

# Current Status and Future Plans for the DRTM LO and CLK Generation Module

The 10th MicroTCA Workshop

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# Agenda

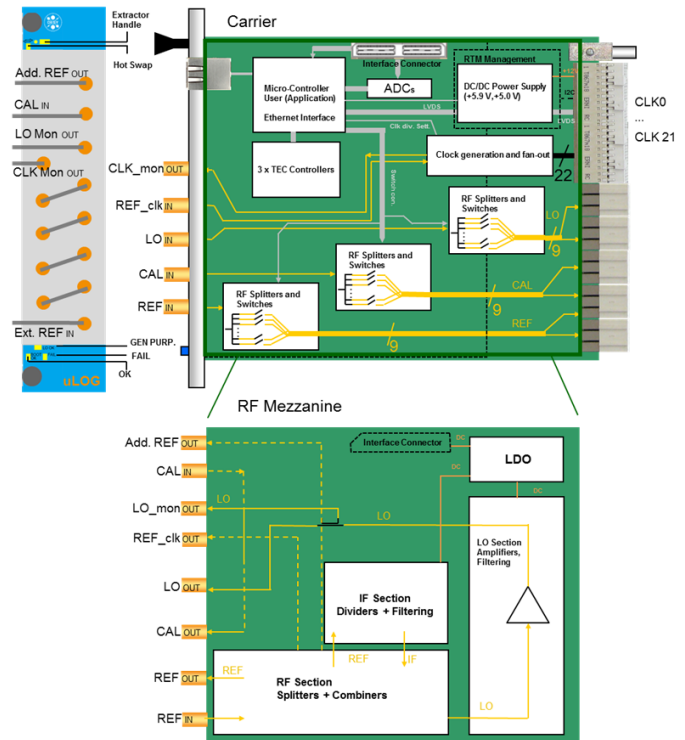
## **Part 1: Introduction of DRTM-LOG**

- DRTM-LOG1300 – Technical Overview
- DRTM-LOG1300 RF Performance
- DRTM-LOG Test-Stand
- System Integration
- Future Developments
- Principles under Investigation
- Collaboration with KVG Quartz Crystal Technology GmbH

## **Part 2: Introduction of KVG Quartz Crystal Technology GmbH**

# DRTM-LOG1300 – Technical Overview

- Generation and splitting of:
  - 9 LO signals (can be turned on/off individually)
  - 22 Diff. CLK signals (can be turned on/off individually)
- Splitting of 9 reference signals and 9 pilot signals.
- Located in slot 15 and slot 14 in the rear.
- MicroTCA.4.1 compatible, includes MMC1.0
- Application control over PCIe.
- Includes on-board active temperature control over Peltier elements.
- Monitoring of: RF power, DC voltages, temperature, humidity, current.



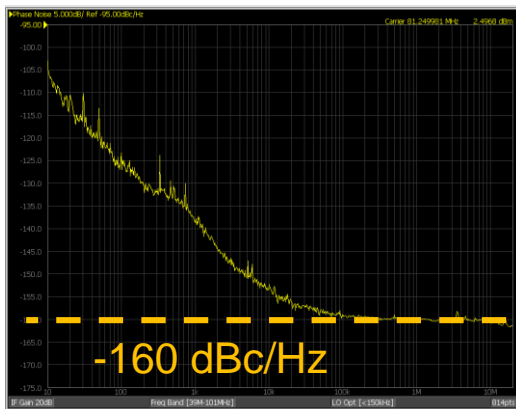
# DRTM-LOG1300 RF Performance

## Challenging design points:

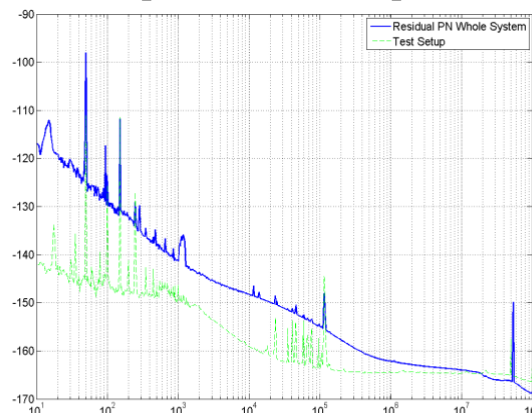
- Limited DC power (30 W)
- Limited cooling capability
- Limited space
- Demanding environment from EMI point
- High density of output channels (~50 RF grade signals)

RF Parameter	Measured Value (Worst Case)
Return Loss	>20 dB
LO Out Power	>29 dBm
Isolation	>80 dBc
Harmonics (2 <sup>nd</sup> , 3 <sup>rd</sup> )	<-80 dBc

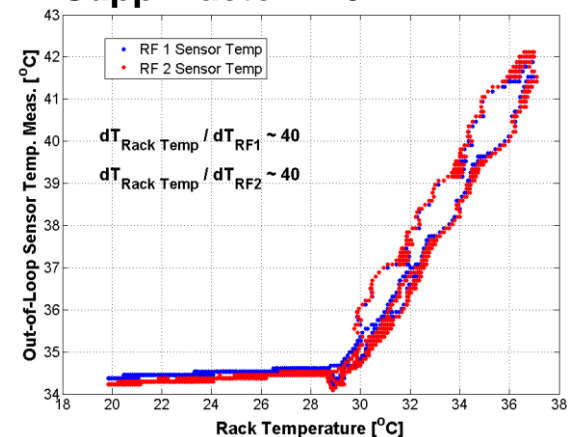
Typical CLK (81.25 MHz)  
Absolute Phase Noise



Measured Residual Phase Noise of the LO  
4.3 fs [10 Hz-10 MHz]

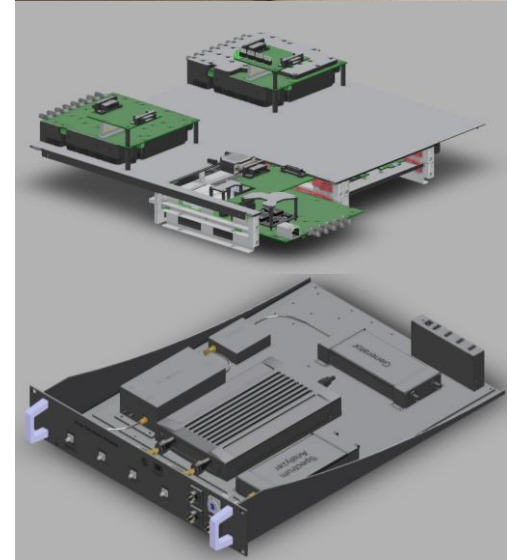


Measured Temperature Regulation on the Board  
Supp. Factor ~40



# DRTM-LOG Test-Stand

- Development of a fully automated test stand to check possible production errors.
- Test-stand for:
  - individual mezzanines (DC/DC mezz., RF mezz.,...)
  - A fully assembled module
- Will cover testing of CLK frequencies up to 500 MHz and LO, REF and pilot up to 6 GHz.





# Future Developments

## New Frequency Variants

- Because of modularity (pluggable mezzanine units) only the affected modules have to be redesigned.
- The current architecture doesn't allow to cover various LO and CLK generation scenarios (e.g. fractional ratios).

## Improvement of RF performance (Goals)

- Improvement of residual phase noise of the LO and CLK generation
  - $< -165$  dBc/Hz for white noise on LO.
  - $-165$  dBc/Hz for white noise on CLK.

# Collaboration with KVG Quartz Crystal Technology GmbH

- The company KVG Quartz Crystal Technology GmbH has taken over the production of DRTM-LOG1300 and DRTM-LOG1500.
- KVG has a licensing agreement with DESY.

**It is possible to order the DRTM-LOG modules at KVG Quartz Crystal Technology GmbH.**



**Quartz Crystal Technology GmbH**





# Thank you

Thanks to all the people involved in the past years:

- DMCS(Dariusz Makowski, Aleksander Mielczarek, Piotr Perek)
- WUT (Pawel Jatczak)
- HZB (Pablo Echevarria)
- N.A.T.
- Tony Rohlev
- DESY colleagues (Frank Ludwig, Matthias Hoffmann, Julien Branlard, Holger Schlarb)

**Part 2:**  
**Introduction of KVG Quartz Crystal Technology GmbH**  
**by Jiaoni Bai**