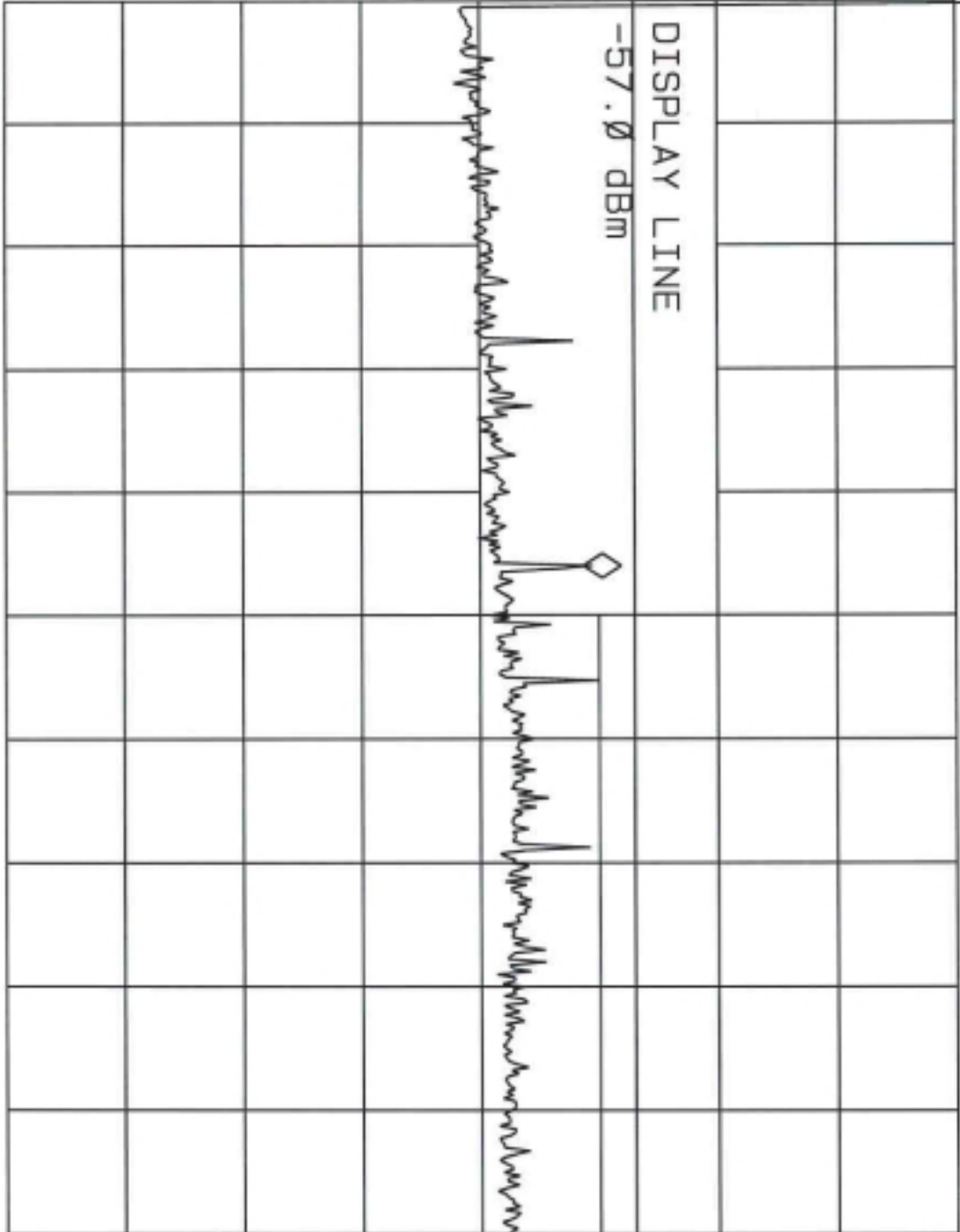
DL
-57.0
dBm

Change
Title

Limit
Lines

WA SB
SC FC
CORR

ANALOG+
ON OFF



More
1 of 2

START 0 HZ

RES BW 3.0 MHz

VBW 1 MHz

STOP 5.000 GHz

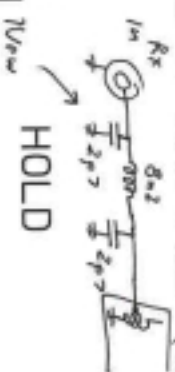
SMP 100 msec

10: 17: 37 DEC 09, 1998

Skylar OFR Rx conducted emissions
Pigtail Trimmed and P1 filter added (F-1)

REF -30.0 dBm AT 10 dB

MKR 2.500 GHz
-68.87 dBm



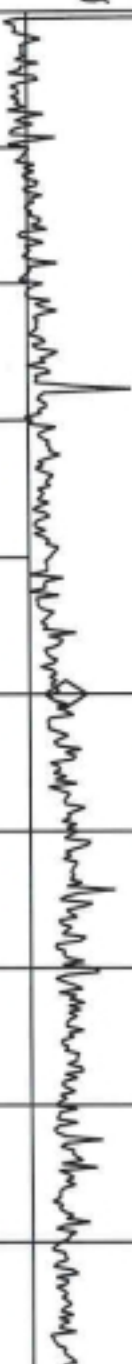
PEAK
LOG
10
dB/

DSP LINE
ON OFF

DISPLAY LINE

-57.0 dBm

DL
-57.0
dBm



Change
Title

Limit
Lines

WA SB
SC FC
CORR

ANALOG+
ON OFF

More
1 of 2

START 0 HZ

FS BW 3.0 MHz

VBW 1 MHz

STOP 5.000 GHz

SWP 100 msec

10: 19:05 DEC 09, 1998

Same as Previous
(Noise Filtered)
>20dB Improvement

REF -30.0 dBm AT 10 dB

MKR 2.500 GHz
-76.63 dBm

SMPL

VID AVG
ON OFF

LOG

10
dB/

DETECTOR
SMP PK

VIDEO AVG

100

NORMLIZE
ON OFF

DL
-57.0

dBm

AVG

100

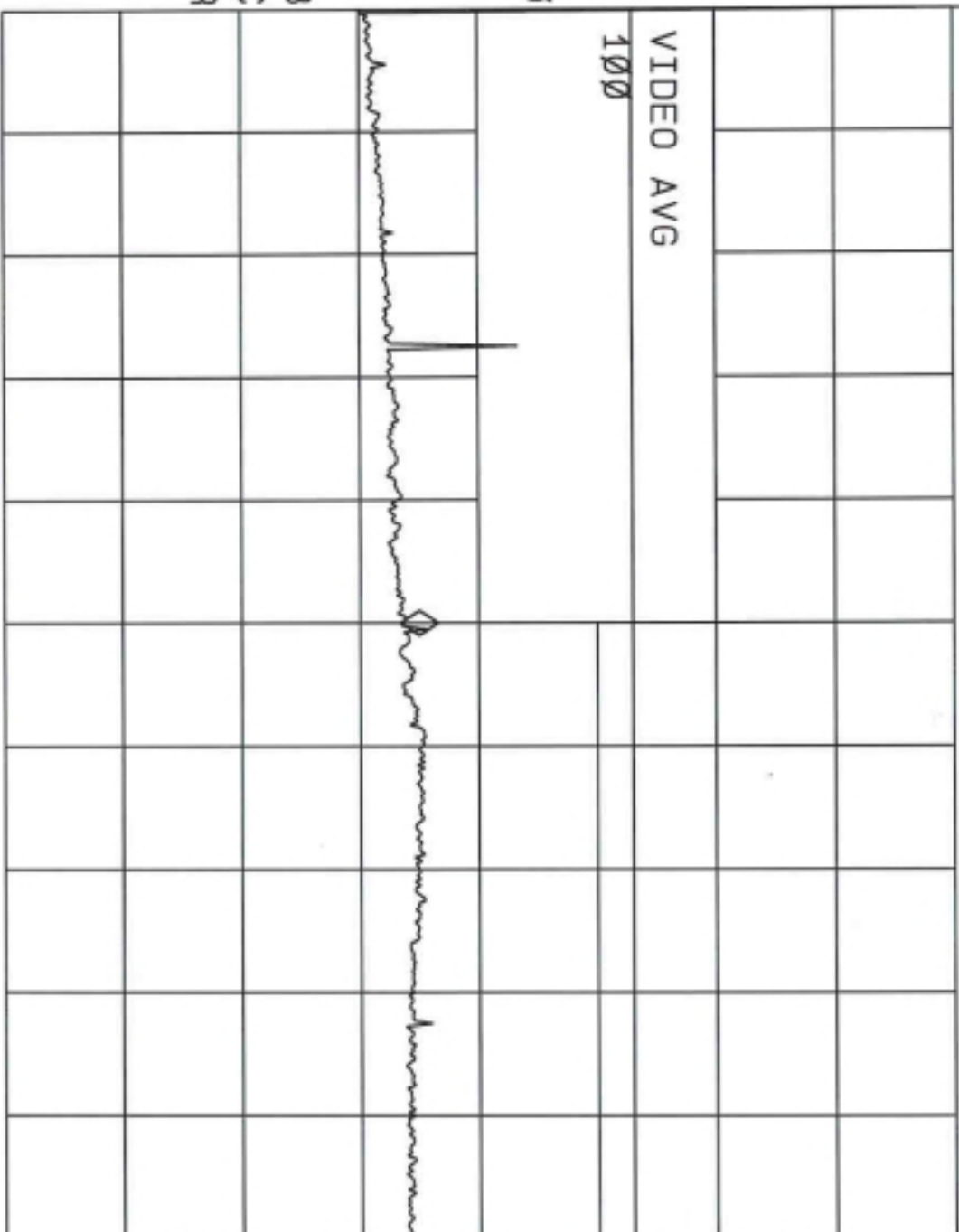
NORMLIZE
POSITION

WA SB

SC FC

CORR

A <--> B



START 0 Hz

RES BW 3.0 MHz

VBW 1 MHz

STOP 5.000 GHz

SMP 100 msec

More
2 of 3