1 Introduction

This document describes the match changes that are recommended, when using the Sanyo ASWMF41CBBAA FEM for Leonardo US dual band boards and the Sanyo ASWMF41CABAAT FEM for Leonardo EU dual band boards.

2 Leonardo EU

The Tx behaved ok, with the original match, which has been used for the original component from another vendor.

The conducted Tx spurious is also OK, with a minimum margin of 7 dB, measured on 2 boards, 3 channels on each band, and high and low voltage. For further details, please see the following link:

Board 6 **(with a shield can)**

3,8 volt		3,8volt	
	1,5GHz-12,75GHz		**3GHz-12,75GHz**
975	-38.25 dBm @ 3^{rd} harm.	**512**	-47.81 dBm @ 6^{th} harm.
62	-42.59 dBm @ 3^{rd} harm.	**700**	-48.56 dBm @ 2^{nd} harm.
124	-42.79 dBm @ 3^{rd} harm.	**885**	-46.28 dBm @ 2^{nd} harm.

Table 1: Worst case harmonics for each band and channel. It is also tested for 3.23 volt supply, with a very similar result to the 3.8 volt supply. It is furthermore tested on another board, with very similar results also (within 1 dB for EGSM and 2 dB for DCS).

The receiver had to be optimized a little, in order to get best possible performance. The Rx match has therefore been changed to this:

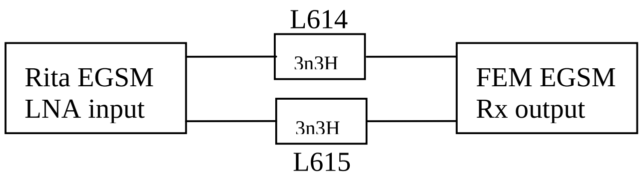

Figure 1: The optimized EGSM Rx match for the Sanyo FEM.

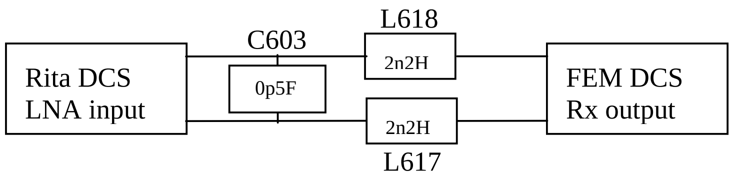

Figure 2: The optimized DCS Rx match for the Sanyo FEM.

These matches has been found using a network analyzer, and verified by measuring the sensitivity, before and after the match change.

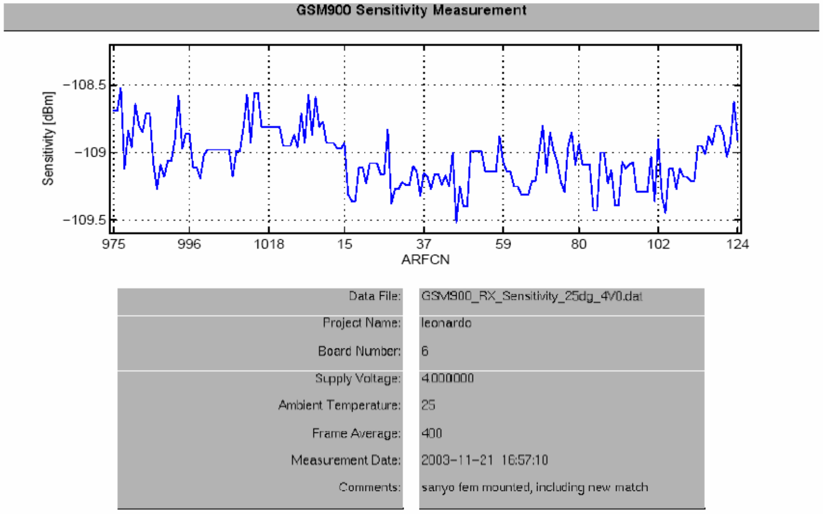

Figure 3: Automatic sensitivity measurement in normal temperature for GSM 900, with the new match.

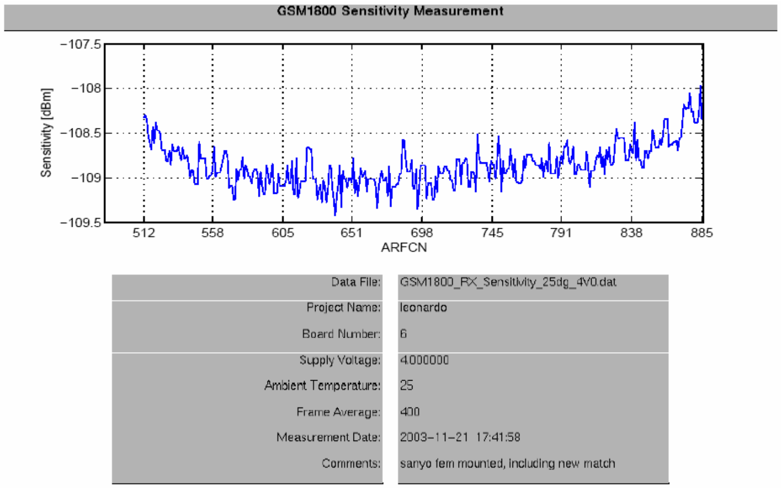

Figure 4: Automatic sensitivity measurement in normal temperature for GSM 1800, with the new match.

3 Leonardo US

It turned out that there were some problems when using the US dual band FEM with the original match components on the Leonardo boards. These problems, where a large variation on the PCS Tx power, which was around 1 dB, and conducted spurious on 850 Tx. It was proved that the conducted spurious emission was due to cross-talk from the PCS Tx. So the PCS Tx match has been optimized to solve these problems. A network analyzer, together with information from the load-pull measurements supplied by the PA vendor, was used, to found a nice match. This new match can be found in the figure below.

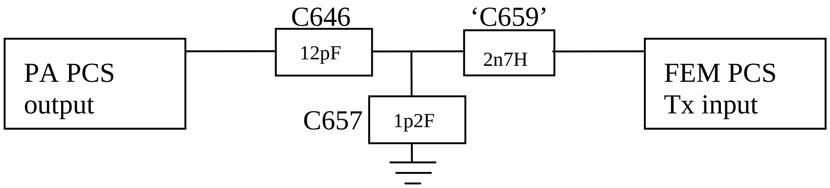

Figure 5: The optimized PCS Tx match for the Sanyo FEM.

With this match the Tx power variation over band is much less, than with the original match. This is proven by measurements.

The conducted spurious emission performance with the new PCS Tx match can be found here.

Board 35 (with a shield can)			
3.8 Volt		3,8 Volt	
TCH	1,5GHz-12,75GHz	TCH	3GHz-12,75GHz
128	-40,32 dBm @ 2nd harm.	512	-40,68 dBm @ 2nd harm.
190	-41,54 dBm @ 2nd harm.	660	-42,70 dBm @ 2nd harm.
251	-43,74 dBm @ 3rd harm.	810	-48,50 dBm @ 2nd harm.

Table 2: Worst case harmonics for each band and channel. It is also tested for 3.23 volt supply, with a very similar result to the 3.8 volt supply.

It can be seen in the table above, that there is minimum 10 dB margin in all measured cases (2 bands, 3 channels and normal voltage).

The power variation and conducted performance, has been checked, with all combination where the capacitor was set to 1pF and 1p5F, and the inductor where set to 2n2H and 3n3H. This was done, to ensure, that this match will work even though the components will spread from there ideal value, both in production and in temperature.

The receiver had to be optimized a little, in order to get best possible performance. The Rx match has therefore been changed to this:

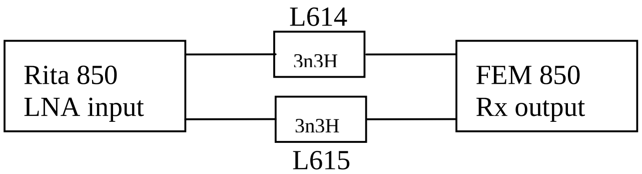

Figure 6: The optimized 850 Rx match for the Sanyo FEM.

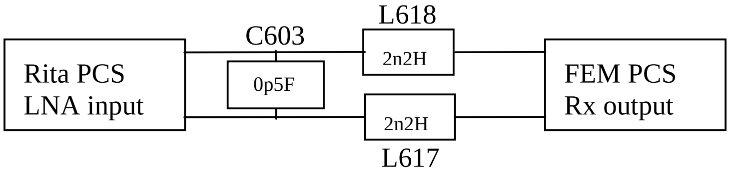

Figure 7: The optimized PCS Rx match for the Sanyo FEM (It actually uses the DCS LNA input).

These matches has been found using a network analyzer, and verified by measuring the sensitivity, before and after the match change.

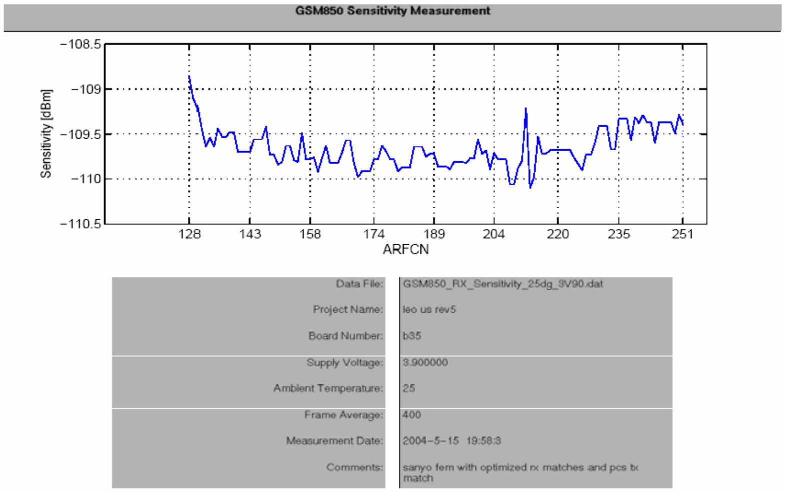

Figure 8: Automatic sensitivity measurement in normal temperature for GSM 850, with the new match.

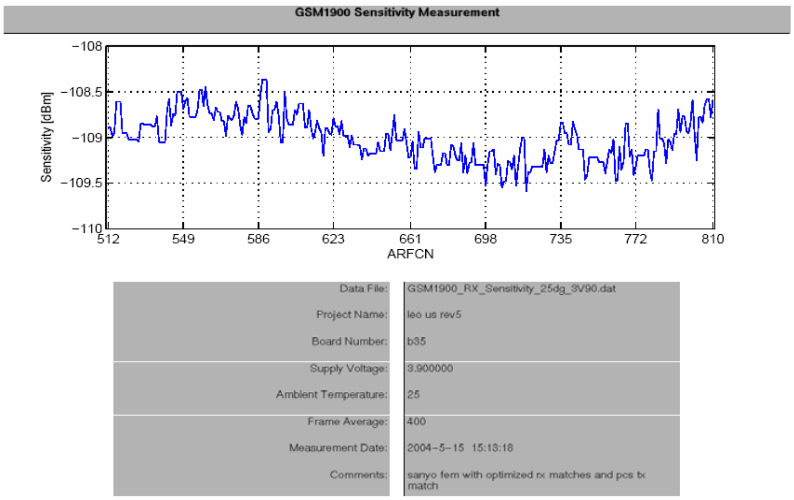

Figure 9: Automatic sensitivity measurement in normal temperature for GSM 1900, with the new match.