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To whom it may concern:

Subject: RF MPE EXPOSURE For FCC ID: 2ACC7LTECOMPB0

Product Name: Compensator US

Brand: KATHREIN Automotive

Model Number: LTECOMPB0

The MPE calculations for the model LTECOMPB0 were done for 3 Outside Antenna combinations and for each supported frequency band.

The calculations were done for the following frequency bands:

- Band 2 (1900 MHz)
- Band 4 (2100 MHz)
- Band 5 (850 MHz)
- Band 12/17 (700 MHz)
- Band 13 (700 MHz).
- Radiation Safety Calculated Combined Power Density

Outside Antenna combinations:

|        |                                        |                         |
|--------|----------------------------------------|-------------------------|
| Ant 1: | DA GSS/TEL/TEL/SDARS LTE               | 9350090-01              |
| Ant 2: | Telefonantenne1 Frontend Folie         | 9273669                 |
| Ant 3: | ECU-01 R1-US-3G / ANT 3G TEL GPS SDARS | 9395306-01 + 9303036-03 |

*rel*

A booster's uplink power must not exceed 1 watt equivalent isotropic radiated power (EIRP) for each band of operation. Composite downlink power must not exceed 0,05 watt EIRP for each band of operation (20.21(e)(8)(i)(D)). The following formula was used to calculate the equivalent isotropic radiated power:

$$\text{EIRP} = \text{Power Out (watt)} * \text{Duty Cycle Percent} * \text{Antenna Gain (non-log)} * \text{Coax loss (non-log)}$$

The power density (mW/cm<sup>2</sup>) is calculated using the following formula:

$$\text{Calculated Power Density} = 1000 * \text{EIRP (watt)} / (4 * \pi * (\text{Distance from Antenna (cm)})^2)$$

Yours Faithfully,



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## MPE Calculation

FCC ID: 2ACC7LTECOMPB0

| Band 2 | Ant. 1 | Ant. 2 | Ant. 3 |
|--------|--------|--------|--------|
|--------|--------|--------|--------|

### INPUT DATA

|                                           |         |         |         |
|-------------------------------------------|---------|---------|---------|
| Frequency (MHz)                           | 1910    | 1900    | 1916    |
| Pout ( W)                                 | 0,25119 | 0,25119 | 0,25119 |
| Duty Cycle (%)                            | 100     | 100     | 100     |
| Ant. Gain (dBi)                           | 3,15    | -4,00   | 0,48    |
| Coax Loss (dB) - Cable RTK031, length 1 m | 0,80    | 0,80    | 0,80    |
| Distance from Antenna (cm)                | 20      | 20      | 20      |

### RESULTS OF CALCULATIONS

|                                                |        |        |        |
|------------------------------------------------|--------|--------|--------|
| Ant. Gain less Coax. Loss (dBi)                | 2,35   | -4,80  | -0,32  |
| EIRP (W)                                       | 0,4315 | 0,0832 | 0,2333 |
| FCC Power Density Limit (mW/cm <sup>2</sup> )  | 1      | 1      | 1      |
| Calculated Power Density (mW/cm <sup>2</sup> ) | 0,0859 | 0,0165 | 0,0464 |

### REFERENCE DATA

|                                         |      |      |      |
|-----------------------------------------|------|------|------|
| Max. Pout + production tolerance (dBm)  | 24   | 24   | 24   |
| Antenna Gain (non-log)                  | 2,07 | 0,40 | 1,12 |
| Coax. Loss (non-log)                    | 0,83 | 0,83 | 0,83 |
| General FCC Limit (mw/cm <sup>2</sup> ) | 1 *  | 1 *  | 1 *  |

\* Limits for General Population/Uncontrolled Exposure (FCC Part 1.1310)

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| Band 4 | Ant. 1 | Ant. 2 | Ant. 3 |
|--------|--------|--------|--------|
|--------|--------|--------|--------|

**INPUT DATA**

|                                           |         |         |         |
|-------------------------------------------|---------|---------|---------|
| Frequency (MHz)                           | 1724    | 1750    | 1724    |
| Pout ( W)                                 | 0,15849 | 0,15849 | 0,15849 |
| Duty Cycle (%)                            | 100     | 100     | 100     |
| Ant. Gain (dBi)                           | 2,66    | -5,00   | 0,28    |
| Coax Loss (dB) - Cable RTK031, length 1 m | 0,78    | 0,78    | 0,78    |
| Distance from Antenna (cm)                | 20      | 20      | 20      |

**RESULTS OF CALCULATIONS**

|                                                |        |        |        |
|------------------------------------------------|--------|--------|--------|
| Ant. Gain less Coax. Loss (dBi)                | 1,88   | -5,78  | -0,50  |
| EIRP (W)                                       | 0,2443 | 0,0419 | 0,1413 |
| FCC Power Density Limit (mW/cm <sup>2</sup> )  | 1      | 1      | 1      |
| Calculated Power Density (mW/cm <sup>2</sup> ) | 0,0486 | 0,0083 | 0,0281 |

**REFERENCE DATA**

|                                         |      |      |      |
|-----------------------------------------|------|------|------|
| Max. Pout + production tolerance (dBm)  | 22   | 22   | 22   |
| Antenna Gain (non-log)                  | 1,85 | 0,32 | 1,07 |
| Coax. Loss (non-log)                    | 0,84 | 0,84 | 0,84 |
| General FCC Limit (mw/cm <sup>2</sup> ) | 1 *  | 1 *  | 1 *  |

\* Limits for General Population/Uncontrolled Exposure (FCC Part 1.1310)

| Band 5 | Ant. 1 | Ant. 2 | Ant. 3 |
|--------|--------|--------|--------|
|--------|--------|--------|--------|

**INPUT DATA**

|                                           |         |         |         |
|-------------------------------------------|---------|---------|---------|
| Frequency (MHz)                           | 840     | 849     | 849     |
| Pout ( W)                                 | 0,25119 | 0,25119 | 0,25119 |
| Duty Cycle (%)                            | 100     | 100     | 100     |
| Ant. Gain (dBi)                           | -0,26   | -3,00   | -3,26   |
| Coax Loss (dB) - Cable RTK031, length 1 m | 0,52    | 0,52    | 0,52    |
| Distance from Antenna (cm)                | 20      | 20      | 20      |

**RESULTS OF CALCULATIONS**

|                                                |        |        |        |
|------------------------------------------------|--------|--------|--------|
| Ant. Gain less Coax. Loss (dBi)                | -0,78  | -3,52  | -3,78  |
| EIRP (W)                                       | 0,2099 | 0,1117 | 0,1052 |
| FCC Power Density Limit (mW/cm <sup>2</sup> )  | 0,56   | 0,57   | 0,57   |
| Calculated Power Density (mW/cm <sup>2</sup> ) | 0,0418 | 0,0222 | 0,0209 |

**REFERENCE DATA**

|                                         |          |          |          |
|-----------------------------------------|----------|----------|----------|
| Max. Pout + production tolerance (dBm)  | 24       | 24       | 24       |
| Antenna Gain (non-log)                  | 0,94     | 0,50     | 0,47     |
| Coax. Loss (non-log)                    | 0,89     | 0,89     | 0,89     |
| General FCC Limit (mw/cm <sup>2</sup> ) | f/1500 * | f/1500 * | f/1500 * |

\* Limits for General Population/Uncontrolled Exposure (FCC Part 1.1310)

f = Frequency in MHz

| Band 13 | Ant. 1 | Ant. 2 | Ant. 3 |
|---------|--------|--------|--------|
|---------|--------|--------|--------|

**INPUT DATA**

|                                           |         |         |         |
|-------------------------------------------|---------|---------|---------|
| Frequency (MHz)                           | 770     | 779     | 770     |
| Pout ( W)                                 | 0,15849 | 0,15849 | 0,15849 |
| Duty Cycle (%)                            | 100     | 100     | 100     |
| Ant. Gain (dBi)                           | 0,75    | -4,00   | -6,07   |
| Coax Loss (dB) - Cable RTK031, length 1 m | 0,50    | 0,50    | 0,50    |
| Distance from Antenna (cm)                | 20      | 20      | 20      |

**RESULTS OF CALCULATIONS**

|                                                |        |        |        |
|------------------------------------------------|--------|--------|--------|
| Ant. Gain less Coax. Loss (dBi)                | 0,25   | -4,50  | -6,57  |
| EIRP (W)                                       | 0,1679 | 0,0562 | 0,0349 |
| FCC Power Density Limit (mW/cm <sup>2</sup> )  | 0,51   | 0,52   | 0,51   |
| Calculated Power Density (mW/cm <sup>2</sup> ) | 0,0334 | 0,0112 | 0,0069 |

**REFERENCE DATA**

|                                         |          |          |          |
|-----------------------------------------|----------|----------|----------|
| Max. Pout + production tolerance (dBm)  | 22       | 22       | 22       |
| Antenna Gain (non-log)                  | 1,19     | 0,40     | 0,25     |
| Coax. Loss (non-log)                    | 0,89     | 0,89     | 0,89     |
| General FCC Limit (mw/cm <sup>2</sup> ) | f/1500 * | f/1500 * | f/1500 * |

\* Limits for General Population/Uncontrolled Exposure (FCC Part 1.1310)

f = Frequency in MHz

| Band 12/17 | Ant. 1 | Ant. 2 | Ant. 3 |
|------------|--------|--------|--------|
|------------|--------|--------|--------|

**INPUT DATA**

|                                           |         |         |         |
|-------------------------------------------|---------|---------|---------|
| Frequency (MHz)                           | 720     | 719     | 720     |
| Pout ( W)                                 | 0,15849 | 0,15849 | 0,15849 |
| Duty Cycle (%)                            | 100     | 100     | 100     |
| Ant. Gain (dBi)                           | -0,38   | -2,50   | -3,59   |
| Coax Loss (dB) - Cable RTK031, length 1 m | 0,48    | 0,48    | 0,48    |
| Distance from Antenna (cm)                | 20      | 20      | 20      |

**RESULTS OF CALCULATIONS**

|                                                |        |        |        |
|------------------------------------------------|--------|--------|--------|
| Ant. Gain less Coax. Loss (dBi)                | -0,86  | -2,98  | -4,07  |
| EIRP (W)                                       | 0,1300 | 0,0798 | 0,0621 |
| FCC Power Density Limit (mW/cm <sup>2</sup> )  | 0,48   | 0,48   | 0,48   |
| Calculated Power Density (mW/cm <sup>2</sup> ) | 0,0259 | 0,0159 | 0,0124 |

**REFERENCE DATA**

|                                         |          |          |          |
|-----------------------------------------|----------|----------|----------|
| Max. Pout + production tolerance (dBm)  | 22       | 22       | 22       |
| Antenna Gain (non-log)                  | 0,92     | 0,56     | 0,44     |
| Coax. Loss (non-log)                    | 0,90     | 0,90     | 0,90     |
| General FCC Limit (mw/cm <sup>2</sup> ) | f/1500 * | f/1500 * | f/1500 * |

\* Limits for General Population/Uncontrolled Exposure (FCC Part 1.1310)

f = Frequency in MHz

## Radiation Safety – Combined Radiation from Amplifier and Cell Phone

### Calculated Power Density and Minimum Safe Distance for Cellular Phones (Uplink)

#### INPUT DATA

|                            |      |      |     |     |     |
|----------------------------|------|------|-----|-----|-----|
| Frequency (MHz)            | 1910 | 1724 | 840 | 770 | 720 |
| Radiated Power ( W)        | 1    | 1    | 1   | 1   | 1   |
| Duty Cycle (%)             | 100  | 100  | 100 | 100 | 100 |
| Distance from Antenna (cm) | 20   | 20   | 20  | 20  | 20  |

#### RESULTS OF CALCULATIONS

|                                                |      |      |      |      |      |
|------------------------------------------------|------|------|------|------|------|
| EIRP (W)                                       | 1    | 1    | 1    | 1    | 1    |
| FCC Power Density Limit (mW/cm <sup>2</sup> )  | 1    | 1    | 0,56 | 0,51 | 0,48 |
| Calculated Power Density (mW/cm <sup>2</sup> ) | 0,20 | 0,20 | 0,20 | 0,20 | 0,20 |

### Calculated Power Density and Minimum Safe Distance for Amplifier (Downlink)

#### INPUT DATA

|                                           |          |          |          |          |          |
|-------------------------------------------|----------|----------|----------|----------|----------|
| Frequency (MHz)                           | 1960     | 2132     | 881      | 751      | 737      |
| Max. Pout + production tolerance (dBm)    | 2,00E-06 | 2,00E-06 | 2,00E-06 | 2,00E-06 | 2,00E-06 |
| Duty Cycle (%)                            | 100      | 100      | 100      | 100      | 100      |
| Ant. Gain (dBi) - Worst Case              | 5        | 5        | 5        | 5        | 5        |
| Coax Loss (dB) - Cable RTK031, length 1 m | 0,80     | 0,78     | 0,52     | 0,50     | 0,48     |
| Distance from Antenna (cm)                | 20       | 20       | 20       | 20       | 20       |

#### RESULTS OF CALCULATIONS

|                                                |          |          |          |          |          |
|------------------------------------------------|----------|----------|----------|----------|----------|
| Ant. Gain less Coax. Loss (dBi)                | 4,2      | 4,22     | 4,48     | 4,50     | 4,52     |
| EIRP (W)                                       | 7,59E-06 | 7,55E-06 | 7,11E-06 | 7,08E-06 | 7,05E-06 |
| FCC Power Density Limit (mW/cm <sup>2</sup> )  | 1        | 1        | 0,59     | 0,50     | 0,49     |
| Calculated Power Density (mW/cm <sup>2</sup> ) | 1,51E-06 | 1,50E-06 | 1,41E-06 | 1,41E-06 | 1,40E-06 |

### Calculated Combined Power Density for Amplifier and Phone at 20 cm

Determined by most limiting factors → Power Density UL >> Power Density DL

|                                                                |      |      |      |      |      |
|----------------------------------------------------------------|------|------|------|------|------|
| FCC Power Density Limit (mW/cm <sup>2</sup> )                  | 1    | 1    | 0,59 | 0,50 | 0,49 |
| Combined Power Density for Phone and Amp (mW/cm <sup>2</sup> ) | 0,20 | 0,20 | 0,20 | 0,20 | 0,20 |