

# Acceptance Tests for diplexer MW Pozuelo 810 kHz & 50 kW, 954 kHz & 50 kW

Technical report



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## Diplexer MW Pozuelo 810 kHz & 50 kW, 954 kHz & 50 kW

### **1. Introduction**

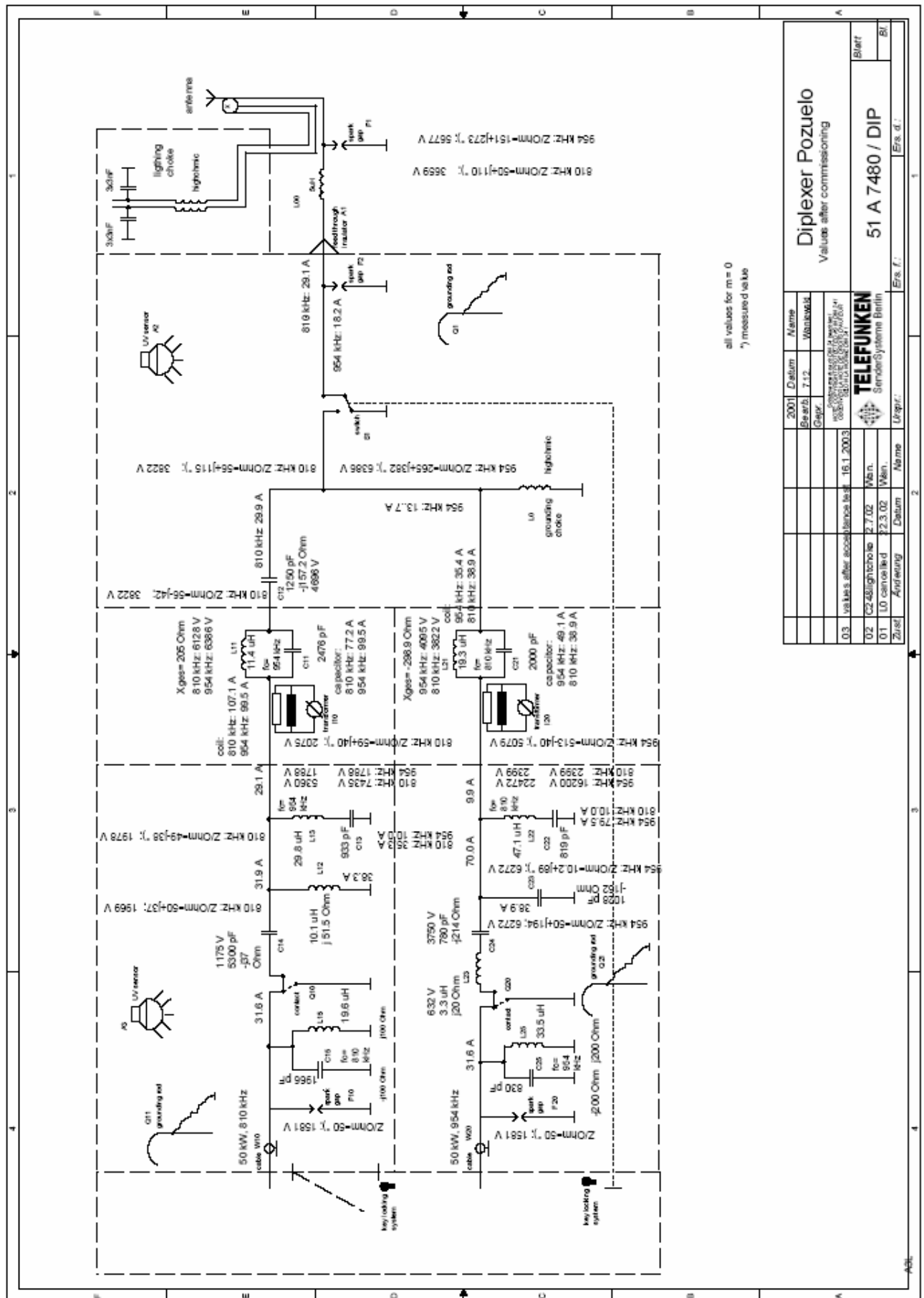
The existing antenna tuning unit for 954 kHz and 100 kW ( left hut on the photo) with the existing mast of 100m was to be modified to a diplexer for 810 kHz (50kW) and for 954 kHz (50 kW). It was necessary to build a new hut (the right one on the photo)

- 1. in order to guarantee as little interruption as possible for the running service on 954 kHz during installing and commissioning of the new diplexer and
- 2. in order to have enough space for the diplexer with four filters: absorption and rejection circuit for each frequency. Diplexer: electrical design including values after commissioning and tuning.

### **2. Diplexer: electrical design including values after commissioning and tuning**

The drawing below shows the electrical design including values after commissioning and tuning:

Diplexer MW Pozuelo 810 kHz & 50 kW, 954 kHz & 50 kW



Diplexer MW Pozuelo 810 kHz & 50 kW, 954 kHz & 50 kW

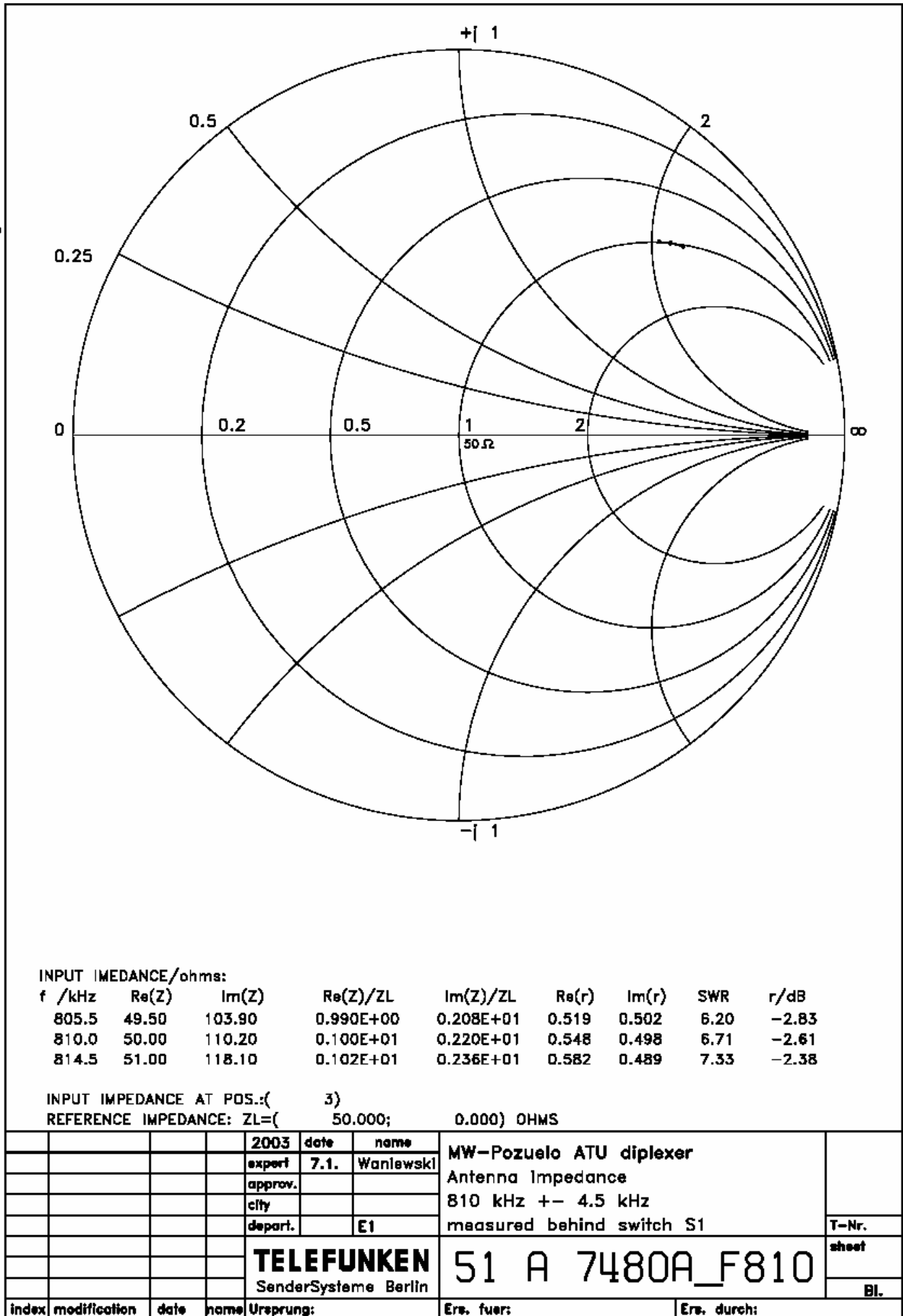
**3. Antenna impedance measured for 810 kHz at feed through insulator inside the antenna tuning hut behind switch S1**

Copyright  
according to DIN 34

7. 1.00 P 15:42:36

7. 1.2003 15:43:41 SMITH-CHART 0 DB

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Diplexer MW Pozuelo 810 kHz & 50 kW, 954 kHz & 50 kW

**4. Antenna impedance measured for 954 kHz at feed through insulator inside the antenna tuning hut behind switch S1**

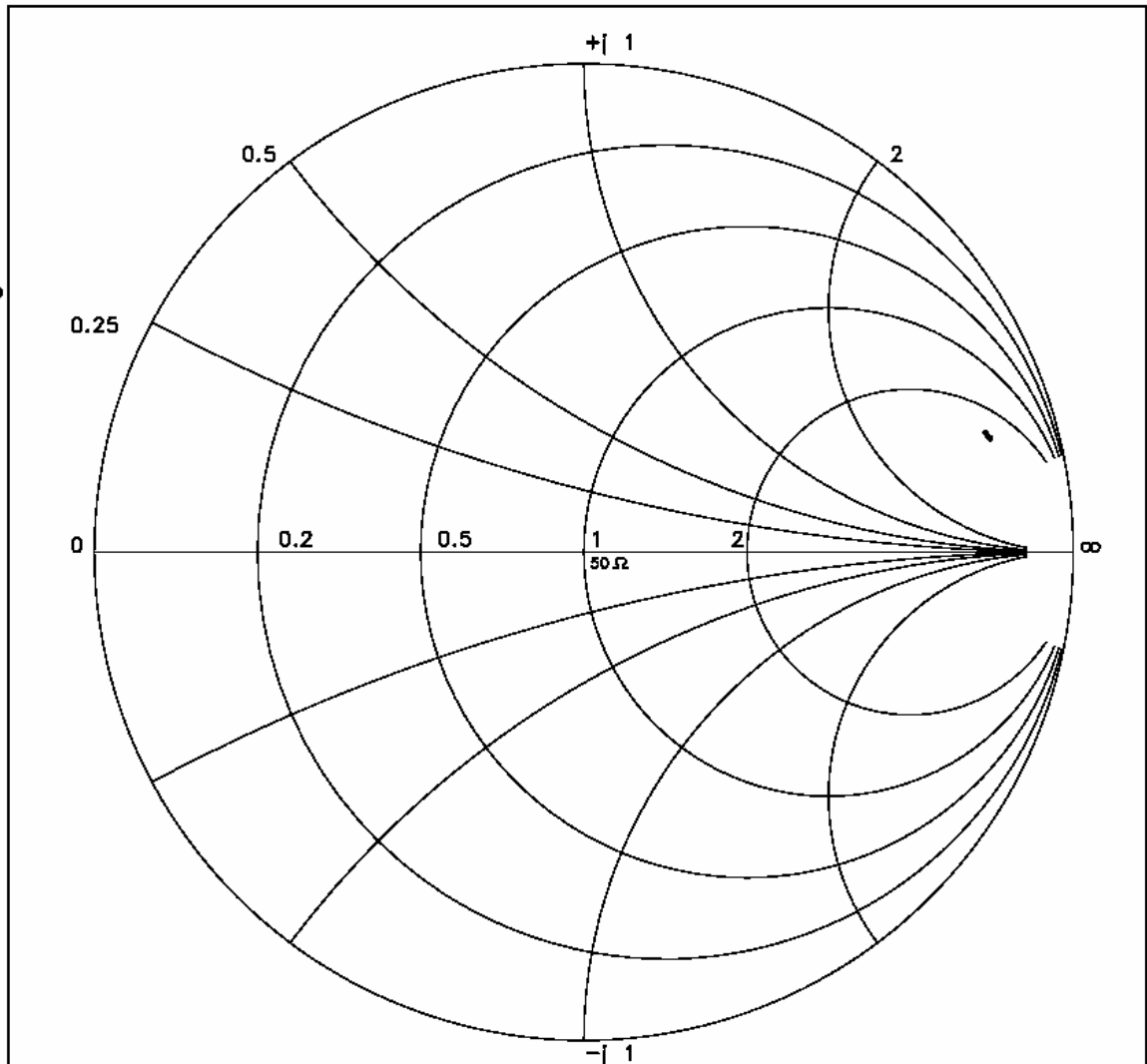
Copyright  
according to DIN 34

7. 1.00 P 15:47:15

F954\_IMP

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7. 1.2003 15:49:42 SMITH-CHART 0 DB



INPUT IMPEDANCE/ohms:

f /kHz	Re(Z)	Im(Z)	Re(Z)/ZL	Im(Z)/ZL	Re(r)	Im(r)	SWR	r/dB
949.5	145.99	265.90	0.292E+01	0.532E+01	0.820	0.244	12.87	-1.35
954.0	150.99	272.79	0.302E+01	0.546E+01	0.825	0.238	13.13	-1.33
958.5	154.99	280.79	0.310E+01	0.562E+01	0.830	0.232	13.52	-1.29

INPUT IMPEDANCE AT POS.:( 3)  
REFERENCE IMPEDANCE: ZL=( 50.000; 0.000) OHMS

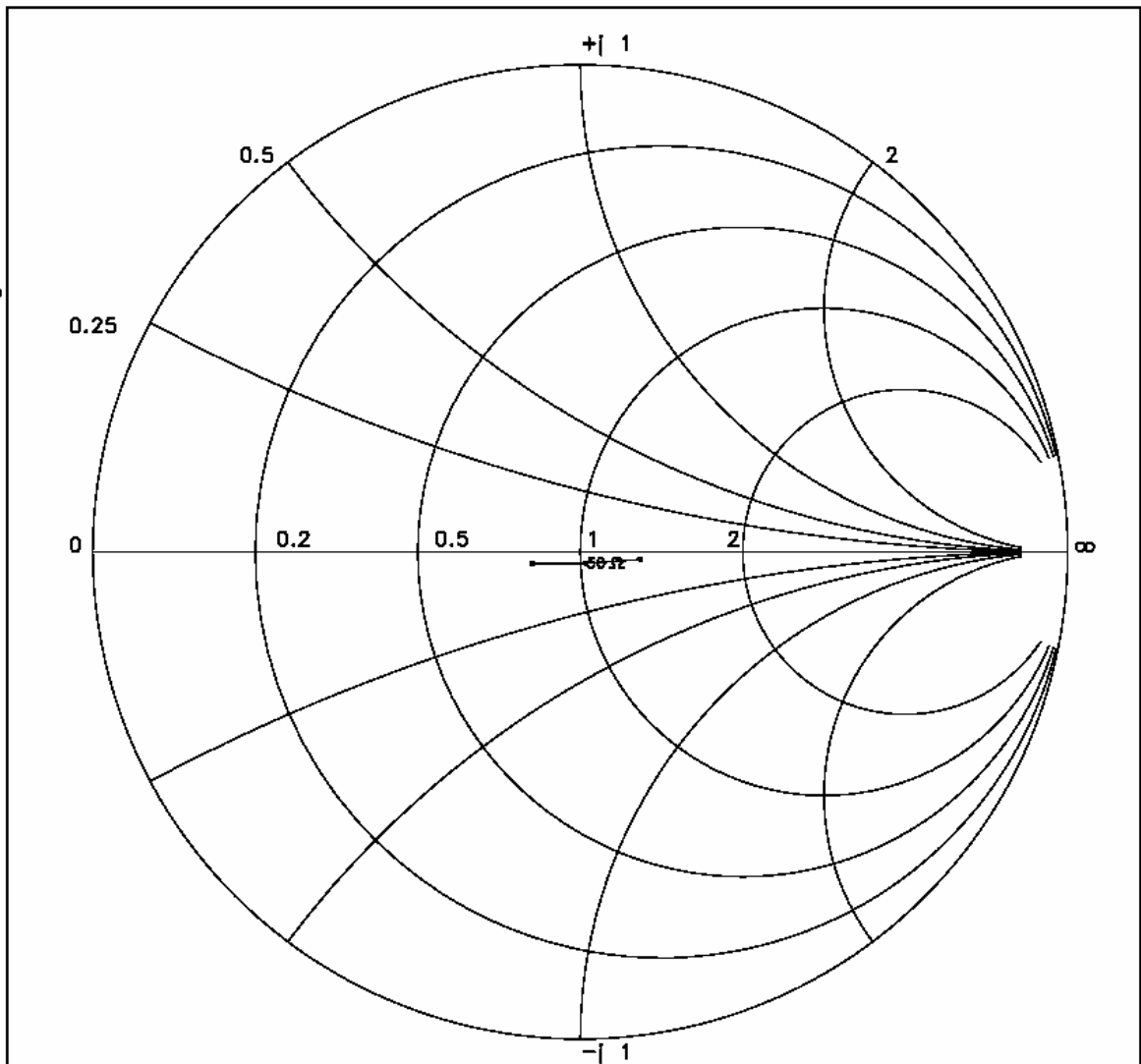
				2003	date	name	MW-Pozuelo ATU diplexer Antenna Impedance 954 kHz +- 4.5 kHz measured behind switch S1	T-Nr.
				expert	7.1.	Waniewski		sheet
				approv.				
				city				
				depart.		E1		Bl.
				<b>TELEFUNKEN</b> SenderSysteme Berlin			51 A 7480A_F954	
index	modification	date	name	Ursprung:	Ers. fuer:	Ers. durch:		

Diplexer MW Pozuelo 810 kHz & 50 kW, 954 kHz & 50 kW

**5. Impedance measured at cable of 50 Ohm for 810 kHz when ATU and antenna are connected**

Copyright  
according to DIN 34

9. 1.2003 11:04:10 SMITH-CHART 0 DB  
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INPUT IMPEDANCE/ohms:

f /kHz	Re(Z)	Im(Z)	Re(Z)/ZL	Im(Z)/ZL	Re(r)	Im(r)	SWR	r/dB
805.5	41.00	-2.04	0.820E+00	-0.408E-01	-0.098	-0.025	1.23	-19.88
810.0	51.00	-2.40	0.102E+01	-0.480E-01	0.010	-0.024	1.05	-31.79
814.5	64.00	-2.04	0.128E+01	-0.408E-01	0.123	-0.016	1.28	-18.13

INPUT IMPEDANCE AT POS.:( 3)  
REFERENCE IMPEDANCE: ZL=( 50.000; 0.000) OHMS

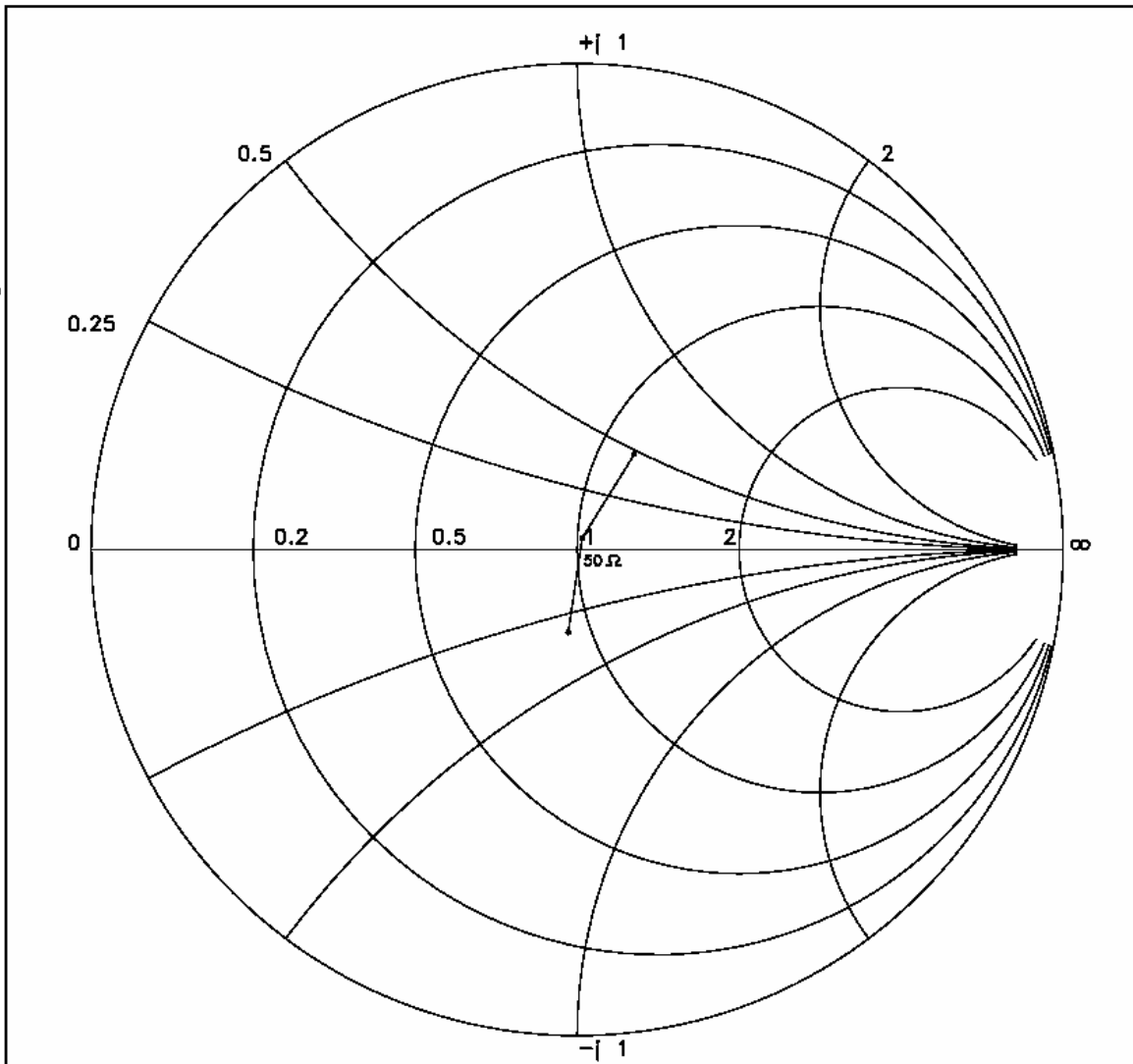
				2003	date	name	MW-Pozuelo ATU diplexer Impedance at cable of 50 ohms 810 kHz +- 4.5 kHz	
				expert	9.1.	Waniewski		
				approv.				
				city				
				depart.		E1		T-Nr.
				<b>TELEFUNKEN</b>		51 A 7480C_F810		sheet
				SenderSysteme Berlin				Bl.
index	modification	date	name	Ursprung:		Ers. fuer:	Ers. durch:	

Diplexer MW Pozuelo 810 kHz & 50 kW, 954 kHz & 50 kW

**6. Impedance measured at cable of 50 Ohm for 954 kHz when ATU and antenna are connected**

Copyright  
according to DIN 34

7. 1.2003 16:02:35 SMITH-CHART 0 DB  
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INPUT IMEDANCE/ohms:

f /kHz	Re(Z)	Im(Z)	Re(Z)/ZL	Im(Z)/ZL	Re(r)	Im(r)	SWR	r/dB
949.5	45.50	-16.00	0.910E+00	-0.320E+00	-0.019	-0.171	1.41	-15.31
954.0	51.00	2.40	0.102E+01	0.480E-01	0.010	0.024	1.05	-31.79
958.5	58.00	24.00	0.116E+01	0.480E+00	0.118	0.196	1.59	-12.82

INPUT IMPEDANCE AT POS.:( 3)  
REFERENCE IMPEDANCE: ZL=( 50.000; 0.000) OHMS

				2003	date	name	MW-Pozuelo ATU diplexer Impedance at cable of 50 ohms 954 kHz +- 4.5 kHz		
				expert	7.1.	Waniewski			
				approv.					
				city					
				depart.		E1		T-Nr.	
				<b>TELEFUNKEN</b> SenderSysteme Berlin			51 A 7480C_F954		sheet
				index	modification	date	name	Ursprung:	
								Ers. fuer:	
								Ers. durch:	
								Bl.	

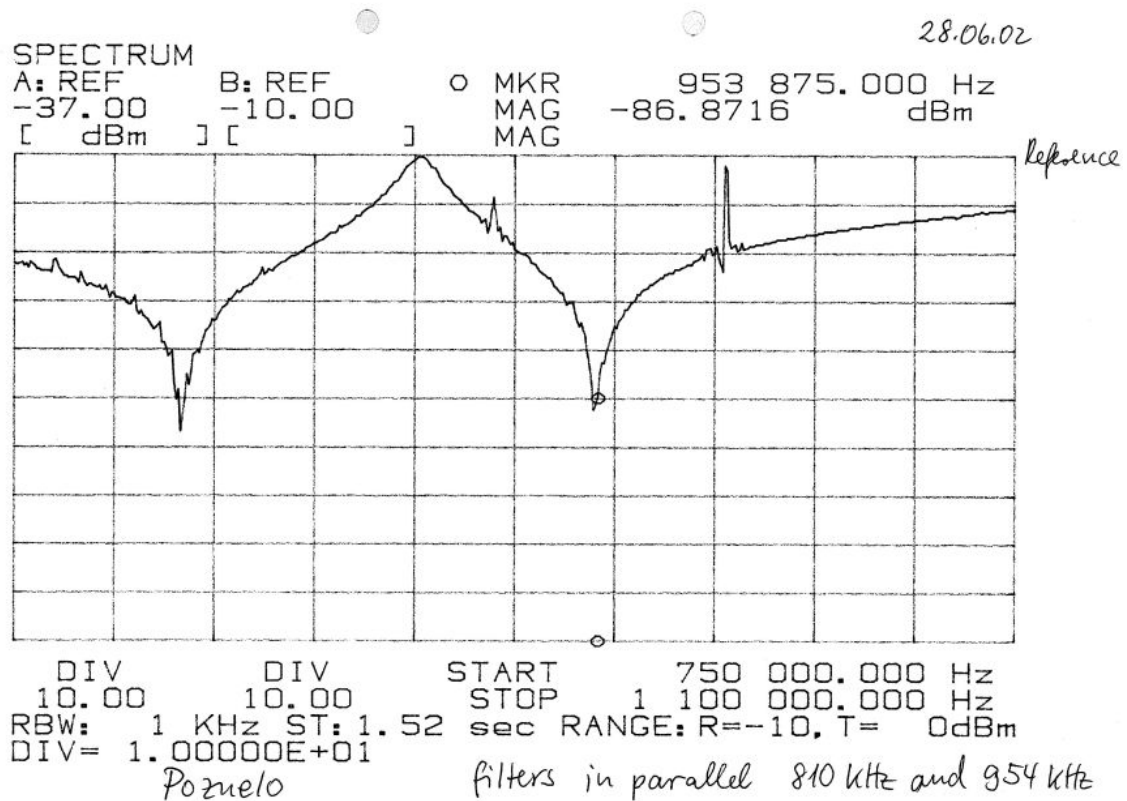
Diplexer MW Pozuelo 810 kHz & 50 kW, 954 kHz & 50 kW

**7. Measurement of filters; transmission characteristic (spectrum)**

The diplexer was disconnected from

- the 50 ohms cable on the 810 kHz side,
- the 50 ohms cable on the 954 kHz side, and
- the antenna including obstruction light coil

The signal was fed on the side of 810 kHz and received on the side of 954 kHz. The result can be seen in the following plots:

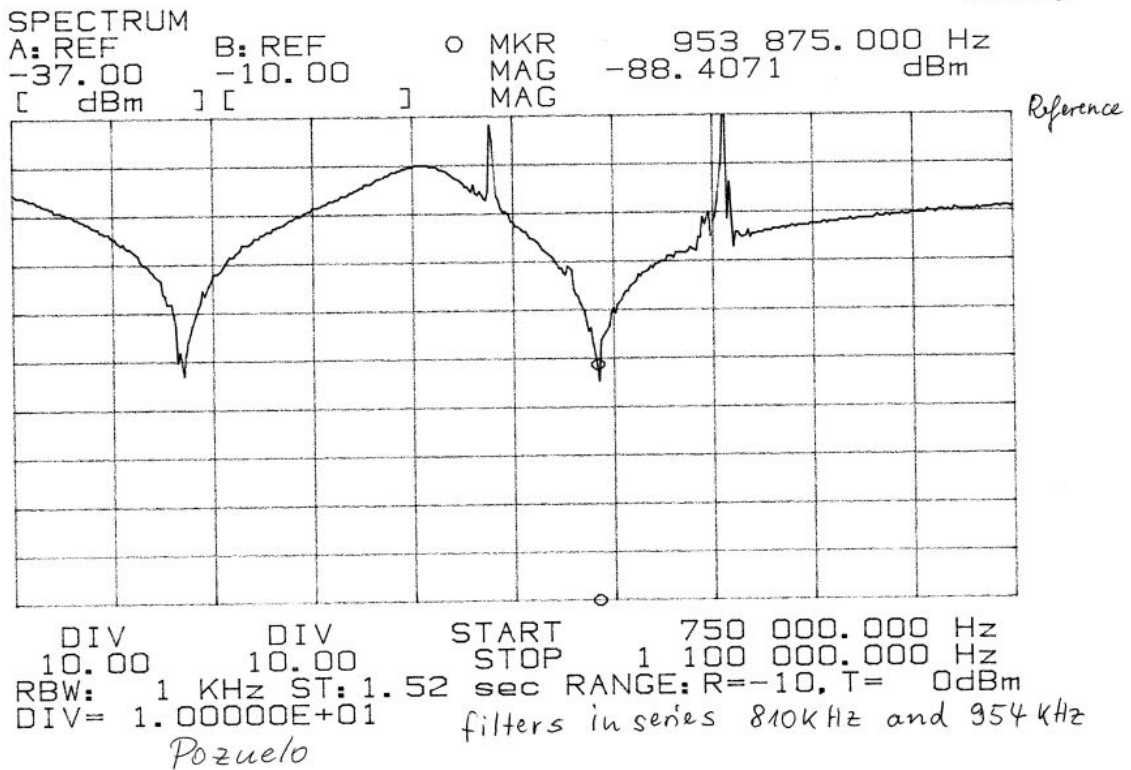


- Plot (filters\_p.jpg) showing the transmission characteristic (spectrum) when parallel filters are active.

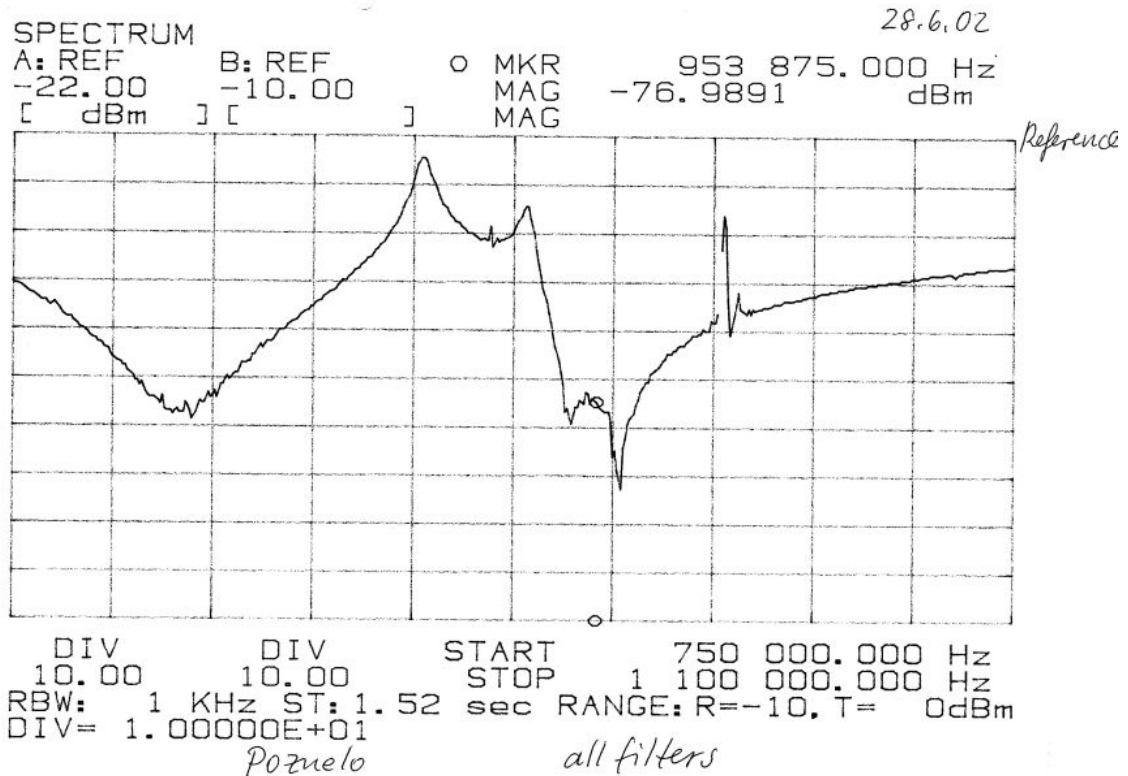


Diplexer MW Pozuelo 810 kHz & 50 kW, 954 kHz & 50 kW

28.06.02



- Plot (filters\_s.jpg) showing the transmission characteristic (spectrum) when series filters are active.



- Plot (filters\_all.jpg) showing the transmission characteristic (spectrum) when all filters are active.

Diplexer MW Pozuelo 810 kHz & 50 kW, 954 kHz & 50 kW

8. ATU settings

<b>C11 :</b>	(13x1000 pF in parallel) in series (13x1000 pF in parallel) in series (12x1000 pF in parallel) in series (12x1000 pF in parallel) in series (12x1000 pF in parallel)	<b>2476 pF</b>
<b>C12 :</b>	(2x1000 pF + 500 pF in parallel) in series (2x1000 pF + 500 pF in parallel)	<b>1250 pF</b>
<b>C13 :</b>	(4x1000 pF in parallel) in series (3x1000 pF + 500 pF in parallel) in series (4x1000 pF in parallel) in series (3x1000 pF + 500 pF in parallel)	<b>933 pF</b>
<b>C14 :</b>	(6x1000 pF in parallel)	<b>6000 pF</b>
<b>C15 :</b>		<b>1966 pF</b>
<b>C21 :</b>	(8x1000 pF in parallel) in series (8x1000 pF in parallel) in series (8x1000 pF in parallel) in series (8x1000 pF in parallel)	<b>2000 pF</b>
<b>C22 :</b>	(3x1000 pF + 300 pF in parallel) in series (4x1000 pF in parallel) in series (3x1000 pF in parallel) in series (3x1000 pF in parallel)	<b>820 pF</b>
<b>C23 :</b>	(3x1000 pF in parallel) in series (3x1000 pF in parallel) in series (3x1000 pF in parallel)	<b>1000 pF</b>
<b>C24 :</b>	(3x1000 pF in parallel) in series (2x1000 pF + 300 pF in parallel) in series (3x1000 pF in parallel)	<b>908 pF</b>
<b>C25 :</b>		<b>830 pF</b>
<b>L11 :</b>	nup= 4.25 active ndown= 3.9 active	<b>≈11.2 uH</b>
<b>L12 :</b>	n= 7.25 active	<b>≈ 10.1 uH</b>
<b>L13 :</b>	n= 17.5 active	<b>≈ 29.8 uH</b>
<b>L15 :</b>		<b>≈ 19.6 uH</b>
<b>L21 :</b>	n= 9.2 active	<b>≈ 19.3 uH</b>

Diplexer MW Pozuelo 810 kHz & 50 kW, 954 kHz & 50 kW

**L22 :** n= 16.5 active ( complete ) **≈ 47.1 uH**

**L23 :** n= 2.5 active **≈ 3.3 uH**

**L25 :** **≈ 33.5 uH**

9. Drawings

<b>Subject</b>	<b>Drawing number</b>	<b>Computer file</b>
Diplexer, electrical design including values after commissioning	51 A 7480 / DIP	POZUELOVAL2.pdf
Antenna impedance 810 kHz +- 4.5 kHz measured behind S1	51 A 7480A_F810	7480a_f8.pdf
Antenna impedance 954 kHz +- 4.5 kHz measured behind S1	51 A 7480A_F954	7480a_f9.pdf
Impedance at cable of 50 ohms for 810 kHz +- 4.5 kHz	51 A 7480C_F810	7480c_f8.pdf
Impedance at cable of 50 ohms for 954 kHz +- 4.5 kHz	51 A 7480C_F954	7480c_f9.pdf
Transmission characteristic when parallel filters are active		filters_p.jpg
Transmission characteristic when series filters are active		filters_s.jpg
Transmission characteristic when all filters are active		filters_all.jpg