# EM-field applicator eoCal™ Low κ

2nd generation

## Make accurate calibration of EM-field probes and make exposure to EMF from DC to 6 GHz

50 Ω adiabatic TEM cell with suppression of first higher-order modes

Electric field strength up to 15 $kV_{RMS}/m$ with an ultra low mean VSWR value of 1.2

Ideal EM-field applicator for eoProbe™ optical RX antennas

One single model for the calibration of any type of E-field or H-field probe in the air

KEY PARTNER FOR ELECTROMAGNETISM

kapteos

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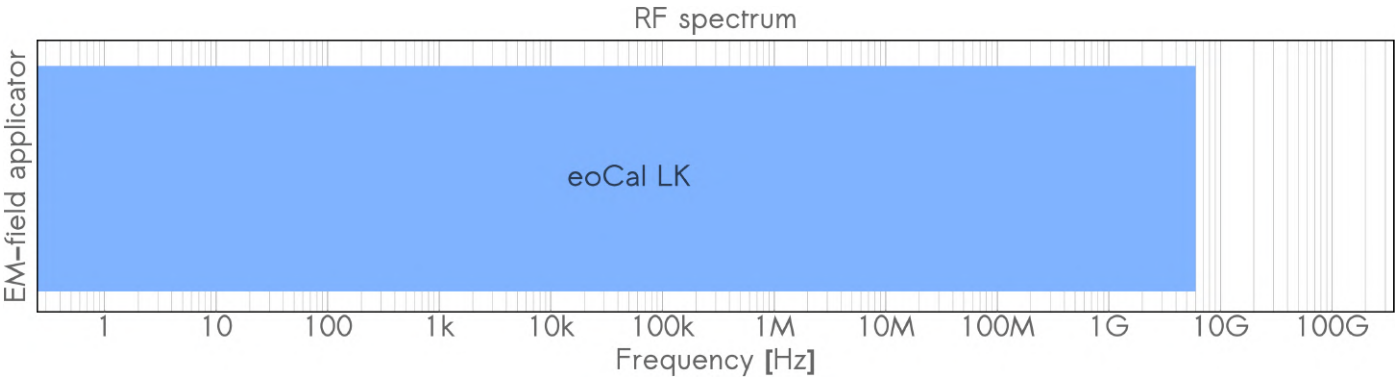
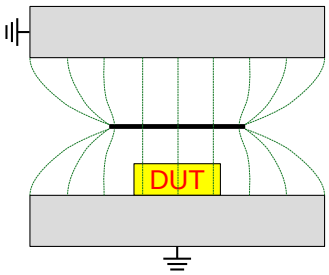
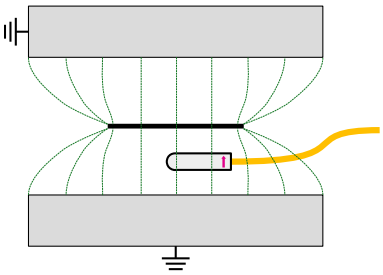
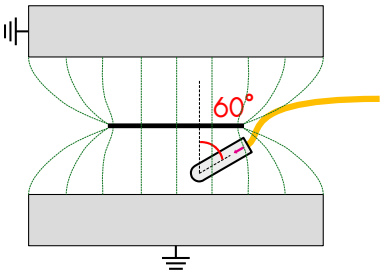
## Applications

This state-of-the-art adiabatic TEM cell strongly reduces energy transfer from fundamental mode to higher order modes. This EM-field applicator allows accurate calibration of E-field probes up to 6 GHz, pre-compliance EMC tests on small electronic cards or dosimetry studies on biological media.

## Implementation




The EM-field applicator eoCal can be used either to calibrate Kapteos® EM-field probes or to expose devices to EMF from DC up to 6 GHz. The impact of EMF exposure on a device can be easily studied with this ultra wide band EM-field applicator. Among potential devices, they are: biological cells / tissues, electronic cards...

| Configuration | Experimental arrangement | Use & features |
|---|---|---|
| EMF exposure |   | Vertical and uniform E-field in the quiet zone of the cell |
| Transverse E-field probe calibration |  | **Requires transverse probe holder**<br>Straightforward calibration of transverse probes with E-field strength seen by the probe given by:<br>$E_{PRB}$ [$V_{RMS}$/m] = 12.85 x 10^($P_{ATEM}$ [dBm] / 20) |
| Longitudinal E-field probe calibration |   | **Requires longitudinal probe holder**<br>Straightforward calibration of longitudinal probes with E-field strength seen by the probe given by:<br>$E_{PRB}$ [$V_{RMS}$/m] = 6.425 x 10^($P_{ATEM}$ [dBm] / 20) |

Glossary of acronyms

| | | |
|---|---|---|
| ATEM | Adiabatic TEM cell (eoCal™) | $P_{ATEM}$ [dBm] → ATEM cell input power<br>$E_{PRB}$ [$V_{RMS}$/m] → E-field strength between ground planes and septum in the quiet zone of ATEM cell |
| DUT | Device Under Test | |
| RMS | Root Mean Square | |



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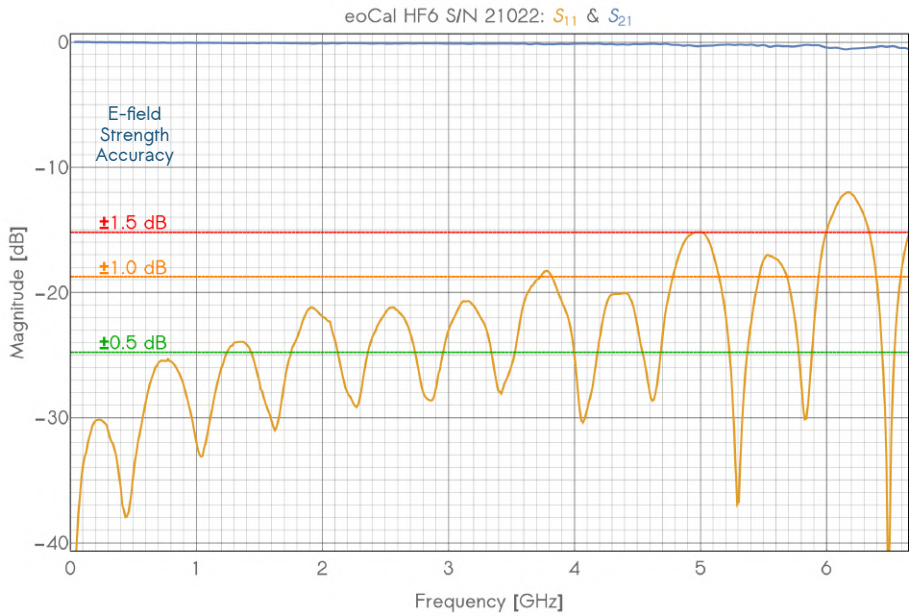
## PERFORMANCE SPECIFICATIONS

| Single model eoCal LK | | Min | Typical | Max | Unit |
|---|---|---|---|---|---|
| Frequency bandwidth | DC to | 5 | 6 | | GHz |
| Characteristic impedance | | | 50 | | Ω |
| Insertion loss | | | | 1 | dB |
| Return loss | | 12 | | | dB |
| VSWR (Voltage Standing Wave Ratio defined by ratio \|Vmax\|/\|Vmin\|) | | | 1.2 | 1.65 | |
| E-field strength | | | | 2 | $kV_{RMS}/m$ |
| EFSWR (Electric Field Standing Wave Ratio defined by ratio \|Emax\|/\|Emin\|) in the quiet zone of ATEM cell ($x \in \{6.25,11.25\}$ mm, $y \in \{-20,+20\}$ mm - see Mechanical Spec. on page 4) | DC → 200 MHz | | 1.03 | 1.10 | |
| | 200 → 1000 MHz | | 1.04 | 1.10 | |
| | 1250 MHz | | 1.05 | 1.20 | |
| | 1600 MHz | | 1.24 | 1.30 | |
| | 2000 MHz | | 1.07 | 1.40 | |
| | 2500 MHz | | 1.23 | 1.45 | |
| | 3200 MHz | | 1.07 | 1.50 | |
| | 4000 MHz | | 1.17 | 1.55 | |
| | 5000 MHz | | 1.53 | 1.60 | |
| | 6400 MHz | | 1.25 | 1.65 | |

Scattering parameters



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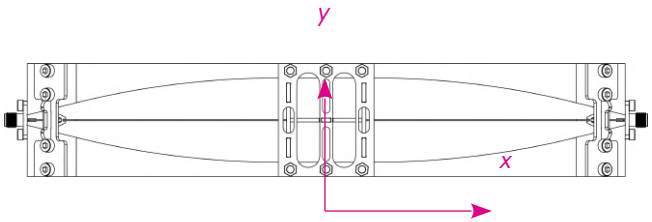
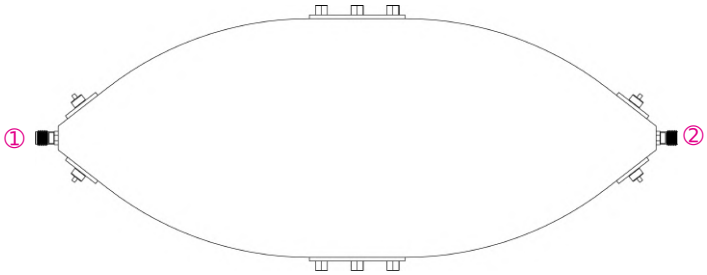
## Mechanical specifications

| | | Min | Typical | Max | Unit |
|---|---|---|---|---|---|
| Dimensions ± 0.2mm (cf. Max for overall dimensions) | Width | | 100 | 108.9 | mm |
| | Depth | | 250.4 | 269.3 | |
| | Height | | 47.3 | 47.3 | |
| Weight | | | 1.0 | | kg |
| I/O ports | ① Input port | SMA female connector | | | |
| | ② Output port | SMA female connector | | | |

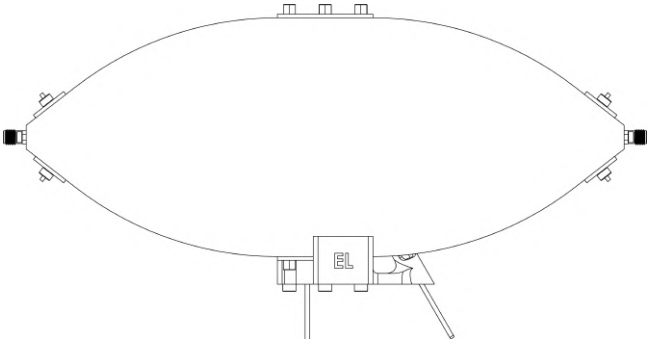
Front view without probe, neither holder



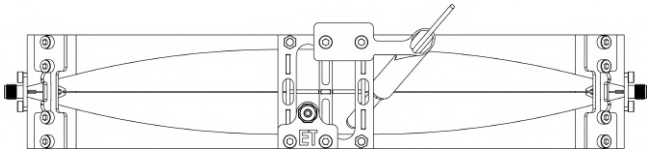

Top view without probe, neither holder




Top view with probes & holders




Front view with probes & holders




## Environmental specifications

| | | Min | Typical | Max | Unit |
|---|---|---|---|---|---|
| Input power | | | | 44 | dBm |
| Temperature | Operating | 15 | | 30 | °C |
| | Storage | 5 | | 50 | |
| Pressure | | 690 | | 2000 | hPa |
| Relative humidity | Non-condensing | | | 90 | % |
| RF connector | Durability | 500 | | | mating |
| Storage | Only in its original case in a clean, dry environment | | | | |
| Cleaning | For field applicator (except connectors and septum) use cloth moistened with clean water mixed with < 20% of isopropyl alcohol<br>For SMA connectors and septum, squirt isopropyl alcohol and dry with air duster | | | | |

## Standards compliance

| | |
|---|---|
| Aluminium alloy grade | 7075 (Ground bodies) |

## Packaging information

| | Contents |
|---|---|
| ATEM cell | Delivered with a routine test report and a 50-Ω SMA male termination (2 W Max.) |
| Transport box | Hard case with protective foam (W x D x H = 385 x 275 x 80 mm) |
| User guide | See website https://en.kapteos.com/ |



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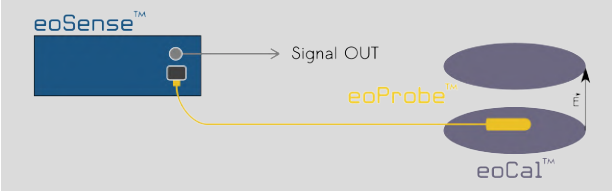
## Compatible devices and accessories

| Device | Associated data sheet | Use | Outline schematic |
|---|---|---|---|
| EM-field probe OE converter | eoProbe-E-FT-25.01.pdf<br>eoSense-FT-25.01.pdf | Required setup for probe calibration in air |  |

## Hardware options, customization and accessories

| Field of activity | Issue | Options and/or accessories |
|---|---|---|
| All | Absolute transverse E-field strength measurements | Transverse E-field probe holder -T-HLD |
| | Absolute longitudinal E-field strength measurements | Longitudinal E-field probe holder -L-HLD |

## Useful equations

| | **Equation** (valid only with a 50-Ω termination) |
|---|---|
| **E-field strength** in central/quiet zone of ATEM cell | $E_{ATEM}$ [dBV$_{RMS}$/m] = $P_{ATEM}$ [dBm] + 22.18<br>$E_{ATEM}$ [V$_{RMS}$/m] = 12.85 x 10^($P_{ATEM}$ [dBm] / 20) |

## Ordering information

| Model | Type | (Option) |
|---|---|---|
| eoCal | LK | -T-HLD |
| | | -L-HLD |

Examples:

EM-field applicator without holder:
- product **eoCal LK** - Qty: 1

EM-field applicator with holder for longitudinal probes
- product **eoCal LK** - Qty: 1
  - option **-L-HLD** - Qty: 1

EM-field applicator with holders for both transverse and longitudinal probes
- product **eoCal LK** - Qty: 1
  - option **-T-HLD** - Qty: 1
  - option **-L-HLD** - Qty: 1



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