

# RDS2 reception

## A modified existing tuner platform

**RDS2 day – Paris**

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# Content

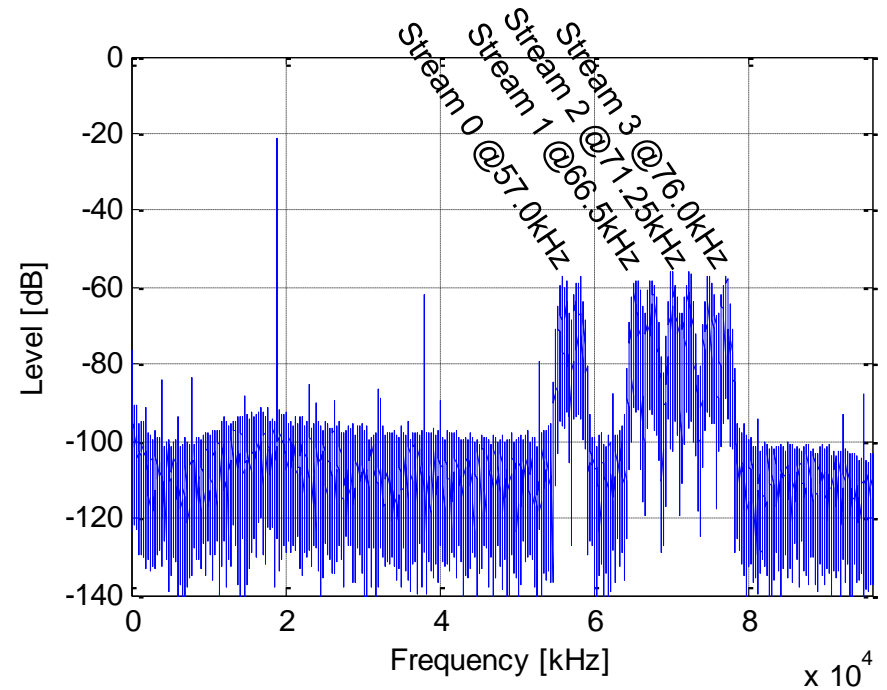
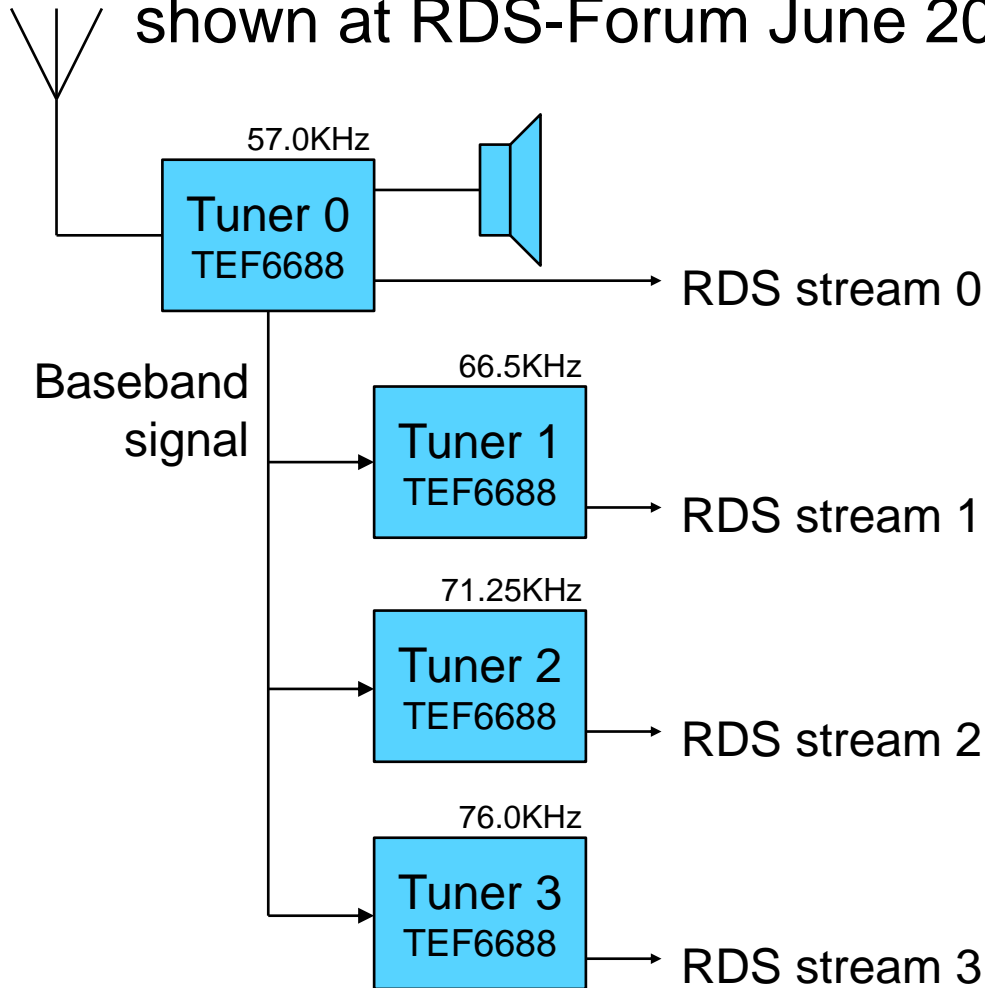
- Introduction/Goal
- RDS2 demo at RDS Forum 2015
- Current RDS solution
- Adaptations for single tuner RDS2 Demo
- Demo PCB
- Additional changes for tuner products with full RDS2 support
- RDS2 measurements
- Conclusions

# Introduction/Goal

- Demo platform to show the advantages of the increase in data-rate of RDS2
- Demo platform enables measurements on RDS2
- Demo platform enables field-tests with RDS2
- Demo platform to show feasibility of products with RDS2 functionality

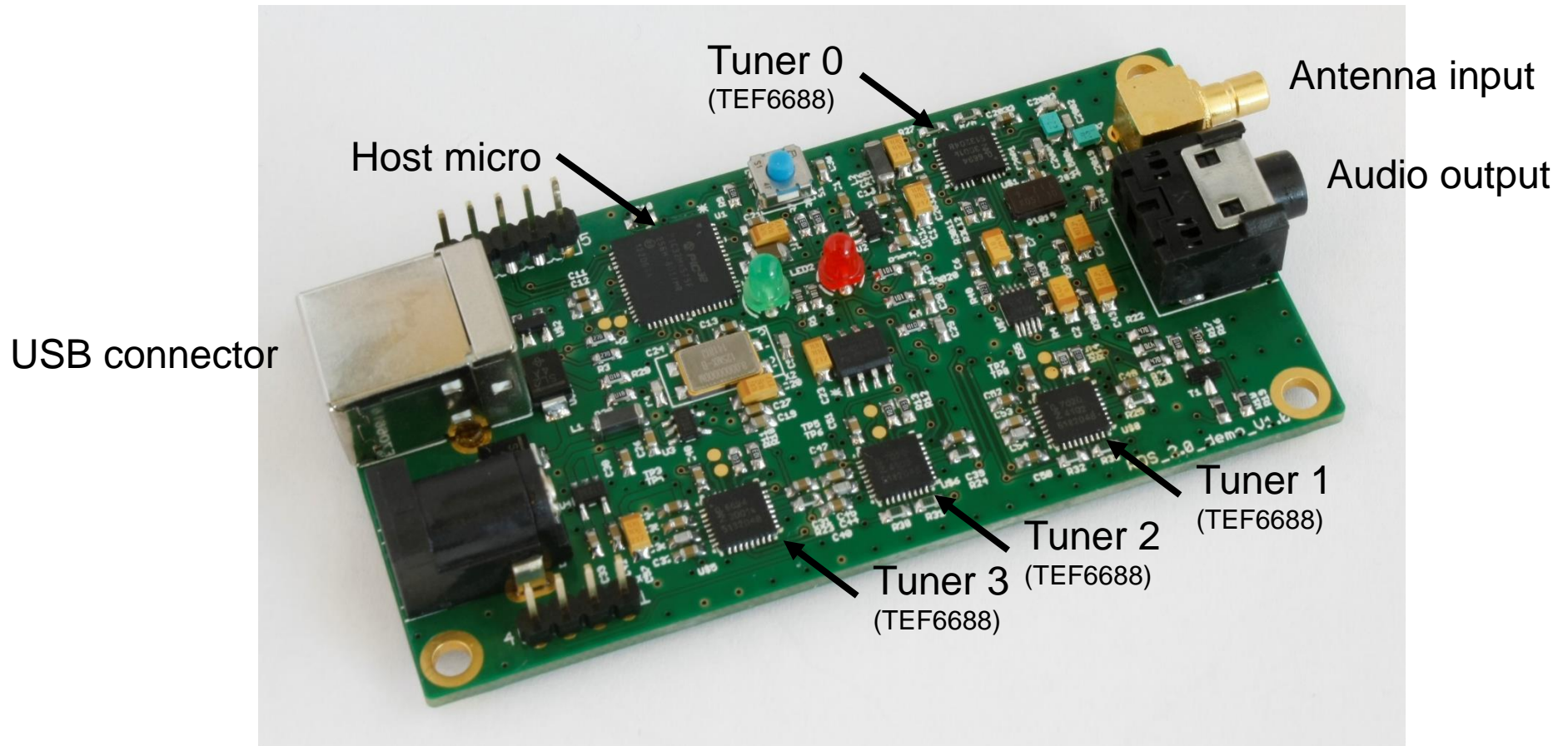
# First RDS2 Demo

shown at RDS-Forum June 2015

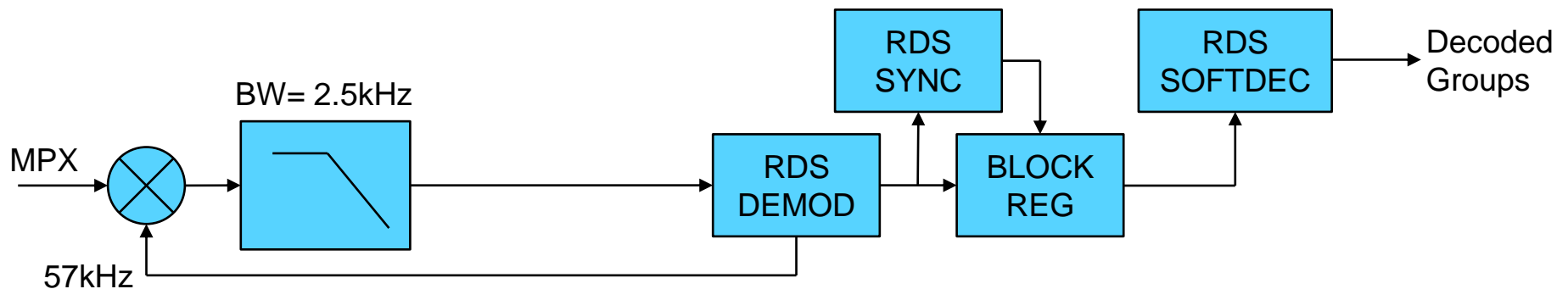


# RDS2 Demo PCB with 4 tuners

shown at RDS-Forum June 2015



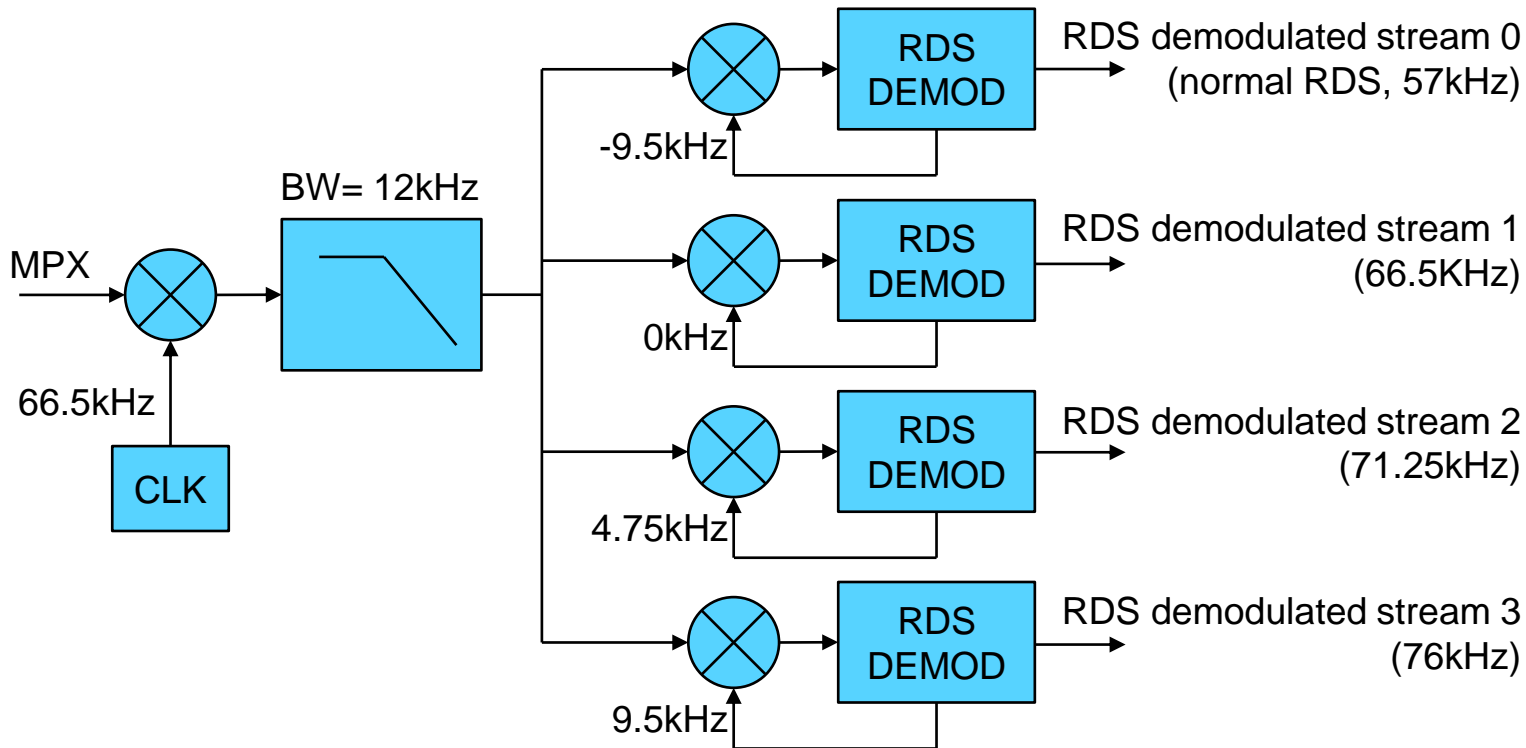
# Current RDS product implementation



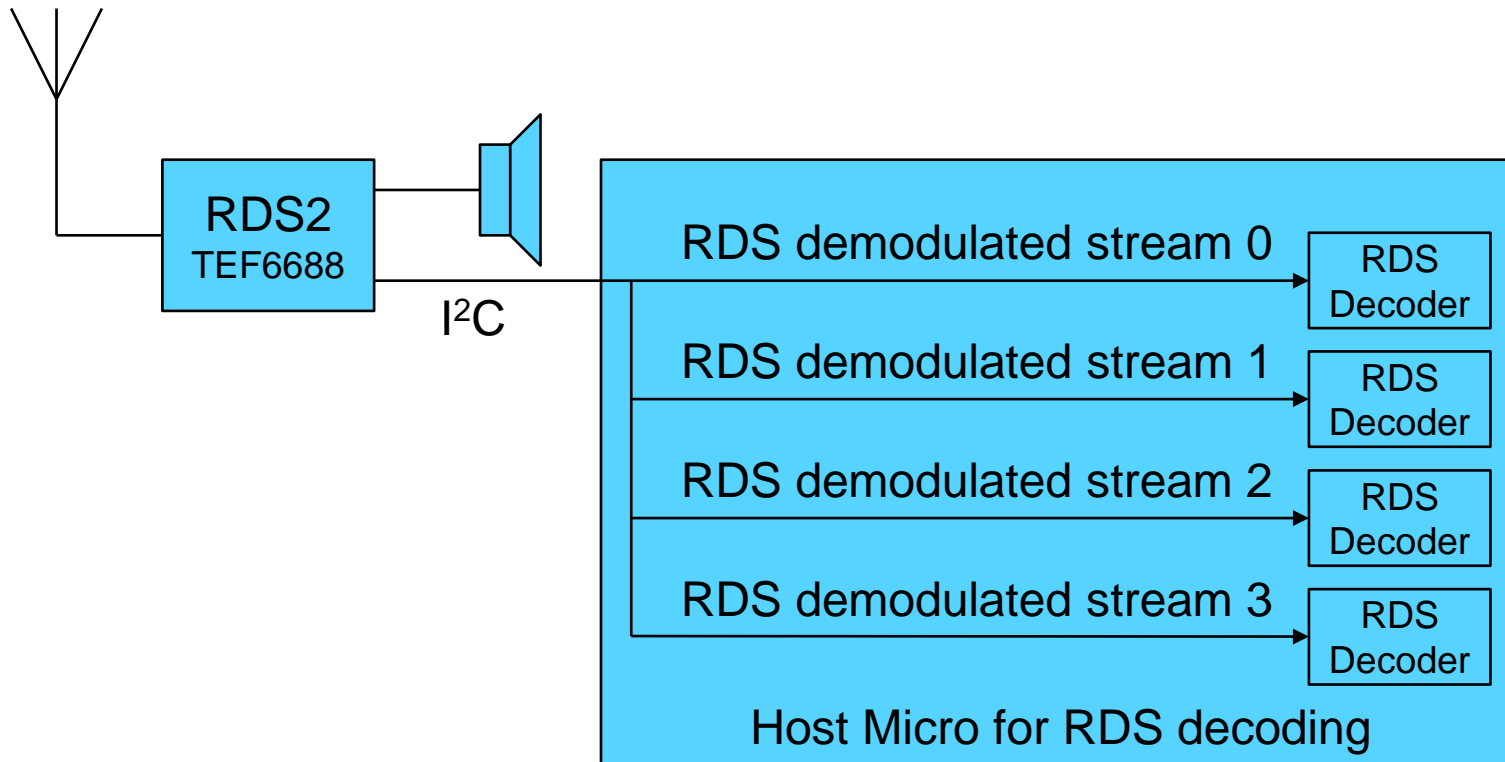
- RDS implementation is partly done in Firmware

# Single tuner RDS2 demo

Based on TEF6688 product  
 Only adaptations needed in Firmware



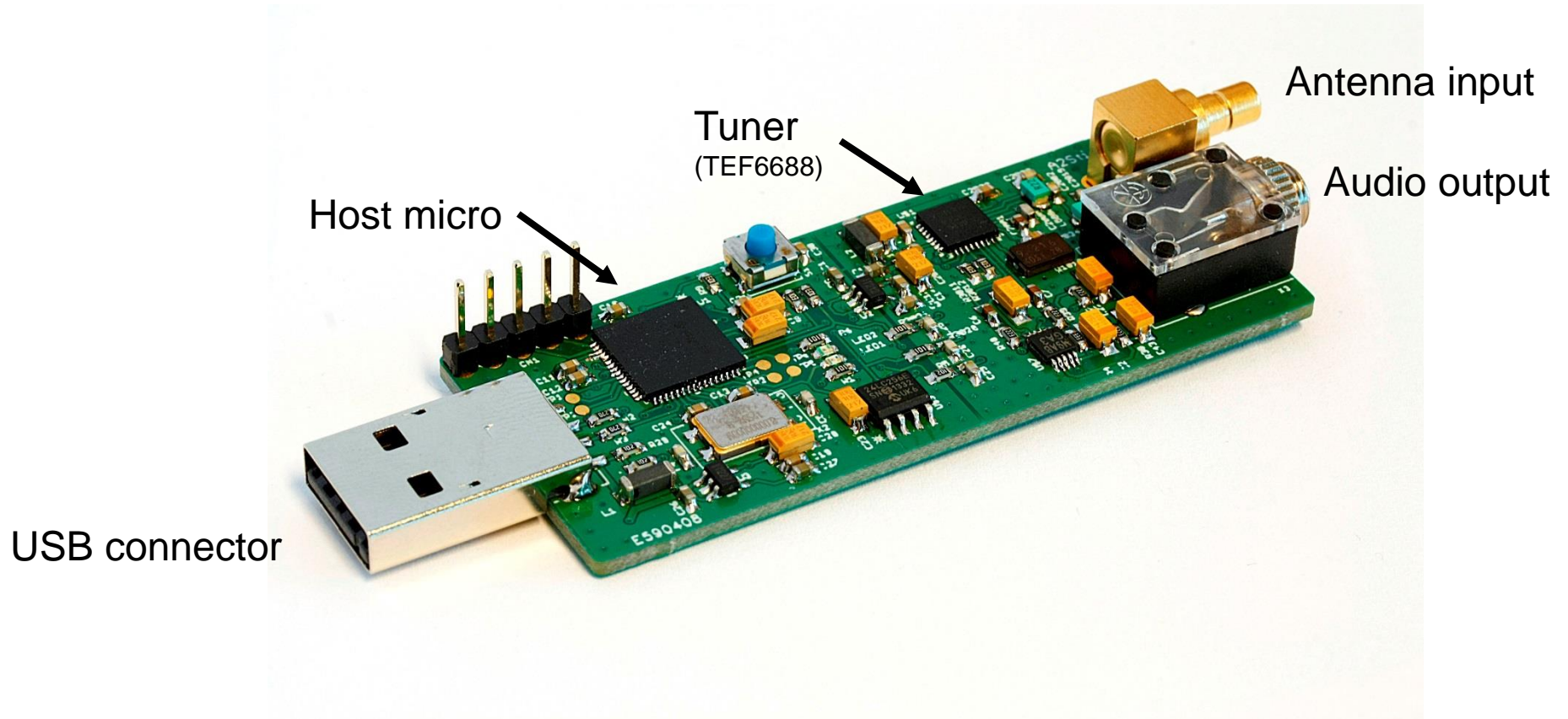
# RDS2 Demo Receiver



- 4 times RDS demodulator implemented in firmware on a single tuner
- Decoding not (yet) done on the tuner, currently done on Host Micro



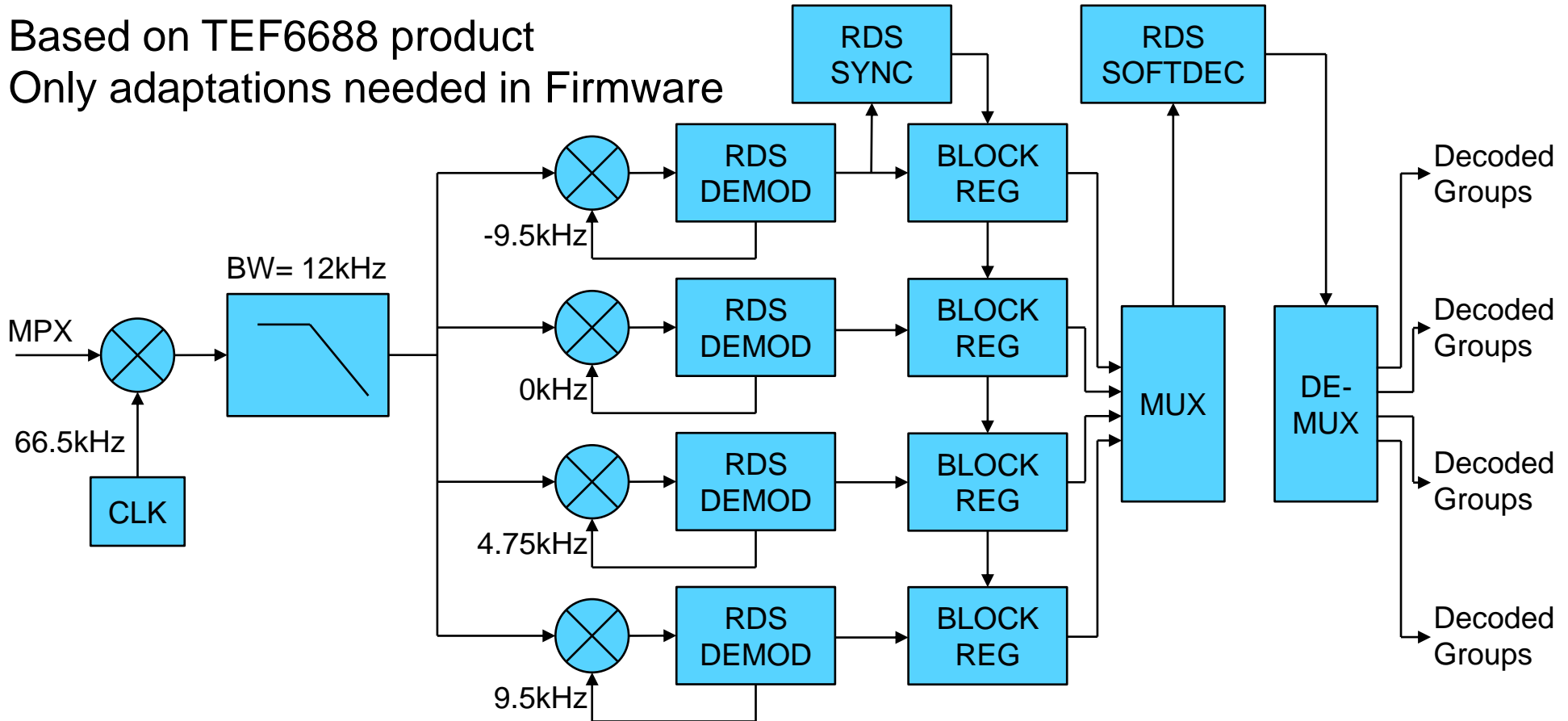
# Single tuner RDS2 Demo PCB



Demo host-firmware and PC-software by MacBe

# Full-feature single tuner RDS2

Based on TEF6688 product  
 Only adaptations needed in Firmware



# RDS sensitivity

Measurement:

RDS sensitivity of all carriers as function of different RDS(2) configurations

	stream 0	stream 1	stream 2	stream 3	phase	stream 0 [dBuV] 50% error	stream 1 [dBuV] 50% error	stream 2 [dBuV] 50% error	stream 3 [dBuV] 50% error
R&S	x	-	-	-	na	<b>17</b>	na	na	na
RDS2 gen	x	-	-	-	na	<b>17</b>	na	na	na
RDS2 gen	x	x	-	-	equal	<b>17</b>	19	na	na
RDS2 gen	x	x	x	-	equal	<b>17</b>	19	20	na
RDS2 gen	x	x	x	x	equal	<b>17</b>	19	20	<b>20.5</b>
RDS2 gen	x	x	x	x	1/4 phase	<b>17</b>	19	20	<b>20.5</b>

Conclusion:

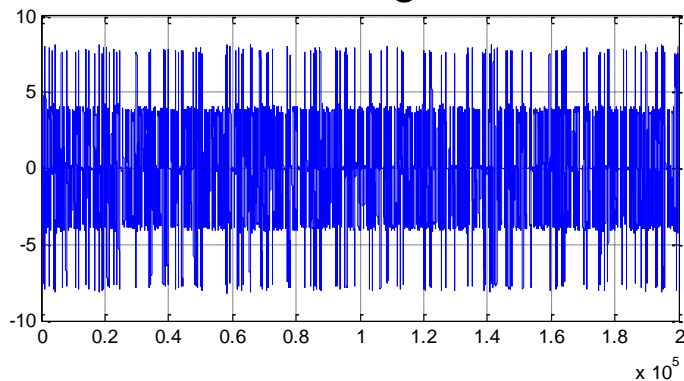
RDS sensitivity reduces upto **3.5dB** for high RDS2 carriers, according to theory (FM demodulation noise increases with MPX frequency)

Number of RDS2 carriers does **not** influence the RDS sensitivity

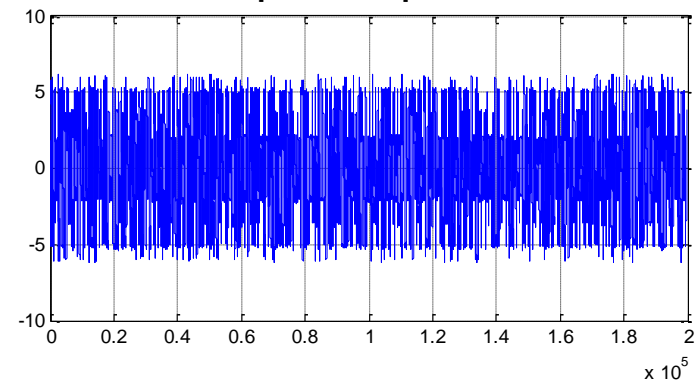
# RDS2 data phase

- Adding RDS carriers increases the FM deviation from 2kHz to 8kHz
- Using  $\frac{1}{4}$  spaced phase RDS2 data reduces the FM deviation
- The RMS value of the deviation does not change
- The peak deviation reduces from  $4 \times 2\text{kHz}$  to  $3 \times 2\text{kHz}$  (**25% reduction**)
  - Based on simulation with random RDS data

Phase aligned



$\frac{1}{4}$  spaced phase



# FM deviation budget

- Maximum allowed deviation in FM transmission is 75kHz
- RDS transmission example:
  - RDS: 2.0kHz
  - Stereo pilot: 6.75kHz
  - Audio: 66.25kHz
- When transmitting RDS2 total deviation shall remain 75kHz
- RDS2 transmission example:
  - RDS2: 6.0kHz
  - Stereo pilot: 6.75kHz
  - Audio: 62.25kHz
- In this example the audio signal-to-noise reduction is **only 0.5dB** when adding all RDS2 carriers with nominal (2kHz) deviation

# Conclusions

- Fully integrated RDS2 decoding can be created with recent released tuner platforms by firmware updates without hardware redesign
- RDS2 tuners may be introduced shortly after market shows interest for RDS2 and services become available
- Sensitivity reduction for higher RDS2 streams is marginal
- Sensitivity of conventional RDS reception is not affected by adding RDS2 carriers
- The reduction of audio quality is negligible when RDS2 data is added to the transmitted channel within existing FM deviation budget