

GROUND TEST REQUIREMENT

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AIRCRAFT

Airbus A330/A340

PROJECT

00800

TITLE

Electromagnetic susceptibility test to demonstrate safe use of ALNAv2 system including OMTS-WW signals on A330 and A340 A/C.

SHORT DESCRIPTION

The following electromagnetic compatibility test shall be performed in order to demonstrate that the use of ALNAv2 system including OMTS-WW signals does not cause disturbances on any electronic equipment installed A330 and A340 A/C.

CA*

see FUN2

VALIDITY*

see FUN2

* Write down only when the GTR is not released in FUN !

	PREPARED	CHECKED	APPROVED
NAME	Eric Duraz	Thiemo Stadtler	Matthias Grossmann
DEPARTMENT	TBCEI33	TBCEI33	TBCEI33
DATE	04.05.2010	06.05.2010	10.05.2010
SIGNATURE	electronically signed	electronically signed	electronically signed

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LIST OF REVISION

ISSUE	DATE	EFFECTED AT		REASON FOR REVISION
		PAGE	PARA	
A	15.05.2009	All	All	First Issue
B	03.09.2009	10f	4	Updated Details of Test Procedure
C	02.10.2009	11 15	4.2.1.1 4.2.2	Removed MSN 1044 special test (not GTI relevant) Corrected "typical range" test power (not GTI relevant)
D	23.02.2010	7	2	Removed WLAN test (not GTI relevant)
E	04.05.2010	1 17-19	 4.2.5	Add A340 A/C (not GTI relevant) Removed WLAN test (not GTI relevant) Updated the wording for A340 A/C (not GTI relevant) Add A340 layout (not GTI relevant)

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LIST OF MODIFICATION PROPOSAL

MODIFICATION- PROPOSAL NO	ISSUE	TITLE
D53891	A	INFORMATION SYSTEMS - CABIN INTEGRATED NETWORK SYSTEM - INSTALL SYSTEM PROVISIONS FOR ALNA V2 WITH INTERNET AND GSM/GPRS/SMS

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1 INTRODUCTION

1.1 Purpose of Test

The following electromagnetic interference test shall be performed in order to demonstrate that the use of ALNAv2 system including OMTS-WW and WLAN does not cause disturbances on any electronic equipment installed on the aircraft. The test is necessary due to the intentional electromagnetic emissions of mobile telephony systems and cabin WLAN systems.

Spurious emissions from Passenger carried Electronic Devices (PEDs) cannot be covered by this test. The test shall be performed, as wireless services in the aircraft are different from usual aircraft certification process due to two major points:

Any wireless service is linked with electromagnetic field emission. In general, these services are separated from the aircraft electromagnetic spectrum. Consequently, a direct influence on the aircraft navigation and communication systems is not expected, but a susceptibility investigation is considered necessary as the electromagnetic field levels in the close vicinity of the signal sources might raise to levels, which non essential equipment is not qualified against.

Additionally, these services usually exceed the emission limits for aircraft electronic equipment for functional purposes. For Airbus aircraft those limits are specified in ABD 200 or older standards.

The test concentrates on the demonstration of the electromagnetic compatibility of CDMA, GSM 900/1800, UMTS and WLAN standards within the aircraft environment, but not on specific portable devices having this standard implemented.

The test procedure applied for testing described herein is strongly in accordance with the EUROCAE document "GUIDANCE FOR THE USE OF PORTABLE ELECTRONIC DEVICES (PEDS) ON BOARD AIRCRAFT" /4/.

Safety margin and signal amplification due to multiple equipment effects are considered and described in details in /5/.

1.2 Airworthiness Requirements

JAR 25.1353(a): Electrical Equipment and Installation
JAR 25.1431(c): Electronic Equipment

1.3 Global System Description

See reference /3/.

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1.4 Abbreviations

ABD	Airbus Design Directives
AI-D	Airbus Industries Germany
AI-F	Airbus Industries France
AP	Auto Pilot
APU	Auxiliary Power Unit
ATC	Air Traffic Control
CDMA	Code Division Multiple Access
CDLS	Cockpit Door Locking System
CIDS	Cabin Information Network System
CSUT	Cabin System Under Test
DME	Distance Measuring Equipment
ECAM	Electronic Centralized Monitoring System
ELT	Emergency Locator Transmitter
FAL	Final Assembly Line
FADEC	Full Authority Digital Engine Control
FAP	Flight Attendant Panel
GPS	Global Positioning System
GSM	Global System for Mobile Communications
IFE	In-flight Entertainment
ILS	Instrument Landing System
LAN	Local Area Network
MMR	Multi Mode Receiver
OBCE	On-Board Control Equipment
PED	Passenger Carried Electronic Devices
PFR	Post Flight Report
UMTS	Universal Mobile Telecommunications System
VHF	Very High Frequency
VOR	VHF-Omnidirectional Range
WLAN	Wireless LAN

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2 SYSTEM TO BE INTEGRATED IN A/C

The test described in this procedure has become necessary because of the installation of the following system:

- ☒ OMTS - WW ("GSM on Board WW" / ALNA v2)
☐ WLAN

3 AIRCRAFT CONDITIONS BEFORE TEST

FAL / A/C operator / ground test engineer shall prepare the a/c and surroundings in the state described in this section.

3.1 Power Supply

Any Power supply appropriated to run the cabin system under test (CSUT) can be used.

A special ground power supply 230V/50Hz (>6kVA, isolating transformer) has to be provided to connect test equipment

3.2 Aircraft Environment

If the leaky lines are already installed, an access to these leaky lines shall be established (beginning and end of each leaky line).

The a/c shall be placed outside the hangar on ground in order to receive GPS and Nav/Com Signals. Cabin doors have to be closed in order to not disturb possible mobile phone ground networks.

Aircraft test condition has to be set-up and denoted by the ground test engineer.

Gangway access to the aircraft shall be established.

During test the essential electronic equipment shall be operational, engines are to be switched off. Hydraulic systems shall be activated for approximately 2 hours (e.g. via hydraulic ground support car). APU shall be running for approximately 2 hours.

ELT shall be installed and observed by VHF3 121,50 MHz in case of unintended activation.

System status according 3.5 shall be established before testing. Cabin Systems, existing in-flight entertainment system and other non-essential equipment (ambient lights etc.) shall be operational. Cooling capabilities for a/c systems shall be provided.

Support will be needed for providing power to the system under test and for operation the airplane systems. A competent and authorized observer shall assist for setting up the aircraft and cabin systems (ground test engineer, AI-D/F). Aircraft test condition has to be denoted.

The ground test engineer shall support the test by following activities:

- Power on and off of the aircraft systems (see section 4.2.3 additionally);
- Activate and deactivate hydraulic power and APU
- Adjust Nav/Com systems
- Operate Flight Computers, Autopilot activation

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- Operate Cabin Systems and IFE
- Observe the systems concerning interferences and abnormalities (see test procedures section 4.2.1, 4.2.3)
- Stand-by in case of critical phases and situations (e.g. unmeant provoking critical systems)
- Perform engine-runs necessary to obtain a PFR before and after the test
- Operate, clean and store flight crew oxygen masks

The test duration is given in section 4.2.5.

3.3 Riggings

N/A

3.4 System to be Operational before Test

Essential electronic equipment shall be operational, as if the aircraft were in flight.

System to be installed, tested and available:

- All flight computers (besides FADEC).
- Hydraulic power.
- Emergency Locator Transmitter (ELT).
- Autopilot system
- All Nav./Com. systems shall be operative before and while testing, including:
 - o VHF Com #1, #2, #3
 - o ADF
 - o DME (depending on FTI)
 - o MMR (ILS : LOC+GS)
 - o VOR
 - o GPS
 - o HF (if installed)
 - o SATCOM (if installed)
- Hand microphones, boomsets, flight crew oxygen masks
- All Cabin Systems shall be operative before and while testing, including:
 - o CIDS
 - o Interphone system
 - o Aircondition
 - o Existing in-flight entertainment system and other non-essential equipment (ambient lights etc.) shall be operational.
 - o Cabin door monitoring shall be possible via ECAM
 - o Cockpit door locking system shall be operative
 - o Smoke detection, lavatory
 - o Cabin lights
 - o Galleys
 - o IFE
 - o Electrical seat actuation, PC power, if installed

Running the engines is requested to generate a Post Flight Report, but not for test.

APU is requested for test positions in ebay and cockpit.

ALNAv2 system does not have to be installed.

Aircraft test condition has to be set-up and denoted by the ground test engineer.

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3.5 Other test to be performed before susceptibility ground test

The test program, described herein, shall be performed after all considered cabin and nav./com. systems are installed and their functional tests have been successfully finished.

FAL operational test shall be preferably performed. The aircraft should have performed its first flight (not necessary if systems' functionality can be ensured).

A PFR shall be generated. For this an engine run has to be performed immediately before the test with both engines running at least for 5 minutes.

Before this Engine Run: Print out Avionics Status Page: Mark all systems with class 3 failures
After this Engine Run: Print out Last leg class 3 faults report of all systems previously marked.

This can only be performed after shutdown of APU. Therefore, if test at locations cockpit or ebay is immediately started, the last leg class 3 report can be printed after these test positions.

3.6 Other test to be performed after susceptibility ground test

A PFR shall be generated. For this an engine run has to be performed immediately before the test with both engines running at least for 5 minutes.

Before this Engine Run: Print out Avionics Status Page: Mark all systems with class 3 failures
After this Engine Run: Print out Last leg class 3 faults report of all systems previously marked.

3.7 Safety Instructions

For the operation of test equipment on-board of the a/c the appropriated safety instructions shall be obeyed. During the test electromagnetic fields are to be generated inside the cabin at an artificially increased power level.

For safety reasons the amplification shall be limited to legally acknowledged power density levels, to ensure safety for testing staff. The power density limits can be obtained for example in Germany by [1]. Some limits essential for the testing are listed in the following Table 3-1.

In order to keep the limits in a distance of roughly 0.5 m from the emitter an absolute limitation of the Effective Isotropic Radiated Power (EIRP) is to be kept.

Frequency range	Limit for General Public Exposition / (W/m ²)	EIRP /dBm for 0.5 m distance	Limit for Occupational Exposition / (W/m ²)	EIRP /dBm for 0.5 m distance	Remarks
400 MHz – 2000 MHz	f / 200 MHz	38...45	f / 40 MHz	45...52	Duration ≥ 6 minutes
2000 MHz – 300 GHz	10	45	50	52	Duration ≥ 6 minutes

Table 3-1: Limits for Human exposition to electromagnetic fields, according to [1]

For the test of the microphone in the flight crew oxygen mask: Do not put oxygen mask fully against your face if oxygen is turned off. Refer to AMM Task 23-51-00-710-004 for details of oxygen mask testing.

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4 TEST DESCRIPTION INCLUDING TEST EQUIPMENT

The test procedure applied for testing described herein is strongly in accordance with the EUROCAE document "GUIDANCE FOR THE USE OF PORTABLE ELECTRONIC DEVICES (PEDS) ON BOARD AIRCRAFT" [4]. Details for determination of safety margin and amplification according to multiple equipment effects are given in [5].

4.1 Test Equipment – Technical Data

The following test equipment shall be provided by the EMC test team:

- Signal Generator,
- Power Amplifier,
- Power Splitter,
- Power Meter,
- Test Receiver,
- Monocone or Bicone Test Antenna,
- Monopole Test Probe,
- Leaky Line Antenna Adapter,
- Leaky Line Termination Resistor capable of withstanding the power given in Table 4-4
- E-Field Probes for field-monitoring in terms of safety.
- Ramp tester for operation of VOR/ILS (LOC+GS),
- Ramp tester for DME if local station not tuneable,

All test equipment brought onto the airplane must be documented in terms of manufacturer, part number, serial number, and date of calibration.

The test equipment has to be arranged in accordance to the different frequency and modulation capabilities of each device. The test set up is shown in figure 1.

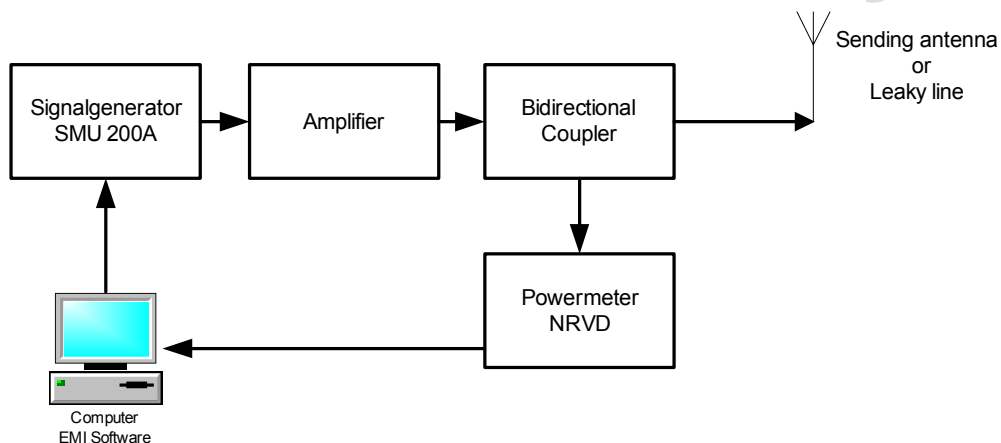


Fig. 4-1: Set up example of test equipment arrangement
(can be differ in detail depending on available test-equipment).

All characteristics of the test equipment have to be determined, e.g. frequency responses, efficiency of antennas and attenuation of cables and connectors.

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4.2 Test requirements/-description

4.2.1 Test procedure

The cabin wireless signal will be artificially increased to a predefined power level (see 4.2.2 additional). During test, positions of the emitting antenna will be announced by means of cabin interphone. After each announcement the correct operation of any electronic system shall be monitored by the competent observer in the cockpit (ground test engineer) and in the cabin.

The test is split up into several parts:

4.2.1.1 Ebay test

Entire ebay radiation:

For each antenna position in ebay: Apply artificially amplified signals (see 4.2.2) into the sending antenna. Monitor electronic equipment indicators in the cockpit. Note equipment disturbed and errors occurred.

Typical range test:

If disturbances occurred while stressing the aircraft with mobile phone system signals the location of the interference has to be rechecked by typical range radiation in the found frequency range. To take into account attenuation of coupling effects from cabin or cockpit the normal ebay test power level (see 4.2.2) shall be used but the antenna shall be moved in a distance of 1m to the tested equipment. If a distance of 1m cannot be reached the transmit power shall be reduced according to table 4-6. Note equipment disturbed and errors occurred.

The test is passed if no equipment is disturbed and no errors occurred during typical range test.

Threshold determination (only for new findings):

For all equipment that failed the typical range test additionally perform following test:

At the same distance used for typical range test reduce the transmitted power until the equipment is not disturbed any more. Note the power.

At the same power used for typical range test move the antenna away from the equipment until it is not disturbed any more. Note the distance.

4.2.1.2 Cockpit test

Entire cockpit radiation:

For each antenna position in the cockpit: Apply artificially amplified signals (see 4.2.2) into the sending antenna inside the cockpit. Monitor electronic equipment indicators in the cockpit. Note equipment disturbed and errors occurred.

Near field test:

If disturbances occurred while stressing the aircraft with mobile phone system signals the location of the interference has to be rechecked by close range radiation in the found frequency range. The antenna shall be moved in a distance of 0.1 m in front of the affected system/component. See 4.2.2 for near-field test levels. Note equipment disturbed and errors occurred.

Typical range test:

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Additionally for all disturbed equipment in the cockpit it shall be determined if the equipment is interfered by radiation from the cabin at near field levels. Either the minimum distance between antenna and equipment for interference free operation of the equipment shall be measured, or the antenna shall be placed at the cockpit door.

The test is passed if no equipment is disturbed and no errors occurred during near filed test / typical range test. For all audio equipment the test is passed if no faults occur, no upset is found, any induced noise is well-below speech level and speech intelligibility is not affected.

4.2.1.3 Cabin test

Entire cabin radiation

Apply artificially amplified mobile telephony signals into the sending antenna on at the different locations given in 4.2.5. Monitor electronic equipment indicators in the cockpit. Note equipment disturbed and errors occurred.

Near field test:

If disturbances occurred while stressing the aircraft with mobile phone system signals the location of the interference has to be checked by close range radiation applying the near-field test levels given in section 4.2.2 by using the sending antenna in a distance of 0.1 m in front of the affected system/component. Note equipment disturbed and errors occurred. If the equipment is located behind some lining, which is not opened during flight, the test antenna shall be held 0.1m away from that lining.

The test is passed if no equipment is disturbed and no errors occurred during near filed test. For all audio equipment the test is passed if no faults occur, no upset is found, any induced noise is well-below speech level and speech intelligibility is not affected.

4.2.1.4 Special near field tests for electrically operated seats

If electrically operated seats have been disturbed during entire cabin radiation, the following tests shall be performed additionally to the near field test described above:

Test for erroneous movement

During near field radiation the seat actuation shall be used to move the seat to different positions. The correct function shall be monitored and denoted.

This test is passed if no unintended or erroneous movement of the seat occurs. Erroneous stop of the movement is to be recorded for review by specialists from safety and seat departments.

Test for proper functioning of the brakes

During near field radiation it shall be checked whether it is possible to manually shift the seat position.

This test is passed if it is not possible to manually shift the seat position.

Test for jamming prevention

During near field radiation the seat actuation shall be used to move the seat against some mechanical resistance.

The test is passed if the seat stops at this resistance and seat actuation is switched off. Additionally the behaviour of the seat shall be observed recorded for review by a seat-specialist.

4.2.1.5 Leaky Line antenna radiation

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If the leaky lines are installed, apply test signal according to section 4.2.2 with leaky line test power levels into the leaky line connection. Monitor electronic indicators in the cockpit. Note equipment disturbed and error occurred, if detected.

4.2.2 Test frequencies and levels

The derivation of the amplification factor is given in [5]. For test on aircraft the maximum number of passengers using a mobile phone is given in Table 4-1. The multiple equipment factor for calculating the test power amplification is based on the maximum number of mobile phones as the RACH access mechanism and communication to ground base station with multiple frequencies does not exclude simultaneous transmitting.

The test signal amplification (A_S) is derived in [4] and defined as $A_S = \max[\text{MEF}, 10\text{dB}]$.

A/C type	Assumed maximum number of passengers	A_S OMTS	A_S WLAN 802.11 b/g	A_S WLAN 802.11 a
A318 / A319 / A320 / A321	220	12 dB	10 dB	10 dB
A330/A340	300	12 dB	10 dB	10 dB
A380	800	13 dB	10 dB	10 dB

Table 4-1: Signal Amplification (A_S) per a/c type

Therefore the test signal amplification for this test is defined to be $A_S = 12$ dB.

Table 4-2 gives the frequencies for GSM 400 (450), GSM 850, GSM 900, DCS (GSM1800), PCS (GSM 1900). For all tests all specified frequency ranges in Table 4-2 should be applied on subsequently.

Block	Frequencies								
CDMA_1	410	415	420	425	430				
	450	455	460	465	470	475			
	480	485	490	495					
GSM_1	776	784	792	800	808	816	824	832	840
	848	856	864	872	880	888	896	904	912
	920	928	936	944	952	960			
PDC	1430	1444	1458	1472	1486	1500	1514		
GSM_2	1710	1727	1744	1761	1778	1795	1812	1829	1846
	1863	1880	1897	1914	1931	1948	1965	1982	1999
UMTS	2020								
	2110	2130	2160	2180					
UMTS 2600	2500	2525	2550	2575					
	2600	2625	2650	2675	2700				

Table 4-2: Test-Frequencies OMTS Europe and OMTS WW (CDMA, GSM, PDC, UMTS)

Block	Frequencies								
WLAN	2400	2424	2448	2472	2496				

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Block	Frequencies							
802.11 b/g								
WLAN 802.11 a (1)	5150	5200	5250	5300	5350	5400		
WLAN 802.11 a (2)	5450	5500	5550					
WLAN 802.11 a (3)	5600	5650	5700	5750	5800	5850	5900	

Table 4-3: Test-Frequencies BT, WLAN

Amplification has to be determined before test by judgement of maximum occurring cumulative effects, see Table 4-4 for OBCE-WW and Table 4-5 for WLAN.

Block	Power in W for transmitting mobile phones	Power in dBm	Power in dBm for entire cabin radiation (+A _S GSM)	Power in dBm for close range radiation, ebay & cockpit positions (+6 dB)	Power in dBm for leaky line test (OBCE level +6 dB)
CDMA_1	2	33	45	39	46
GSM_1	2	33	45	39	46
PDC	2	33	45	39	46
GSM_2	1	30	42	36	46
UMTS	1	30	42	36	46
UMTS 2600	0.5	27	39	33	46

Table 4-4: Power-Levels for test-antenna testing (OMTS-WW / OBCE-WW)

Block	Power in W for transmitting mobile phones	Power in dBm	Power in dBm for entire cabin radiation (+A _S WLAN)	Power in dBm for close range radiation (+6 dB)	Power in dBm for leaky line test (WLU level +6 dB)
WLAN 802.11 b/g	0.5	27	37	33	37
WLAN 802.11 a (1)	0.5	27	37	33	37
WLAN 802.11 a (2)	1	30	40	36	37
WLAN 802.11 a (3)	1	30	40	36	37

Table 4-5: Power-Levels for test-antenna testing (WLAN)

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Antenna distance to equipment under test	Power reduction in dB	Power in dBm for typical range radiation (ebay)	Comment
1.00 m	0	39	Preferred test
0.50 m	6	33	
0.25 m	12	27	

Table 4-6: Power reduction for ebay typical range test

The EMI test signal for tests shall provide a pulse modulation with a PRF in the range of 200 Hz and a small duty cycle in the range of 625 µs (12.5%).

The dwell time for each frequency/modulation step shall be enough to observe interferences or abnormalities in the a/c systems.

4.2.3 Aircraft systems to be checked during the test

Aircraft system to be observed in detail, see table 4:

Aircraft System	Condition during test on ground	Observation method	Remark
Engines	Off	n/a	Engine Run before and after test for PFR
APU	ON/Off	Cockpit Displays	On for test position "ebay" and "cockpit"
FADECs	Off	n/a	
All Computers	On	Cockpit Displays	Denote Computers
Auto Pilot	On/Off	Cockpit Displays	On for test position "ebay" and "cockpit"
Hydraulic System	On	Cockpit Displays	On for test position "ebay" and "cockpit". Shall be monitored, to protect pumps from overheating
Cockpit Displays (EWD, ND, SD, PFD), announcements and lights	On	visual	Note warnings / failures and abnormalities
MCDU pilot's side	Display Avionics Status Page	visual	Note warnings and abnormalities
MCDU F/O side	Display Rad / Nav Page	visual	Note abnormalities
Navigation Systems (e.g. VOR, ILS,DME,..)	On	visual via cockpit display, acoustic	Ramp Tester, adjust and note lowest operational Level or tune to local station if no ramp tester exists. Note interferences related to wireless service
VHF 1	On	acoustic	Adjust Lower Frequency
VHF 2	On	acoustic	Adjust ELT frequency 121,5 MHz
VHF 3	On	acoustic	Adjust Upper Frequency
GPS 1 +2	On	visual via MCDU	Indicate Position of Aircraft
HF	On (if installed)	acoustic	Indicate abnormalities

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Aircraft System	Condition during test on ground	Observation method	Remark
SATCOM	On	visual	Indicate abnormalities
ADF 1	On	visual + acoustic	Indicate abnormalities
ADF 2	On	visual + acoustic	Indicate abnormalities
Cockpit Hand Mikes and Boomsets	In use	acoustic	Indicate interferences. Only for Position Cockpit and M1.
In Flight Entertainment	On if available	visual + acoustic	Note Display and audio abnormalities
CIDS	On	visual + acoustic	Note Warnings on System Panels, and abnormalities
ELT	On	acoustic via VHF2	Note Warnings, take care for unwanted emergency call
FAP	On	visual	Observe Display and indicated systems
Smoke Detection	On	visual	Note failures and warnings
Interphone	In use	acoustic	Note Interferences
CDLS	Locked	visual via cockpit display + acoustic	Indicate abnormalities
Cabin Equipment, Lights and Galley	On	visual	Indicate abnormalities
Air Conditioning	On	visual	Indicate abnormalities
Cabin Doors	Closed	visual	SD "Doors status page" for measurement positions in cockpit, indicate abnormalities
CVR (Cockpit Voice Recorder)	Active	acoustic, connect headset to cockpit CVR panel	Indicate abnormalities
Flight crew oxygen masks	Microphone in use	acoustic	Indicate interferences

Table 4-7: System status for testing, systems to be observed.

The systems have to be monitored by a competent observer in terms of visual and acoustical observation on the system itself, the STATUS PAGE(s), ECAM and FAP.

4.2.4 Equipment excluded from test

A/C equipment listed in table 4-8 can be excluded from the test to reduce test time, because:

- Equipment susceptibility behavior is well known and has been proven to be similar in several previously tested configurations
- And equipment susceptibility behavior can be generalized from previous tests because the equipment is a device of low complex electronics.

All equipment that is excluded from the test and its anticipated behavior shall be listed in the test report.

Excluded equipment	P/N	Susceptibility behaviour in previous tests
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Cockpit Hand Microphone	M 83 P 1801 A (LEM)	Test failed: Microphone is susceptible from cockpit Microphone is susceptible from cabin
Flight Crew Oxygen Mask (F.F. Quick Donning Mask)	MF20-534 (integrated Microphone: P/N S4045-1)	Test failed: Integrated Microphone is susceptible from cockpit Integrated Microphone is not susceptible from cabin (only low Background noise, speech is intelligible)
CVR Microphone (Ambient Microphone)	93A055-66	Test failed: Microphone is susceptible from cockpit Microphone is susceptible form cabin
Boomset	64300-210 (Telex Airman 750)	Test failed: Boomset is susceptible from cockpit Boomset is not susceptible from cabin
Boomset	046-55-xx (Sennheiser HME46)	Test passed
CIDS Handsets (analog)	89-01-07xxx	Test failed
CIDS Handsets (analog)	89-01-27xxx	Test passed
CIDS Handsets (analog)	N40-1Axxxxx-xxx	Test failed

Table 4-8: Equipment to be excluded from testing

for information only

4.2.5 Antenna Positions to Investigate

In total at least 17 specific antenna positions shall be investigated:

- 4 antenna position inside the ebay
- 1 antenna position inside the cockpit
- at least 14 antenna positions at the most in the cabin, figure 4-2 shows the test positions on an exemplary A330/A340 layouts.

To perform the test on each position vertical and horizontal polarization shall be used. Antenna height shall be 1.20 m in Cabin and 0.80m in ebay and cockpit. The procedure needs to be performed for each frequency range.



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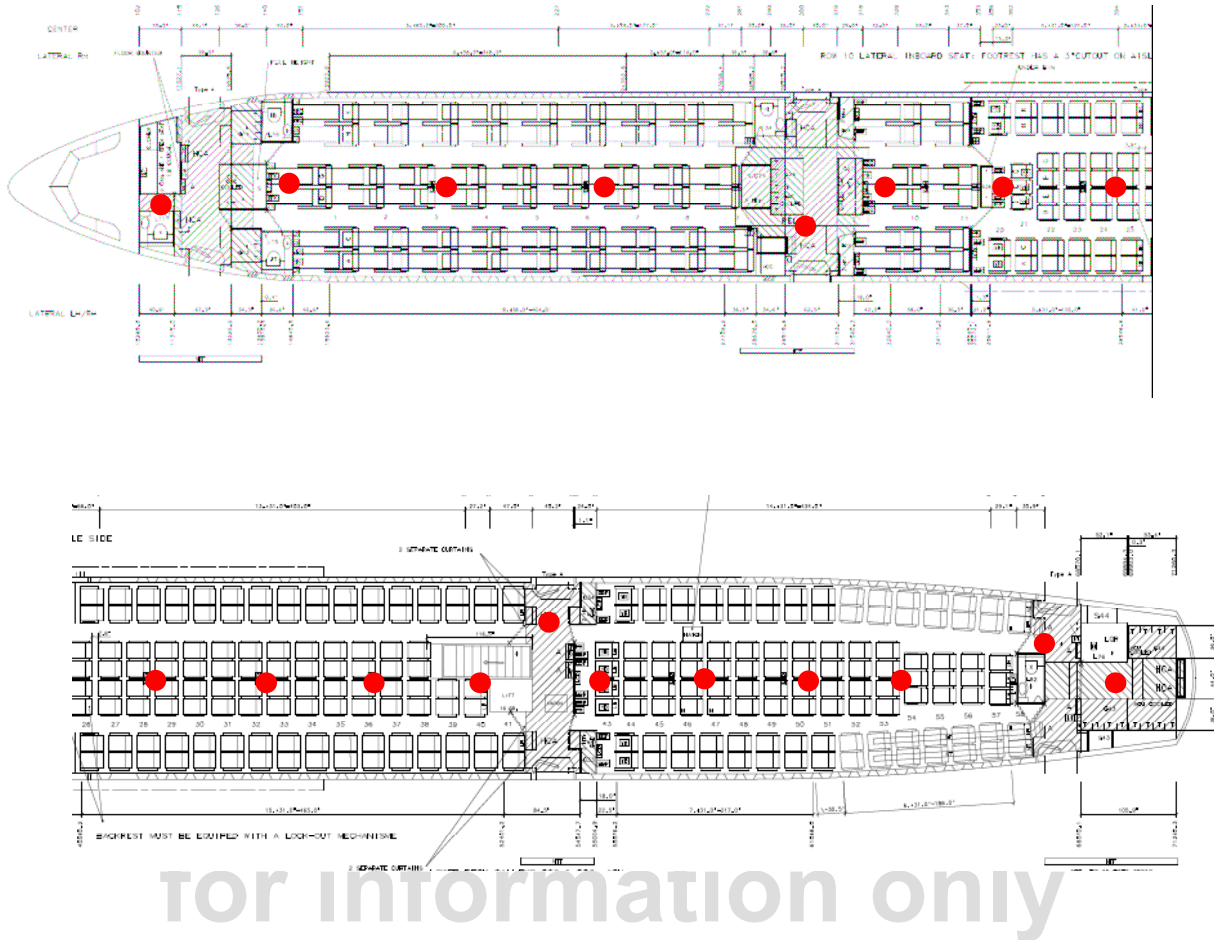


Fig. 4-3: A340 test antenna positions (exemplary layout)

4.2.6 Test duration

Test duration is 2 days (8 hours per day) including setup time.

4.2.7 Personal Test support

The test will be performed by EVMVM2 (AI-D).

A ground test engineer provided by the flight-line or FAL is needed to power on/off and control the aircraft systems over the whole test duration since test set-up.

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5 DEVELOPMENT AIRCRAFT (IF REQUIRED)

5.1 *Specific Tests*

N/A

5.2 *Flight Test Installation (FTI) System-Aircraft Interface Tests*

N/A

5.3 *FTI Tapping Tests*

N/A

6 TEST CLOSE UP

6.1 *Aircraft Condition after Test*

Remove test equipment.
Re-install lining if removed.

6.2 *System Inoperative*

N/A

6.3 *Power off*

De - energize a/c electrical systems after the test.

6.4 *Safety Conditions*

N/A

7 APPENDIX

None.

8 REFERENCES

- [1] Berufsgenossenschaft der Feinmechanik und Elektrotechnik (Hrsg.): BGV B11, Unfallverhütungsvorschrift Elektromagnetische Felder, 1 June 2001
- [2] Technical Note: X23RP0310255: On-Board Mobile Telephony System and WLAN electromagnetic interference test description: Test Set-up and Procedure for aircraft test on ground
- [3] GSM on Board - Air Interface Introduction & Worst-Case Scenarios
- [4] EUROCAE ED-130: Guidance for the use of portable electronic devices (PEDS) on board aircraft
- [5] Technical Note: X23RP0601581: EMC qualification test procedure to demonstrate the safe use of T-PED's inside aircraft