

Adlane Fellah  
+1-305-865-1006  
[afellah@maravedis-bwa.com](mailto:afellah@maravedis-bwa.com)



**Nokia Networks W-CDMA/LTE Multi-mode Baseband Unit  
083833A.104  
Model FSME**

**November 2014**



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# EXECUTIVE SUMMARY

This report is a design "teardown" analysis of a Nokia Networks (formerly Nokia Siemens Networks/Nokia Solutions Networks) multi-mode W-CDMA/LTE baseband system module. The baseband processing "digital Unit" supports both W-CDMA and LTE technology. The analysis covers the entire system including the signal processing functions. A simplified mechanical analysis of the unit along with detailed bill of materials analysis is presented in this report. The Nokia product name is FSME. The Nokia P/N for this unit is 083833A.104 FSME Core. The Nokia P/N for the metal case is 471469A.104. We believe this particular unit was manufactured in China. We are aware of other units being manufactured in Germany and possibly in India.

## ***Active/Passive Component Summary***

<b>Total Weight:</b>	8.5 kg
<b>Total Active/Passive Components:</b>	x [1]
<b>Total Active Components:</b>	x [1]
<b>Total Passive Components:</b>	x [1]
<b>Total Other Components:</b>	x [2]

[1] Excluding components on hybrid modules and DC/RF cables & connectors

[2] Primarily DC/RF Cables & Connectors

### ***Important Note:***

**This particular unit was built in Q3 2010**, given the date codes present on many of the semiconductor integrated circuits contained within the unit as well as on the front panel of the unit. As such, some of the components, both active and passive, may have been updated or replaced by more recent part numbers. The majority of the components contained within the bill of materials analysis are RoHS compliant. We believe that the overall system and functionality presented has not changed dramatically compared to the latest version of this unit.

Where possible, all components, both passive and active, have been identified with the manufacturer's part number within the bill of materials analysis.

This analysis does not include any pricing information or estimated costs on the mechanical design or for any passive or active components contained within the system.

All dimensions, unless otherwise specifically stated, are in metric format.

# CHAPTER 1: NOKIA FLEXI MULTIRADIO BTS SYSTEM

## ***Overview of Nokia Flexi Product Offering***


The current generation Flexi BTS product portfolio consists of a macrocell main/RM/RRH system.

The indoor (FCIA)/outdoor (FCOA) Flexi macro BTS cabinets can support up to a combination of 12 system and radio modules.

The LTE digital baseband unit is designated as FS<z><x> where <z> is"





-  I Indoor Version
-  M Outdoor Version

<x>=:













-  Hardware Variant (D, E, F, etc.)

There are also GSM/EDGE variants call ESM<x> where <x> is the hardware variant A, B, C, etc.

The RF module/remote radio head unit is called the F<z> <x> <y> where <z> is:

-   $\Delta$  Remote radio head (1TX, 2TX)
-   $\Delta$  Radio module/remote radio head (1 TX, 2TX, 3TX)
-   $\Delta$  Radio module (1 TX, 2TX, 3TX)
-   $\Delta$  Radio module/remote radio head (2TX, 4TX, 8TX)

And <x> is the frequency band:

-   $\Delta$  400MHz
-   $\Delta$  700MHz Band 13
-   $\Delta$  800MHz Band 5/6
-   $\Delta$  900MHz Band 8
-   $\Delta$  1800MHz Band 3
-   $\Delta$  1900MHz Band 2
-   $\Delta$  2100MHz Band 1
-   $\Delta$  2600MHz Band 7
-   $\Delta$  2100MHz AWS Band 4
-   $\Delta$  1500MHz Band 11
-   $\Delta$  700MHz Band 12
-   $\Delta$  800MHz Band 20

And where <y> is the product revision.

There are currently three variations of the LTE digital unit with regards to capacity configurations, Rel 9 vs. Rel 10 support and FDD vs. TDD support. This report focuses only on the multi-mode W-CDMA/LTE Rel 9 FSME version. The typical power consumption is 150W at 100% load at 23 Deg C while the maximum power consumption is 325W. The external dimensions of the unit are 447mm x 422mm x 133mm including the case. Each system module is 3U in height and fits into a standard 19 inch equipment rack for installation.

The FSME provides the switching, traffic management, timing, baseband processing and radio interface for the base station.

Exhibit 1: Nokia Flexi Macro Cell Indoor/Outdoor BTS System Cabinets, FCIA (L) and FCOA (R)



Source: Nokia Networks

Exhibit 2: Flexi FSMx System Module w/Case, Front/Back Covers and External Cable Entry Covers





Source: Nokia Networks




There are currently three versions of the FSMx supporting LTE:

-  FSMD
-  FSME
-  FSMF

 FSMD      x CE for W-CDMA  
3GPP Rel 9 Support  
FDD/TDD Support  
Maximum Downlink Throughput xMbps  
Maximum Uplink Throughput xMbps  
xMHz Bandwidth  
x cells  
x per cell

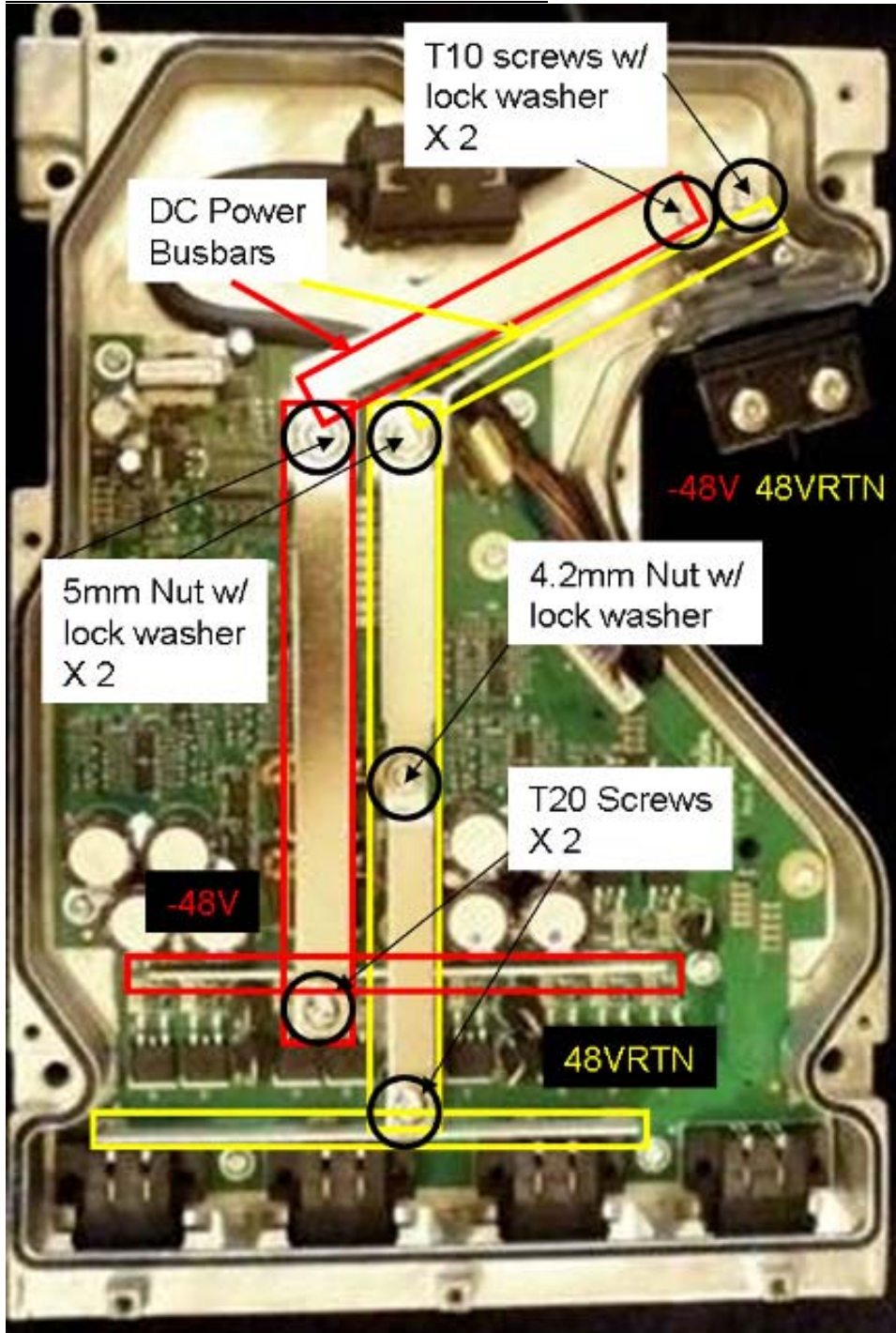
 FSME      x CE for W-CDMA  
3GPP Rel 9 Support  
FDD/TDD Support  
Maximum Peak Downlink Throughput xMbps  
Maximum Peak Uplink Throughput xMbps  
xMHz Bandwidth per cell  
x cells  
x per cell

 FSMF      x TRx for GSM/EDGE  
x CE for W-CDMA  
Maximum peak downlink for HSDPA x Mbps  
Maximum peak downlink for HSUPA x Mbps  
3GPP Rel 10 Support  
FDD/TDD Support  
Maximum Peak Downlink Throughput xMbps  
Maximum Peak Uplink Throughput x Mbps  
xMHz Bandwidth per cell  
x cells  
x per cell

Each FSMx unit can support up to three radio modules (RM) or three remote radio heads (RRH). Up to two FSMx system modules may be combined to pool baseband resources. Each FSMx system module can support up to x cells with xMHz or up to x cells with xMHz.

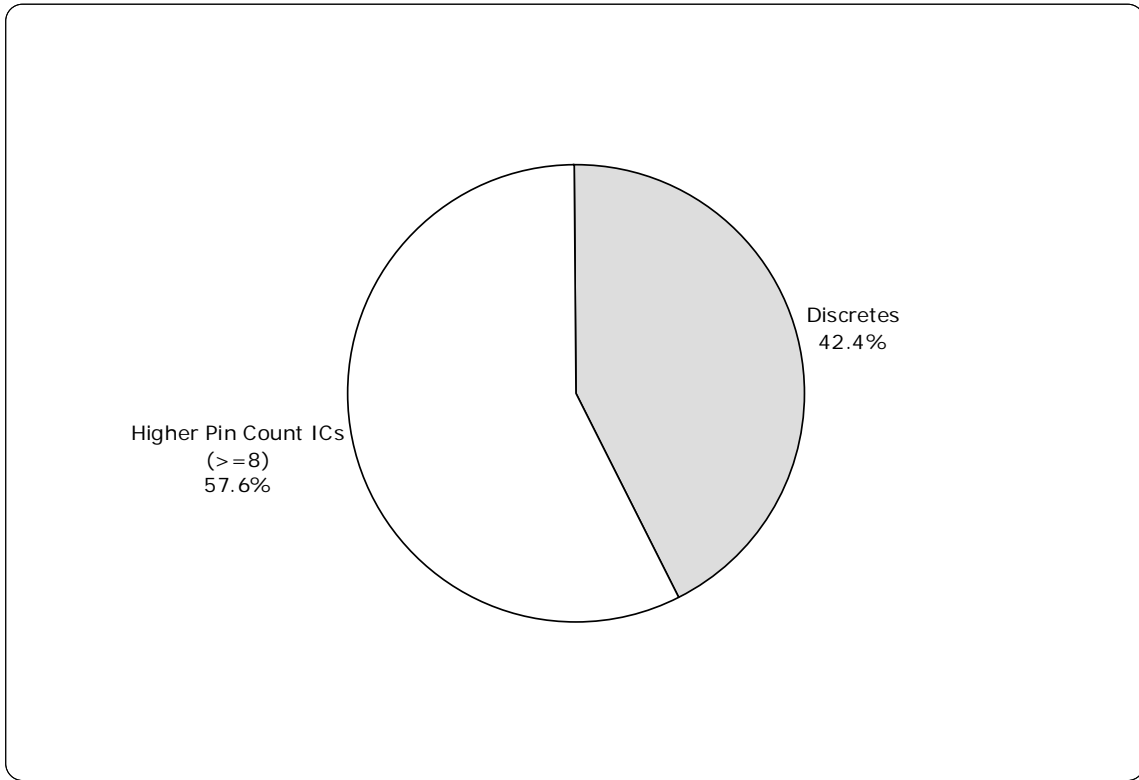
Upon removal of the cover, the internal architecture of the x module is revealed. The main -48V DC power is fed through the terminal connections to a set of metal bus bars that distribute the -48V and the return to the PCB. The weight of the frame including the PCB and the metal bus bars is 1.393kg.

Exhibit 3: x Internal View of Frame w/ PCB



Source: EJM Wireless Research LLC (November 2014)

Exhibit 4: High Pin Count IC vs. Discretes



Source: EJL Wireless Research LLC (November 2014)

Approximately 58% of the semiconductors in the FSME are in packages with 8 or more pins.