
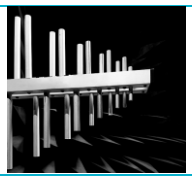
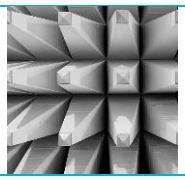

CTC advanced
member of RWTÜV group

Bundesnetzagentur

BNetzA-CAB-02/21-102

ilac-MRA DAkkS Deutsche Akkreditierungsstelle D-PL-12076-01-04

SAR Test exclusion documentation according to FCC KDB 447498

Report identification number: 1-1845/21-01-92 Exclusion (FCC)

Certification numbers and labeling requirements	
FCC ID	QZ9-WCACS

This test report is electronically signed and valid without handwritten signature. For verification of the electronic signatures, the public keys can be requested at the testing laboratory.

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Marco Scigliano
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EUT technologies:

Technologies:	Max. meas. cond. AVG Power*
NFC 13.56 MHz	17.74 dBm

)* according test report R-HF_167-20/08 provided by the manufacturer (Annex A)

SAR test exclusion according to KDB447498 (General RF Exposure Guidance)

Equations from Chapter 4.3.1: Standalone SAR test exclusion considerations page 11 and ff. and tables in Annex C

(c) (2) Standalone SAR test exclusion below 100 MHz < 50mm

$0.5 \times (\text{Threshold}_{100MHz}) \times (1+\log(100/f))$

where

$\text{Threshold}_{1\text{-g;}10\text{-g}}$	is 3 for 1-g; 7.5 for 10-g
f	is the RF channel transmit frequency
$\text{Threshold}_{100MHz,50mm}$	is $\text{Threshold}_{1\text{-g;}10\text{-g}} \times d / f^{0.5}$; with f = 100MHz and d=50mm

The table below gives the calculated maximal power that could be used for source based time averaged conducted power, adjusted for tune up tolerance. If this is below the calculated value SAR testing is excluded.

frequency [MHz]	Threshold1-g;10-g	$\text{Threshold}_{100MHz,50mm}$	Powerlimit [mW]	$P_{max\text{-}declared}$		Exclusion
				[dBm]	[mW]	
13.56	3	474.34	442.97	17.74	59.4	yes

Annex A: Test report R-HF_167-20/08:

BMW – WCA Center Stack				
Report no.:	R-HF_167-20/08			
Project no.:	*Project name*	*Project Stage*	*Report version*	*No. of page*
M0854_061	BMW WCA Center Stack	Certyfication	8	7

M0854_061

BMW WCA Center Stack

NFC Power analysis

Prepared by: Michał Rak

Data: 25.01.2022

1. Introduction

Performance of NFC , NFC Output power, Duty Cycle

2. Used Equipment

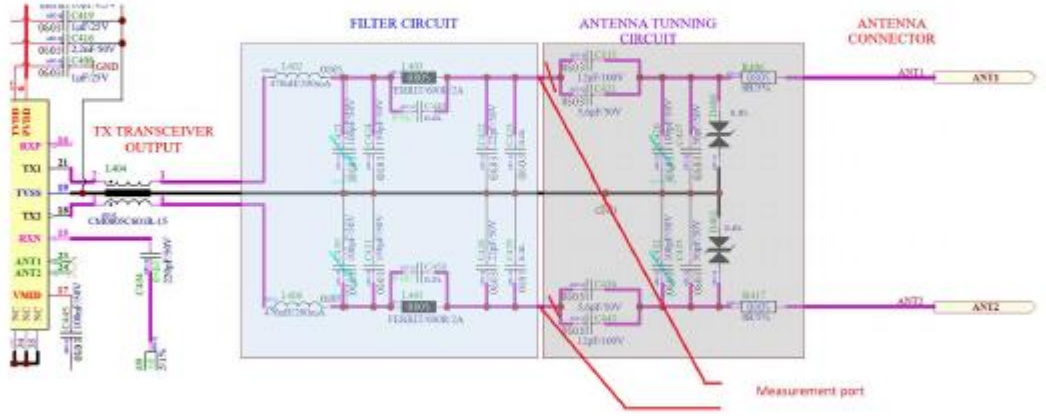
a) RTO2044 - Real Time Osciloscope from Rohde&Schwarz
b) FSW27 - Signal & Spectrum Analyzer from R&S
c) SMBV100B - Vector Signal Generator
d) PCB Main: BL14210.P14 – from BURY

3. Performed Test

a) Output power without antenna
b) Output power with circuit matching to 50 Ohm
c) Duty Cycle

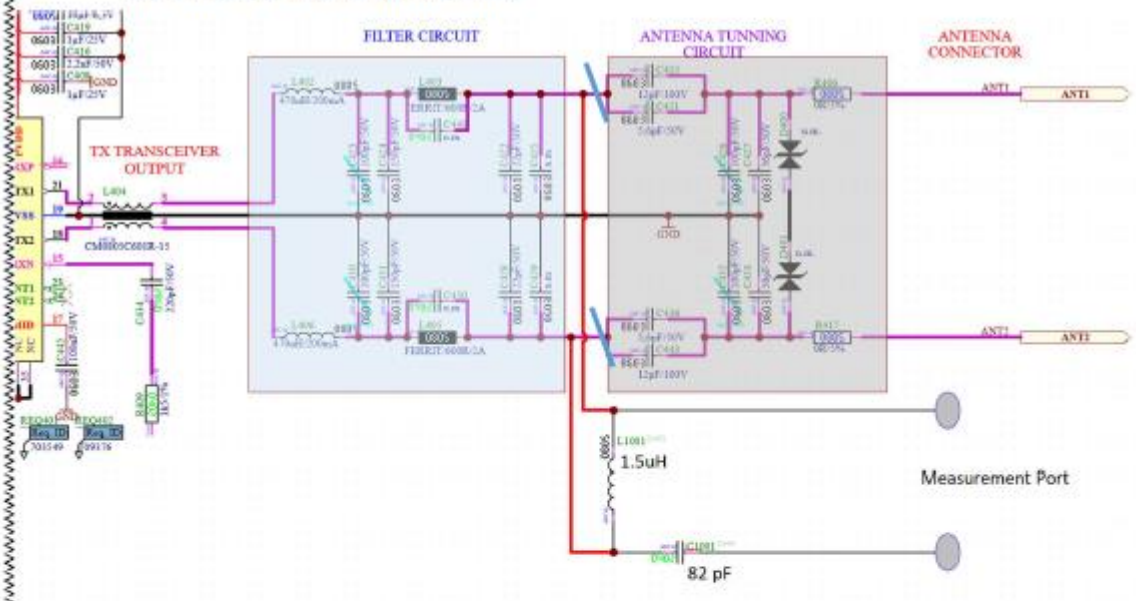
4. **NFC circuit for:**

a) **Output power**



For this case Antenna Tuning Circuit was removed and antenna was disconnected

b) **Output power with matching**

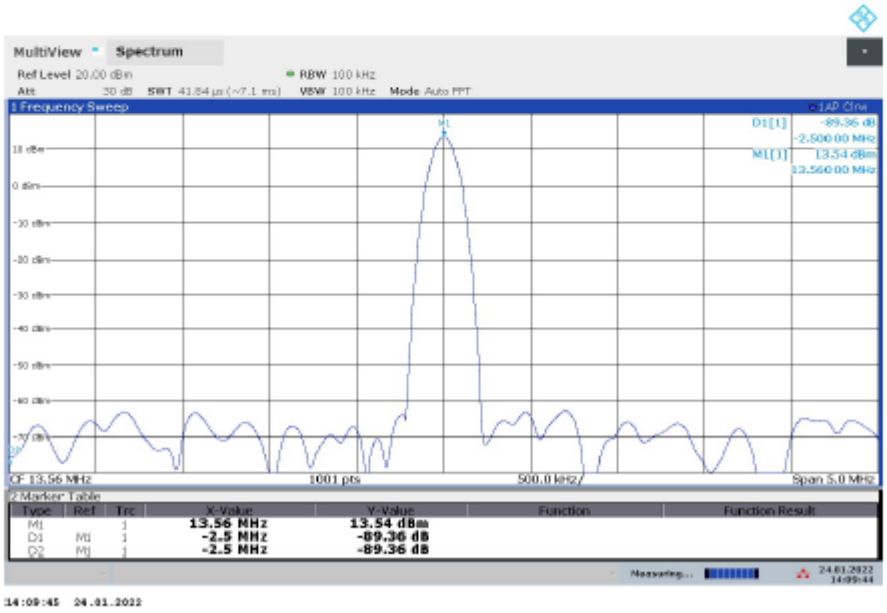


For this case Antenna Tuning Circuit was removed and antenna was disconnected, additional TX transceiver and Filter circuit was matched to 50 Ohm

c) **Duty cycle was measured by magnetics coupling on osciloscope**

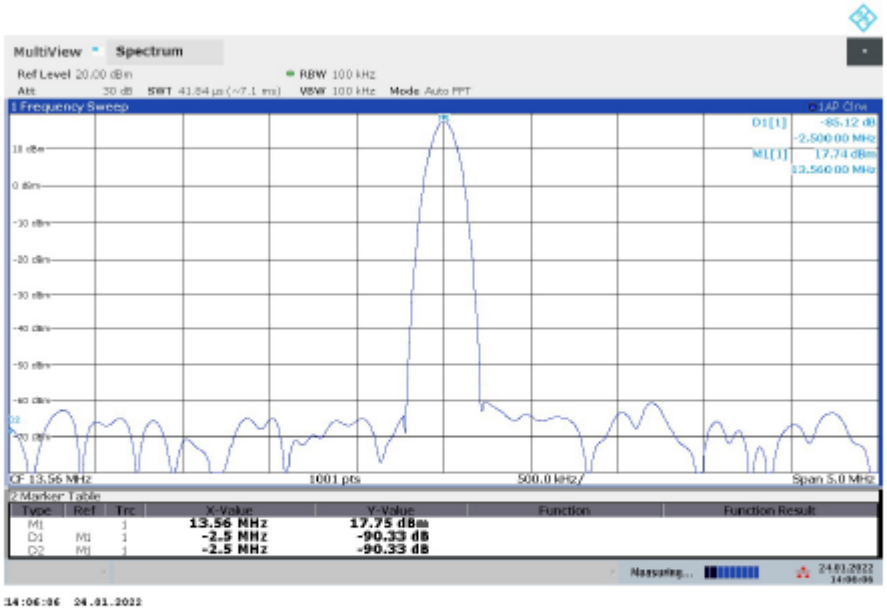
5. NFC Measurement Result

a) Result without matching



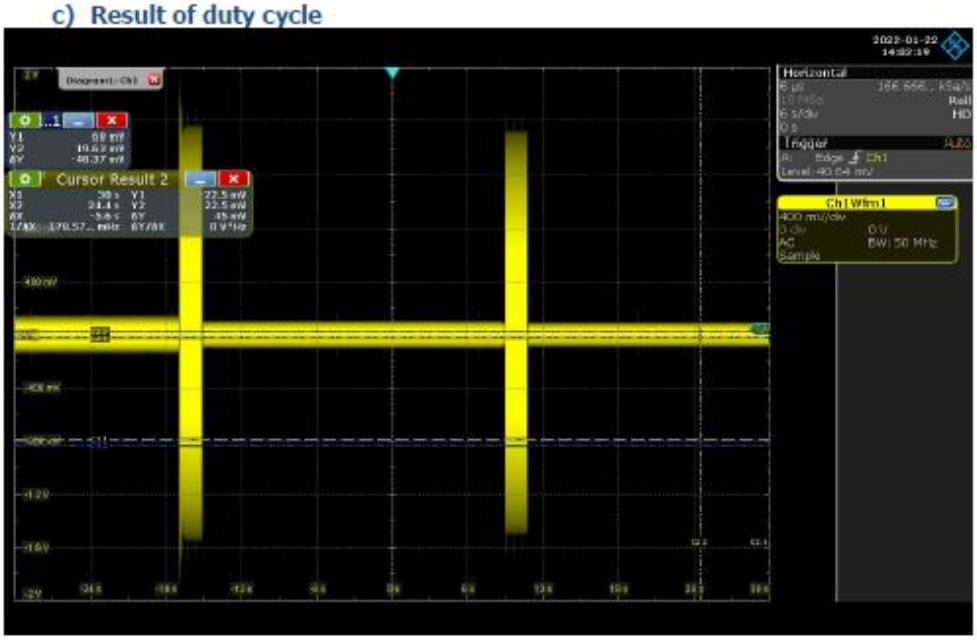
Result without matching circuit = 13,54 dBm = 22,59mW

b) Result with matching



Result with matching circuit = 17,74 dBm = 59,42mW

c) Result of duty cycle



Result per one minute

2*1,8 s → P_{max}
60-(2*1,8s) → P_{LPOD}

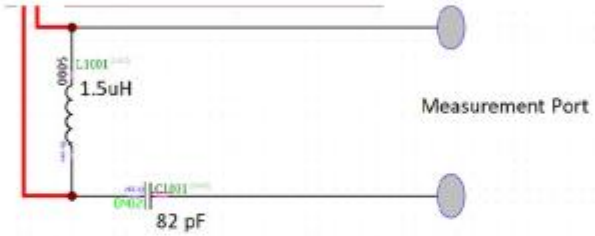
P_{LPOD} measured power = -13,5 dBm = 0,045 mW

$$Medium\ Power = \frac{2 * 1,8s * P_{max} + (60 - 2 * 1,8)s * P_{LPOD}}{60}$$

$$Medium\ Power = \frac{2 * 1,8s * 59,42mW + (60 - 2 * 1,8)s * 0,045mW}{60}$$

$$Medium\ Power = \frac{215,538}{60} = 3,59\ mW$$

6. NFC Result overview



Correction factor of Matching circuit equals:

$$Correction\ Factor = P_{matching} - P_{nominal}$$

$P_{matching}$ from point 5b → 17,74dBm
$P_{nominal}$ from point 5a → 13,54dBm

$$Correction\ Factor = 17,74 - 13,54 = 3,93\ \mathbf{dB}$$

Below attached picture from DUT