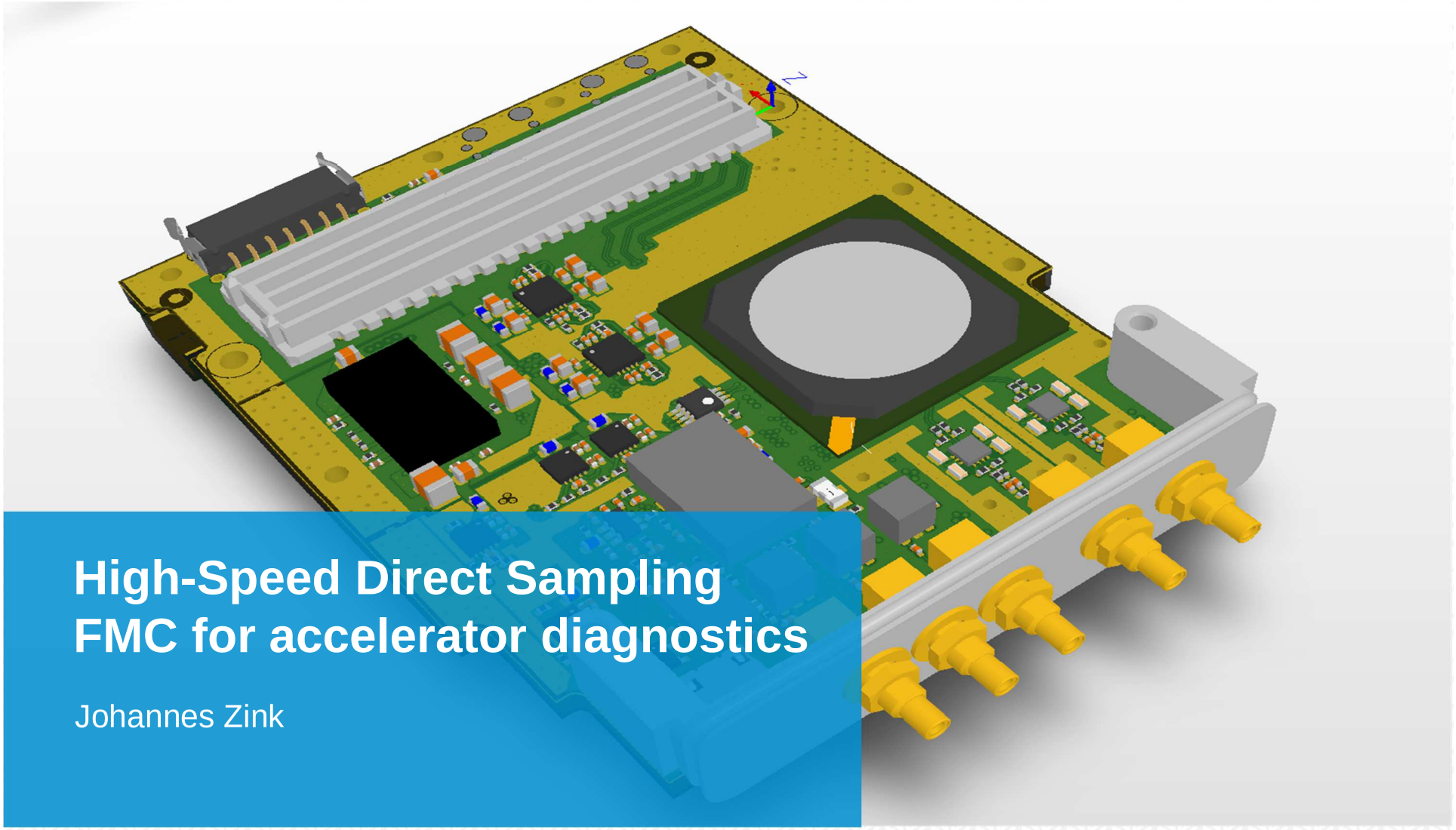


# High-Speed Direct Sampling FMC for accelerator diagnostics

Johannes Zink

MicroTCA TECHNOLOGY LAB
A HELMHOLTZ INNOVATION LAB

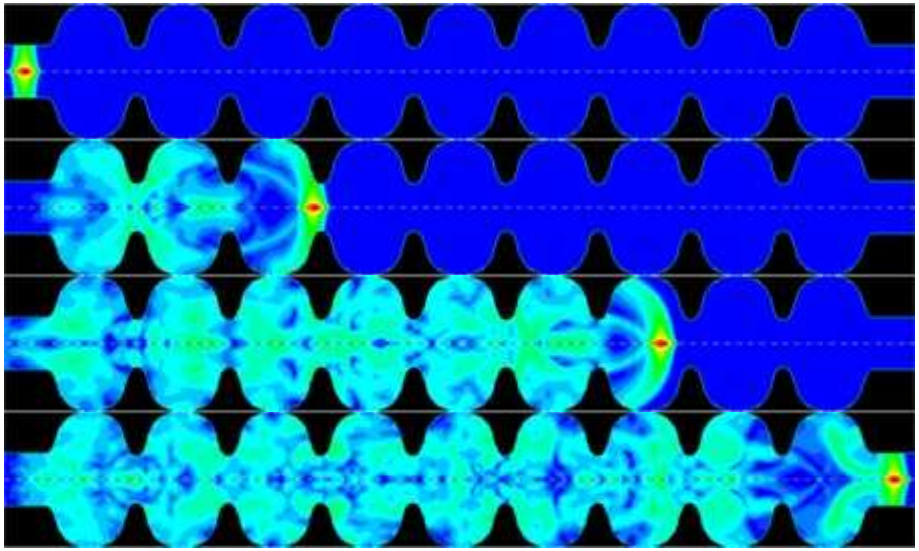
DESY

6th MicroTCA Workshop, DESY 2017

# AGENDA

1. Applications in accelerator diagnostics
2. DFMC-DS800 Overview
3. DFMC-DS800 Clock Tree
4. DFMC-DS800 PLL Configurations
5. Power Supply Evaluation Modules
6. Industrial applications and Outlook

# Applications in accelerator diagnostics



bunch passing a cavity, H.Padamsee

Klystron melt-down after arc, TV transmitter

## High-Order Modes

- electron bunch excites HOM in cavity
- signals from HOM couplers can provide informations about:

1. beam position
2. beam charge
3. cavity alignment

– „Electronics for High-Order Modes Detection“, Uros Mavric et al. (next presentation)

## Klystron Lifetime Management

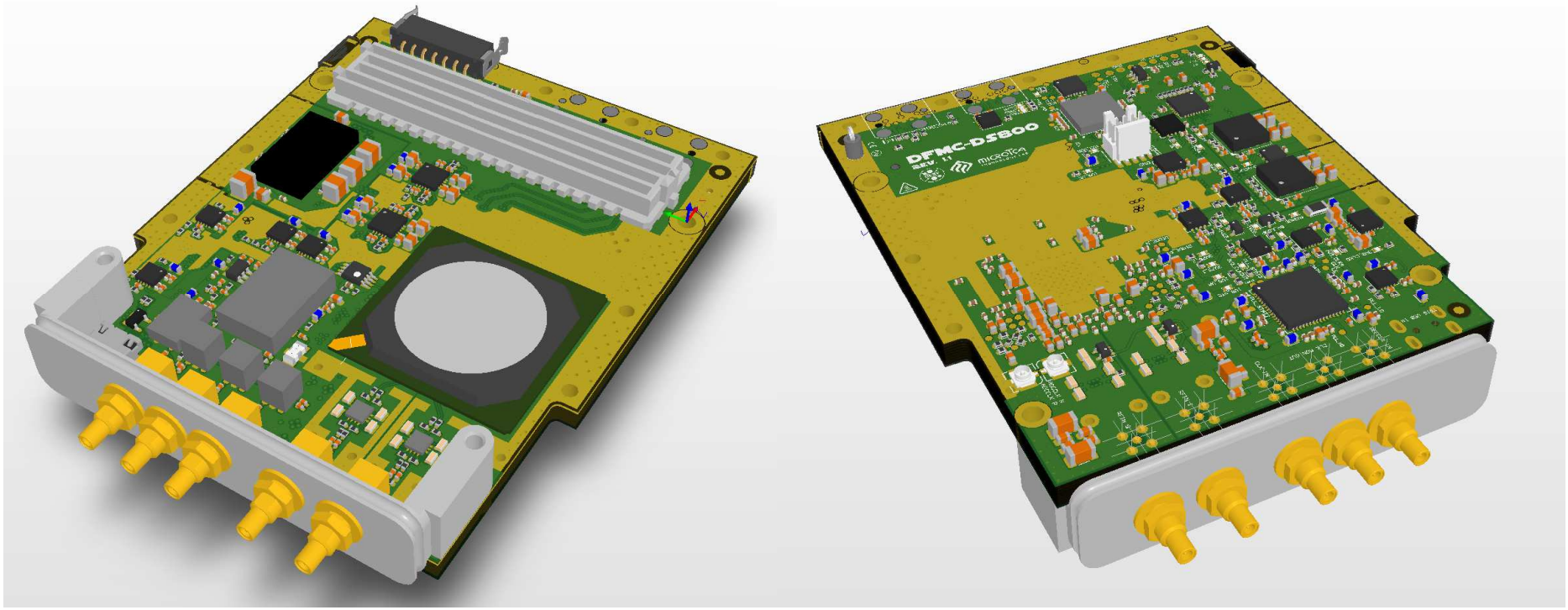
- detection of dangerous Klystron states:

1. gun arcs
2. loss of beam
3. loss of HF signal

- immediate shut down needed

– Model Based Fast Protection System For High Power RF Tube Amplifiers Used At European XFEL Accelerator, Lukasz Butkowski

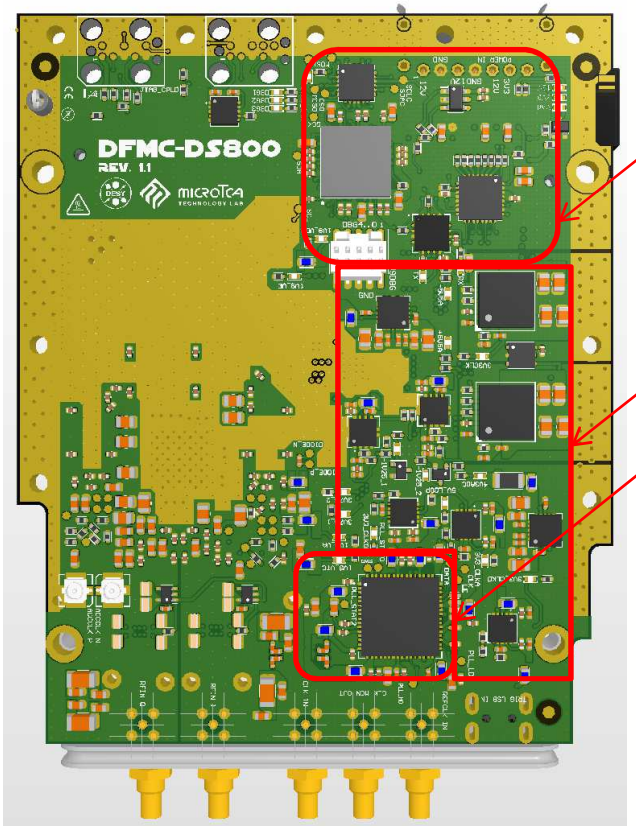
# DFMC-DS800 Overview

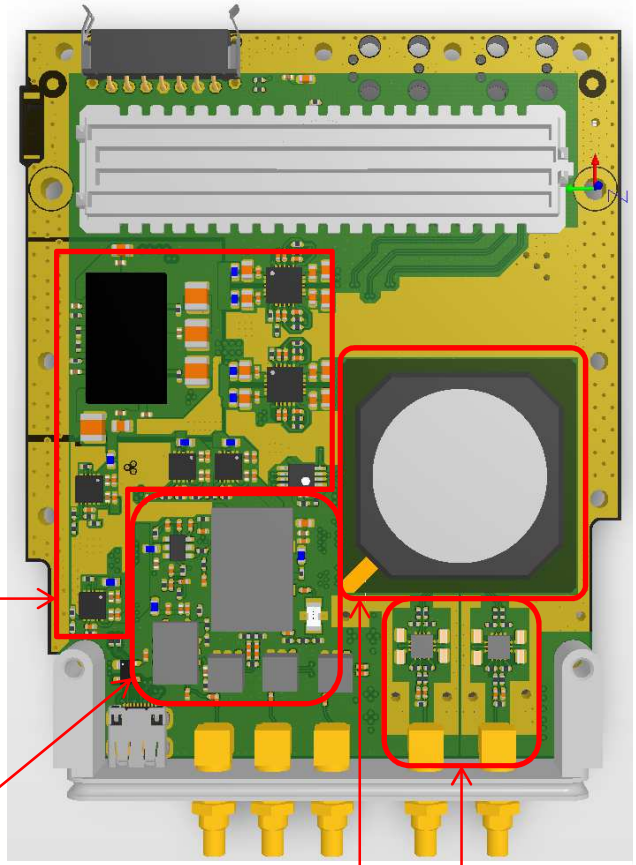



- single size FMC meeting the ANSI/VITA 57.1 standard
- 8.5 mm stacking height
- air cooled, shielding cage + heatsink planned
- front panel: 5 RF SSMC + 1 HDMI Type D (micro) connectors
- 2 external JTAG connections
- 1 external power connector
- 2 UFL ADC CLK DBG + 1 Pin Header DBG

# DFMC-DS800 Overview

- 12-bits, 500/800 MSP/s dual ch., 1/1.6 GSP/s dingle ch.
- ADC input bandwidth: 2.7 GHz
- amplifier LS bandwith: 4.8 GHz
- no anti-aliasing filter present, variants with up to 3.6 GSP/s



management

power supply

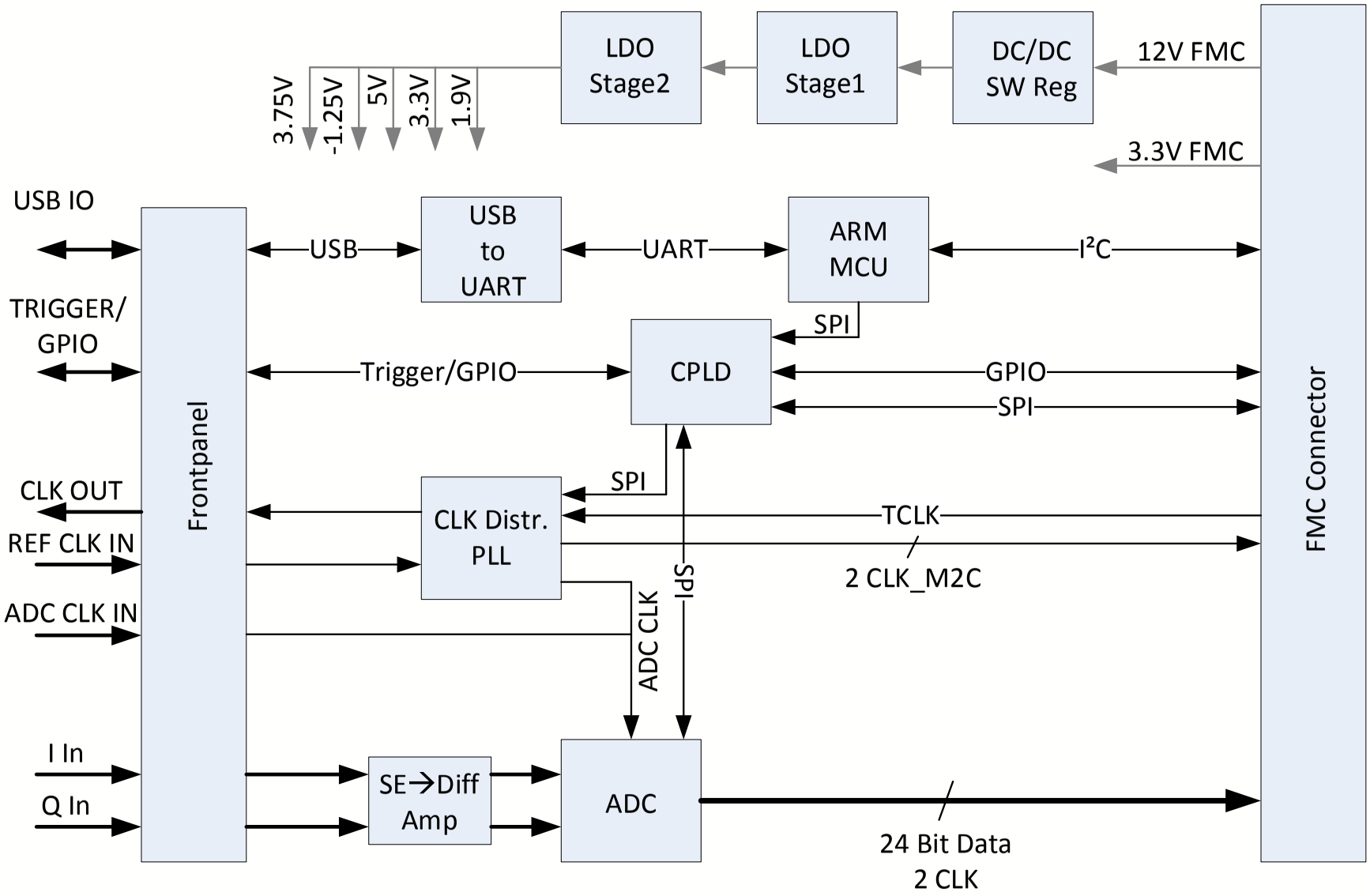
PLL

oscillators / loop filters

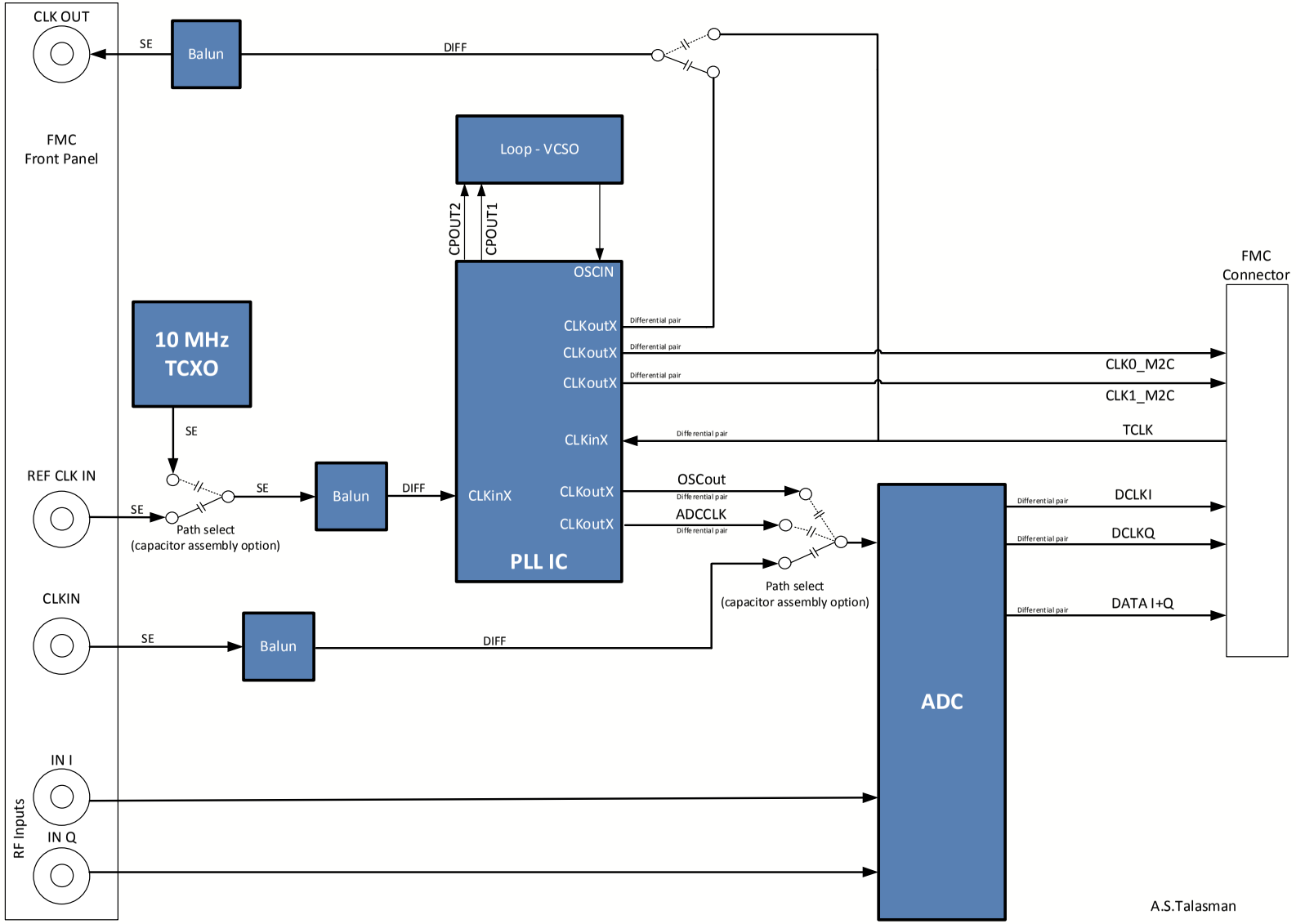
ADC

SE → DIFF amplifiers

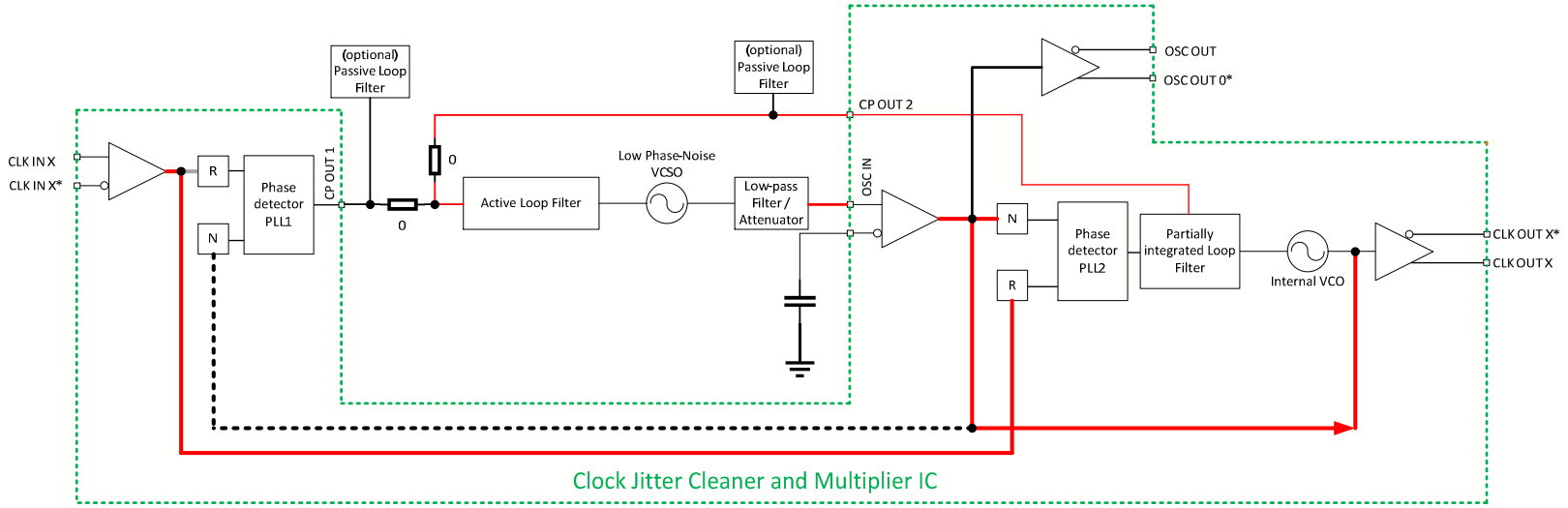
# DFMC-DS800 Overview

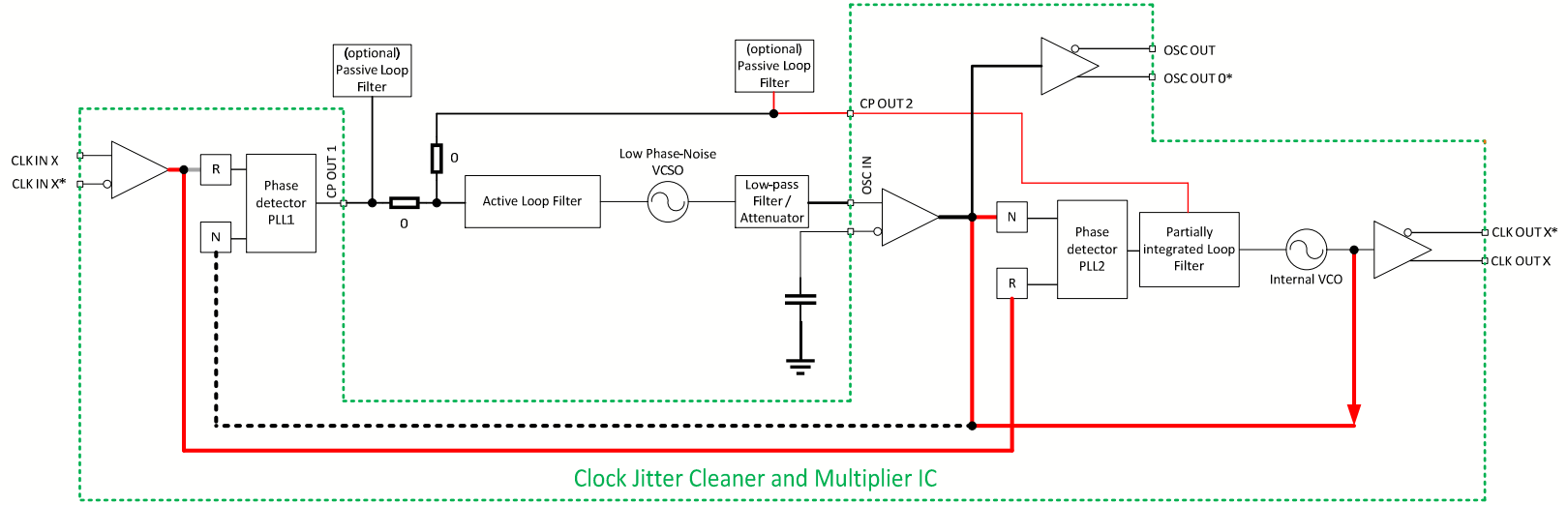


# DFMC-DS800 Clock Tree



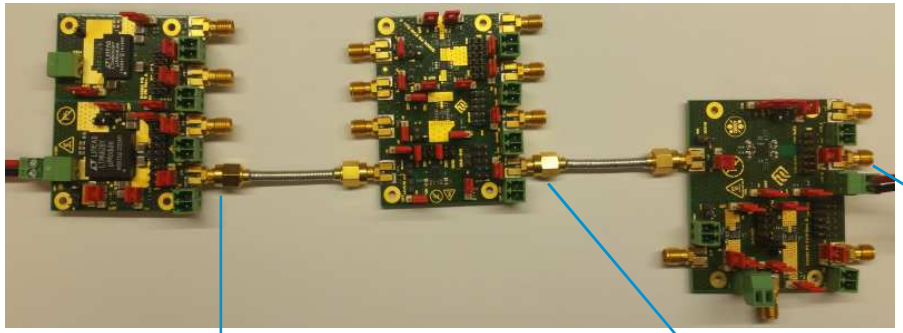
# DFMC-DS800 PLL Configurations



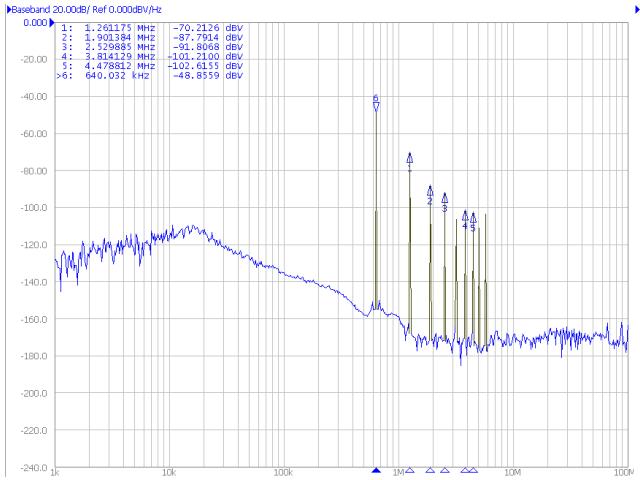



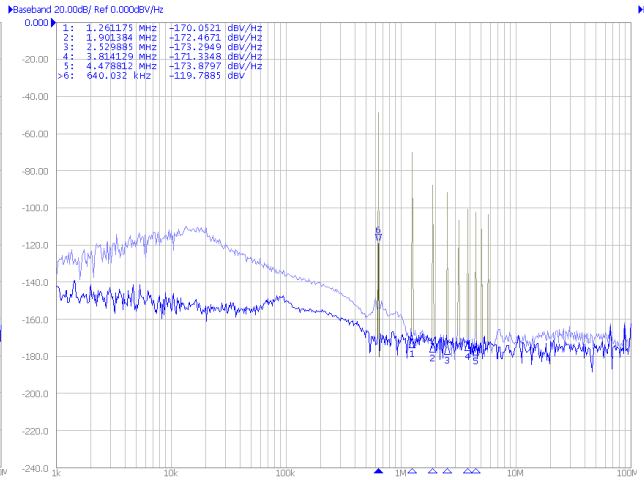

special thanks to Szymon Jabłoński

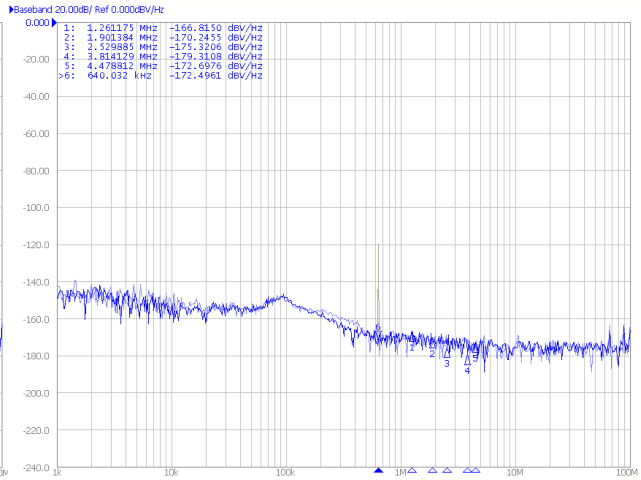
# Power Supply Evaluation Modules



- power supply test boards
- measure ripple rejection ratio of low-noise LDOs



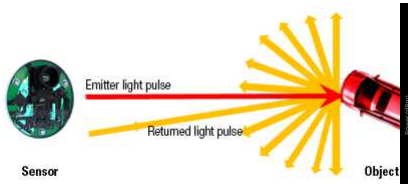



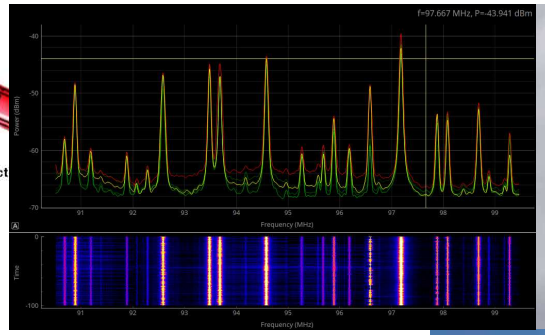

-48dBV@640kHz → -119dBV@640kHz → -172dBV@640kHz

# Industrial applications and Outlook

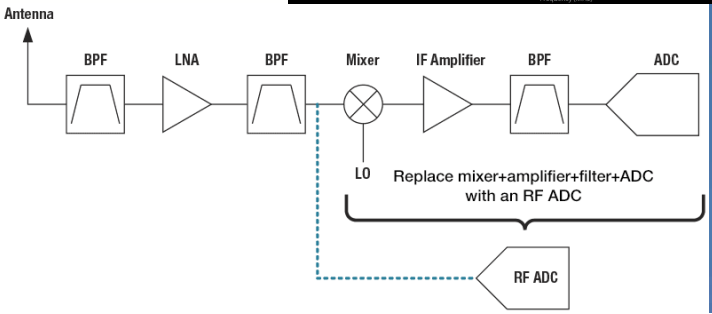
- RADAR / LiDAR
- Signal Intelligence
- RF sampling SDR
- Consumer RF
- 3G/4G Basestations
- Communications



© Leddartech



© Sixt

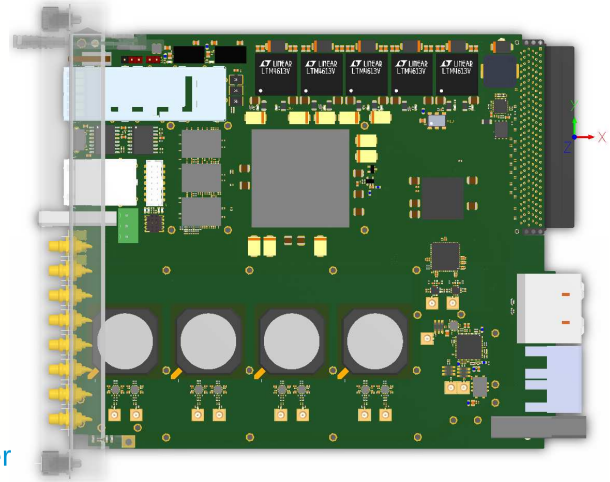


© Texas Instruments

© Kizhakedath Media Service

## Upcoming 2018:

- DFMC-DS800 prototype production in Dec 2017
- boards available end of 1st quarter 2018
- DAMC-DS800 → 8 channel digitizer AMC, same ADCs as DFMC-DS800
- 10/12-Bit variants with up to 3.6 GSP/s available



special thanks to Michael Fenner

# Thank you for your attention