

MINIATURE 3.1-10.6 GHz FCC TRANSMITTER FOR UWB IMPULSE RADIO

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Context and Goals

- FCC IR – UWB : 3.1 - 10.6 GHz
- Low cost and low power applications : RFID, WPAN, ...
- Design a low cost transmitter for impulse radio UWB :
 - SiP approach
 - Printed antenna on PCB
 - A single CMOS die pulse generator
 - Standard wirebond attach

Technologies

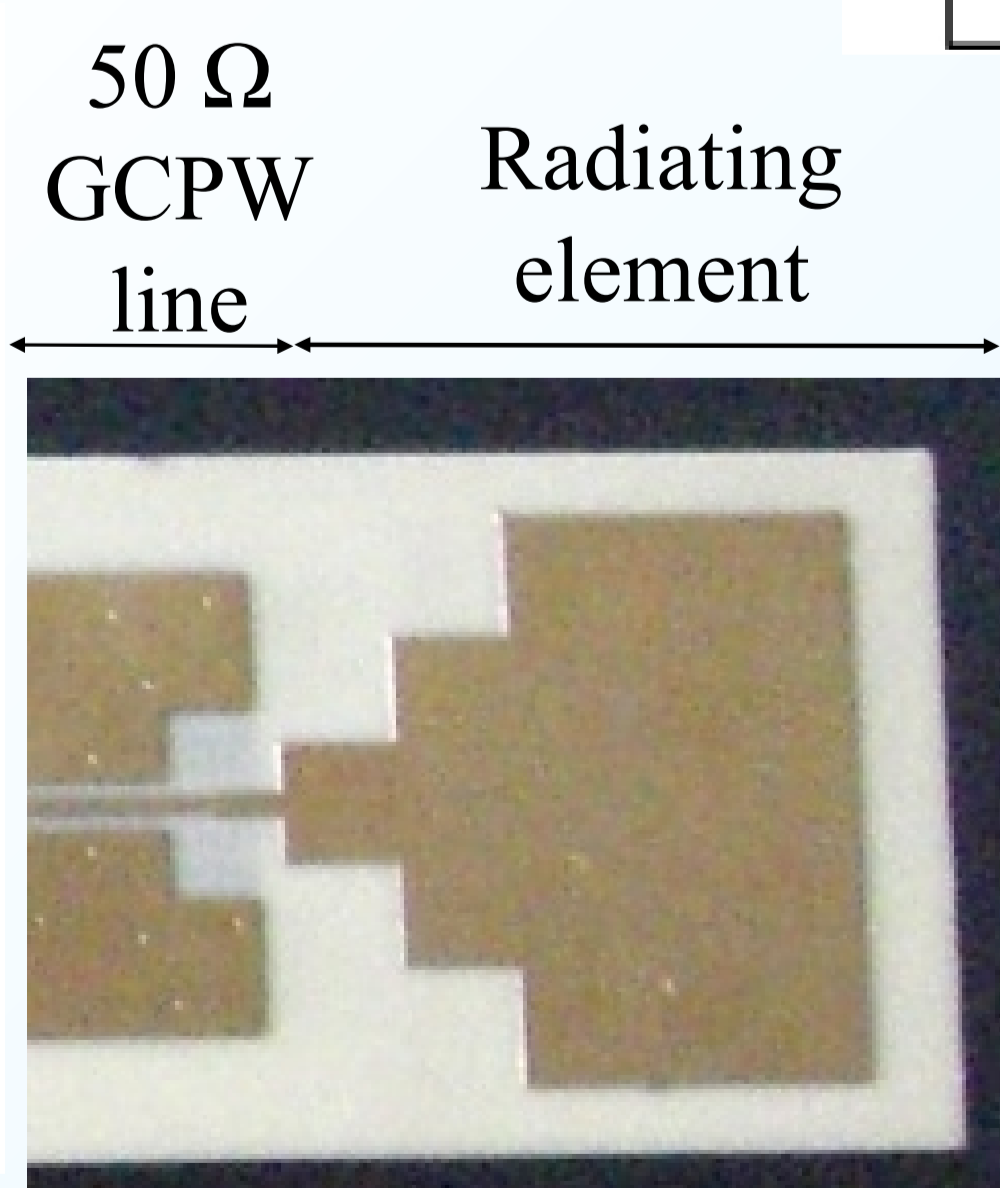
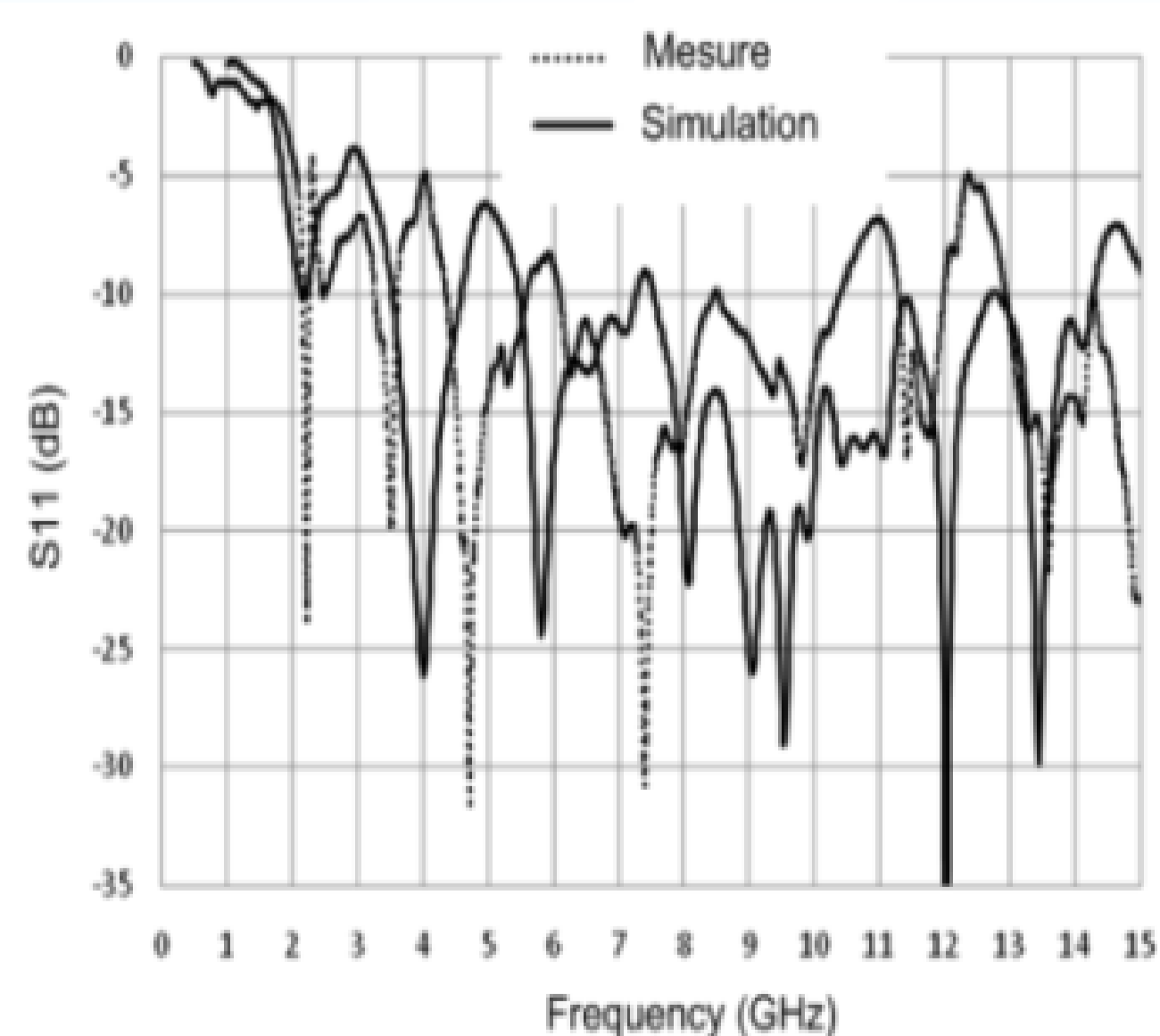
- Rogers 4003 PCB
- CMOS die 0.13 μm (HCMOS9)
- Alumina wirebond

Design Methodology and problematic

- Design an antenna printed on the PCB which covers the whole FCC band
- Do the RF transition between the die and the PCB with wirebonds and without degrading the signal integrity
- Design a low power pulse generator on chip

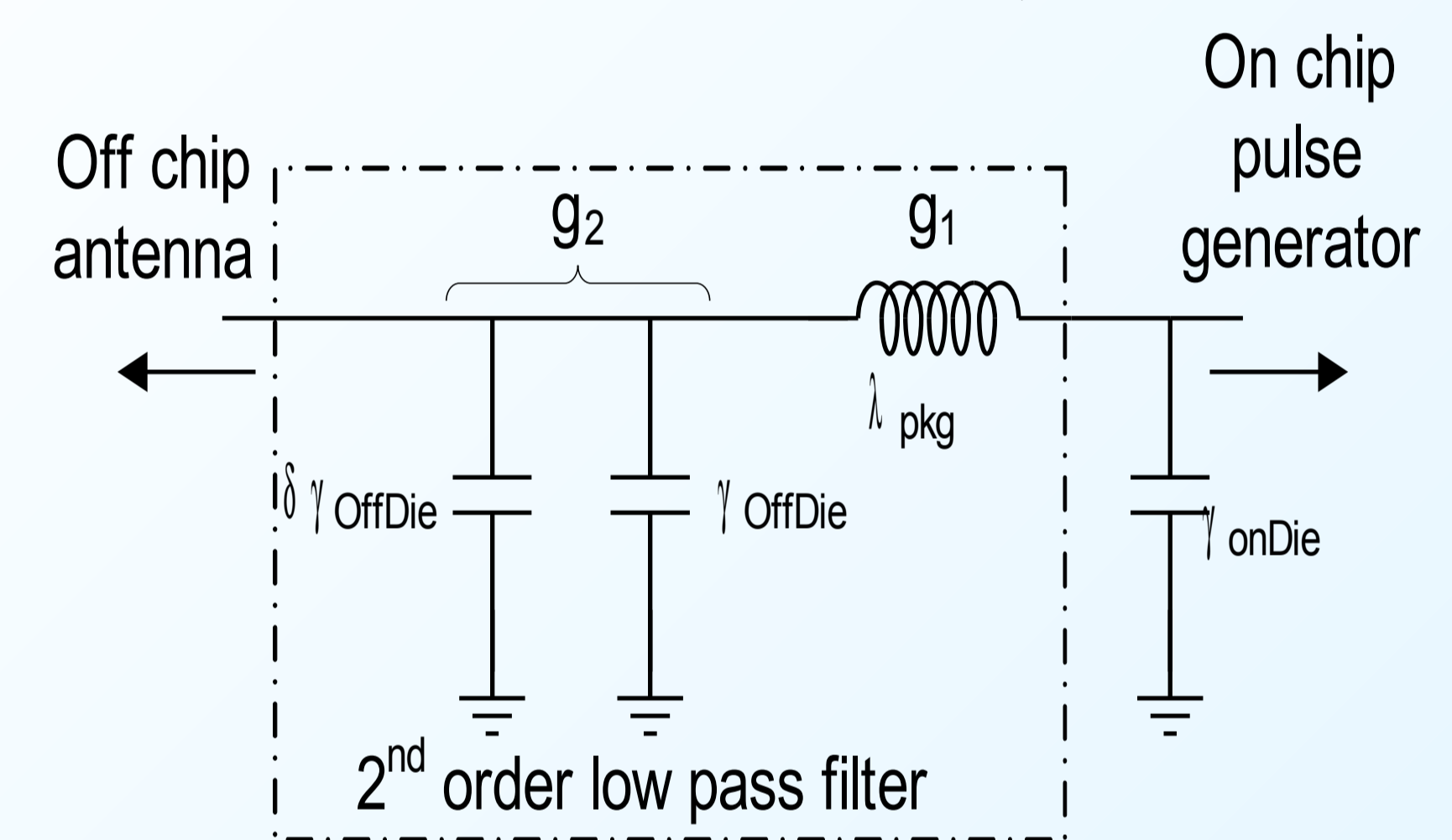
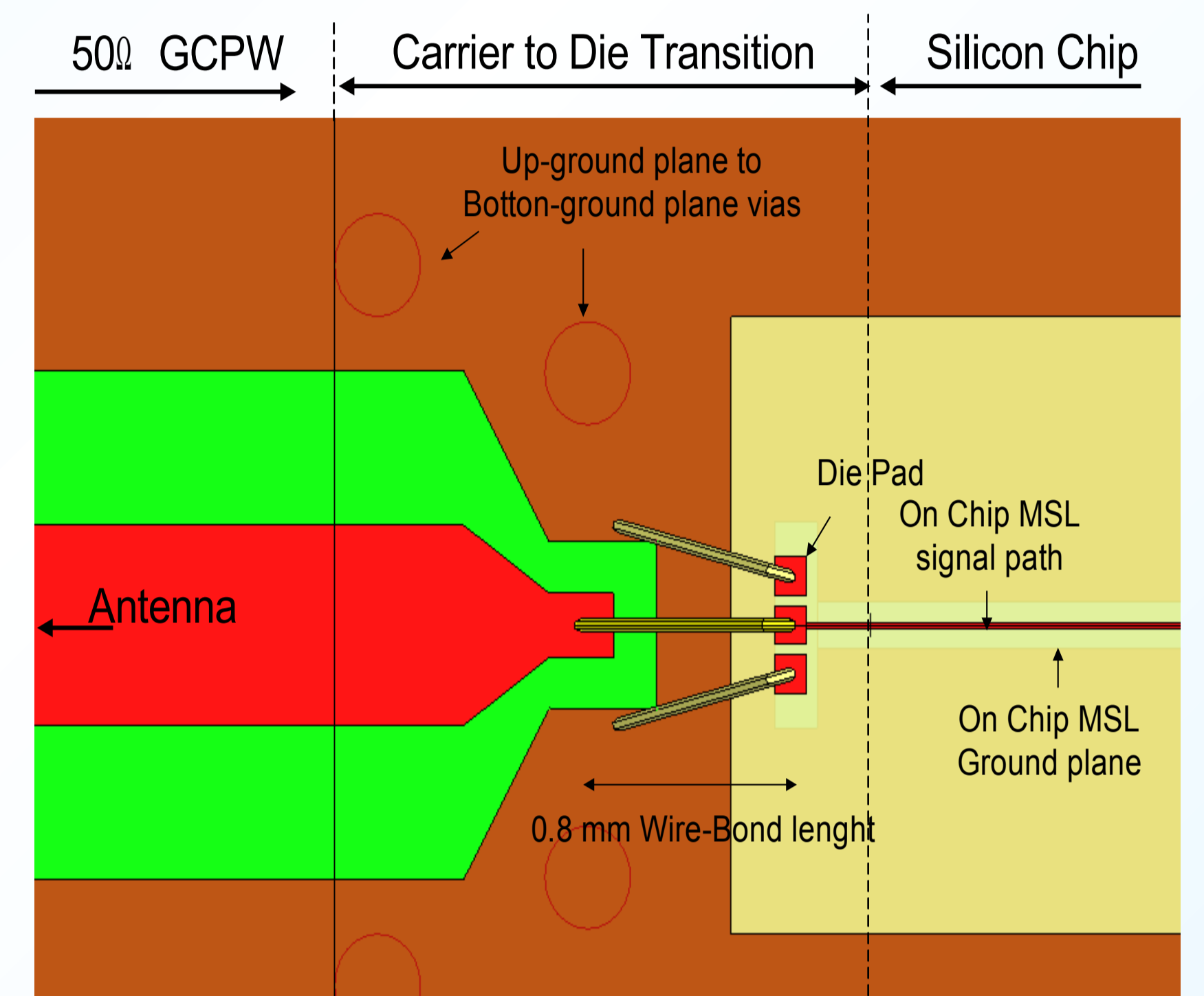
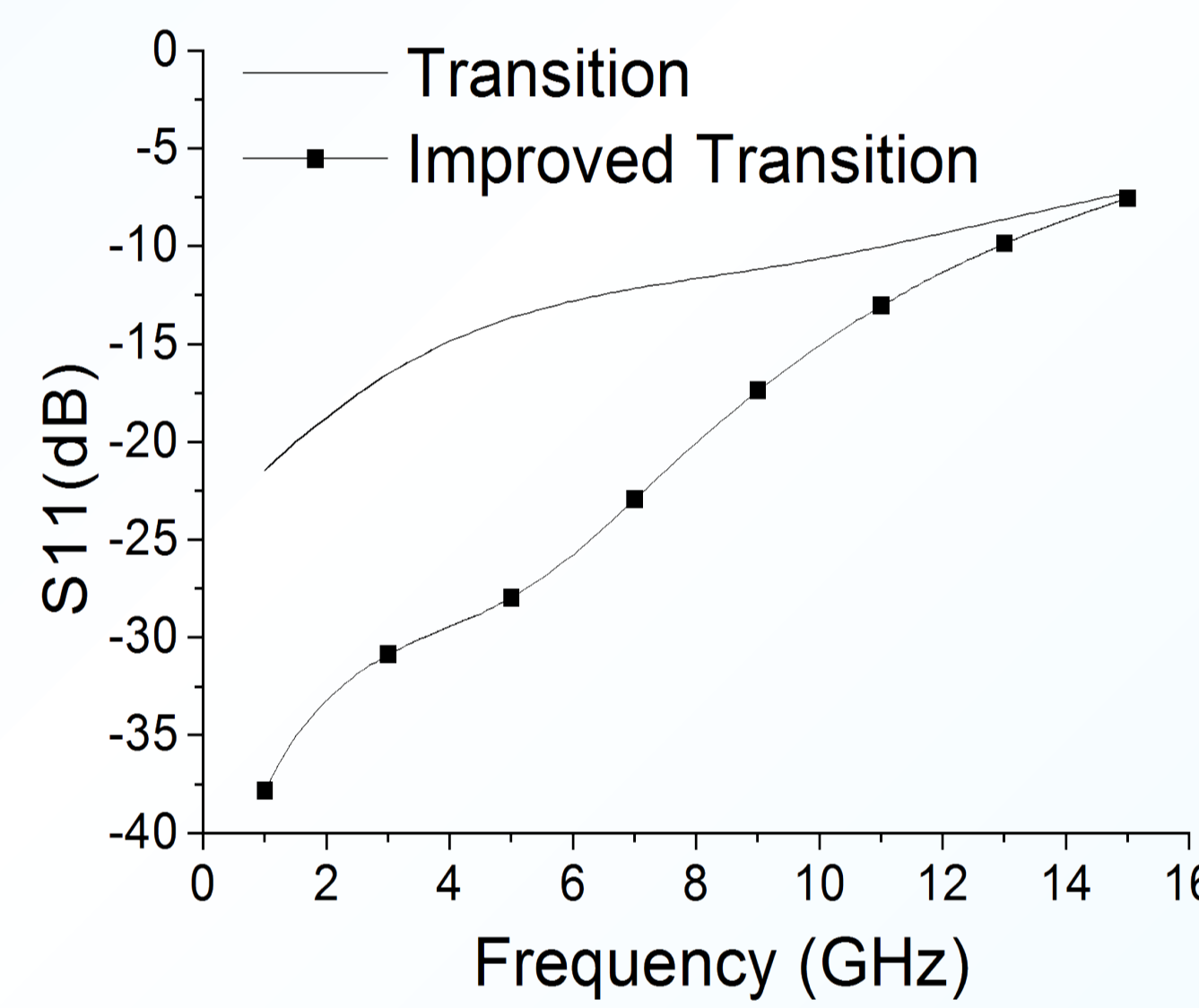
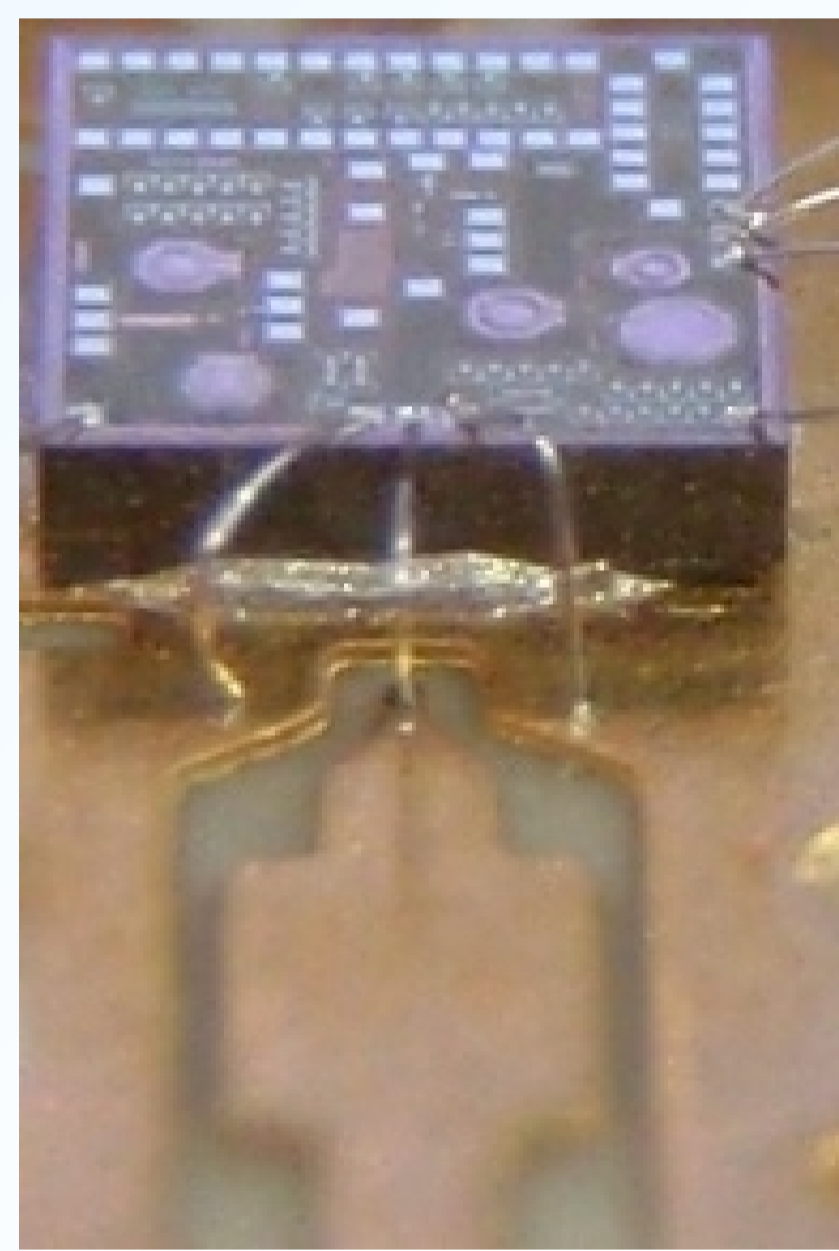
Antenna design

- Monopole antenna printed on PCB
- Size of 12 * 13 mm²
- Antenna is fed by a 50 Ω GCPW line
- Electromagnetic simulation with CST
- Return loss greater than 5 dB in the FCC band



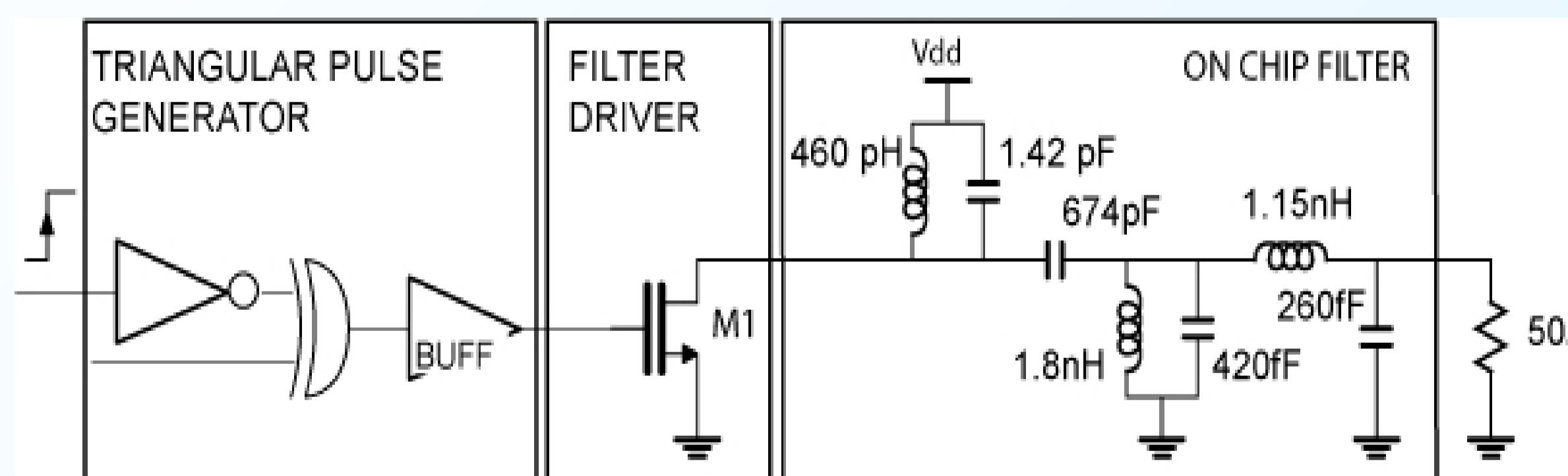
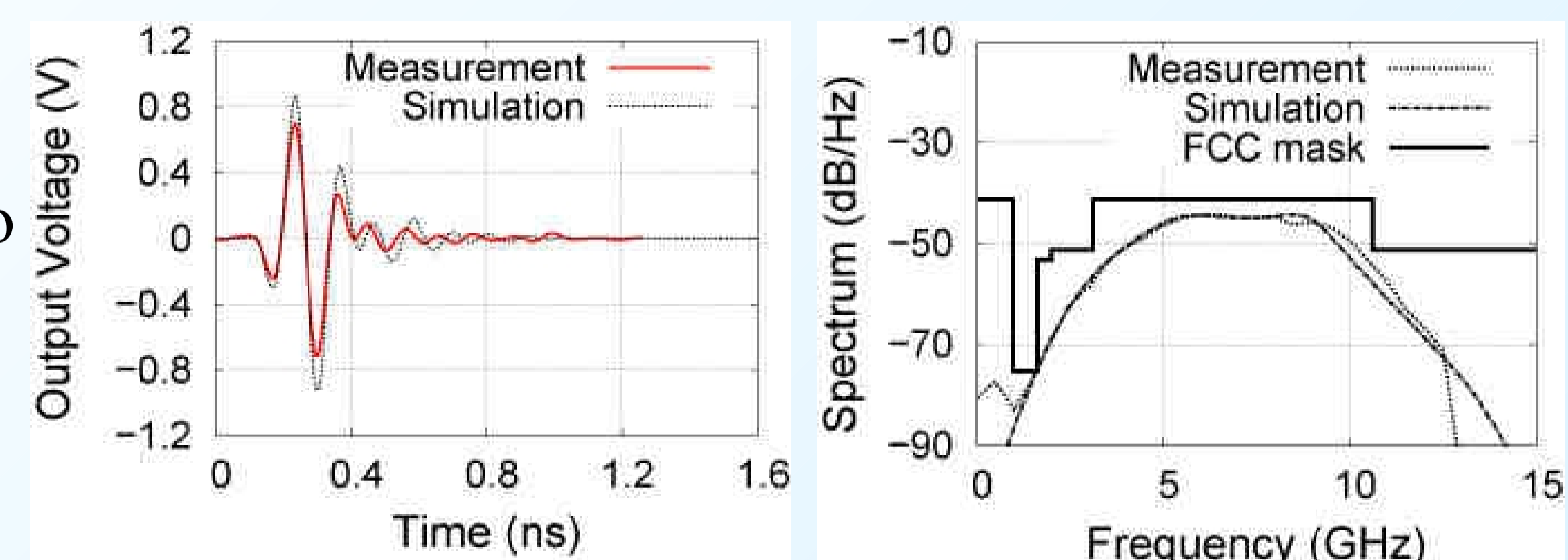
Wirebond transition

- Low cost needs standard wirebond attach
- HFFS simulations show that transition can be approximated by a π model
- Transition can be improved by embedding a low pass filter
 - A distributed capacitor is added on PCB



Pulse generator

- Pulse generator is based on impulse filter response
- A short impulsion is created thanks to numeric stage on chip
- Filter excitation is achieved using the impulsion created with the help of a current driver



- Power consumption is 3.8mW at 100MHz Pulse Repetition Frequency
- Energy consumption is 10.5pJ per pulse
- Measured pulse voltage magnitude 1.42Vpp

FCC transmitter

- Demo consists in generating pulses with transmitter and in receiving them with an oscilloscope
- Pulses of 8.5 and 5 mV have been obtained from distance of respectively 30 and 50 cm

