

Shifts rebroadcasting to a future level: The new R&S®TLU9 GapFiller

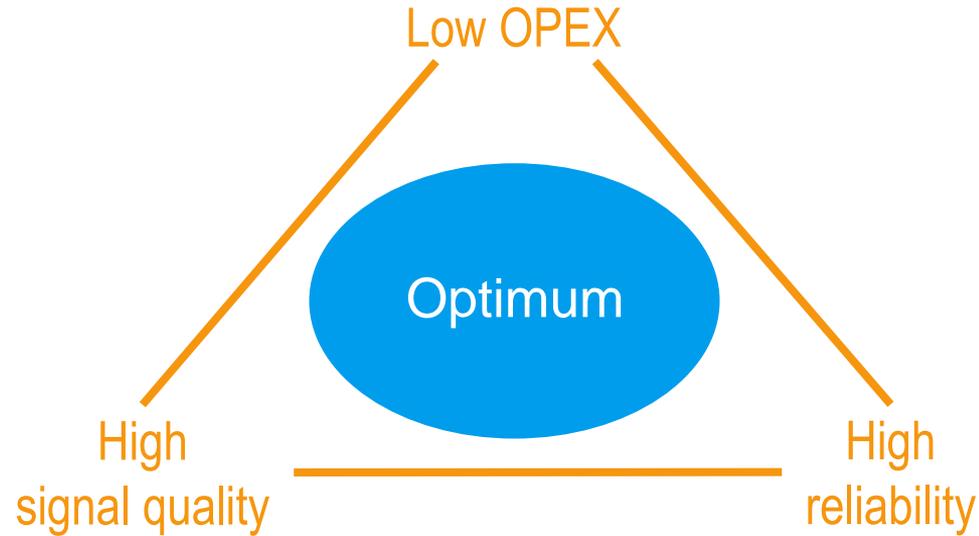
May 2018

Limitations of today's gap filler products

- High **MER degradation**
- Weak **Doppler Echo** performance
- **Difficult** echo cancellation **configuration**
- Not robust in **adjacent channel scenarios**
- Can not handle **changing echo situations**



Desired working point of gap filler operators



Top signal quality, best reliability and minimal operational costs
at the same time



Motivation for a new gap filler from R&S



Our customers need a gap filler with

- **Reliability**
similar to low-power transmitters
- **Performance**
independent from outside conditions
- Allow **deterministic network planning**

➔ Simply run without problems

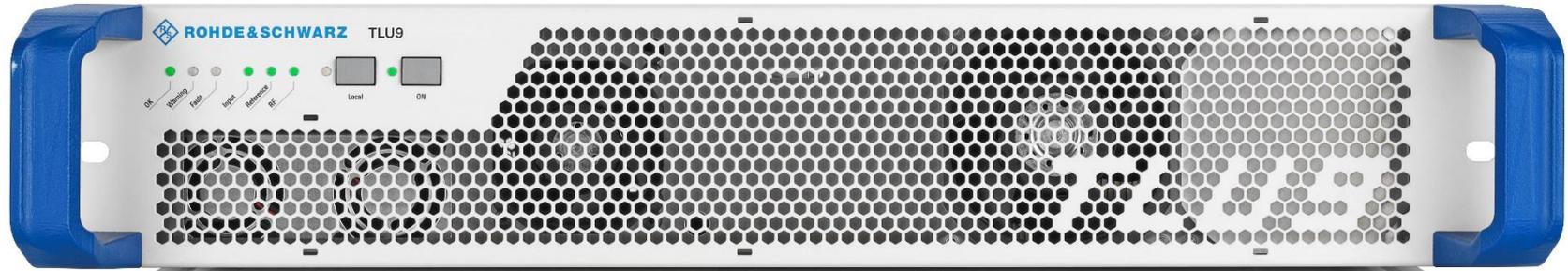


The first of a new gap filler generation



Technical Overview

R&S® TLU9 GapFiller



UHF 470 – 790 MHz

(on request: 790 – 862 MHz)

5W – 200W

DVB-T2, DVB-T, ISDB-T_B

19" x 1U – 2U

The Next Generation GapFiller

TLU9 GapFiller Features



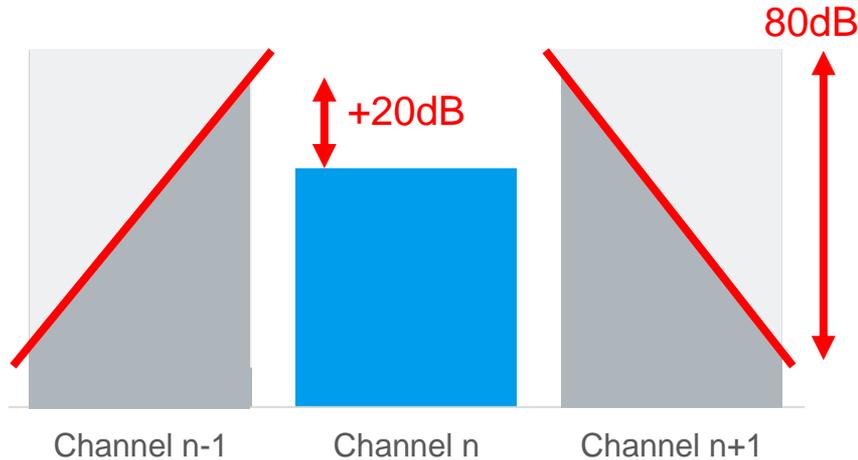
- Higher max. Echo Level: +25 dB
- Bigger Echo Window: 17 μ s
- Better Input sensitivity: -80dBm
- Integrated input filter: 80dB suppression incl. LTE filter
- Adaptive non-linear digital pre-distortion



What actually makes the difference?

Input filtering

Today's gap fillers



Example:

- 30dB higher neighboring channels
- Adjacent channel suppression: 80dB

After input filtering:

- Still 20dB higher neighboring levels
- Still effects of adjacent channels

- ➔ Loss of 20dB dynamics in signal processing
- ➔ Additional input filtering needed

Highly Robust Transmission

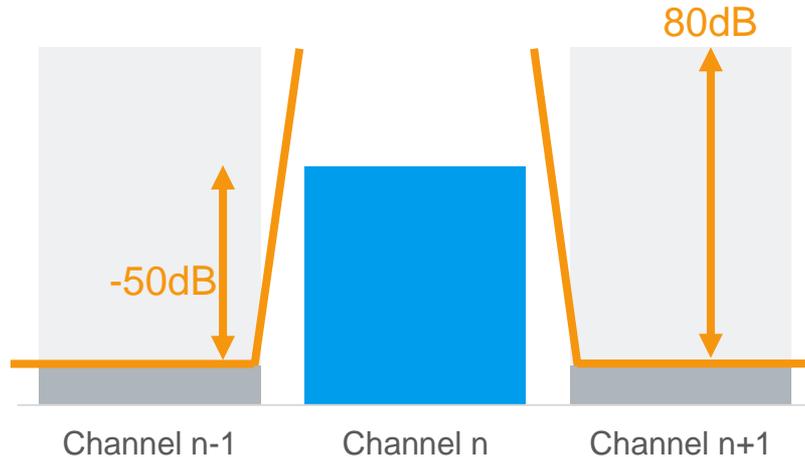
R&S®TLU9 GapFiller

- Independence from outside influences
- Robust for high adjacent channels levels
- Protection from LTE signals



Integrated input filter

Highly robust transmission



- Adjacent channel suppression: 80dB
 - Suppression of up to 30dB higher levels
- Extremely sharp filter edges
 - 80dB @ ± 4.115 MHz
 - 50dB lower neighboring levels
- Input filter in very early stage
 - ➔ No influence of neighboring channels on processing of actual signal
- No emissions of adjacent channels
 - ➔ No need for additional input filtering



Maximized Signal Quality

R&S®TLU9 GapFiller



- Highly advanced Echo Cancellation
- Stable in complex echo situations
- Minimized MER degradation

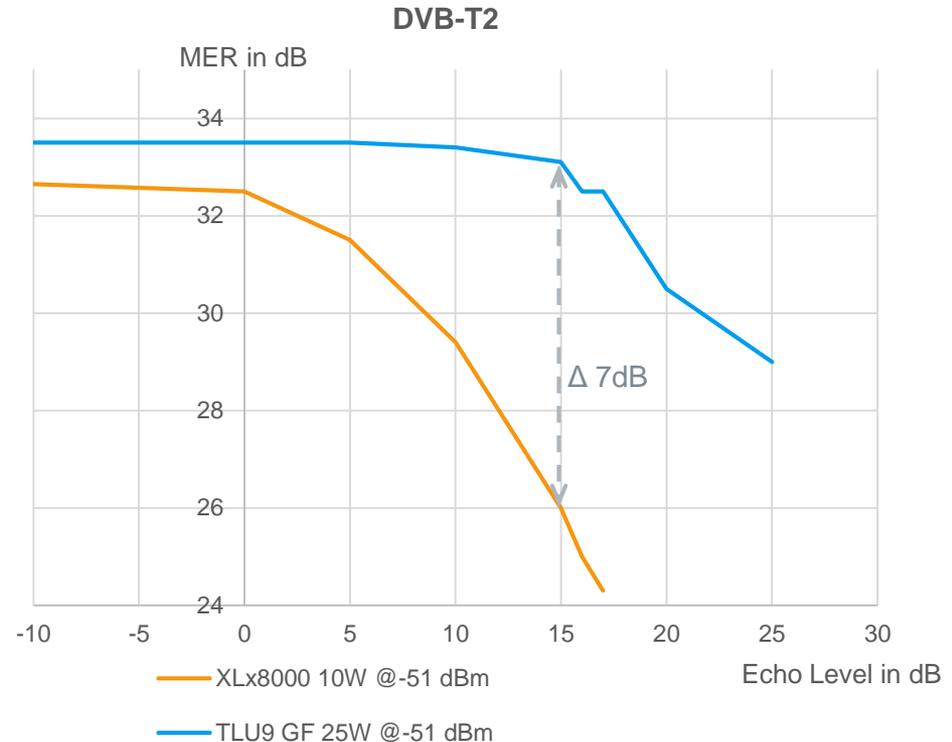


Echo Cancellation to meet highest needs

Maximized signal quality

■ Superior performance

- Strong for high echo levels
- Cancellation of multiple echos individually
- Highly improved signal quality
 - e.g. 33dB MER @ +15dB echo gain
 - e.g. 29dB MER @ +25dB echo gain



Optimal Echo Cancellation?

Fundamental limitations of today's gap fillers

- **Most challenging scenarios**
 - Doppler Echoes
 - Changing echo characteristics
- Fundamental limitations of today's gap filler result from static settings of
 - Window size
 - Step size
- **But optimal operation demands:**

Best MER ↔ High Flexibility



Start gap filling without worrying

R&S®TLU9 GapFiller

First and only product to provide:

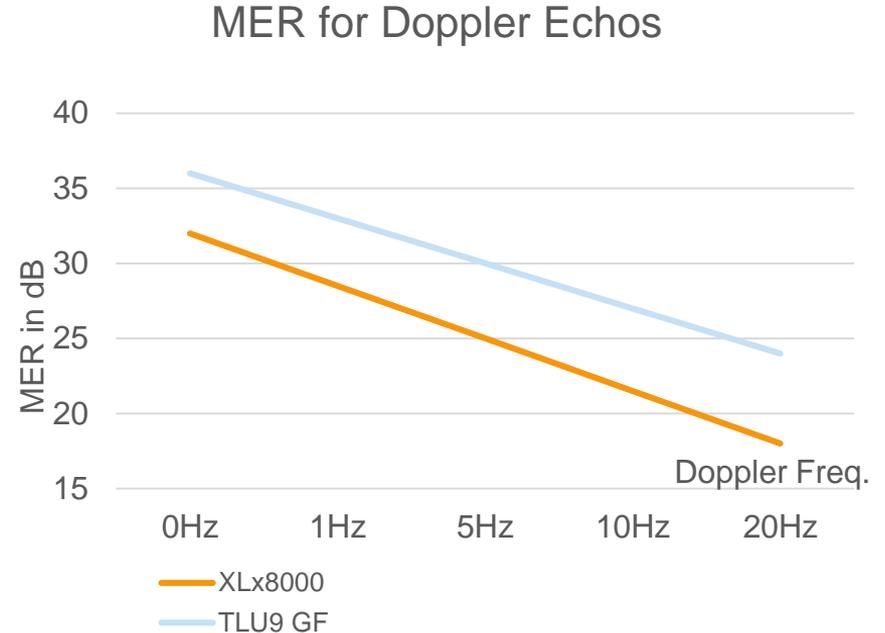
- **Optimal Echo Cancellation anytime**
- Continuous adaptation to changing echo characteristics
- No need for recurrent corrections of EC settings



World-Class Echo Cancellation Mechanism

■ Addresses technical and commercial challenges of our customers:

- Changing echo situations
- Doppler echoes
- Complex echoes (Multi-Echoes)
- Unpredictable MERs
- High operational costs



World-Class Echo Cancellation Mechanism

Optimal Echo Cancellation – anytime!

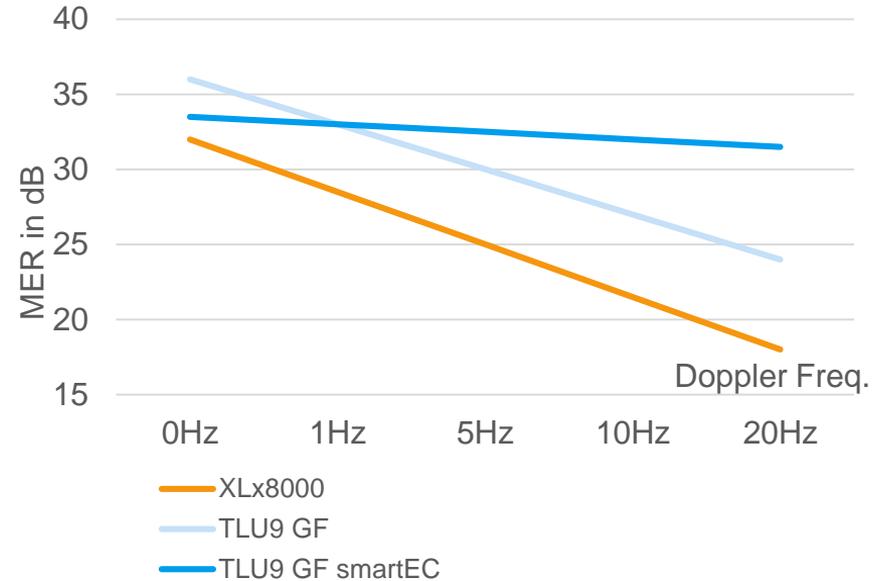
■ Addresses technical and commercial challenges of our customers:

- Changing echo situations
- Doppler echoes
- Complex echoes (Multi-Echoes)
- Unpredictable MERs
- High operational costs

■ Key feature name: R&S®smartEC

➔ Continuous optimization to changing echo situation in real-time

MER for Doppler Echos



R&S®smartEC – shifts rebroadcasting to a future level

R&S®TLU9 GapFiller

- 
- New operational models
 - Significant reduction of OPEX
 - New coverage planning options:
GapFiller sites instead of Tx sites



Pioneering Features of the TLU9 GapFiller



- Cancellation of very high echos
- Stable in complex echo situations
- Robust for high adjacent channel levels
- Self-configuration of echo settings
- Adaptive to changing echo scenarios

With minimal MER degradation



Resulting Customer Benefits

R&S®TLU9 GapFiller

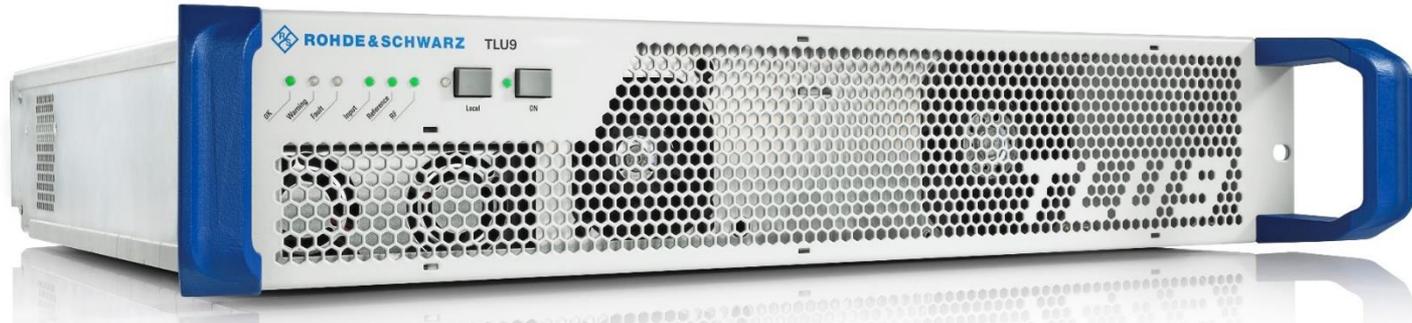


- **Maximized Signal Quality**
- **Minimized influence of outside conditions on MER**
- **No need for regular modification of EC setting**
- **Reliable signal transmission**
- **Deterministic planning of GapFiller performance**



R&S® TLU9 GapFiller

Key Benefits



Top signal quality

by minimized MER degradation

Rock-stable in complex echo scenarios

by superb Echo Cancellation

Minimized operational costs

by adaptivity to changing echo characteristics



R&S® TLU9 GapFiller – The Smart Decision

