

## APPENDIX C: DIELECTRIC PARAMETERS OF THE TISSUE SIMULANTS

### Head tissue simulant dielectric parameters used in the measurements:

| f<br>(MHz)            | Date       | Ch 23780<br>709.0 MHz  |                | Ch 23790<br>710.0 MHz  |                | Ch 23800<br>711.0 MHz  |                |
|-----------------------|------------|------------------------|----------------|------------------------|----------------|------------------------|----------------|
|                       |            | $\epsilon_r$           | $\sigma$ [S/m] | $\epsilon_r$           | $\sigma$ [S/m] | $\epsilon_r$           | $\sigma$ [S/m] |
| LTE700                | 2014-08-13 | 44.3                   | 0.88           | 44.2                   | 0.89           | 44.2                   | 0.88           |
|                       | 2014-08-14 | 44.0                   | 0.87           | 44.0                   | 0.87           | 44.0                   | 0.87           |
|                       | 2014-08-15 | 43.2                   | 0.85           | 43.2                   | 0.86           | 43.2                   | 0.86           |
|                       | 2014-08-25 | 43.8                   | 0.88           | 43.8                   | 0.88           | 43.8                   | 0.88           |
| f<br>(MHz)            | Date       | Dielectric Parameters  |                |                        |                |                        |                |
|                       |            | Ch 128<br>824.2 MHz    |                | Ch 190<br>836.6 MHz    |                | Ch 251<br>848.8 MHz    |                |
|                       |            | $\epsilon_r$           | $\sigma$ [S/m] | $\epsilon_r$           | $\sigma$ [S/m] | $\epsilon_r$           | $\sigma$ [S/m] |
| GSM/GPRS/<br>EGPRS850 | 2014-08-15 | 43.2                   | 0.91           | 43.1                   | 0.92           | 42.9                   | 0.94           |
| f<br>(MHz)            | Date       | Dielectric Parameters  |                |                        |                |                        |                |
|                       |            | Ch 4132<br>826.4 MHz   |                | Ch 4175<br>835.0 MHz   |                | Ch 4233<br>846.6 MHz   |                |
|                       |            | $\epsilon_r$           | $\sigma$ [S/m] | $\epsilon_r$           | $\sigma$ [S/m] | $\epsilon_r$           | $\sigma$ [S/m] |
| WCDMA850              | 2014-08-07 | 42.7                   | 0.90           | 42.6                   | 0.91           | 42.5                   | 0.92           |
|                       | 2014-08-08 | 42.5                   | 0.90           | 42.4                   | 0.91           | 42.3                   | 0.92           |
| F<br>(MHz)            | Date       | Dielectric Parameters  |                |                        |                |                        |                |
|                       |            | Ch 20450<br>829.0 MHz  |                | Ch 20525<br>836.5 MHz  |                | Ch 20600<br>844.0 MHz  |                |
|                       |            | $\epsilon_r$           | $\sigma$ [S/m] | $\epsilon_r$           | $\sigma$ [S/m] | $\epsilon_r$           | $\sigma$ [S/m] |
| LTE850                | 2014-08-06 | 43.6                   | 0.92           | 43.5                   | 0.92           | 43.4                   | 0.92           |
|                       | 2014-08-07 | 42.7                   | 0.91           | 42.6                   | 0.91           | 42.5                   | 0.92           |
|                       | 2014-08-21 | 41.6                   | 0.90           | 41.5                   | 0.90           | 41.4                   | 0.91           |
|                       | 2014-08-22 | 41.6                   | 0.90           | 41.6                   | 0.91           | 41.6                   | 0.91           |
| f<br>(MHz)            | Date       | Dielectric Parameters  |                |                        |                |                        |                |
|                       |            | Ch 1312<br>1712.4 MHz  |                | Ch 1412<br>1732.4 MHz  |                | Ch 1513<br>1752.6 MHz  |                |
|                       |            | $\epsilon_r$           | $\sigma$ [S/m] | $\epsilon_r$           | $\sigma$ [S/m] | $\epsilon_r$           | $\sigma$ [S/m] |
| WCDMA1700/<br>2100    | 2014-08-19 | 39.1                   | 1.31           | 39.0                   | 1.33           | 38.9                   | 1.35           |
|                       | 2014-08-20 | 38.8                   | 1.32           | 38.7                   | 1.34           | 38.6                   | 1.36           |
| f<br>(MHz)            | Date       | Dielectric Parameters  |                |                        |                |                        |                |
|                       |            | Ch 20050<br>1720.0 MHz |                | Ch 20175<br>1732.5 MHz |                | Ch 20300<br>1745.0 MHz |                |
|                       |            | $\epsilon_r$           | $\sigma$ [S/m] | $\epsilon_r$           | $\sigma$ [S/m] | $\epsilon_r$           | $\sigma$ [S/m] |
| LTE1700/<br>2100      | 2014-08-18 | 39.0                   | 1.32           | 39.0                   | 1.33           | 38.9                   | 1.34           |

(Head tissue simulant dielectric parameters used in the measurements table continues)

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| f<br>(MHz)             | Date       | Dielectric Parameters  |                |                        |                |                        |                |
|------------------------|------------|------------------------|----------------|------------------------|----------------|------------------------|----------------|
|                        |            | Ch 512<br>1850.2 MHz   |                | Ch 661<br>1880.0 MHz   |                | Ch 810<br>1909.8 MHz   |                |
|                        |            | $\epsilon_r$           | $\sigma$ [S/m] | $\epsilon_r$           | $\sigma$ [S/m] | $\epsilon_r$           | $\sigma$ [S/m] |
| GSM/GPRS/<br>EGPRS1900 | 2014-08-07 | 38.9                   | 1.34           | 38.8                   | 1.37           | 38.7                   | 1.40           |
|                        | 2014-08-20 | 38.8                   | 1.32           | 38.7                   | 1.35           | 38.5                   | 1.38           |
| f<br>(MHz)             | Date       | Dielectric Parameters  |                |                        |                |                        |                |
|                        |            | Ch 9262<br>1852.4 MHz  |                | Ch 9400<br>1880.0 MHz  |                | Ch 9538<br>1907.6 MHz  |                |
|                        |            | $\epsilon_r$           | $\sigma$ [S/m] | $\epsilon_r$           | $\sigma$ [S/m] | $\epsilon_r$           | $\sigma$ [S/m] |
| WCDMA1900              | 2014-08-05 | 39.3                   | 1.35           | 39.2                   | 1.39           | 39.1                   | 1.42           |
|                        | 2014-08-12 | 38.9                   | 1.34           | 38.8                   | 1.36           | 38.7                   | 1.39           |
| f<br>(MHz)             | Date       | Ch 18700<br>1860.0 MHz |                | Ch 18900<br>1880.0 MHz |                | Ch 19100<br>1900.0 MHz |                |
|                        |            | $\epsilon_r$           | $\sigma$ [S/m] | $\epsilon_r$           | $\sigma$ [S/m] | $\epsilon_r$           | $\sigma$ [S/m] |
|                        |            |                        |                |                        |                |                        |                |
| LTE1900                | 2014-08-07 | 38.9                   | 1.35           | 38.8                   | 1.37           | 38.7                   | 1.39           |
|                        | 2014-08-20 | 38.7                   | 1.33           | 38.7                   | 1.35           | 38.6                   | 1.37           |
|                        | 2014-08-25 | 38.4                   | 1.41           | 38.3                   | 1.43           | 38.2                   | 1.45           |
| f<br>(MHz)             | Date       | Ch 1<br>2412.0 MHz     |                | Ch 6<br>2437.0 MHz     |                | Ch 11<br>2462.0 MHz    |                |
|                        |            | $\epsilon_r$           | $\sigma$ [S/m] | $\epsilon_r$           | $\sigma$ [S/m] | $\epsilon_r$           | $\sigma$ [S/m] |
|                        |            |                        |                |                        |                |                        |                |
| WLAN2450               | 2014-08-05 | 38.6                   | 1.78           | 38.5                   | 1.81           | 38.4                   | 1.84           |
| f<br>(MHz)             | Date       | Dielectric Parameters  |                |                        |                |                        |                |
|                        |            | Ch 20850<br>2510.0 MHz |                | Ch 21100<br>2535.0 MHz |                | Ch 21350<br>2560.0 MHz |                |
|                        |            | $\epsilon_r$           | $\sigma$ [S/m] | $\epsilon_r$           | $\sigma$ [S/m] | $\epsilon_r$           | $\sigma$ [S/m] |
| LTE2500                | 2014-08-25 | 38.0                   | 1.86           | 37.7                   | 1.87           | 37.3                   | 1.89           |
|                        | 2014-08-26 | 37.8                   | 1.88           | 37.5                   | 1.91           | 37.4                   | 1.95           |
|                        | 2014-08-27 | 38.2                   | 1.86           | 38.0                   | 1.89           | 38.0                   | 1.94           |

**Body tissue simulant dielectric parameters used in the measurements:**

| f<br>(MHz)            | Date       | Ch 23780<br>709.0 MHz  |                | Ch 23790<br>710.0 MHz  |                | Ch 23800<br>711.0 MHz  |                |
|-----------------------|------------|------------------------|----------------|------------------------|----------------|------------------------|----------------|
|                       |            | $\epsilon_r$           | $\sigma$ [S/m] | $\epsilon_r$           | $\sigma$ [S/m] | $\epsilon_r$           | $\sigma$ [S/m] |
| LTE700                | 2014-08-06 | 55.6                   | 0.92           | 55.6                   | 0.92           | 55.5                   | 0.92           |
|                       | 2014-08-11 | 55.6                   | 0.92           | 55.5                   | 0.92           | 55.5                   | 0.92           |
|                       | 2014-08-12 | 55.5                   | 0.93           | 55.6                   | 0.93           | 55.5                   | 0.93           |
|                       | 2014-08-25 | 56.0                   | 0.96           | 56.0                   | 0.96           | 56.0                   | 0.96           |
| f<br>(MHz)            | Date       | Dielectric Parameters  |                |                        |                |                        |                |
|                       |            | Ch 128<br>824.2 MHz    |                | Ch 190<br>836.6 MHz    |                | Ch 251<br>848.8 MHz    |                |
|                       |            | $\epsilon_r$           | $\sigma$ [S/m] | $\epsilon_r$           | $\sigma$ [S/m] | $\epsilon_r$           | $\sigma$ [S/m] |
| GSM/GPRS/<br>EGPRS850 | 2014-08-14 | 53.5                   | 0.95           | 53.4                   | 0.96           | 53.2                   | 0.97           |
| f<br>(MHz)            | Date       | Dielectric Parameters  |                |                        |                |                        |                |
|                       |            | Ch 4132<br>826.4 MHz   |                | Ch 4175<br>835.0 MHz   |                | Ch 4233<br>846.6 MHz   |                |
|                       |            | $\epsilon_r$           | $\sigma$ [S/m] | $\epsilon_r$           | $\sigma$ [S/m] | $\epsilon_r$           | $\sigma$ [S/m] |
| WCDMA850              | 2014-08-13 | 53.6                   | 0.95           | 53.5                   | 0.96           | 53.3                   | 0.97           |
| F<br>(MHz)            | Date       | Dielectric Parameters  |                |                        |                |                        |                |
|                       |            | Ch 20450<br>829.0 MHz  |                | Ch 20525<br>836.5 MHz  |                | Ch 20600<br>844.0 MHz  |                |
|                       |            | $\epsilon_r$           | $\sigma$ [S/m] | $\epsilon_r$           | $\sigma$ [S/m] | $\epsilon_r$           | $\sigma$ [S/m] |
| LTE850                | 2014-08-11 | 53.9                   | 0.94           | 53.9                   | 0.95           | 53.8                   | 0.96           |
|                       | 2014-08-12 | 53.7                   | 0.96           | 53.7                   | 0.97           | 53.6                   | 0.97           |
|                       | 2014-08-21 | 53.7                   | 0.95           | 53.6                   | 0.96           | 53.5                   | 0.96           |
| f<br>(MHz)            | Date       | Dielectric Parameters  |                |                        |                |                        |                |
|                       |            | Ch 1312<br>1712.4 MHz  |                | Ch 1412<br>1732.4 MHz  |                | Ch 1513<br>1752.6 MHz  |                |
|                       |            | $\epsilon_r$           | $\sigma$ [S/m] | $\epsilon_r$           | $\sigma$ [S/m] | $\epsilon_r$           | $\sigma$ [S/m] |
| WCDMA1700/<br>2100    | 2014-08-19 | 54.0                   | 1.43           | 53.9                   | 1.45           | 53.9                   | 1.47           |
|                       | 2014-08-26 | 53.3                   | 1.44           | 53.2                   | 1.46           | 53.2                   | 1.48           |
| f<br>(MHz)            | Date       | Dielectric Parameters  |                |                        |                |                        |                |
|                       |            | Ch 20050<br>1720.0 MHz |                | Ch 20175<br>1732.5 MHz |                | Ch 20300<br>1745.0 MHz |                |
|                       |            | $\epsilon_r$           | $\sigma$ [S/m] | $\epsilon_r$           | $\sigma$ [S/m] | $\epsilon_r$           | $\sigma$ [S/m] |
| LTE1700/<br>2100      | 2014-08-12 | 53.2                   | 1.42           | 53.2                   | 1.43           | 53.1                   | 1.44           |
|                       | 2014-08-13 | 53.3                   | 1.41           | 53.3                   | 1.42           | 53.3                   | 1.43           |
|                       | 2014-08-14 | 53.0                   | 1.40           | 53.0                   | 1.42           | 53.0                   | 1.43           |
|                       | 2014-08-19 | 53.9                   | 1.44           | 53.9                   | 1.45           | 53.9                   | 1.46           |
|                       | 2014-08-26 | 53.3                   | 1.45           | 53.2                   | 1.46           | 53.2                   | 1.47           |

(Body tissue simulant dielectric parameters used in the measurements table continues)

(Body tissue simulant dielectric parameters used in the measurements table continues)

| f<br>(MHz)             | Date       | Dielectric Parameters  |                |                        |                |                        |                |
|------------------------|------------|------------------------|----------------|------------------------|----------------|------------------------|----------------|
|                        |            | Ch 512<br>1850.2 MHz   |                | Ch 661<br>1880.0 MHz   |                | Ch 810<br>1909.8 MHz   |                |
|                        |            | $\epsilon_r$           | $\sigma$ [S/m] | $\epsilon_r$           | $\sigma$ [S/m] | $\epsilon_r$           | $\sigma$ [S/m] |
| GSM/GPRS/<br>EGPRS1900 | 2014-08-19 | 51.6                   | 1.47           | 51.4                   | 1.50           | 51.3                   | 1.52           |
| f<br>(MHz)             | Date       | Dielectric Parameters  |                |                        |                |                        |                |
|                        |            | Ch 9262<br>1852.4 MHz  |                | Ch 9400<br>1880.0 MHz  |                | Ch 9538<br>1907.6 MHz  |                |
|                        |            | $\epsilon_r$           | $\sigma$ [S/m] | $\epsilon_r$           | $\sigma$ [S/m] | $\epsilon_r$           | $\sigma$ [S/m] |
| WCDMA1900              | 2014-08-19 | 51.6                   | 1.47           | 51.4                   | 1.50           | 51.3                   | 1.52           |
|                        | 2014-08-20 | 51.4                   | 1.47           | 51.3                   | 1.49           | 51.2                   | 1.51           |
|                        | 2014-08-27 | 51.9                   | 1.48           | 51.8                   | 1.51           | 51.7                   | 1.54           |
| f<br>(MHz)             | Date       | Ch 18700<br>1860.0 MHz |                | Ch 18900<br>1880.0 MHz |                | Ch 19100<br>1900.0 MHz |                |
|                        |            | $\epsilon_r$           | $\sigma$ [S/m] | $\epsilon_r$           | $\sigma$ [S/m] | $\epsilon_r$           | $\sigma$ [S/m] |
| LTE1900                | 2014-08-11 | 51.9                   | 1.48           | 51.9                   | 1.50           | 51.8                   | 1.52           |
|                        | 2014-08-18 | 51.6                   | 1.48           | 51.5                   | 1.50           | 51.5                   | 1.52           |
|                        | 2014-08-26 | 52.2                   | 1.48           | 52.1                   | 1.50           | 52.0                   | 1.52           |
|                        | 2014-08-27 | 51.9                   | 1.49           | 51.8                   | 1.51           | 51.7                   | 1.53           |
| f<br>(MHz)             | Date       | Ch 1<br>2412.0 MHz     |                | Ch 6<br>2437.0 MHz     |                | Ch 11<br>2462.0 MHz    |                |
|                        |            | $\epsilon_r$           | $\sigma$ [S/m] | $\epsilon_r$           | $\sigma$ [S/m] | $\epsilon_r$           | $\sigma$ [S/m] |
| WLAN2450               | 2014-08-18 | 52.1                   | 1.85           | 52.4                   | 1.92           | 52.5                   | 1.96           |
| f<br>(MHz)             | Date       | Dielectric Parameters  |                |                        |                |                        |                |
|                        |            | Ch 20850<br>2510.0 MHz |                | Ch 21100<br>2535.0 MHz |                | Ch 21350<br>2560.0 MHz |                |
|                        |            | $\epsilon_r$           | $\sigma$ [S/m] | $\epsilon_r$           | $\sigma$ [S/m] | $\epsilon_r$           | $\sigma$ [S/m] |
| LTE2500                | 2014-08-20 | 51.8                   | 2.00           | 51.7                   | 2.05           | 51.6                   | 2.09           |
|                        | 2014-08-21 | 51.3                   | 2.02           | 51.1                   | 2.07           | 51.0                   | 2.11           |
|                        | 2014-08-22 | 53.4                   | 2.01           | 53.3                   | 2.05           | 53.2                   | 2.09           |