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EMC & RF Measurement equipment

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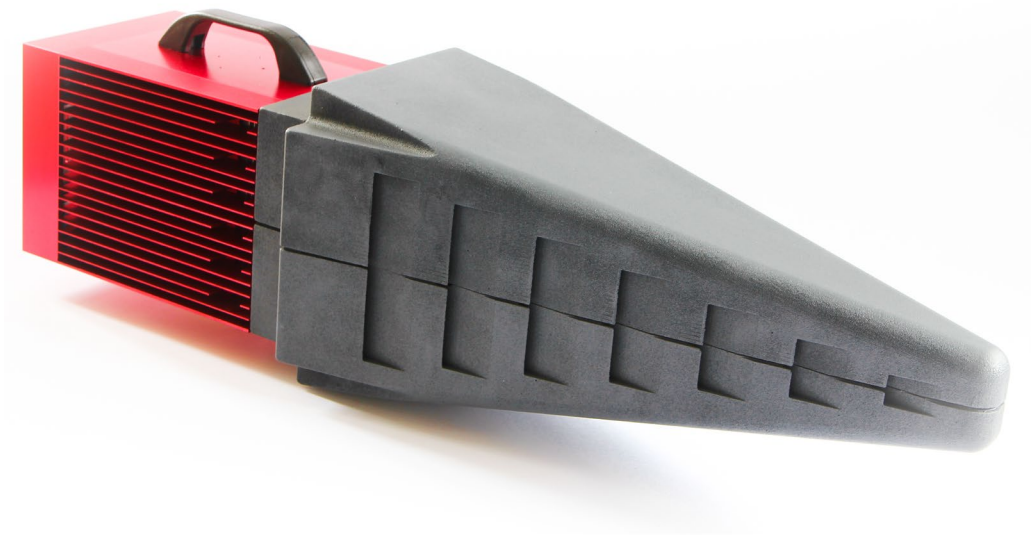
RadiField®

Product Manual



EMC Immunity Test System

Triple A, Field Generator

Models:

RFS2006A RFS2003A
RFS2006B RFS2003B

DARE!! Products B.V.
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RadiField® Product Manual

This product manual pertains to the RadiField® system.
Models: RFS2006A, RFS2006B, RFS2003A and RFS2003B.
Made by DARE!! Instruments.

We ask that you read this manual carefully before operating your new product and adhere to any safety instructions it might contain.

A Quick Start Guide has been added to this product for your convenience. This double printed A4 sheet contains the basic start-up steps and the safety warnings for the RadiField®.

Please keep the Quick Start Guide (and this regular manual) close at hand when you operate your new RadiField® system.

Please contact DARE!! Instruments or your local reseller if you have any questions.

Supplier Information

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WARNINGS & PRECAUTIONS

Read the contents of the product manual (including the manual for the RadiCentre® system) and become familiar with the safety markings, instructions, operation and handling of the system.

Only qualified service personnel is allowed to carry out adjustments, maintenance or repairs on the equipment. During service, disconnect the mains cable(s) from the RadiField® PSU plug-in card and RadiCentre.

Verify that your mains voltage is within the operating range of the equipment. Connect the equipment to a fused (16 A max) mains network.
Only use the supplied power cords for connecting the RadiField® PSU plug-in card and RadiCentre to the mains.

The RadiField® (PSU plug-in card) requires a protective earth connection. The mains power source for the equipment must supply an uninterrupted safety ground to the IEC input connector(s).

The RadiField® system is designed to be used for radiated immunity measurements in a shielded room or anechoic EMC chamber. Any other use is prohibited. Human exposure to the generated field may cause failure of medical implants which can result in fatality!

Do not modify the equipment in any way without consulting the manufacturer.

The RadiField® contains materials that can be recycled and reused to minimize material waste. At the ‘end-of-life’, specialized companies can dismantle the discarded system to collect the reusable and recyclable materials. If your product is discarded at its ‘end-of-life’, please return it to your local reseller for recycling.

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WARNINGS & PRECAUTIONS

Please make sure that the airflow through the in- and outlets of the RadiField® are not restricted to maintain a constant temperature. The cooling system is designed to operate in the specified operating temperature range.

Please use a suitable coaxial cable to connect the PSU plug-in card with the Triple A: fitted with an N-type connector on both sides, maximum allowed attenuation of 10dB at 6GHz and able to handle a DC current of 8 amps.

To make the RadiField® system as safe as possible, the RadiField® will only power on when all connections are properly made.
In addition, the RadiField® will shut down if the interlock of the RadiCentre® is triggered.

Use two people to mount the RadiField® Triple A to the RTW2000 antenna mast. Take caution while translocating the mast.

During change of polarization (rotation) of the RadiField® Triple A with the RTW2000A antenna mast, there is a risk of entrapment. Keep a safe distance to moving parts of the antenna while the polarization is changed.
Prior to and during movement an acoustic signal is audible.

Position the equipment in such a way that power cables are easily accessible or connect the equipment to a mains network that can be easily disconnected from the mains.

For cleaning, use a clean, dry cloth (or a damp cloth where needed) and wipe the surface of equipment.

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1 Introduction

1.1 Product Introduction

In conventional EMC immunity systems, large amplifiers are needed to compensate for cable losses because the amplifiers are normally placed away from the radiating antenna. When generating large amounts of RF power, the power from multiple amplifiers needs to be added using power combiners, resulting in even more power loss.

The Radi*F*ield® has solved these problems by placing compact amplifiers right behind the antenna array. This eliminates the use of long coaxial cables between the amplifier and antenna. By using an antenna array and combining the electrical fields of the antennas instead of combining RF power, the power losses are reduced even further.

The Radi*F*ield® is controlled through the Radi*C*entre®, with the Radi*M*ation® software. The use of Radi*M*ation® software is optional.

1.2 Related Products

Radi*C*entre® system

The Radi*C*entre® is a modular EMC test system that serves as the user and computer interface for all the Radi*C*entre® plug-in cards and modules (such as the Radi*F*ield® system).

Radi*M*ation® software

Radi*M*ation® is the EMC software package from DARE!! Instruments used for remote control and automated testing of the Radi*C*entre® plug-in cards and modules (such as the Radi*F*ield® system).

2 The RadiField®

2.1 Product Characteristics

Eliminate Power Loss - Due to the integrated design of the RadiField®, the RF-power loss is at a minimum, reducing energy consumption and eliminating the need for expensive, high power amplifiers.

Integrated Power Meters - Each amplifier has a built in coupler with forward and reflected RadiPower® power meters, eliminating the need for separate external coupler and power meters.

Easy to Use - By using only one coaxial cable for the transport of the RF signal, the communication signals and DC-power supply of the RadiField® system are easy to set up. Saving time and costs, as well as reducing the risk of equipment damage due to incorrect equipment connections.

Fully Compliant - The RadiField® system is fully compliant with the international EMC immunity standards. These standards describe aspects such as the frequency, field strength and homogeneity.

High Value for Money - The RadiField® is not only cost effective due to its low sale price. Because of the integrated coupler and power meters, the RadiField® is a complete EMC immunity testing setup. This reduces calibrations costs since the RadiField® does not need to be calibrated.

RadiCentre® Integrated - The RadiField® is integrated in the RadiCentre® system, which allows for easy touchscreen operation and several control interfaces such as GPIB, Ethernet and USB. This also allows for control by the RadiMation® software which is fully compatible with the RadiField® system.

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2.2 System Safety Features

To ensure the safety of the RadiField® system, the RadiField® will only be able to power on if all connections are properly made. In addition, the RadiField® will shut down immediately if the interlock of the RadiCentre® is triggered.

2.2.1 RadiField® start-up procedure

The start-up procedure consists of three phases that ensure the safe use of the RadiField®. If the RadiField® is not connected correctly, or if there is any other irregularities, the safety measures of this start-up procedure will be triggered. In each phase the supply power is increased, building up to the DC-power needed for normal usage.

1) The probing phase

   When the start-up command is given to the RadiField®**,** a safe 'probe signal' is sent through the coaxial cable to the RadiField®. If the RadiField® does not respond correctly to the probe signal, the start-up procedure is aborted. This probe signal is harmless to other equipment and will therefore not cause defects to other instruments in case of an incorrect connection.

2) Communication phase

   After a successful probing phase, the plug-in card will attempt to communicate with the intelligent backplane of the RadiField®. If the intelligent backplane does not respond, the start-up procedure is aborted.

3) Final start-up

   When communication is established, the final DC-power will be applied on the coaxial cable to power the RadiField®. The amplifiers in the RadiField® can now be switched on and are ready to operate.

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2.3 Components

The RadiField® system is delivered with the following items:

RadiField® Triple A (Active Antenna Array)

Model: RFS1006A, RFS1006B, RSF1003A or RSF1003B.
The field generating active antenna array.

RadiField® PSU2400A plug-in card

Power supply plug-in card (for the RadiCentre®) to power the Triple A. Communicates with the Triple A and transfers the RF-signal to the Triple A.

This card is plugged into the RadiCentre® and fills two adjecent slots.

Supporting documentation in the form of:

- USB stick containing the (digital) User Manual and Quick Start Guide.
- Hardcopy of the Quick Start Guide.

REMINDER - A RadiCentre® modular test system is required to operate the RadiField® system. RadiCentre®, model: CTR1009B (or CTR1004B), serves as a user and computer interface for the RadiField® system. This allows for touchscreen operation and several communication interfaces.

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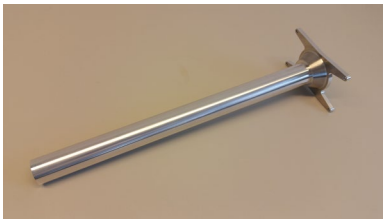
2.4 Optional Accessories

Transport Pelicase

Product number: RFP1000A.
This transport Pelicase is designed for short distance transportation, for example on-site or between facilities. The RadiField® Triple A must be stored in this protective case when it is shipped between different locations.



Antenna stinger mount boom

Product number: RFB1040A.
This custom antenna boom can be mounted on the back of the RadiField® Triple A.
It is 35 cm long and has a diameter of 40 mm.

Coaxial N-type cable

Product number: CBL2000N#010.
To connect the RadiField® Triple A with the RadiField® PSU2400A power supply plug-in card. Color may differ from the actual delivery.

Antenna mast with polarizer

Product number: RTW2000A.
Antenna mast with fixed height and automatic polarizer for the RadiField® Triple A. The actuator of the polarizer connects directly to the RadiField® Triple A and is controlled through this unit. Polarization can be moved between horizontal and vertical position.
The height of the antenne can be fixed between 50 cm and 200cm. The mast is provided with wheels for easy movement in a chamber.
The 40mm antenna boom is part of the mast.

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2.5 RadiField® Triple A

The RFS2006A/B or RFS2003A/B Triple A is the field generating element of the system. This module contains the amplifiers, antenna array and backplane. The amplifiers and backplane are located in the red aluminum housing, the antenna array in the grey foam cones.

2.5.1 Cooling system

The Triple A is air-cooled. Air is drawn in at the back of the Triple A and blown out along the external cooling ribs, through the side air outlets and then out of the openings in the grey foam cones. The cooling system keeps the internal amplifiers at a constant operating temperature. Failure to meet the specified environmental temperature range might result in a too high or too low amplifier temperature.

2.5.2 Connections

The power, RF input and communication connection of the Triple A run through one coaxial cable. This cable is connected at the back of the Triple A to an N-type connector.

2.5.3 Mounting

The Triple A has a standard ¼-20" UNC-1B thread on the bottom. This can be used to mount the Triple A on a tri-pod, antenna tower or boom mount.

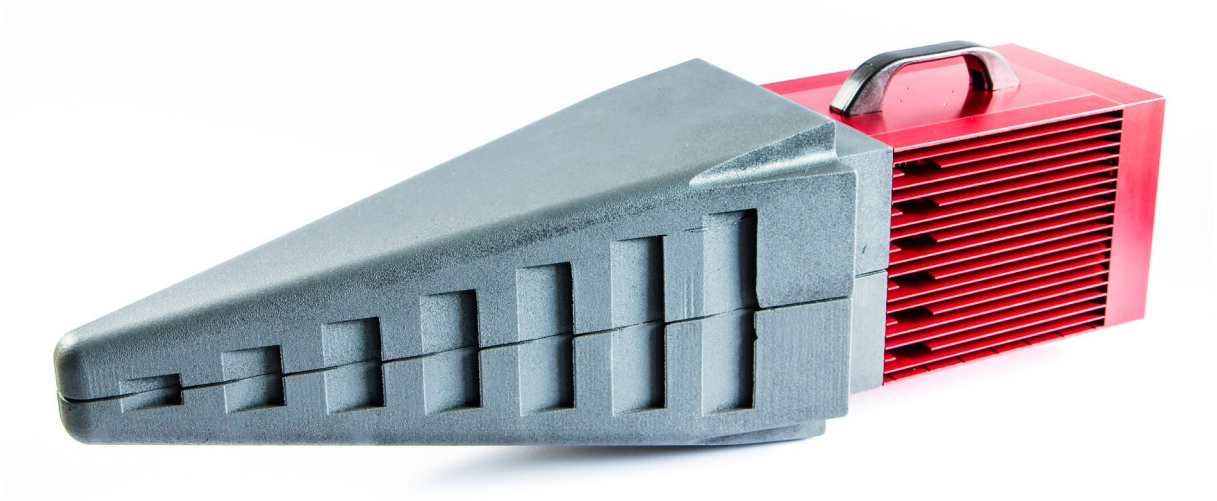

Figure 1: The RadiField® Triple A

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2.6 RadiField® PSU2400A

The PSU2400A is a (two slot) plug-in card for the RadiCentre®. The PSU2400A combines power, RF input and communication within the coaxial cable to the Triple A.

2.6.1 Connections

The PSU2400A has a separate mains input connection to power the RadiField® Triple A.
A SMA connector is used for the RF input and an N-type connector for the connection to the Triple A.

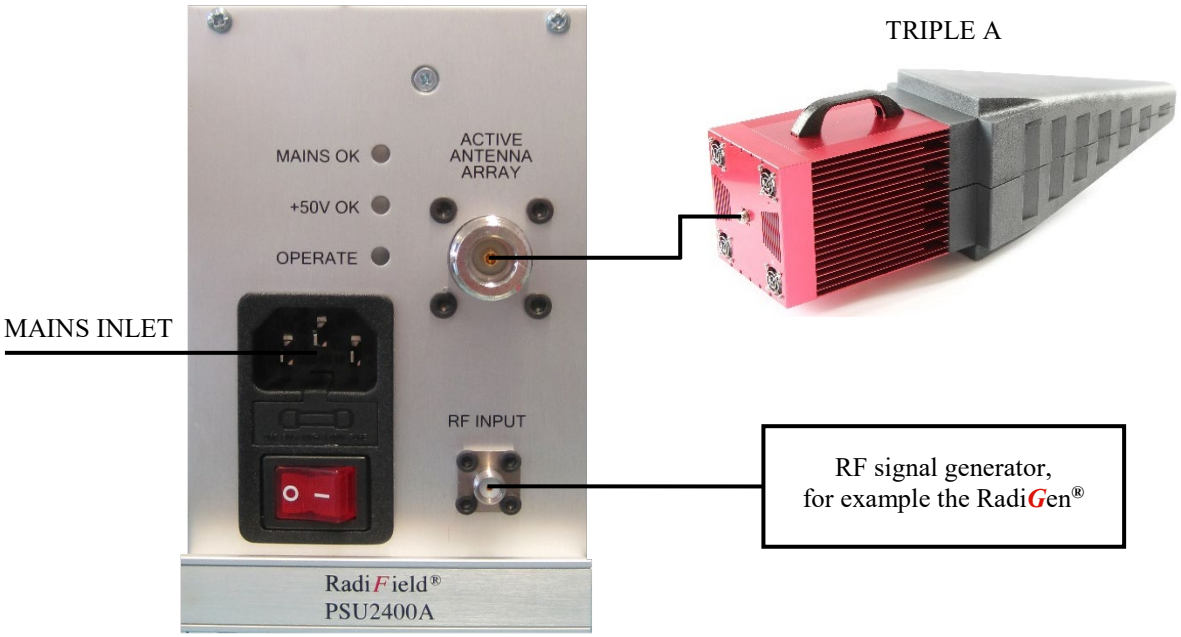

Figure 2: Overview of the RadiField® plug-in card connections

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2.7 Transport Case

A transport case has been designed especially for the RadiField® Triple A. This transport case can be bought as an option, together with the RadiField® system.
The case is designed for on-site and facility transports. The RadiField® Triple A must be stored in the transport case when it is shipped between different locations. Be advised that if you do not buy this specially designed transport case, we recommend that you yourself provide an alternative method of protection for your RadiField® Triple A.

REMINDER – This transport case is designed for short distance transportation. It does not provide sufficient protection for air travel or other long distance shipping. The RadiField® Triple A might be damaged if the transport case is handled in a rough manner. Additional or different (protective) packaging is needed in those situations.

2.8 Antenna Boom

A custom made antenna boom can be mounted on the back of the RadiField® Triple A. It is 50 cm long and has a diameter of 40 mm.
This antenna boom can be bought as an option, together with the RadiField® system.

2.9 Coaxial cable

A coaxial cable is used to connect the PSU plug-in card with the Triple A. The coaxial cable needs to be fitted with an N-type connector on both sides. The maximum allowed attenuation of the cable for proper system operation is 10dB at 6GHz. The selected cable also needs to be able to handle a DC current of 8 amps.
Suitable cables can be bought as an option, together with the RadiField® system.

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3 Installation

3.1 Hardware Configuration

The hardware configuration is carried out in the following steps:

1. Make sure that all connections to the plug-in card (PSU2400A) are made:

   Connect a suitable N-type coaxial cable from the PSU2400A to the RadiField® Triple A and connect a coaxial cable from a RF signal generator to the RF input of the PSU2400A.
   Please note that the maximum field is reached at an input power between -10 dBm and 0 dBm, depending on the frequency response and attenuation of the N-type cable used.

2. Make sure that the remote interlock connection of the RadiCentre® system is closed.

3. Plug the mains cords into the mains inlet of the RadiCentre® system and the mains inlet of the PSU2400A plug-in card.

4. Switch the main power switches on both mains inlets to the 'ON' position.

5. Touch the touchscreen on the front panel of the RadiCentre® to activate the RadiField®.

The system is now ready to be used.

The user can control the RadiField® through the touchscreen of the RadiCentre® system, or by external software, such as the RadiMation® EMC test software.

REMINDER – Please make sure that the airflow out of the grey foam openings is not restricted to prevent possible overheating of the RadiField®. The cooling system is designed to operate in the specified operating temperature range.

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3.2 Field Polarization and Reference Point

In order to perform radiated immunity measurements, standards require a certain distance from the field generating antenna to the Equipment Under Test (EUT). In most immunity setups, the tip of the transmitting antenna is used to determine the distance to the EUT. Since the actual antenna of the RadiField is not visible, a small hole in the nose of the RadiField is used as a reference point to determine this distance.

For most test setups, it is also necessary to know the polarization of the field generated by the antenna.

Both the field polarization and reference point on the RadiField® are shown in the picture below.

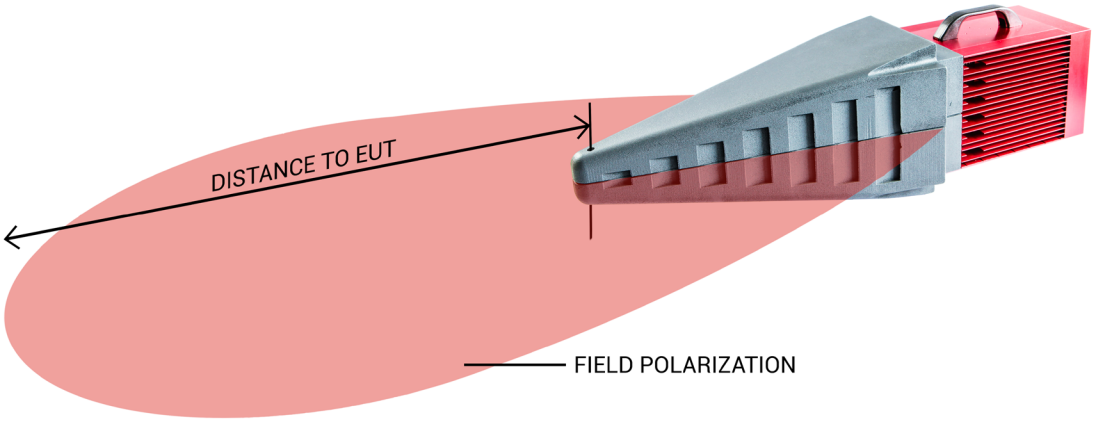

Figure 3: RadiField® field polarization and reference point

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3.3 Software Configuration

In order to control the RadiField® from a computer, one can use either custom made software or the RadiMation® EMC software package from DARE!! Instruments (to be purchased separately).
In order to control the RadiField® (either manually or remote through software) the PSU2400A must be plugged into a RadiCentre®.
If the RadiField® is operated manually, this paragraph can be skipped.

If RadiMation® software is used; select the required device driver for the RadiField®.

3.3.1 RadiMation® software

1. Configure the RadiMation® software for a RadiField® / RadiCentre® field generator. Configure a device driver and select the correct communication port.

2. In the 'equipment list' that you are using, select the 'field generator' device driver.

3. Open a Test Set-up File (TSF) and click on the 'Outputs' button. Select the field generator(s) to be used.

4. Save the TSF.

RadiMation® is now ready for use with the RadiField® / RadiCentre® field generator.

The RadiMation® software package verifies the generator at the beginning of each test (if a field generator is selected).

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4 Using the RadiField®

4.1 Manual Control of the RadiField®*

Once the RadiCentre® is switched on, the RadiField® can be activated from the 'main screen' on the RadiCentre®. An example of this screen is visible in Figure 4.

By pressing the 'status'-button proceeded by the 'Ack'-button, the start-up procedure of the RadiField® will begin. Once this procedure has been completed successfully, the amplifiers in the RadiField® will be powered.

The system is now heating up to its final temperature of 75°C. It will be ready to be switched to operate once it has reached a temperature above 50°C.

Figure 4: RadiCentre® 'main screen' with RadiField® 'status button'

* Please note that the screenshots shown in this manual are related to RadiCentre® firmware v1.16.0. Other version may look different and support other functions.

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In the RadiField® 'control screen' (visible in Figure 5), the parameters of the system can be read. In order to generate an EM-field, the system must be switched to operate. It is important to enter the frequency of the generator driving the RadiField® to read the correct power meter level. Entering the actual frequency will automatically correct for the frequency dependent coupler and power meter response inside the amplifiers.

Typical operating parameters are:

- Amplifier temperature: 75°C +/- 5°
- RadiField® DC-voltage: +50Vdc
- RadiField® Current: 5 to 8 A max

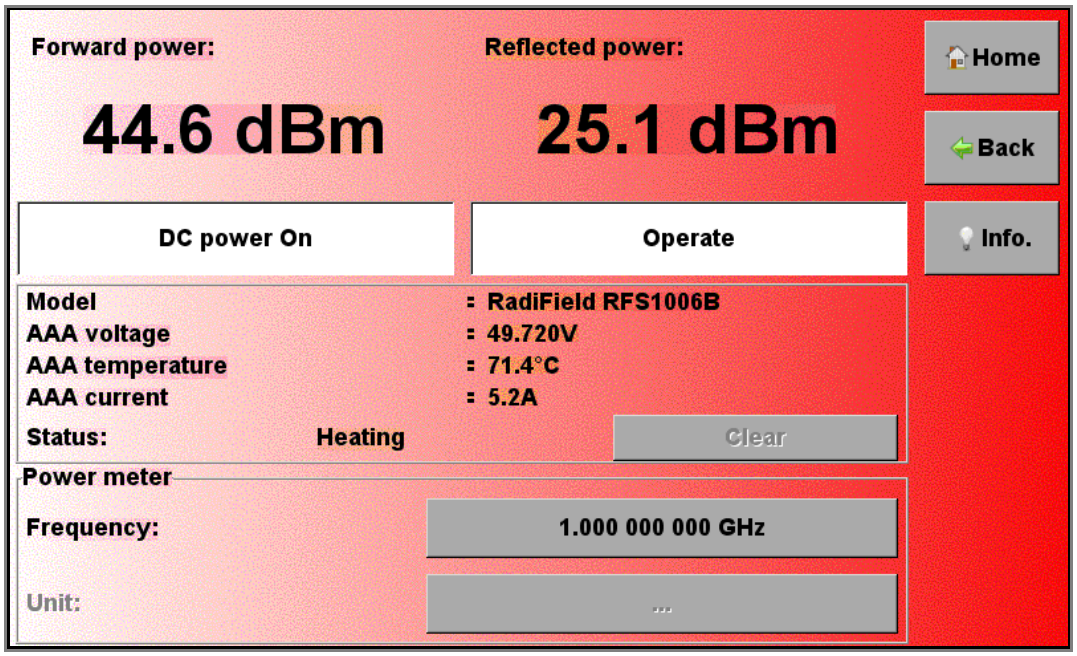

Figure 5: Example of the RadiField® 'control screen'

4.2 Remote Control of the RadiField®

The RadiField® can be controlled remotely through the interfaces of the RadiCentre®. The exact communication protocol can be found in the RadiCentre® manual. The specific commands for the RadiField® are shown in chapter 5 'RadiField® Command Set'.

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5 RadiField® Command Set

5.1 Commands

5.1.1 General commands

Command	Description & Reply
ID_NUMBER?	Returns unique identifier number. Reply (for example): '1.58.95.146.21.0.0.124'
LOCAL	Return to local mode, the local display is used to set items. Reply: 'OK'
VERSION_HW?	Returns the hardware version. Reply (for example): '2'
*IDN?	Returns the ID of the system. Reply (for example): 'DARE!!, RadiField PSU2400A, 1.0.0'
RESET	Reset the module. This will: • Clear all errors • Clear all occurred crowbars • Reset the filter to filter 1 • Reset the frequency to 3 GHz • Set the amplifier to standby mode, if this fails an error is replied Reply: 'OK' or error code
CLEAR	All errors are cleared and crowbars are reset. Reply: 'OK'

*This table continues on the next page.

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General commands, part 2

Command	Description & Reply
MAINS?	Get the state of the mains. Reply: '1' = ON Reply: '0' = OFF
MAINS<space><value>	Turn the main power ON or OFF. <value> = 'ON' or 'OFF' Reply: 'OK' or error code
STANDBY	Set the AAA in the standby mode. (FETs are biased). Reply: 'OK' or error code
OPERATE	Set the AAA in the operate mode (RF path opened). Reply: 'OK' or error code
MODE?	Returns in which mode the AAA is. Reply (for example): 'Operate'
CURRENT?	Returns the current measured by the plug in card (in ampere). Reply (for example): '1.2'
TEMP?	Returns the temperature (in degrees Celsius). Reply (for example): '23.6'
POS<space><value>	Set the position of the polarizer. <pos> can be "HOR" for horizontal or "VER" for vertical. Reply: 'OK' or error code
POS?	Reply the status of the polarizer. <pos> can be: "ERROR <Error Code>" "HOR" (When stopped and in horizontal position) "VER" (When stopped and in vertical position) "STOP" (When stopped and not in horizontal or vertical position) "MOV" (When moving)
STOP	Stop the movement of the polarizer

The commands: POS, POS? and STOP can only be used if the polarizer is connected.

**This table continues on the next page.*

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General commands, part 3

Command	Description & Reply
STATUS?	Returns a number which indicates what kind of error is occurred. This includes the following replies: • '0' = No error • '1' = 3.3V error • '2' = 5V error • '4' = 10V error • '8' = -10V error • '16' = 50V error • '32' = current driver 3 error • '64' = current final error • '128' = temperature error • '256' = power error • '512' = driver fet adjustment error • '1024' = final fet adjustment error • '2048' = Oven too cold • '4096' = Oven too hot • '8192' = memory error • '16384' = driver vGate min limit • '32768' = driver vGate max limit • '65536' = driver adjustment timed out • '131072' = final vGate min limit • '262144' = final vGate max limit • '524288' = final adjustment timed out Some numbers represent multiple (of the previously mentioned) errors occurring at ones. For example, reply: • '3' = error 1 and 2 = 3.3V and 5V error • '5' = error 1 and 4 = 3.3V and 10V error • '6' = error 2 and 4 = 5V and 10V error • Etc.

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5.1.2 Commands for the power meter

Command	Description & Reply
POW<value>?	Get measure power level (in dBm). <value> = FWD or RFL. Reply (for example): '-12.34'
FREQUENCY? MIN	Get the minimal frequency (in Hz). Reply (for example): '1000000000'
FREQUENCY? MAX	Get the maximum frequency (in Hz). Reply (for example): '6000000000'
FREQUENCY<space> <value>	Set the frequency. <value> = frequency (in Hz), for example: 500000000 Reply: 'OK' or 'ERROR'
FREQUENCY?	Get the frequency (in Hz). Reply (for example): '500000000'
FILTER? MIN	Get the minimal meter filter. Reply (for example): '0'
FILTER? MAX	Get the maximum meter filter. Reply (for example): '7'
FILTER AUTO	Set filter to automatic. Reply: 'OK'
FILTER<space><value>	Set the filter. <value> = 1,2,3,4,5,6 or 7 Reply: 'OK' or 'ERROR'
FILTER?	Get the current filter. Reply (for example): '1'

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5.2 Error Codes

The following tables show the generic error codes and the product specific error codes for the RadiField®. This includes the error codes for the amplifier, backplane and plug-in card that are part of the RadiField® system.

5.2.1 Generic error codes

Error code	Description
1	Wrong command
2	Parameter too high
3	Parameter too low
4	Invalid parameter
5	Buffer overflow
6	Already in progress
7	Parity error

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5.2.2 Module specific error codes - Amplifier

Error code	Description
500	Already in standby
501	Already in operate
502	Already in off
503	Not in standby
504	Hardware failure
506	Out of specification
507	Power measurement, frequency not set
508	Power measurement, over range
509	Power measurement, under range
510	Power measurement, no calibration data
511	No error logs available
512	Not for customer! (Null pointer)
513	First send the startup command
514	Already started
515	Regulating FET
516	3V3 out of range
517	5V out of range
518	10V out of range
519	-10V out of range

**This table continues on the next page.*

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Module specific error codes – Amplifier, part 2

Error code	Description
520	50V out of range
521	Driver current out of range
522	Final current out of range
523	Temperature out of range
524	Power out of range
525	Driver FET adjustment error
526	Final FET adjustment error
527	Going to standby
528	Going to operate
529	Going to off
530	Oven too cold
531	Oven too hot
532	Calibrating busy
533	Power not updated

5.2.3 Module specific error codes – Polarizer

Error code	Description
561	Polarizer not detected
562	Polarizer current too high
563	Polarizer H-bridge fault
564	Polarizer strength too high
565	Polarizer speed too low
566	Polarizer wrong direction

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5.2.4 Module specific error codes - Backplane

Error code	Description
551	Communication busy
552	Amplifier error
553	Amplifier wrong *IDN
554	Amplifier wrong answer
555	Amplifier time-out
556	Amplifier wrong mode
557	No amplifier connected
558	Received command length are no digits
559	Received command length incorrect

5.2.5 Module specific error codes – Plug-in card

Error code	Description
504	Hardware failure
575	Communication busy
576	Communication time-out
577	Power supply already on
578	Power supply off
579	Incorrect impedance

**This table continues on the next page.*

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Module specific error codes – Plug-in card, part 2

Error code	Description
580	Impedance short
581	Impedance open
582	External unit is not connected
583	Unknown error
584	SW update – supply backplane not off
585	SW update – supply backplane not on
586	SW update – software download not started
587	SW update – sync retries failed
588	SW update – reboot unit failed
589	SW update – amplifier to off mode error
590	SW update – transparent mode on error
591	SW update – transparent mode off error
592	SW update –binary frame error
593	SW update –binary frame header error
594	SW update – binary frame header size error
595	Illegal backplane command length
596	Length error - received command length are no digits
597	Length error - received command length incorrect
598	Mains on sequence error – BPL supply switch error
599	Mains on sequence error – AMP startup error

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6 RadiField® Specifications

Model	RFS2003A	RFS2006A	RFS2003B	RFS2006B
Performance				
Frequency range	0,8 GHz – 3 GHz	0,8 GHz - 6 GHz	0,8 GHz – 3 GHz	0,8 GHz –6 GHz
TME Field†	3V/m		10 V/m	
Input connector	N-Type			
Max. input power to reach TME Field	0 dBm			
Number of internal power meters	2 (Forward & Reflected)			
Power meter type	Integrated RadiPower			
Directional Coupler	Integrated			
Safety				
Safety circuit	Safe start & shutdown			
Cable (dis)connect	Intrinsically safe			
Voltage	55 VDC (Safe Voltage)			
Interlock	Hardware interlock			
Connections				
Tri-pod mount	¼-20" UNC thread			

*This table continues on the next page.

† Three Meter Equivalent (TME) Field: 1,5 m x 1,5m homogeneous field @ 3 m according to IEC 61000-4-3

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RadiField® Specifications, part 2

Model	RFS2003A	RFS2006A	RFS2003B	RFS2006B
Dimensions				
Length	860 mm			
Height	250 mm			
Width	250 mm			
Weight	9 kg	10 kg		11 kg
Environmental conditions				
Temperature range	10˚ C – 40˚ C			
Relative humidity	10% - 90% (non-condensing)			
Sound level produced	< 70 dB(A)			
Maximum installation height	2000 meters above sea level			
Power consumption				
Supply voltage	115 VAC / 230 VAC			
Mains fuse of PSU	4 AT			
Max power consumption	200 W	300 W		400 W
Mains	Safety class I, Overvoltage category II			
Warranty				
Warranty	3 years (misuse excluded)			

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Standard Compliance

The RadiField® RFS1006B is a 10 V/m TME system, capable to perform radiated immunity tests according to (but not limited to) the standards mentioned in the table below.
The RadiField® field generator is capable of:

- Generating 18 V/m max. at a test distance of 3 m, in the frequency range of 1 GHz to 4 GHz, taking into account the Uniform Field Area requirements of IEC 61000-4-3. (18 V/m is required to perform a 10 V/m test with 80% AM modulation)

- Generating 10 V/m max. at a test distance of 3 m, in the frequency range of 4 GHz to 6 GHz, taking into account the Uniform Field Area requirements of IEC 61000-4-3. (10 V/m is required to perform a 10 V/m test with digital modulation or pulse modulation)

The tables on the following pages provide an overview of the standards for which the 10 V/m TME- system can be used:

Standard	Frequency band	Test frequency	Test distance	Test level	Modulation
EN 61326-1 (laboratory equipment)	1400 – 2000 MHz	-	3 m	3 V/m	AM, 80%, 1 kHz
	2000 – 2700 MHz	-	3 m	1 V/m	
IEC 60945 (maritime)	1000 – 2000 MHz	-	3 m	10 V/m	AM, 80%, 1 kHz or 400 Hz
IEC 60533 (maritime, electric installations on ships)	1000 – 2000 MHz	-	3 m	10 V/m	AM, 80%, 1 kHz
DNV SFC 2.4 (maritime)	1000 – 2000 MHz	-	3 m	10 V/m	AM, 80%, 1 kHz or 400 Hz
Germanische Lloyd part 1 (maritime)	1000 – 2000 MHz	-	3 m	10 V/m	AM, 80%, 1 kHz or 400 Hz
Lloyd's Register TSN1 (maritime)	1000 – 2000 MHz	-	3 m	10 V/m	AM, 80%, 400 Hz
Veritas Section 6 (maritime)	1000 – 2000 MHz	-	3 m	10 V/m	AM, 80%, 1 kHz or 400 Hz

**This table continues on the next page.*

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Standards, part 2

Standard	Frequency band	Test frequency	Test distance	Test level	Modulation
EN 12016 (lifts, escalators)	1429 – 1516 MHz	-	3 m	10 V/m	AM, 80%, 1 kHz
	1710 – 1785 MHz	-			
	1840 – 2170 MHz	-			
	2300 – 2655 MHz	-			
EN 50130-4 (alarm systems)	1000 – 2700 MHz	-	3 m	10 V/m	AM, 80%, 1 kHz / Pulse 1 Hz
EN 50293 (road traffic signal systems)	1889 – 1891 MHz	-	3 m	10 V/m	200 Hz, Pulse (50%)
EN 61000-6-1 (generic, domestic)	1400 – 2000 MHz	-	3 m	3 V/m	AM, 80%, 1 kHz
	2000 – 2700 MHz	-		1 V/m	
EN 61000-6-2 (generic, industrial)	1400 – 2000 MHz	-	3 m	3 V/m	AM, 80%, 1 kHz
	2000 – 2700 MHz	-		1 V/m	
EN 61000-6-7 (EVS-EN, safety related systems)	1400 – 2000 MHz	-	3 m	10 V/m	AM, 80%, 1 kHz
	2000 – 2700 MHz	-		3 V/m	
EN 60335-1 (household)	1400 – 2000 MHz	-	3 m	10 V/m	AM, 80%, 1 kHz
EN 50121-3-2 (railway, rolling stock)	1400 – 2100 MHz	-	3 m	10 V/m	AM, 80%, 1 kHz
	2100 – 2500 MHz			5 V/m	
EN 50121-4 (railway, signalling & telecom)	1400 – 2100 MHz	-	3 m	10 V/m	AM, 80%, 1 kHz
	2100 – 2500 MHz			5 V/m	
	5100 – 6000 MHz			3 V/m	
EN 50121-5 (railway, fixed power supply installations)	1400 – 2100 MHz	-	3 m	10 V/m	AM, 80%, 1 kHz
	2100 – 2500 MHz			5 V/m	

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Standards, part 3

Standard	Frequency band	Test frequency	Test distance	Test level	Modulation
ETSI 301 489-1 (R&TTE)	1400 – 2700 MHz	-	3 m	3 V/m	AM, 80%, 1 kHz or 400 Hz
EN 301 489-1 V2.1.0 (2016-04) On Approval	800 - 6000 MHz	-	3 m	3 V/m	AM, 80%, 1 kHz
IEC 60601-1-2 (medical)	1700 – 1990 MHz GSM 1800 CDMA 1900 GSM 1900 DECT LTE Band 1,3,4,25 UMTS	1720 MHz 1845 MHz 1970 MHz	2 m	28 V/m‡	Pulse, 217 Hz
	2400 – 2570 MHz Bluetooth WLAN 802.11 b/g/n/ RFID 2450 LTE band 7	2450 MHz	2 m	28 V/m‡	Pulse, 217 Hz
	5100 – 5800 MHz	5240 MHz 5500 MHz 5785 MHz	3 m	9 V/m	Pulse, 217 Hz
CISPR CDV 35 2015	GSM (1 W)	1800 MHz	3 m	3 V/m	AM, 80%, 1 kHz
	WiMAX / 3G (1W)	2600 MHz			
	WiMAX (1,26W)	3500 MHz			
	Wi-Fi (1W)	5000 MHz			
Regulation10– (Automotive)	800 - 2000 MHz	1300 MHz 1800 MHz	1 m	30 V/m	Pulse, 577 µs / 4600 µs
EN 13309 (machines with internal power supply)	800 – 2000 MHz	-	1 m	24 V/m	Pulse, 577 µs / 600 µs

For other test distances, the maximum field can be calculated using the formula:

$E = 3 * E_{TME,max} / d$; where $E_{TME,max}$ = 18 V/m and d = the new distance

For example: the maximum field at 1 m distance is 3*18/1 = 54 V/m *(1 to 4 GHz)*

‡ The distance between the transmitting antenna and the ME equipment or ME system may be reduced to 1 m. For compliance to EN61000-4-3 and required field amplitude it is necessary to test at a distance of 2 m.

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WARRANTY CONDITIONS

DARE!! Instruments offers a standard warranty term of three years on their products, starting from the shipping date. This warranty is applicable to all EMC test & measurement products, such as:

- RadiCentre® modular / multifunctional EMC test systems
- RadiControl® antenna tower/turntable controllers
- RadiField® Triple A field generators
- RadiGen® signal generators
- RadiPower® RF power meters
- RadiSense® laser powered E-field probes
- RadiSwitch® RF coaxial switches

If a defect occurs within the warranty term, a Return Material Authorization (RMA) 'Warranty Repair' request can be issued using the RMA link at http://rma.dare.eu. The defective product can then be shipped to DARE!! Instrument for repair by our service department.
There will be no charge for repair services (materials or labor) within the warranty term. The customer will need to cover the costs for returning the product to DARE!!, such as shipping and/or any applicable duties and taxes. DARE!! Instruments will arrange the courier and cover the costs for the return shipment.

These warranty terms are not applicable to:

- Fiber optic cables
- Products that have been improperly used
- Products that have been used outside their specified range
- Products that have been improperly installed and/or maintained
- Products that have been modified without approval of DARE!! Instruments
- Calibration and/or re-calibration of the product
- Consumable products such as batteries, ink etc.

Repair services on products that are not covered by the DARE!! warranty will be charged to the customer. If a defect occurs to our product outside the warranty period, a RMA repair and/or re-calibration request must be issued using the RMA link at http://rma.dare.eu.
The repairs (outside the original warranty period) have a warranty limited to six months. Shipping conditions are the same as with repairs within the original warranty period.

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EUROPEAN DECLARATION OF CONFORMITY

We, DARE!! Instruments, declare under our sole responsibility that the product;

RadiField®

Models RFS2003A, RFS2003B, RFS2006A and RFS2006B

to which this declaration relates, is in conformity with the following standards or other normative documents;

Emission:	EN 61326-1:2013, Class A Electrical equipment for measurement, control and laboratory use.
Immunity:	EN 61326-1:2013, Industrial level, performance criteria A Electrical equipment for measurement, control and laboratory use.
Safety:	EN 61010-1:2010, Safety requirements for electrical equipment for measurement, control, and laboratory use EN 61010-2-81, Particular requirements for automatic and semi-automatic laboratory equipment for analysis and other purposes

following the provisions of;

EMC-Directive 2014/30/EU
Low Voltage Directive 2014/35/EU

The Technical Construction Files are maintained at;

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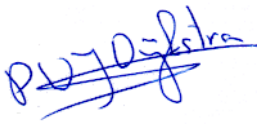

P.W.J. Dijkstra
Title of authority: Director

CERTIFIED LR ISO 9001

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