

AN 1901

OmniDir5030-iL Reference Design for G2iL and G2iL+

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Application note

Document information

| Info | Content |
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| Abstract | This application note is a reference antenna design description for the UCODE G2iL / G2iL+ IC. |



Revision history

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|-----|------------|------------------------------------|
| 1.0 | 02.04.2010 | First initial release; Author: BFI |

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1. OmniDir Reference Antenna Design

1.1 Geometry

- Dimensions of the design: 95 mm x 10 mm;
- Antenna material: aluminium; thickness 10um;
- Substrate material: PET; thickness 50um;
- Antenna should be matched to following assembled IC impedance:
($Z_{\text{ass. IC}} = 17.3 - j 171.4 \text{ Ohm @ } 915 \text{ MHz @ } P_{\text{IC}} = P_{\text{IC min}} + 0.5\text{dB}$);
 $C_{\text{serial}} = 1.02 \text{ pF}$;

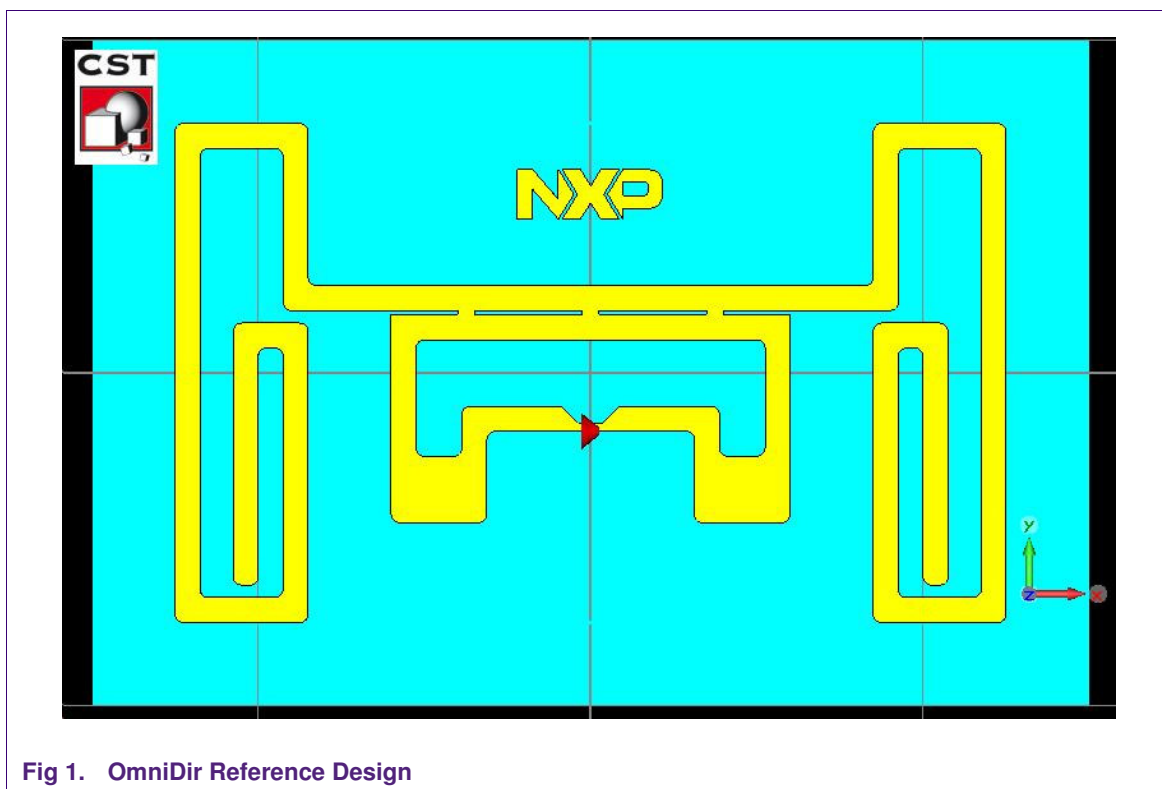


Fig 1. OmniDir Reference Design

2. CST Simulation Results

The following simulations are solved using CST with Transient Solver, a commercial 3-D solver for electromagnetic structures used for antenna design and the design of complex RF electronic circuit elements.

2.1 Antenna Impedance

One of the key characteristics of the label antenna is its complex input impedance as a function of frequency. The curves of Antenna_Real Part and Antenna_Imaginary Part of the optimized design are shown in **Fig.2**. The marker is on the position of the resonance frequency from the S11 curve. This shows the matching between the antenna and the assembled IC impedance.

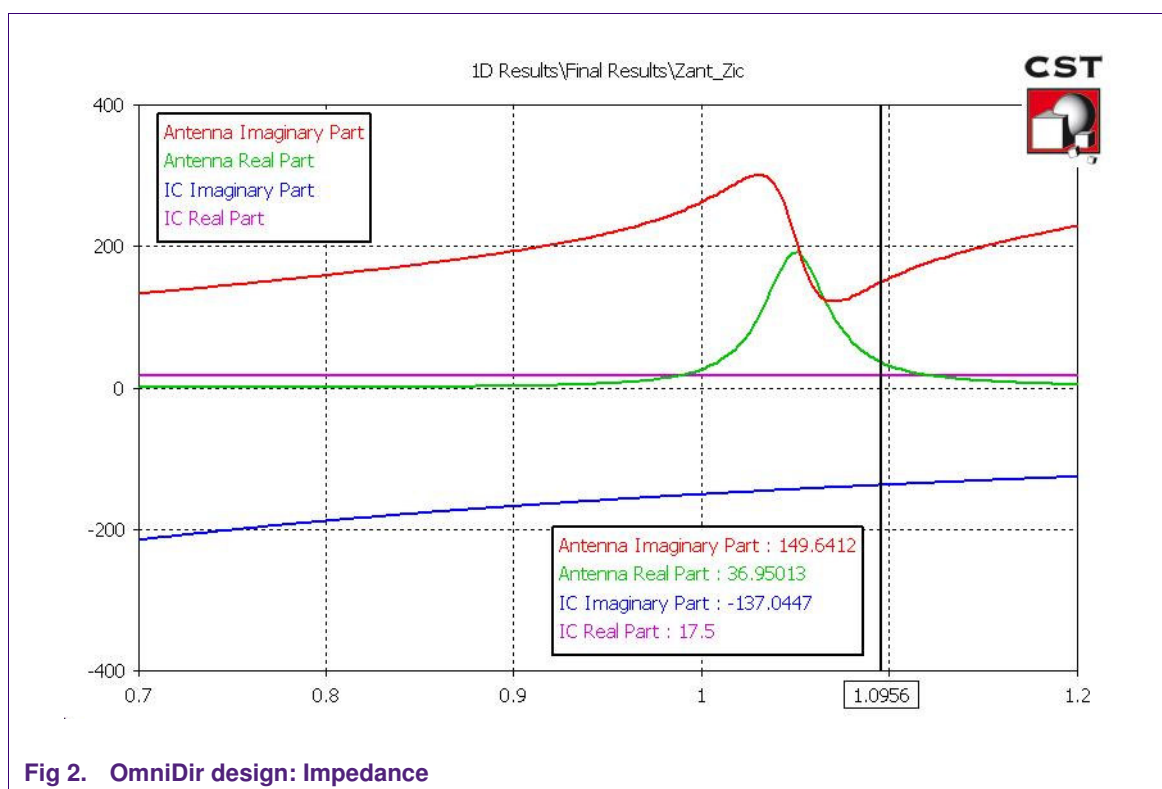


Fig 2. OmniDir design: Impedance

2.2 Return Loss

The antenna impedance on one side and the assembled IC impedance on the other let calculate the return loss, Γ , which show a degree of matching between them (**Equation 1**).

$$\Gamma = \frac{Z_A - Z_{IC}^*}{Z_A + Z_{IC}} \quad (1)$$

The corresponded curve is shown in **Fig 3**. The curve is based on the assumption that the IC impedance remains constant for all frequencies and corresponds to those, measured at 915MHz by $P_{IC} = P_{min\ IC} + 0.5\ \text{dB}$.

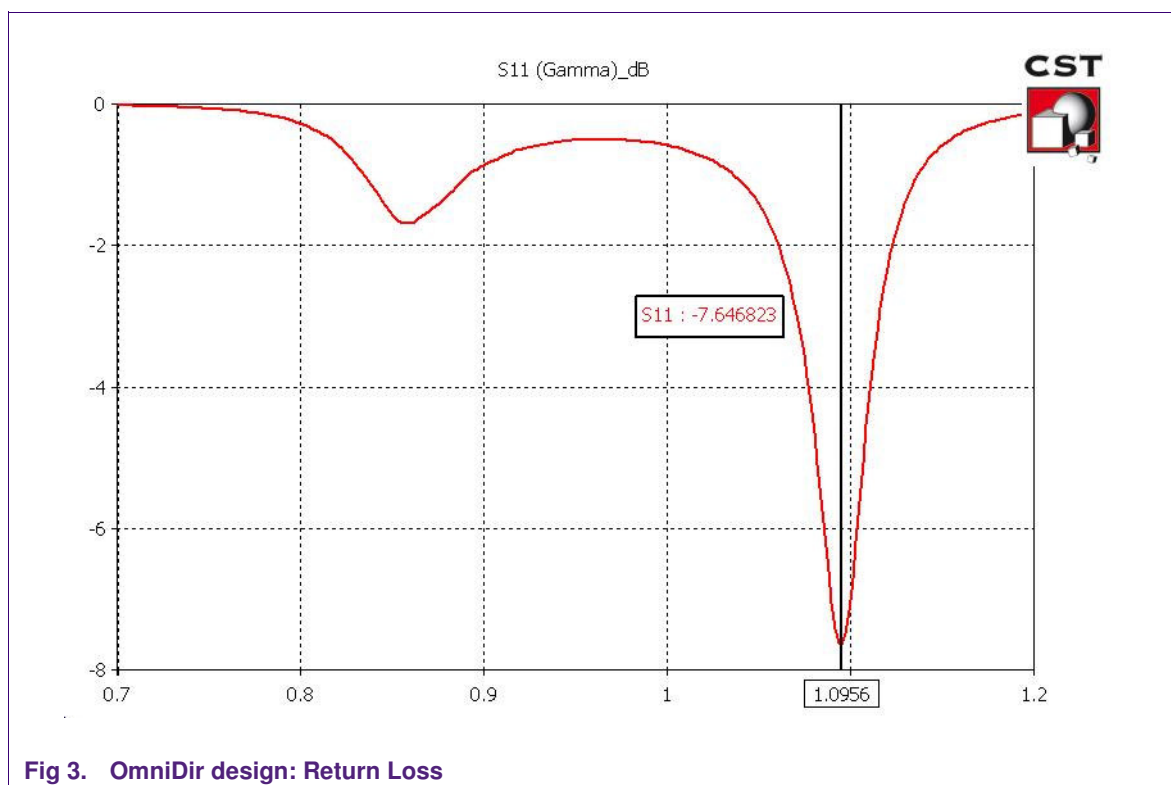


Fig 3. OmniDir design: Return Loss

The matched frequency area covers the whole UHF RFID frequency band (860-960 MHz) as well additional frequency band up to 1.1 GHz, thus building a margin which accounts for frequency shift which takes place when additional dielectrics (laminates, garments) come in contact with label in an application.

2.3 Antenna Gain

The label radiation properties are shown in Fig 4 - Fig 7. The maximal Gain is 0.96 dBi. The minimum Gain is -8 dBm. The antenna has null-filling thanks to its special bent geometry and radiates in the direction of its axis (Axis Y). The difference is 8 dB.

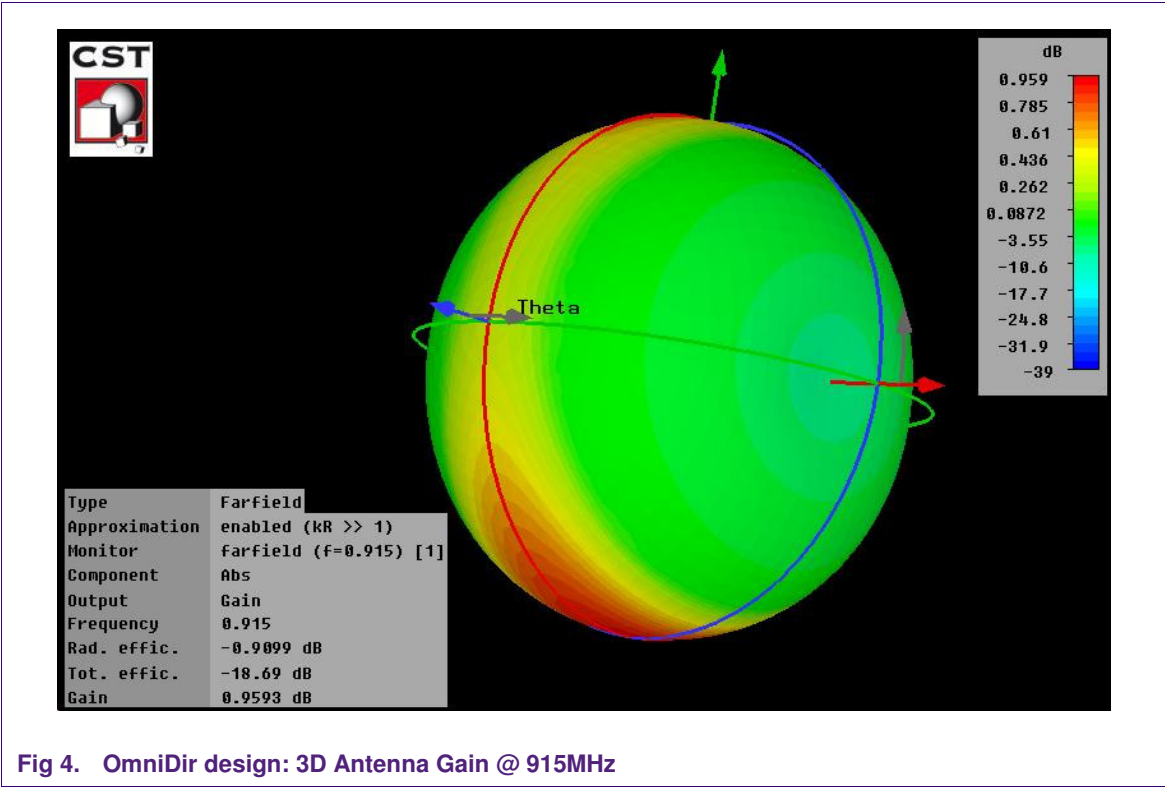


Fig 4. OmniDir design: 3D Antenna Gain @ 915MHz

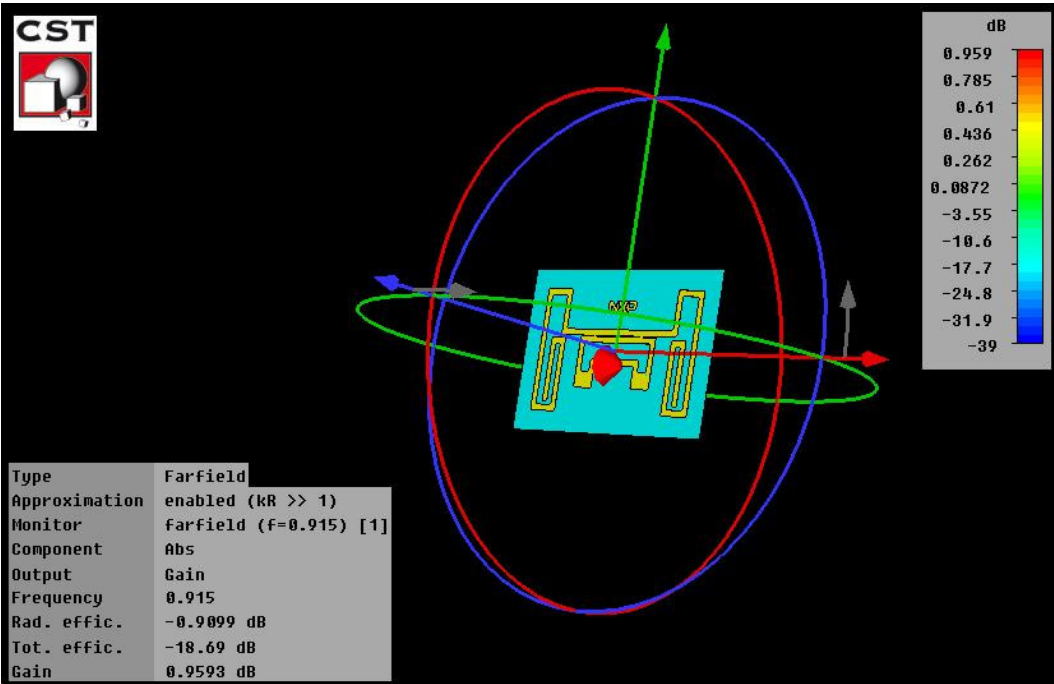


Fig 5. OmniDir design: 3D Antenna Gain @ 915MHz – label position

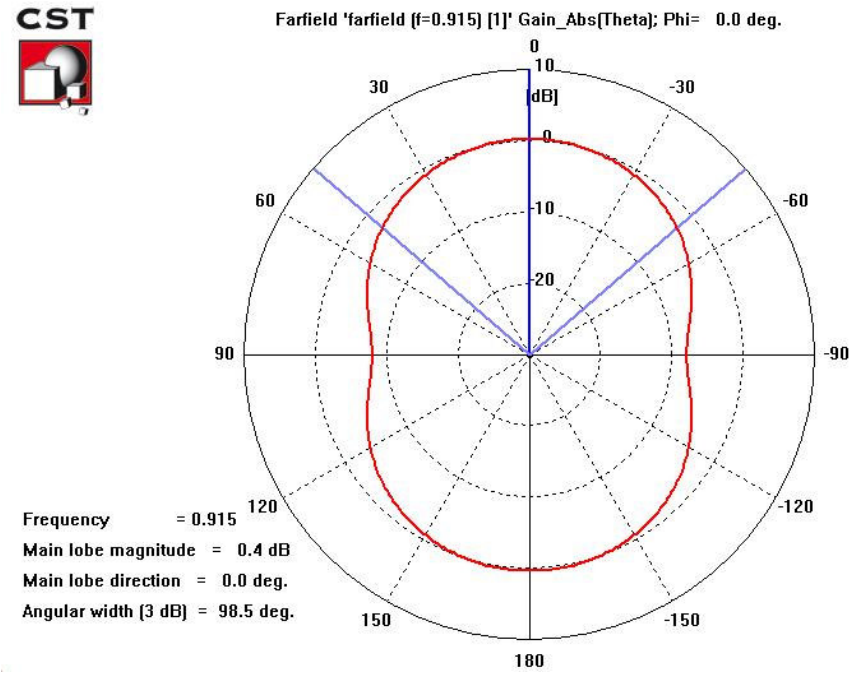
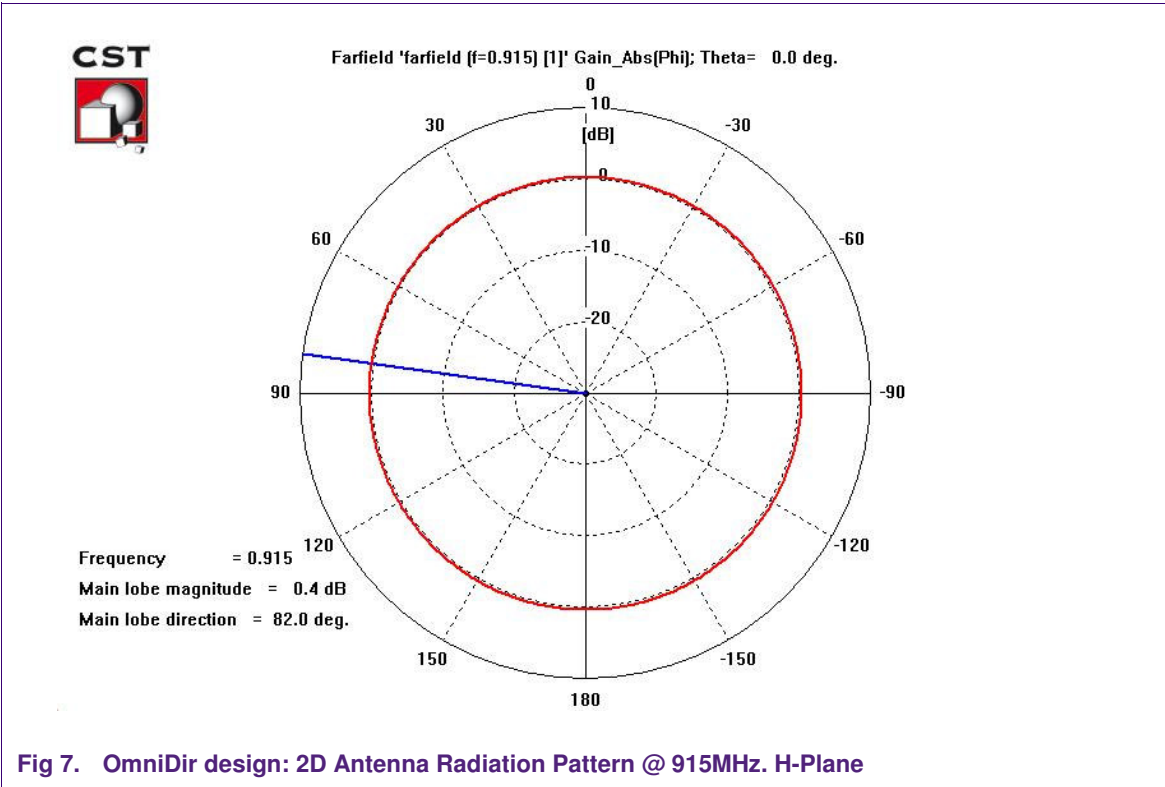


Fig 6. OmniDir design: 2D Antenna Radiation Pattern @ 915MHz. E-Plane



3. Assembly process

3.1 Equipment

- Thermode Test Station TTS 300 from Mühlbauer
- Low force thermode

3.2 Recommended assembly parameters

- Antenna: Alu 10um
- Substrate: PET 50um
- Glue: E&C 13975-11A
- Temperature
 - Upper thermode: 190 °C
 - Lower thermode: 160 °C
- Bonding time: 10 sec.
- Bonding pressure: 1,9 N

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