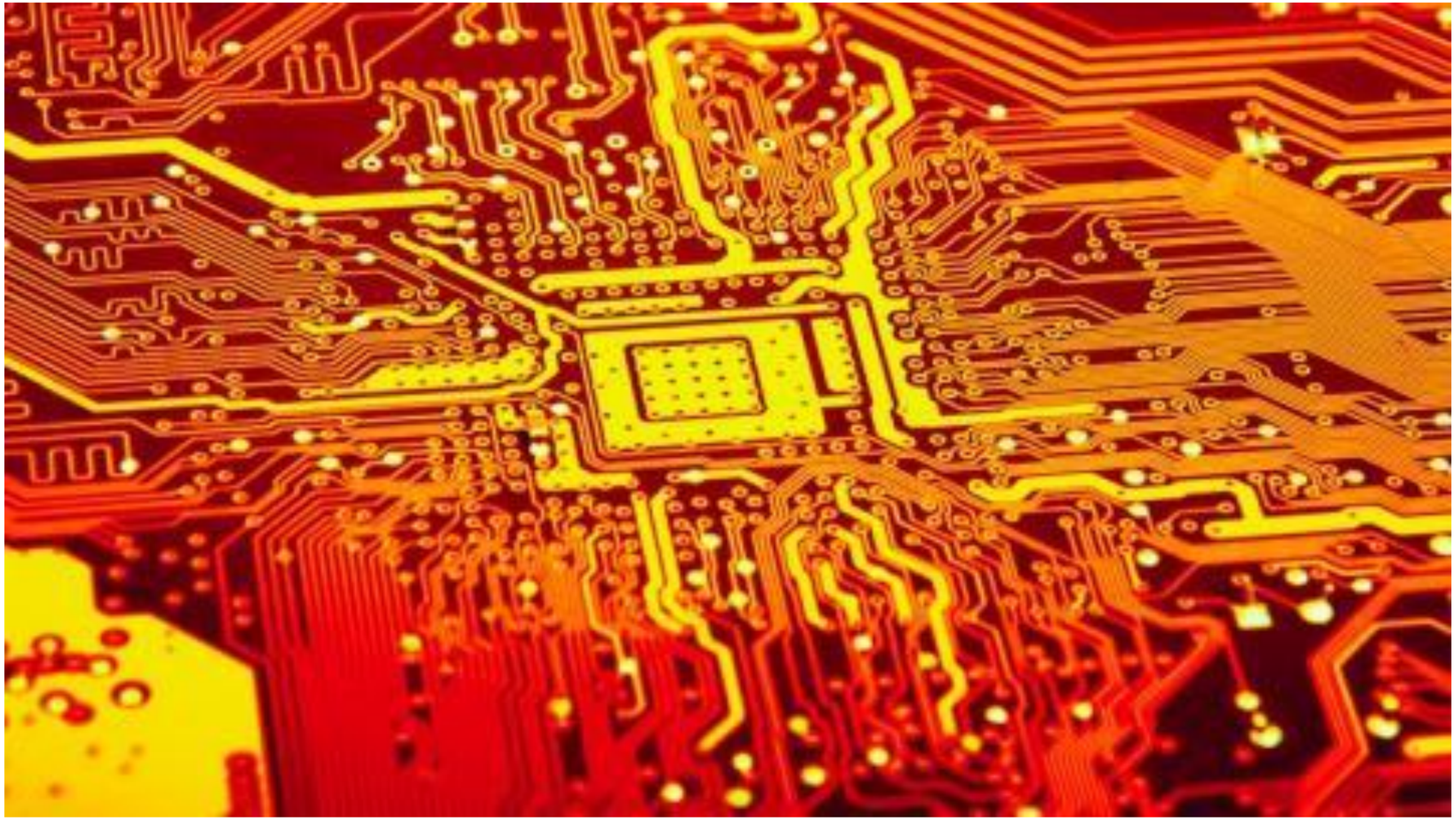
Solve Interference & Heat - Integrated Solutions



THE SAFEST CHOICE

TELEREX

RF 2022 TECHNOLOGY EVENT

29 MAART 2022

QuTech/TU Delft

RF

Solve Interference & Heat - Integrated Solutions

Bij het ontwerpen van elektronica zorgt een kleine beschikbare ruimte en compact ontwerp voor een flinke uitdaging.

Kijk hoe Telerex de knelpunten en enkele geïntegreerde oplossingen onderzoekt wanneer ontwerpers gelijktijdig warmte en RF interferentie moeten aanpakken.

Een alles-in-één oplossing bespaart ruimte en tijd en verbetert de prestaties op lange termijn.

THE SAFEST CHOICE
TELEREX

RF 2022
TECHNOLOGY EVENT
29 MAART 2022
QuTech/TU Delft

Solve Interference & Heat - Integrated Solutions

INTRODUCTIE

- What did the RF Engineer say when he got his booster shot?
- It Hertz!

Agenda

- **De Uitdagingen: Warmte en RF signaal interferentie door hogere snelheid en kleine ruimte**
- Aanpak: Zet elk onderdeel aan het werk. Praktijkvoorbeelden
- Pak de workflow aan: naar de Multifunctionele Toekomst

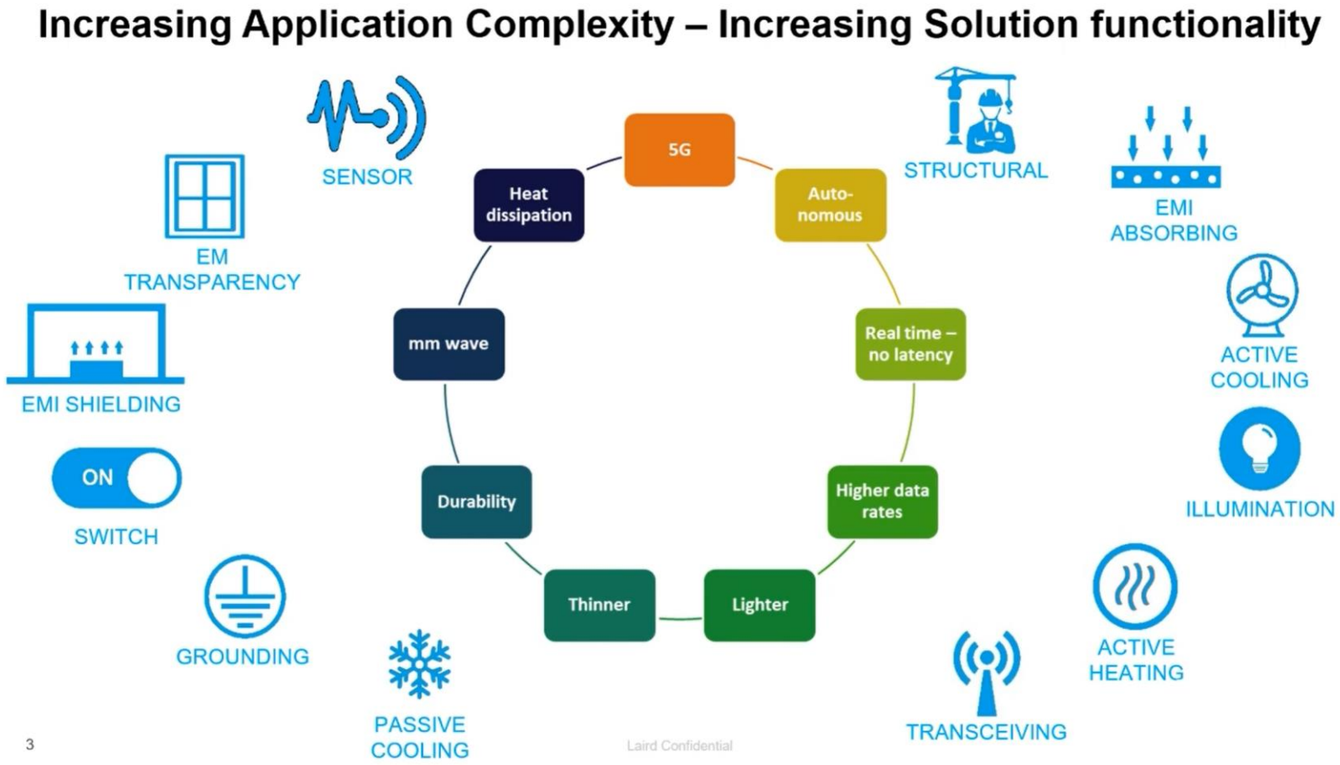
THE SAFEST CHOICE
TELEREX

RF 2022
TECHNOLOGY EVENT
29 MAART 2022
QuTech/TU Delft

Solve Interference & Heat - Integrated Solutions

Het kenmerk van de huidige geavanceerde technologie - of het nu gaat om autonome voertuigen, sensoren die een internet der dingen creëren of thuisrouters - is een zeer snelle en omvangrijke gegevensoverdracht.

Dit stelt ontwerpers voor flinke uitdagingen…



Solve Interference & Heat - Integrated Solutions

1 RF signaal interferentie

2 Warmte

Gezamenlijke aanpak van Interferentie en Warmte is mogelijk

THE SAFEST CHOICE
TELEREX

RF 2022
TECHNOLOGY EVENT
29 MAART 2022
QuTech/TU Delft

Agenda

- De Uitdagingen: Warmte en RF signaal Interferentie door hogere snelheid en kleine ruimte
- Aanpak: Zet elk onderdeel aan het werk. Praktijkvoorbeelden
- Pak de workflow aan: naar de Multifunctionele Toekomst

Solve Interference & Heat - Integrated Solutions

Drie oplossingsmogelijkheden

- Combinatie met metaaldelen
- Multifunctionele Materialen
- Gebruik de constructie (dragende) delen

Combinatie met Metaaldelen

Solve Interference & Heat - Integrated Solutions

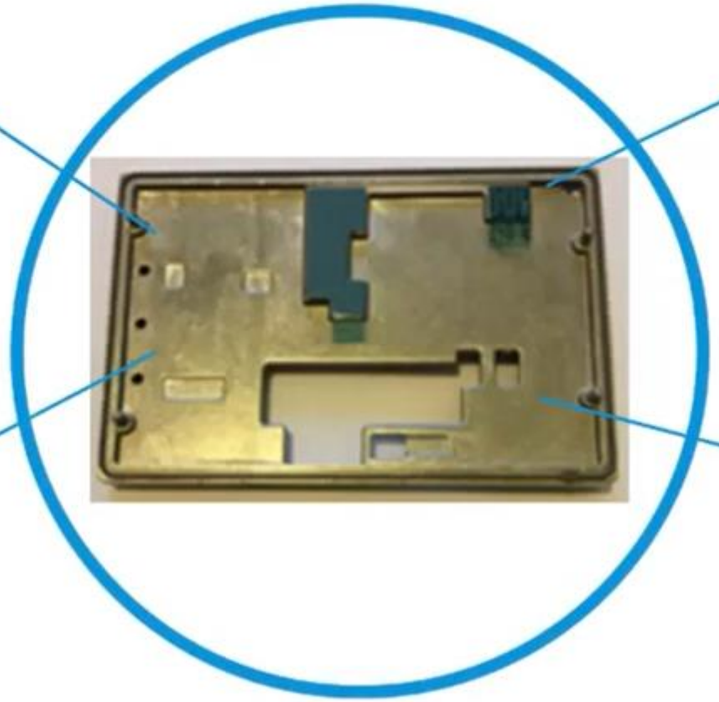
Application - ADAS Radar Heatsink Assembly

Key Technical Requirement

- EMI shielding of control board
- Thermal management of multiple ICs on control board
- High compression rate to absorb casting tolerance
- Low compression force

Issue Statement

- Direct casting to board contact caused EM leakage
- Assembly difficulty
- Risk of supply chain management



Solution

Heatsink Assembly

- FIP with triangular cross section to ensure electric contacts between board and casting and low force
- Thermal pad to meet thermal spec.
- Automated FIP+TIM placement+on line inspection+packing

Capability

- Full FIP/thermal product line
- FIP Dispensing
- Automation

THE SAFEST CHOICE
TELEREX

RF 2022
TECHNOLOGY EVENT
29 MAART 2022
QuTech/TU Delft

Solve Interference & Heat - Integrated Solutions

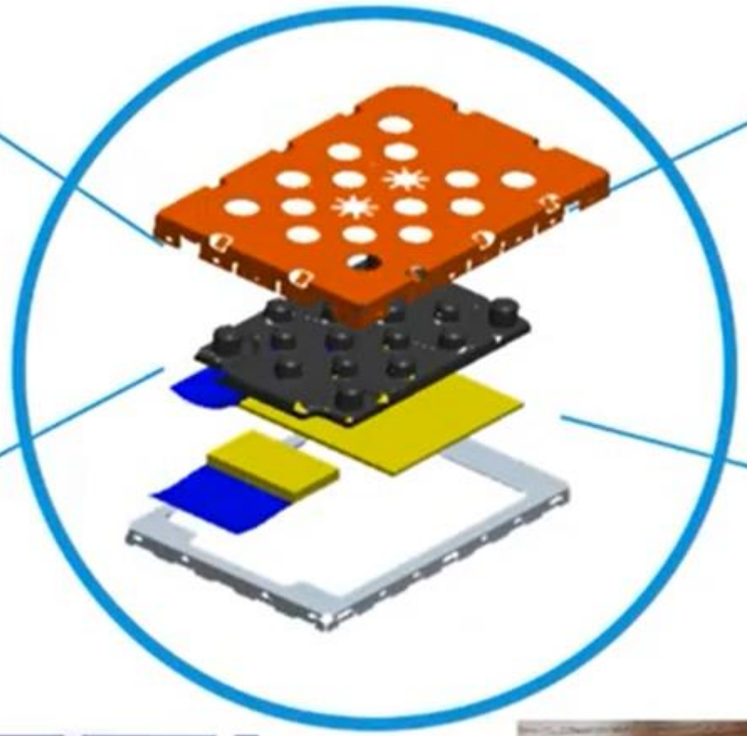
EMI Shield with Thermal Solution

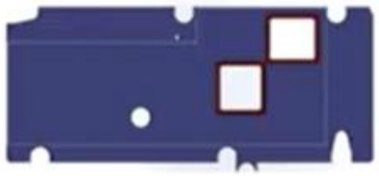
Solution Detail

- BLS/Deep draw metal +TIM
- BLS/Deep draw metal + Thermal dispensable
- Simulation (mechanical + EMI + thermal)
- Automated/manual assembly

Customer Problems

- Long term reliability
- Thermal Management
- Low compression force
- Space constrain
- EMI/EMC performance
- Supply Chain management





Target Market/Application

- Automotive: ADAS Camera
- Consumer Electronics: tablet
- System in Packaging
- Telecom: AAU
- Datacom: Switch, router

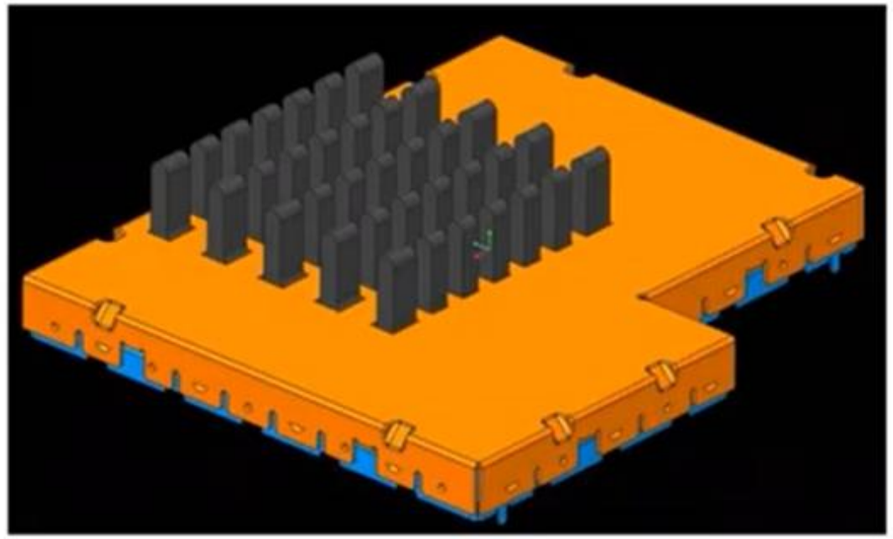
Value to Customer

- Reliable performance
- Shorter design cycle
- Total cost of ownership

Solve Interference & Heat - Integrated Solutions

Case Study on Application

- **Formerly low power consumer device getting more advanced**
  - Customer has an IOT device, which did not previously need additional cooling on SOC
  - With advancing complexity and higher power SOC used, the need for a heatsink with EMI shielding to keep SOC in proper thermal range to avoid throttling.
  - Customer wants to keep cost down and avoid active cooling or additional features to secure cooling
- **Where is this occurring:**
  - Smart home devices are being required to complete more advanced tasks now that the market is advancing
    - Home mesh routers
    - Smart vacuums
    - Smart home speakers/hubs are adding video
- **Laird one stop shop**
  - In the above case, Laird designed the shield, did the thermal modeling, designed the heatsink, chose the thermal gap pad, and would deliver the cover as one assembly

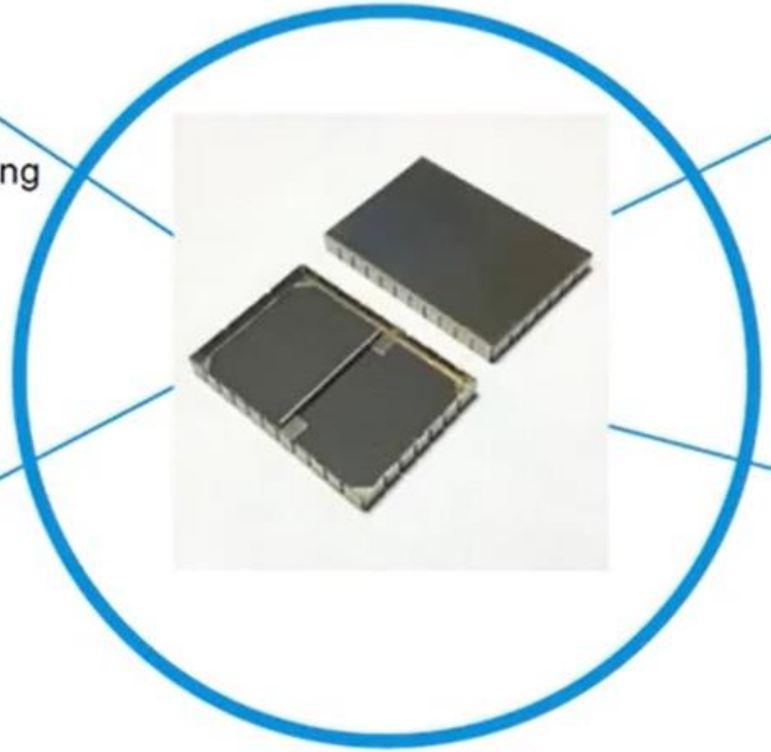


Solve Interference & Heat - Integrated Solutions

BLS cover with EMI Absorber Integrated

Solution Detail

- Absorber enhanced BLS
- BLS can be either two piece stamping
  Deep draw one piece
- EMI simulation
- Automated assembly



Target Market/Application

- Automotive: ADAS Radar
- CE: Smartphone, tablets, drone

Customer Problems

- Poor EMC at mmWave band
- Desense of devices
- Reliable performance
- Efficient assembly

Value to Customer

- Short design cycle
- Improved performance
- Low TCO
- Low supply chain risk

THE SAFEST CHOICE
TELEREX

RF 2022
TECHNOLOGY EVENT
29 MAART 2022
QuTech/TU Delft

Multifunctionele Materialen – een hybride oplossing

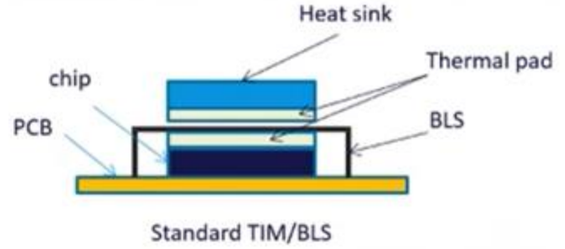
Solve Interference & Heat - Integrated Solutions

Thermal and EMI Management

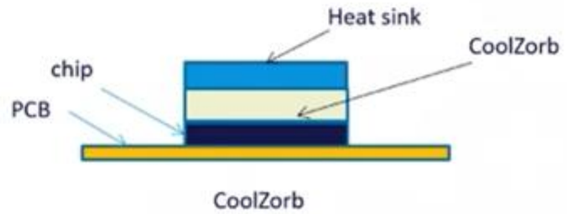
- **When to use ?**
  - Replace TIM in applications with EMI frequency concerns at 6 GHz and above to raise shielding effectiveness and suppress EMI noise
  - High data transfer rate products (ex. optical modules) are now requiring EMI absorber and additional thermal interface material due to increased EMI frequency in the 10+ GHz range and more heat generation
  - Elimination of board level shield need for low noise producing ICs by replacing existing traditional TIM

- **Key usage benefits:**
  - One layer / two functions
  - Combines performance of thermal interface material and EMI absorber
  - High thermal conductivity compared to competitors of CoolZorb
  - Suppresses unwanted radiation from IC
  - Suppresses radiating electromagnetic fields coupling between IC and heat sink
  - Reduced number of components
  - Simplified board design & layout

- Frequency Selection Guide:
  - **<2 GHz: CoolZorb-600**
  - **2 GHz - 20 GHz: CoolZorb-200** or **CoolZorb-600** based on thermal needs
  - **20+ GHz: CoolZorb-600** or **CoolZorb-500** based on thermal needs
  - **High Deflection Requirement: CoolZorb-HD500**



Standard TIM/BLS



CoolZorb

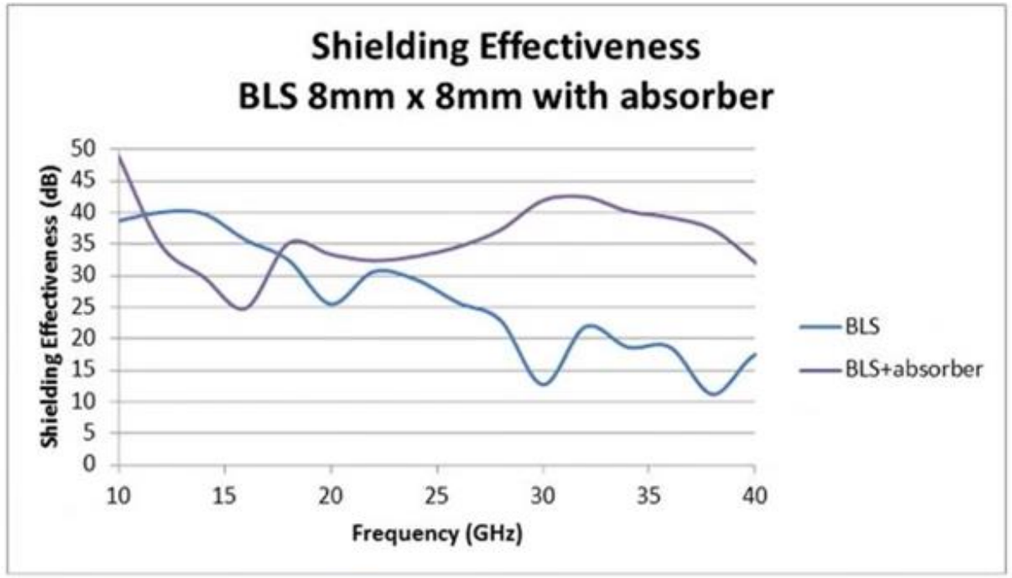
THE SAFEST CHOICE
TELEREX

RF 2022
TECHNOLOGY EVENT
29 MAART 2022
QuTech/TU Delft

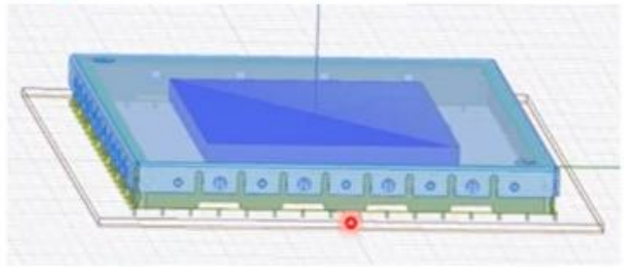
Solve Interference & Heat - Integrated Solutions

Shielding Effectiveness 10+ GHz

- Wavelength getting shorter @mmWave and easier to leak from apertures on BLS.
- Castellation often needed for effective soldering which become leakage tunnel.
- Cavity resonance leads to shielding degradation at resonant frequencies.
- Solution
  - CoolZorb replacing TIM to damp cavity resonance leading to significant SE increase



Significant increase in SE above the first cavity resonance frequency



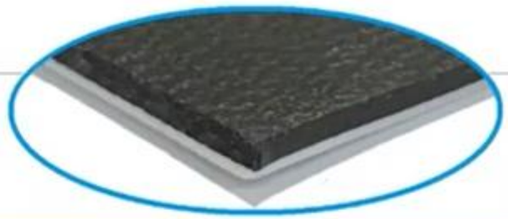
THE SAFEST CHOICE
TELEREX

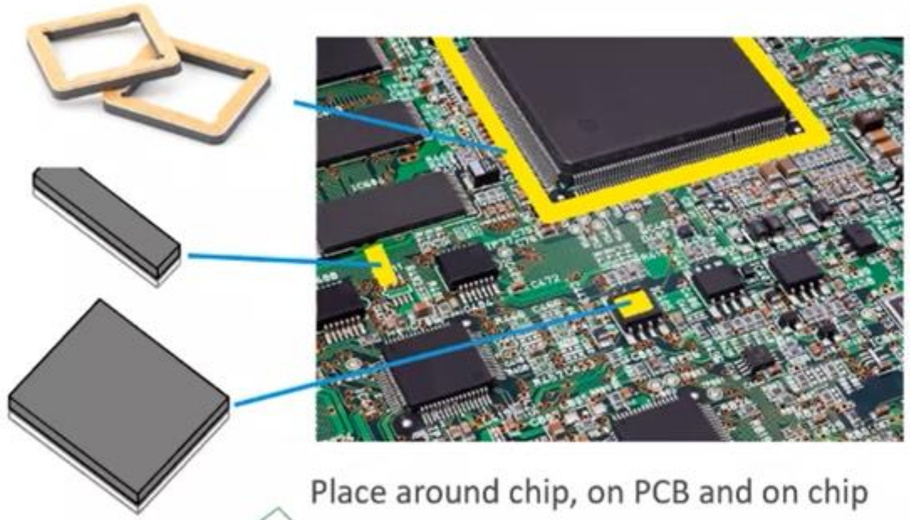
RF 2022
TECHNOLOGY EVENT
29 MAART 2022
QuTech/TU Delft

Solve Interference & Heat - Integrated Solutions

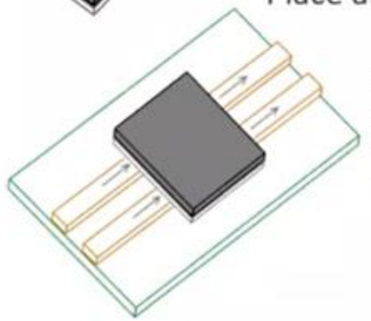
Dielectric / Absorber system

Co-rolled silicone dielectric layer with silicone absorber provides attenuation while maintain signal integrity





Place around chip, on PCB and on chip



Attenuates without effect to trace impedances

FEATURES

- All Laird elastomeric absorbers available to be used in Kzorb configuration
- Mechanically flexible
- Excellent electrical insulation
- Can be applied directly to PCB

BENEFITS

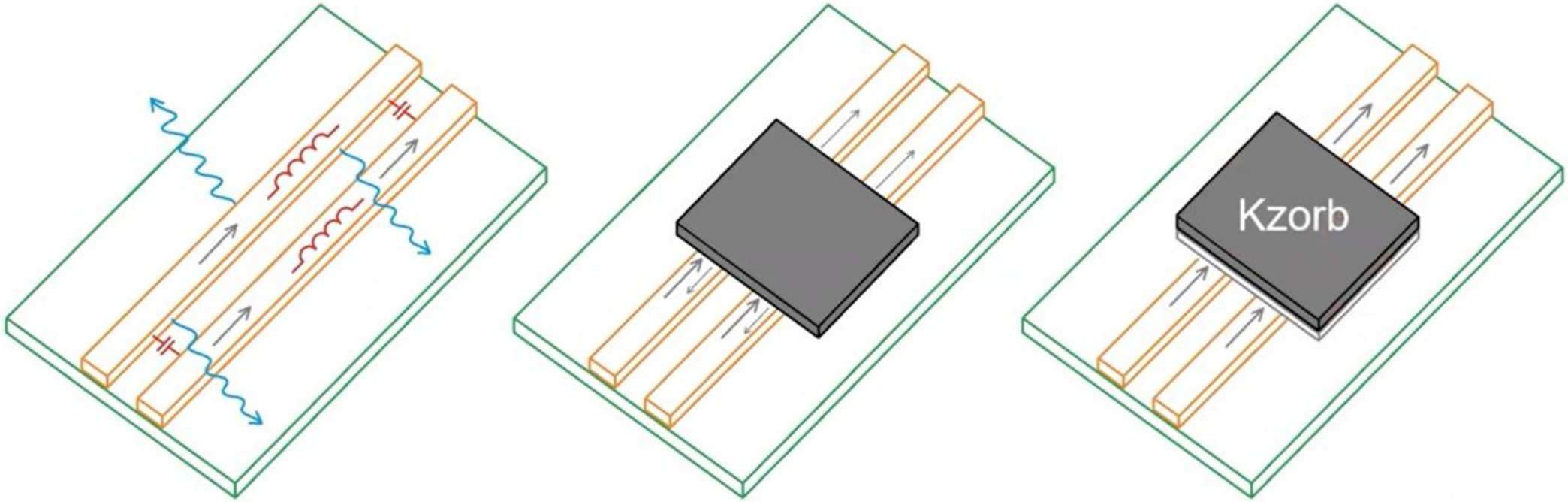
- IC chip emissions are effectively attenuated with picture frame arrangement on IC perimeter
- Dielectric properties on PCB side prevents trace impedance for better signal integrity
- Kzorb construction is co-rolled for a monolithic material (no peeling)

MARKETS / TARGET APPLICATIONS

- 5G platforms / Data infrastructure / Mobile Infrastructure / Optical transceiver
- IC chip emission attenuation around perimeter of chip
- PCB trace emission attenuation direct on board (server side for high bandwidth optical connections)
- IC Chip emission attenuation direct on chip

Solve Interference & Heat - Integrated Solutions

A Protected Absorber and How it Works



Traces pass signal freely

Absorber cause change in inductance, capacitance and impedance; signals are reflected

Kzorb spaces absorber from traces and reduces EMI

Solve Interference & Heat - Integrated Solutions

Graphite Over Foam: A Thermal Gasket

- **What is Graphite over Foam?**
  - Soft compressible gasket used for thermal transfer via the outer graphite layer
- **When to use Graphite over Foam?**
  - Thermal transfer is needed between two components in a sliding joint or insertion operation
  - Thermal transfer over a large gap (2.5mm+) is more efficient for GOF than TIM
  - Large or repeated relative vertical motion is expected after assembly (ex. Dropped device)
  - When a very low compression force is needed due to sensitive components
  - Disassembly for rework, inspection, or operation will occur
  - **(GOF3000)** Grounding is needed in conjunction with thermal transfer (2 in 1)

- **Additional key usage benefits:**
  - Vertical reliability in large gaps between components
  - Thermal conductivity can be tuned/increased with parallel graphite loops

- **GOF1000**: GOF with Polyurethane Foam:
  - Lowest cost due to more cost-effective PU foam
  - 80C maximum operating temperature
- **GOF2000**: GOF with Silicone Foam:
  - UL V0 rating (passed in house testing, but is pending UL cert.)
  - 125C maximum operating temperature
- **GOF3000**: CGOF with Copper Wrapper and Silicone Foam
  - Good electrical conductivity for grounding as well as thermal transfer
  - More force than graphite alone, still low force compared to TIM

Solve Interference & Heat - Integrated Solutions

Thin EMI Shield w/ Thermal Interface Material

Solution Detail

- Stack up film of metal foil, CPSA & TIM
- Metal foil and TIM rolled in line
- Customized converting
- Can sustain reflow
- used with BLS frame to replace BLS cover

Customer Problems

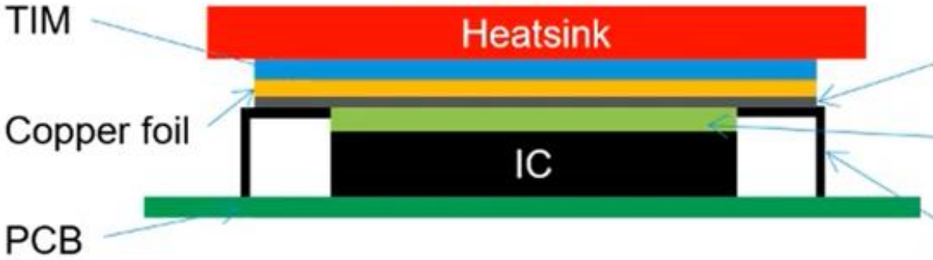
- Limited space
- Complexity of Assembly
- Repairing

Target Market/Application

- CE: Smart Phone, tablets,
- Industrial: drone, portable medical

Value to Customer

- Low height
- Disposable (easy of repairing)
- Low weight
- Low TCO



THE SAFEST CHOICE
TELEREX

RF 2022
TECHNOLOGY EVENT
29 MAART 2022
QuTech/TU Delft

Gebruik de constructie – de dragende delen

Solve Interference & Heat - Integrated Solutions

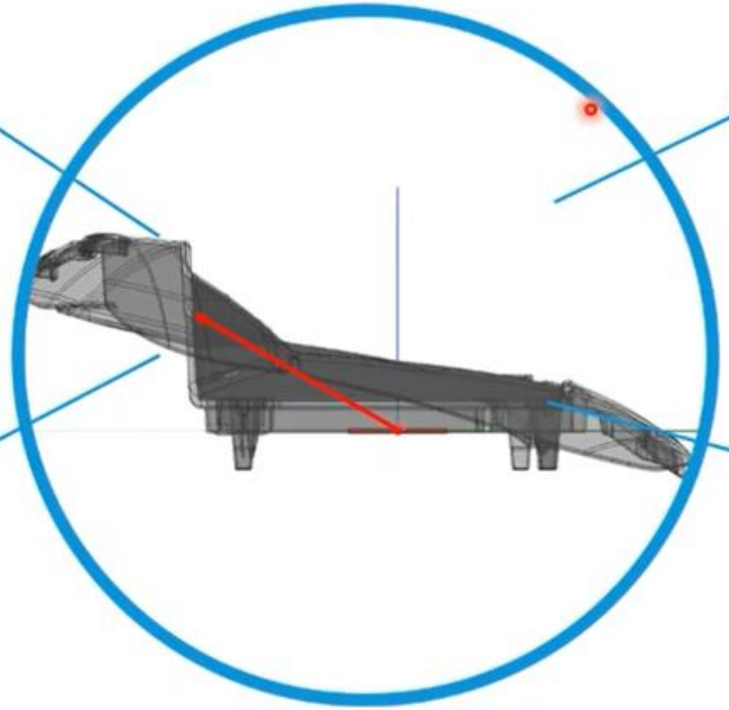
ADAS Radar Bracket

Key Technical Requirement

- Reduce radar antenna pattern distortion
- Elimination of unwanted reflection from radar surround structure such as bumper and bracket itself
- Mechanical Strength
- Feasible for mass production

Issue Statement

- High detection error due to bumper reflections
- Radar radome is tuned but bumper is not
- False detection
- Low antenna gain



Laird Solution

Radar Bracket from Patterned Injection Molded Absorber

- Specially designed surface structure pattern to eliminate surrounding reflection
- High efficiency injection molding process

Laird Capability

- EM simulation
- Surface pattern optimization
- Mold flow simulation to optimize mechanical design and reduce part deformation
- Absorber formulation
- High frequency measurement
- Injection molding expertise

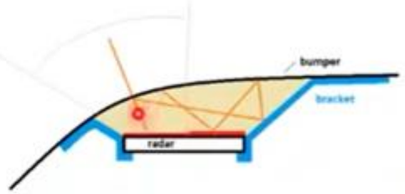
THE SAFEST CHOICE
TELEREX

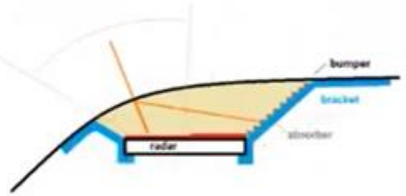
RF 2022
TECHNOLOGY EVENT
29 MAART 2022
QuTech/TU Delft

Solve Interference & Heat - Integrated Solutions

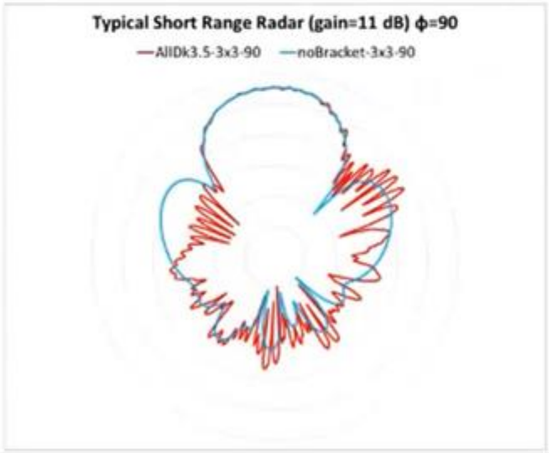
Concept Explained

- For aesthetic reasons, the radar modules are embedded inside of the car bumper
- Held in place with brackets
- Significant reflections from automobile
  - Multi-path interference
  - Introduce ambiguity in location or speed of target
- Design bracket to minimize impact of reflections

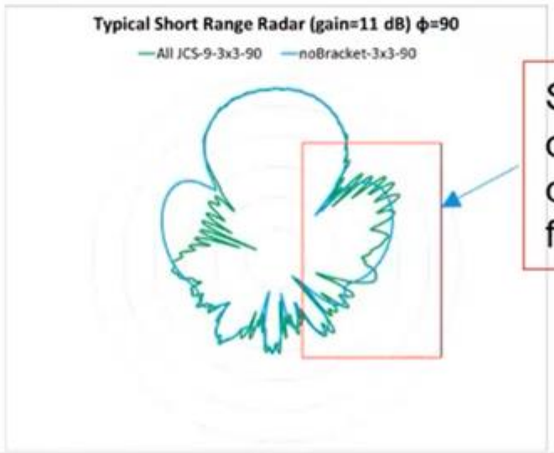




Plastic bracket

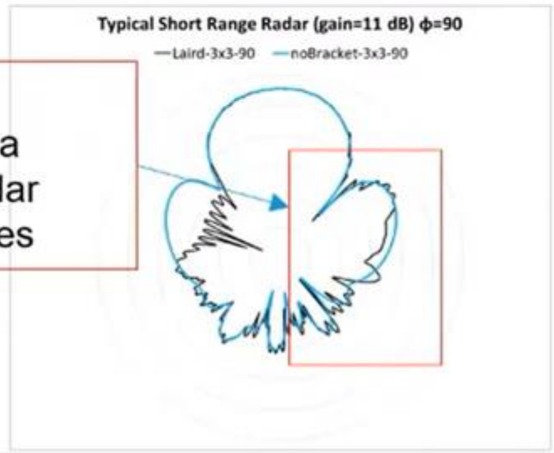


Absorber bracket



Side Lobe distortion is a cause of radar false positives

Laird ReZorb bracket



Solve Interference & Heat - Integrated Solutions

Injection Molded Materials:
Injection Molded ABS or Over Molded Precision Metals

Solution Detail

- Stamped metals over molded with injection molded materials
- Complex shaped absorbers from injection molding
- Multi-shot injection molding with traditional plastics and absorber material

Customer Problems

- Complex shape requirements
- Electrical isolation of metal components
- Limited space requiring integration of EMI absorber and metals/plastic

Target Market/Application

- Consumer
  - Acoustic chambers
- Industrial
  - Smart meter terminal
  - Remote disconnect contacts
- Telecom/Datacom
  - High data rate connectors

Value to Customer

- Metal stamping and injection molding together
- EMI shielding and EMI absorber design knowledge
- High volume manufacturing

THE SAFEST CHOICE
TELEREX

RF 2022
TECHNOLOGY EVENT
29 MAART 2022
QuTech/TU Delft

Agenda

- De Uitdagingen: Warmte en RF signaal Interferentie door hogere snelheid en kleine ruimte
- Aanpak: Zet elk onderdeel aan het werk. Praktijkvoorbeelden
- Pak de workflow aan: naar de Multifunctionele Toekomst

Solve Interference & Heat - Integrated Solutions

Workflows herzien om ontwerp te verbeteren

Hoe kunnen ontwerpingenieurs de aanzienlijke hoeveelheid signaalinterferentie en stijgende warmtelast in de geavanceerde technologie van vandaag aanpakken? Door elk onderdeel van een apparaat te beschouwen als een potentiële oplossing.

THE SAFEST CHOICE
TELEREX

RF 2022
TECHNOLOGY EVENT
29 MAART 2022
QuTech/TU Delft

Solve Interference & Heat - Integrated Solutions

Plannen voor een multifunctionele toekomst

De uitdagingen op het gebied van warmte en HF zullen alleen maar toenemen naarmate elektronica steeds grotere hoeveelheden gegevens sneller overdraagt om tegemoet te komen aan de behoeften van bedrijven en consumenten.

Ontwerpers hebben in dat geval geen andere keuze dan de multifunctionele toekomst te omarmen.

Solve Interference & Heat - Integrated Solutions

Telerex biedt oplossingen in het beschermen van uw elektronica.

We zijn gespecialiseerd in het helpen van bedrijven in allerlei sectoren bij het implementeren van multifunctionele oplossingen om HF, thermische en constructieve uitdagingen op te lossen.

THE SAFEST CHOICE
TELEREX

RF 2022
TECHNOLOGY EVENT
29 MAART 2022
QuTech/TU Delft

Solve Interference & Heat - Integrated Solutions

Hybrid - ISE

Multi-function Solutions (MFS) / ISE (Integrated Solutions Engineered)

Merged Functionality

Laird Hybrid-ISE solutions merge thermal, EMI shielding, and microwave absorbers into a single-engineered package to meet your demands for cutting-edge products. Today's electronics are creating more heat, are operating at higher frequencies, are needing to fit into smaller packages, and are relying on precise signals from their antennas to compete in an ever-evolving market landscape. Laird solutions are targeted directly to meet these challenges and needs.

Waar kunnen we u mee helpen?

Visiting address
Telerex Nederland B.V.
Minervum 7139
4817 ZN BREDA
Postal address
Postbus 6852
4802 HW BREDA

Tel: +31 76 578 20 00
E-Mail: info@telerex-europe.com

www.telerex-europe.com

Komt u naar onze stand 8?

THE SAFEST CHOICE
TELEREX

RF 2022
TECHNOLOGY EVENT
29 MAART 2022
QuTech/TU Delft