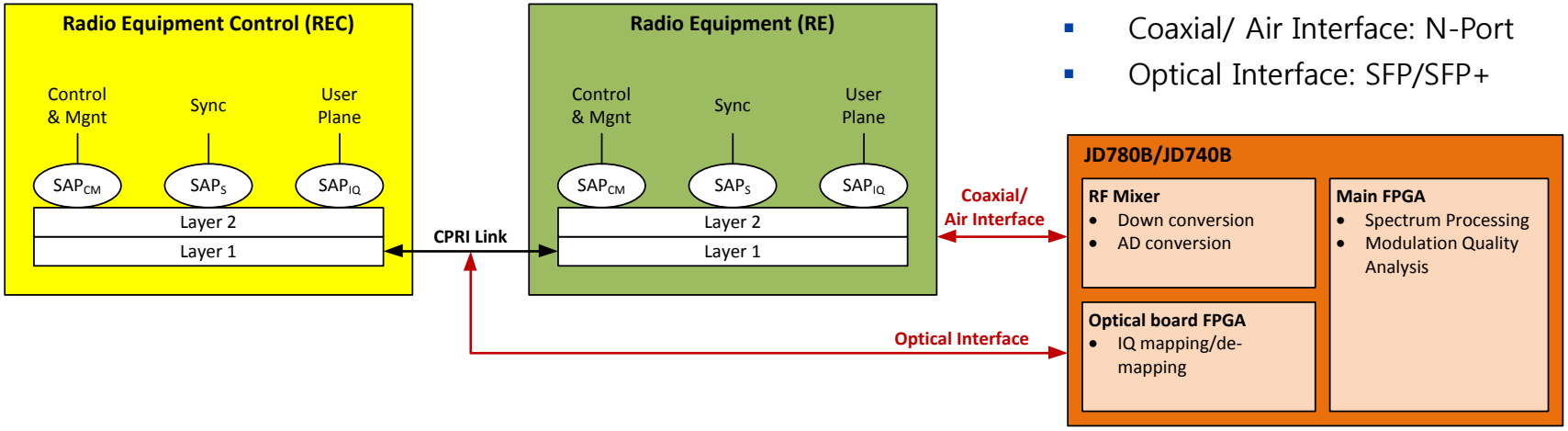
CellAdvisor RFoCPRI™

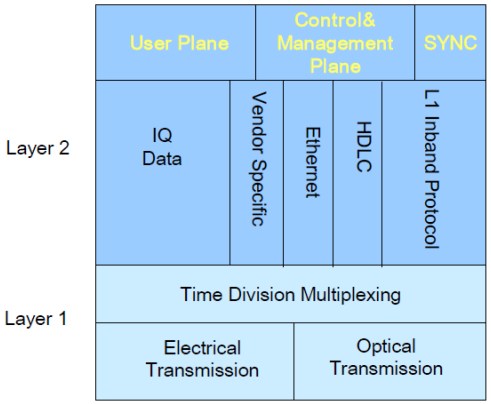
RFoCPRI™ Technology
Interface

JD745B은 RRH 테스트를 위한 인터페이스의 두 가지 유형을 지원합니다



- Coaxial/ Air Interface: N-Port
- Optical Interface: SFP/SFP+

CPRI 프로토콜 개요



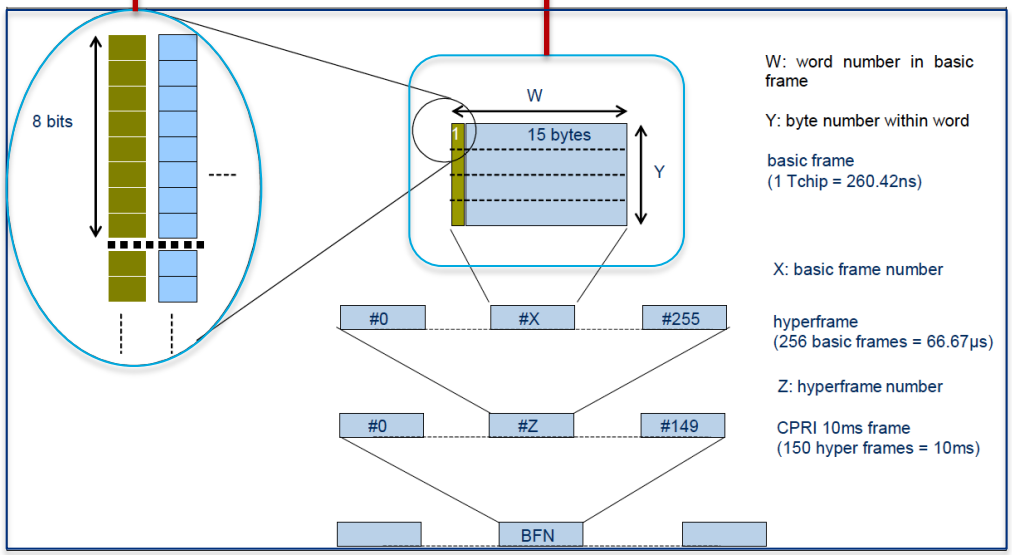
User Plane: 하나의 안테나 및 하나의 캐리어(AC)의 IQ 데이터 흐름.
Control Plane: 정보는 운영, 관리 및 CPRI 링크의 유지 보수 관련. 제어 데이터 바이트의 실제 내용은 CPRI 정의되지만 제조사에 특정되지 않는다
Synchronization Plane: 노드들 사이의 프레임 시간 동기 정보를 전송하는 데이터 흐름.
IQ Data: 동 위상 및 직교 변조 된 데이터의 형태로 사용자 정보 (디지털베이스 밴드 신호).
L1 Inband Protocol: 링크 관련되어 직접적으로 물리 계층에 의해 반송되는 정보 신호.

CPRI Technology Overview

CPRI Frame 구조

Length of control word

Line Rate [Mbps]	Length of word [bit]
614.4	T=8
1228.8	T=16
2457.6	T=32
3072.0	T=40
4915.2	T=64
6144.0	T=80
9830.4	T=128



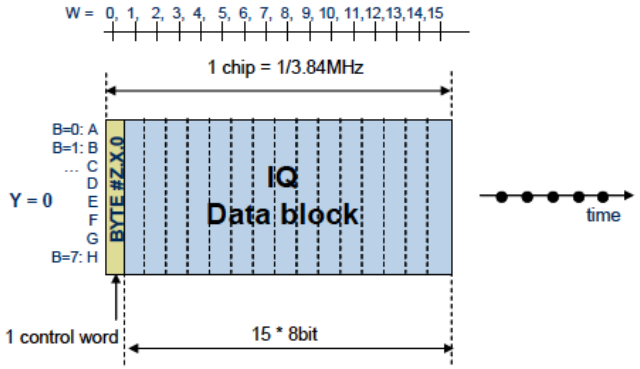


Figure 7: Basic frame structure for 614.4 Mbit/s CPRI line bit rate

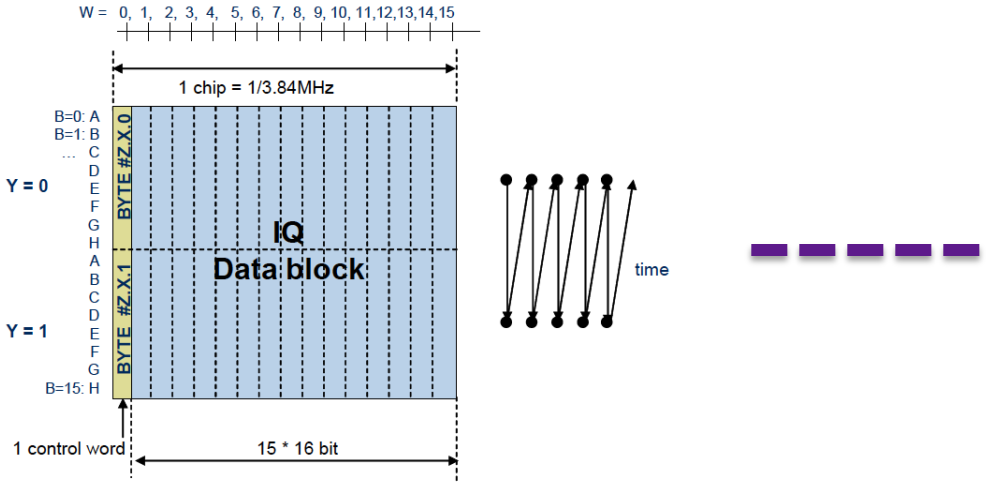


Figure 8: Basic frame structure for 1228.8 Mbit/s CPRI line bit rate

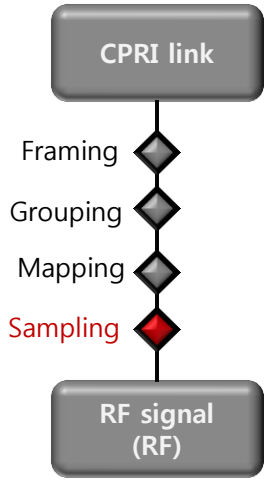
CPRI Technology Overview

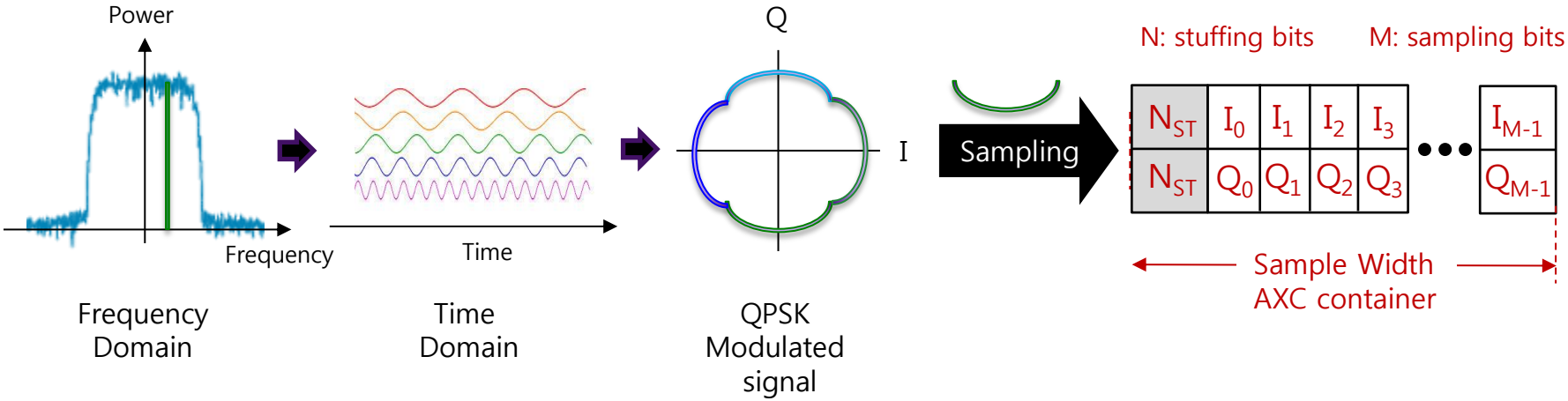
User Plane Sampling

- **Sampling:**

  - 사용자 데이터는 하나의 캐리어, 다시 말해서, 안테나 캐리어 (AxC) 콘테이너에 대해 하나의 안테나의 데이터를 반영하고 IQ 데이터 흐름의 형태로 이송된다.

  - AxC 당 샘플링 레이트는 스터핑 샘플 첨가 정수배에 동등하지 않은 신호 인 경우 (3.84MHz)의 정수배로 맞추어 집니다.

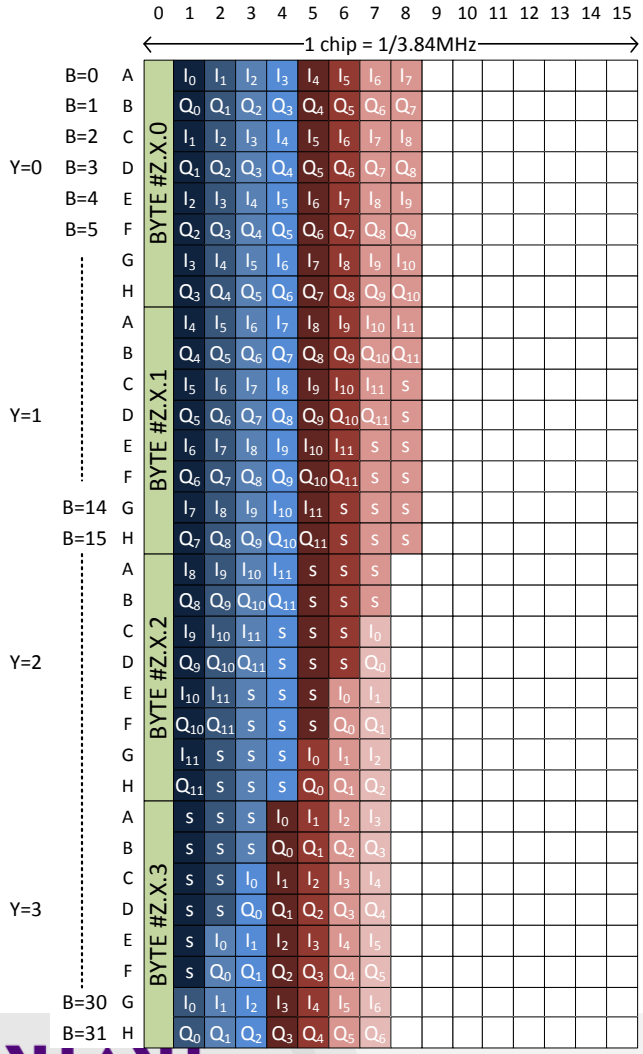


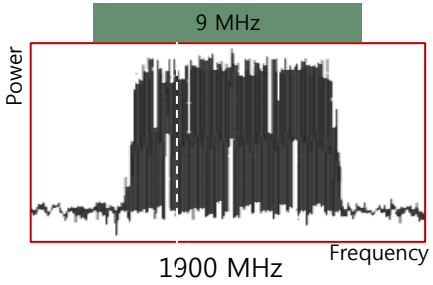


RFoCPRI™ 측정

LTE Spectrum 측정

- **LTE CPRI Mapping – 2457.8 Mbps**





AxC Group #1 AxC Group #2

I_0 AxC #0	I_0 AxC #4
I_0 AxC #1	I_0 AxC #5
I_0 AxC #2	I_0 AxC #6
I_0 AxC #3	I_0 AxC #7

Total bits / Basic Frame
= 8 x 4 x 16
= 512

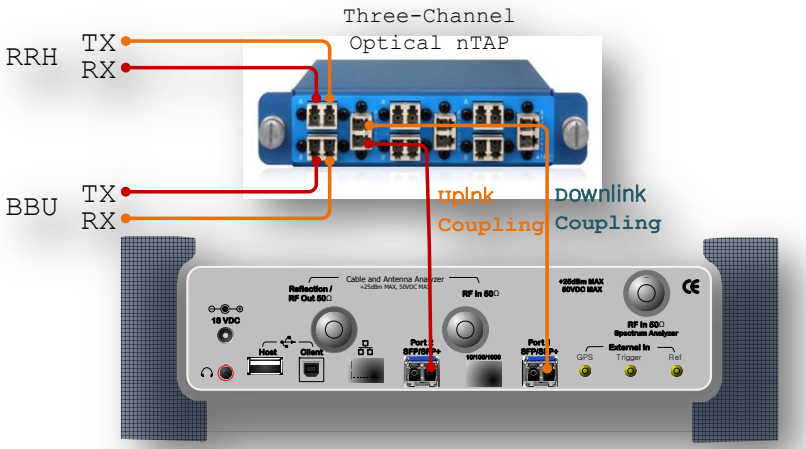
512 – 32
= 480

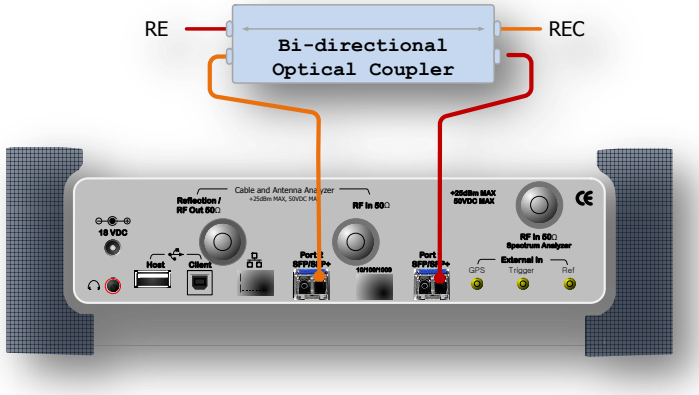
DUT	
CPRI line rate (Mbps)	2457.6
LTE Bandwidth	9 MHz
Carriers	MIMO
AxC positioning	Packed
IQ Sampling	15
Over sampling	1
Stuffing Bits	3

Test Configuration		
Link Rate (Mbps)		2457.6
Bandwidth (MHz)		10
NEM		None
AxC Group		1 – 2
IQ Sample Width		12
Map Position (AxC Spacing)	AxC 0	0 (0)
	AxC 1	15 (30)
	AxC 2	30 (60)
	AxC 3	45 (90)
	AxC 4	60 (120)
	AxC 5	75 (150)
	AxC 6	90 (180)
	AxC 7	105 (210)

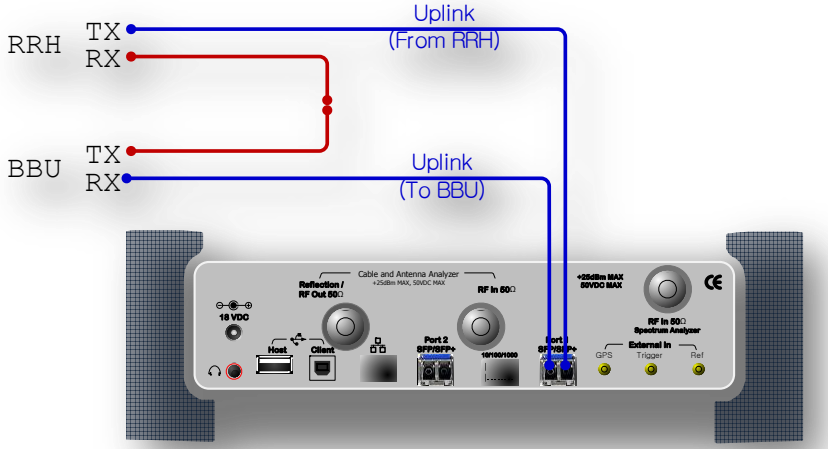
RFoCPRITM Measurement
Cable 연결방법

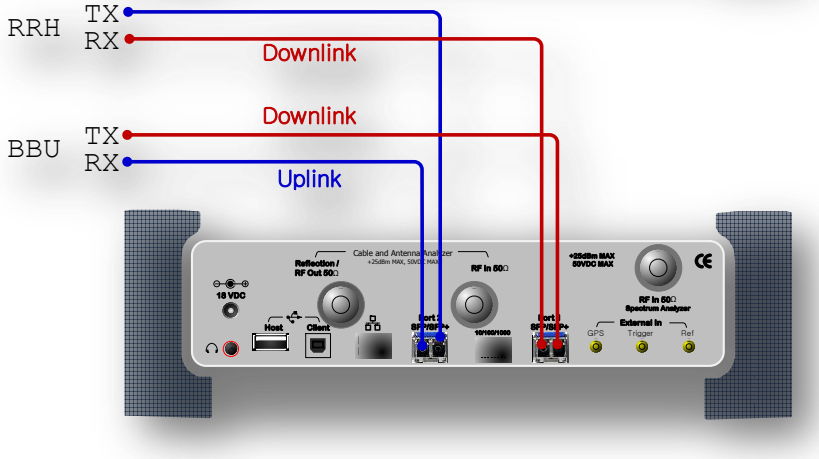
- **Tab/Coupler 를 이용하는 경우**





- **Thru Mode를 이용하는 경우**





CellAdvisor RFoCPRI

Link 유지 보수

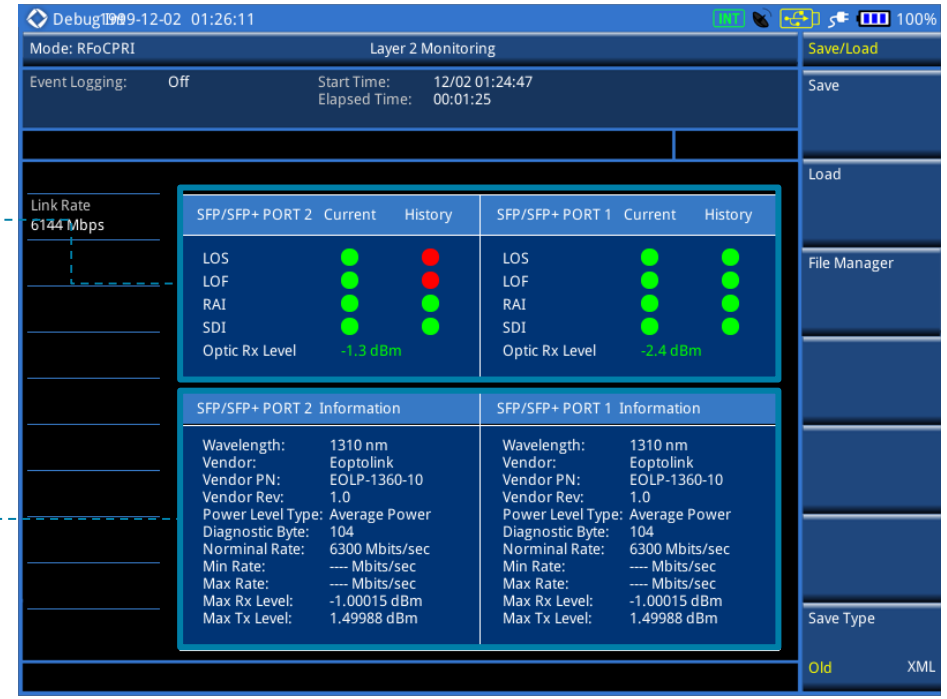
CellAdvisor RFoCPRI

Layer 2 Monitoring

CellAdvisor RFoCPRI™
Layer 2 Monitoring

- **링크 유지 보수**
  - **Loss of signal (LOS):** 코드 위반 또는 낮은 광 파워.
  - **Loss of frame (LOF):** 프레임 동기화 또는 정렬.
  - **Remote alarm indication (RAI):** LOS, LOF를 포함한 모든 오류.
  - **SAP defect indication (SDI):** 서비스 액세스 포인트에 연결 상태
  - **Optical Power Level**

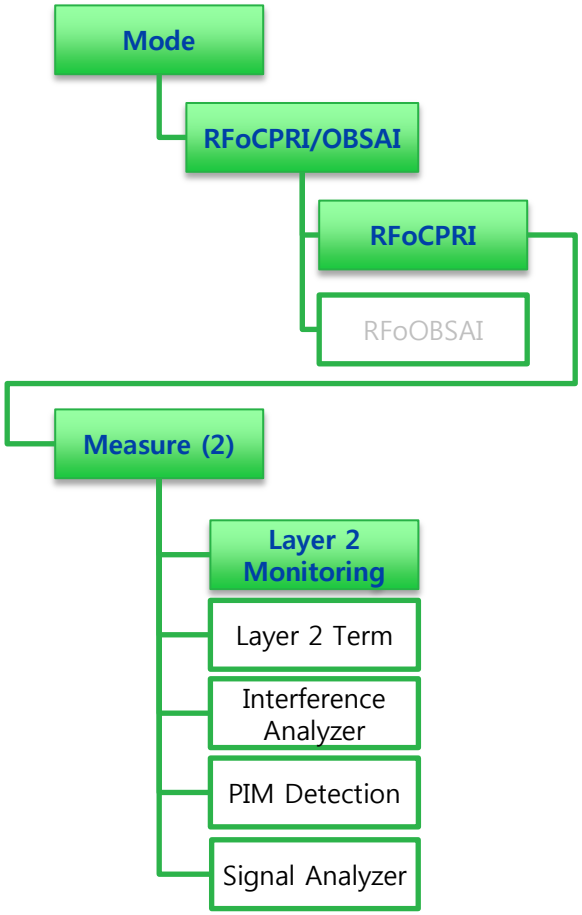
- **SFP 사양 및 정보**
  - **Wavelength (파장)**
  - **Nominal Rate**
  - **Max RX Level**

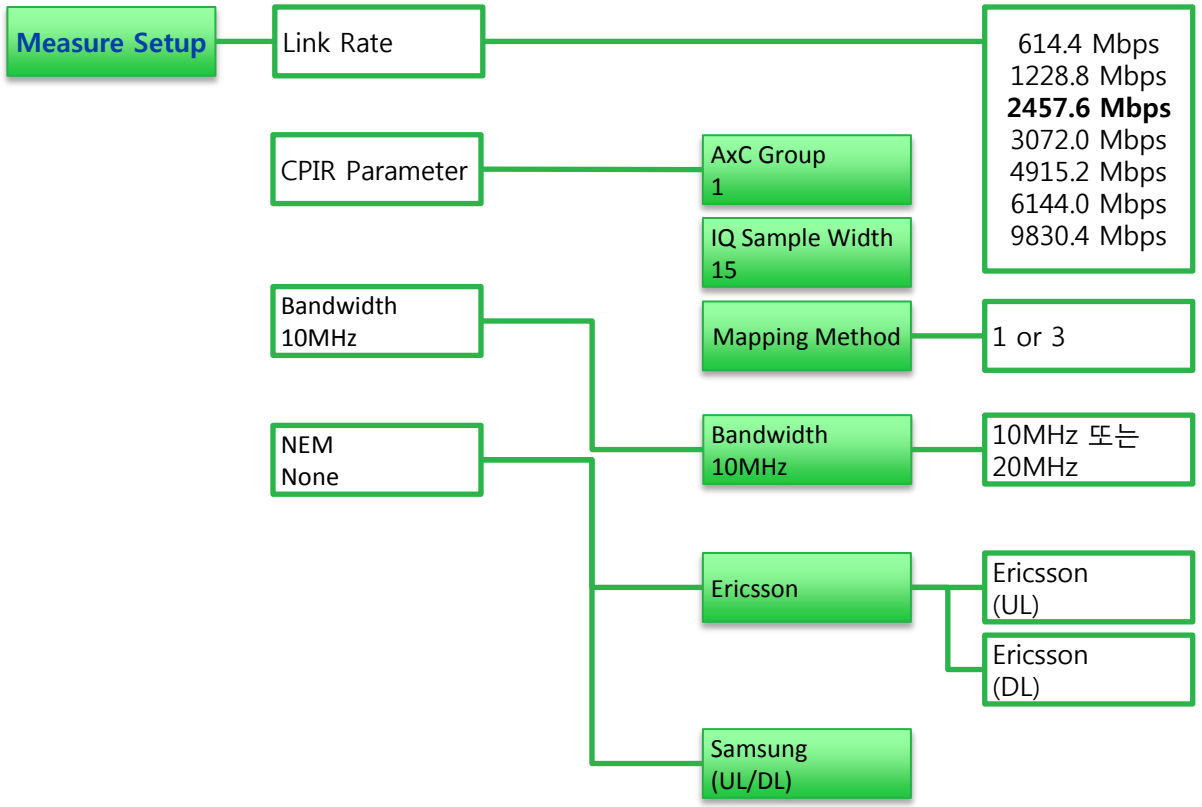


팁!
- SFP는 DU-RU라인에 맞는 사양을 사용 하시기 바랍니다.
- SFP는 DU-RU링크 속도 보다 높은 것을 사용 해야 합니다.

RFoCPRITM Measurement

메뉴 구조 – Layer 2 Monitoring





팁!

- 광 수신 레벨을 확인 :이 수준이 너무 낮으면 (<-18dBm)의 CPRI 링크가 제대로 작동하지 않을 수 있습니다.
- 라인 속도가 정확하지 않으면, LOS과 LOF 알람의 양쪽 또는 어느 한쪽은 빨간색 될 것입니다.

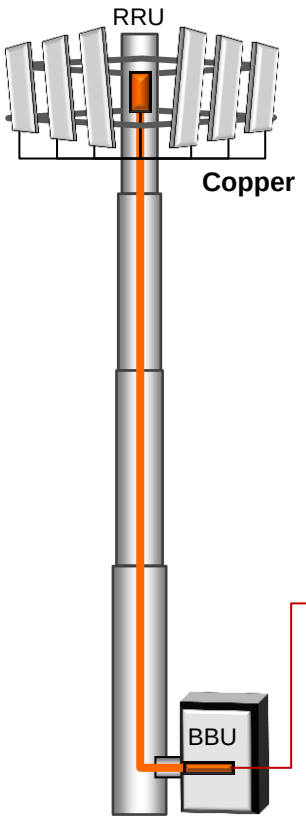
CellAdvisor RFoCPRI

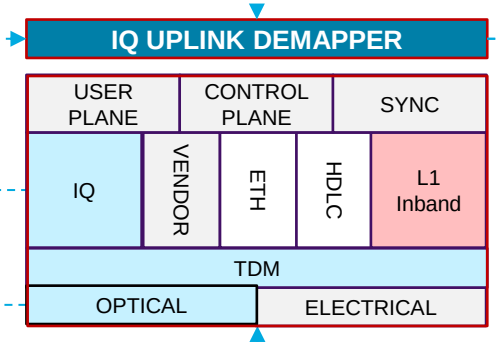
Interference Analysis

CellAdvisor RFoCPRI™

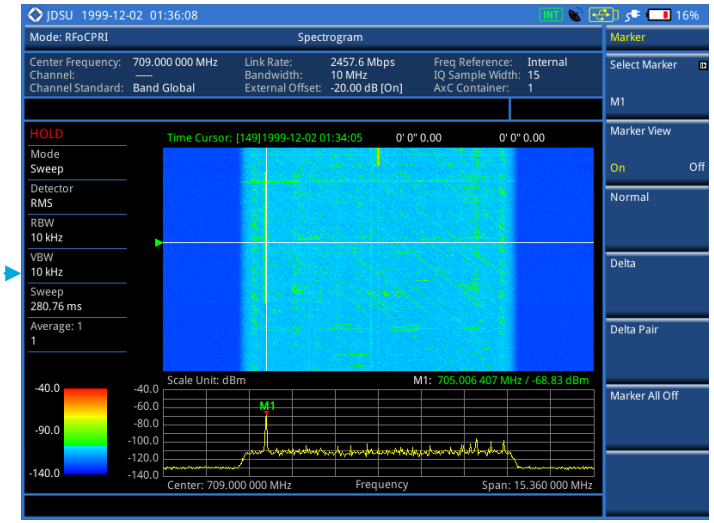
Uplink / Downlink Spectrum Analysis

Line Rate Mbps	Word Size bits	CPRI Frames
1228.8	16	2
2457.6	32	4
3072.0	40	5
4915.2	64	8
6144.0	80	10
9830.4	128	16



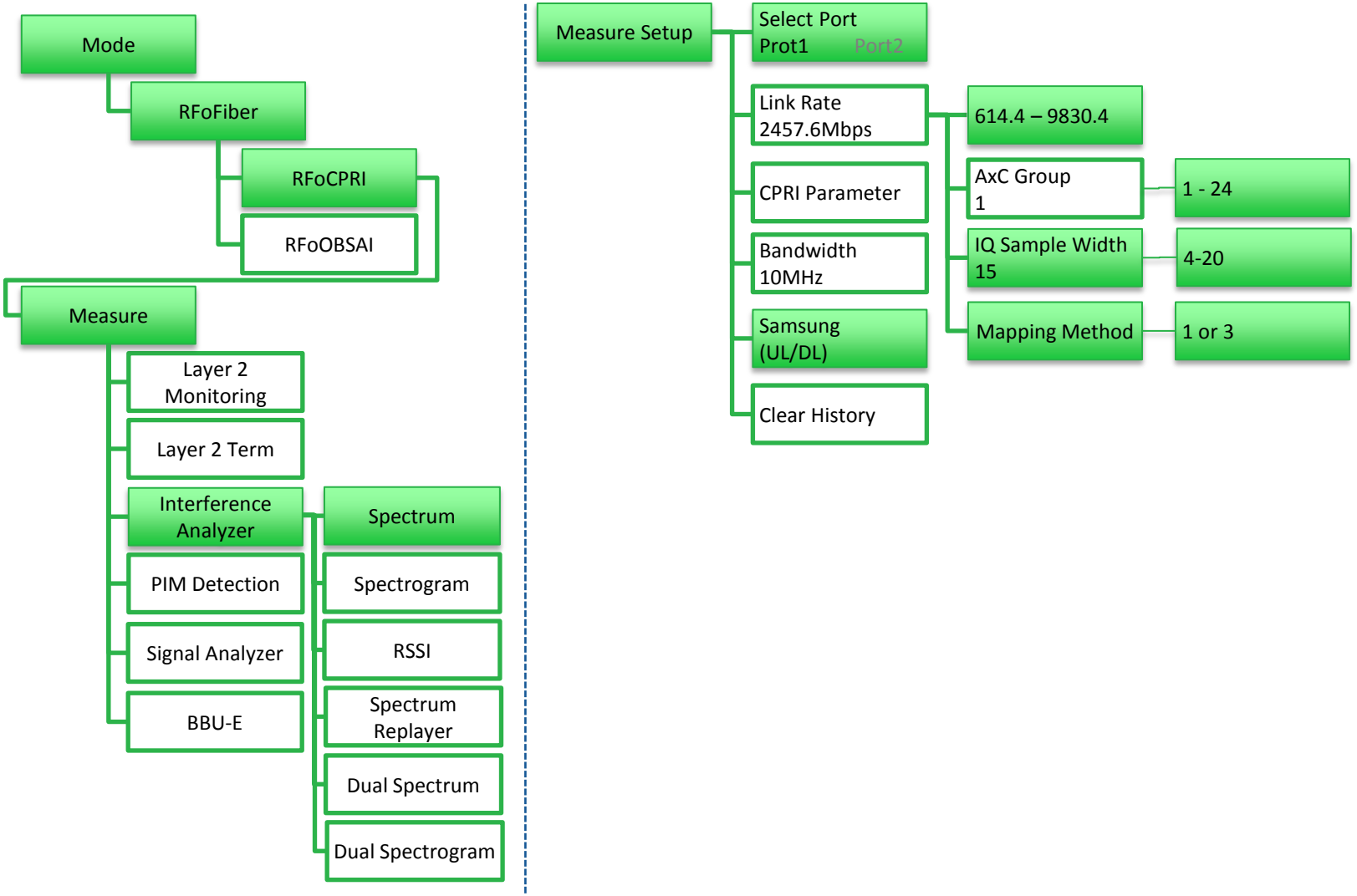


CellAdvisor JD785B
RFoCPRI



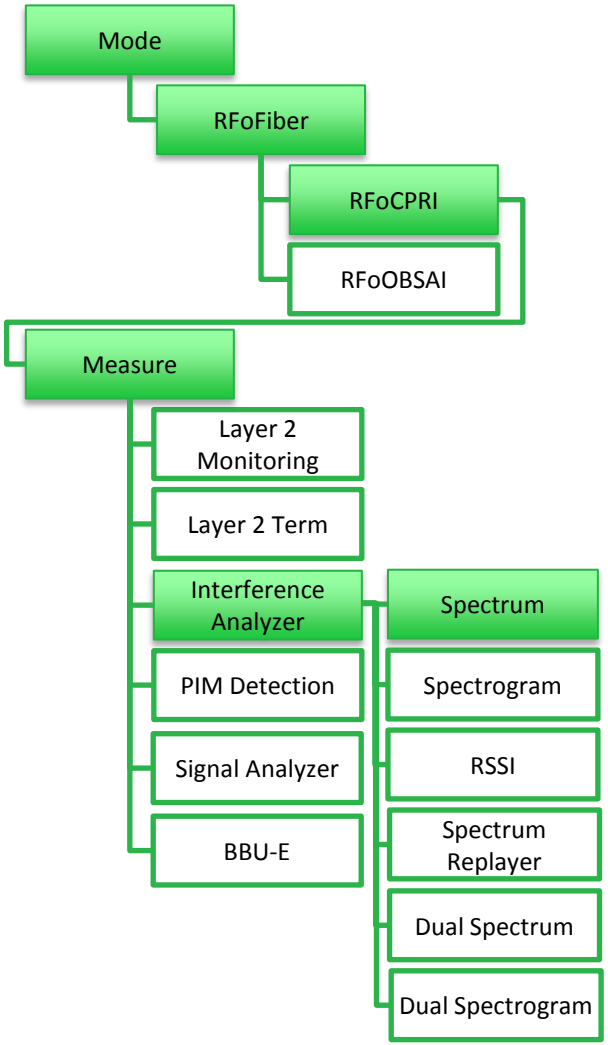
RFoCPRI™ Measurement

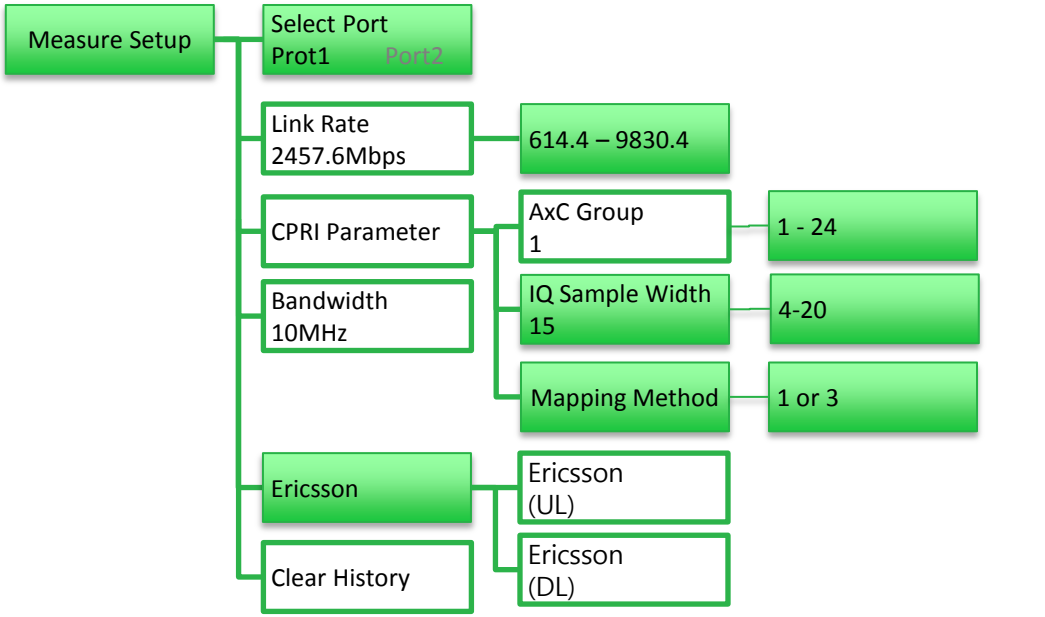
Menu 구조: Interference Analyzer - 삼성



RFoCPRI™ Measurement

Menu 구조: Interference Analyzer - 에릭슨





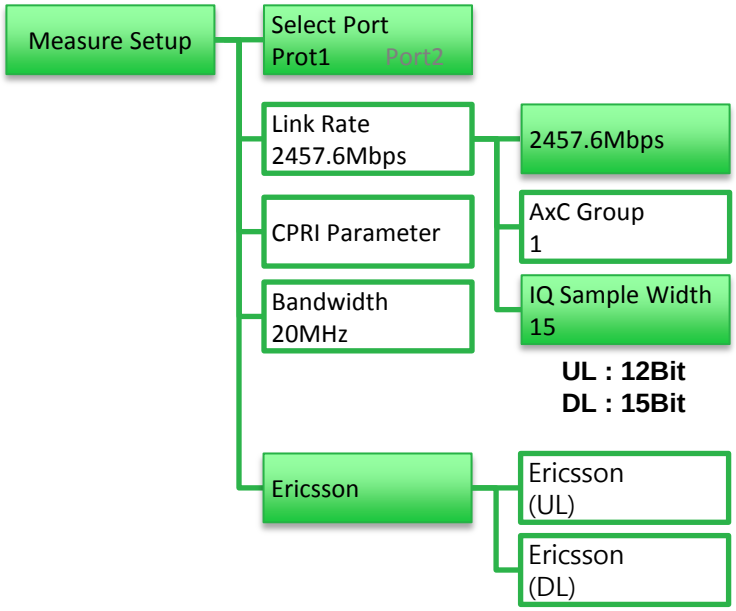
팁!

- 에릭슨은 CPRI 파라메터 설정이 현재 3가지가 있습니다.

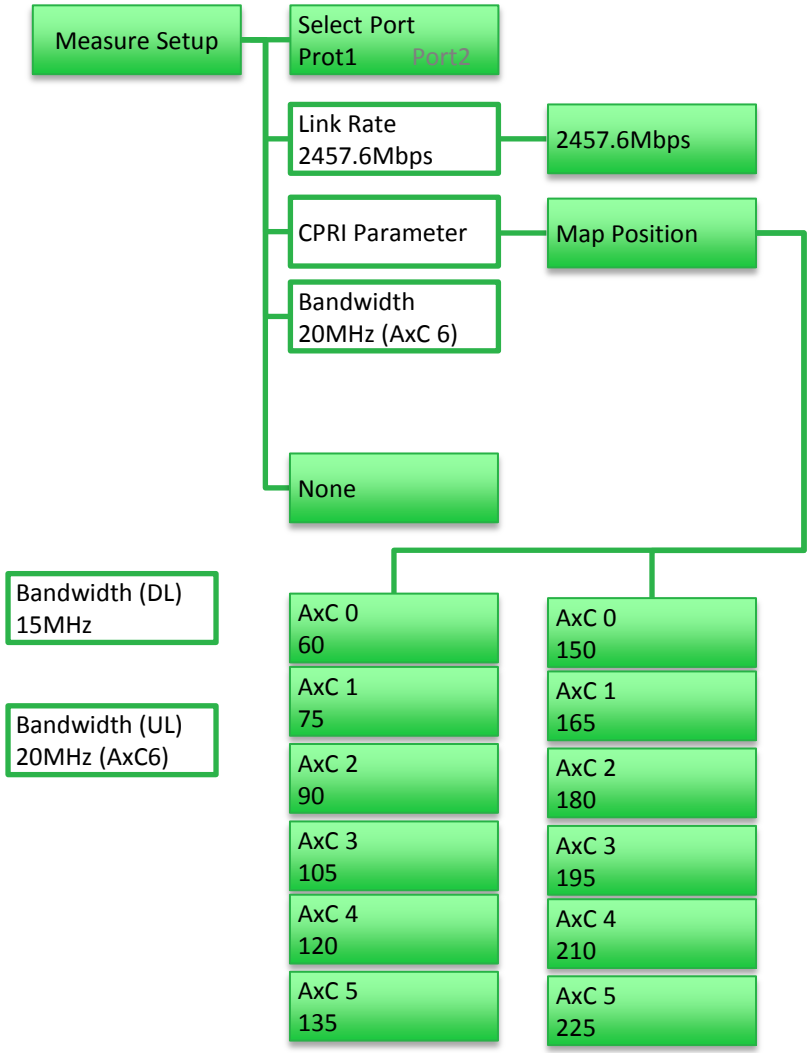
RFoCPRI™ Measurement

Menu 구조: Interference Analyzer – 에릭슨 Measure Setup

- **Ericsson 기본 인 경우**



- **Ericsson 압축 모드 인 경우**

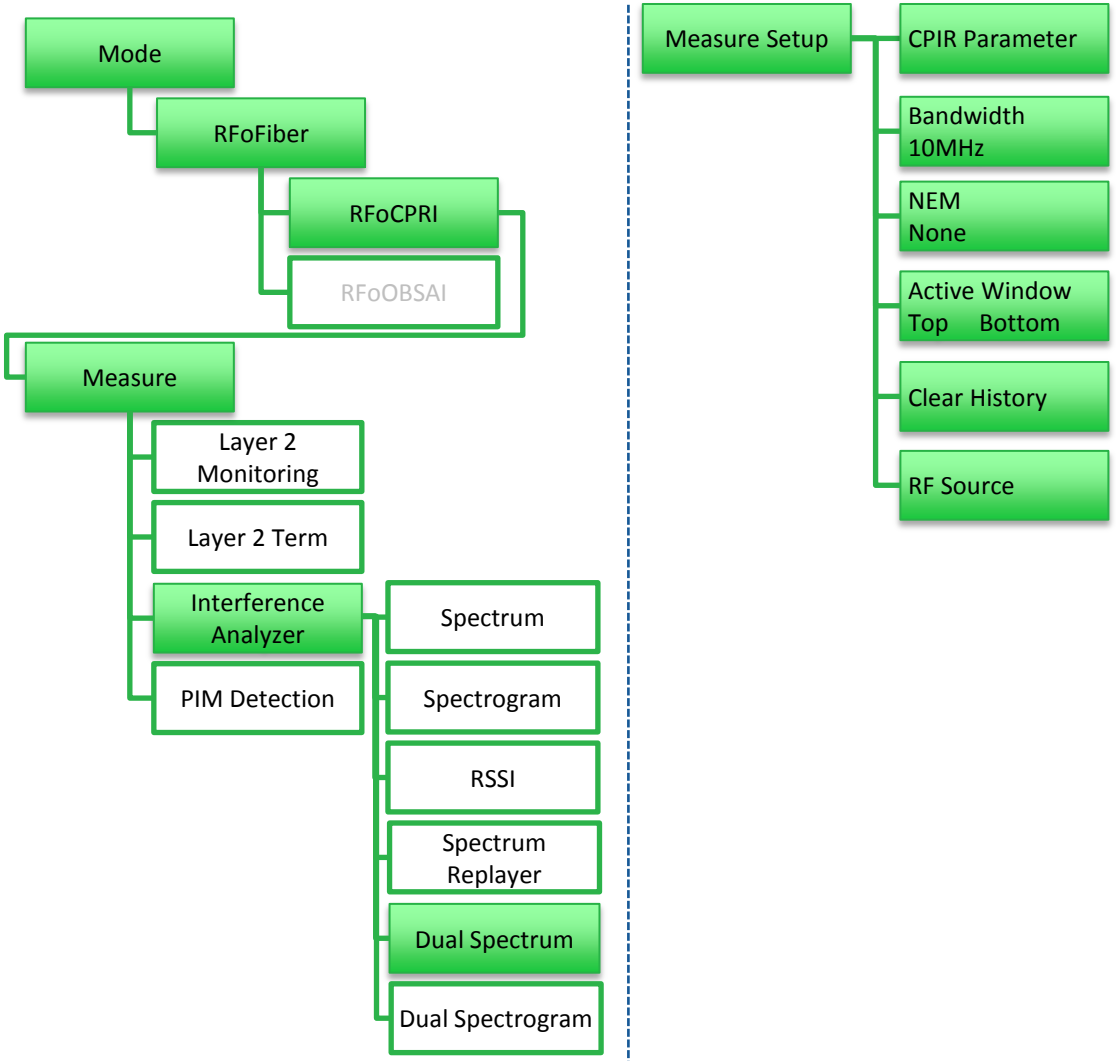


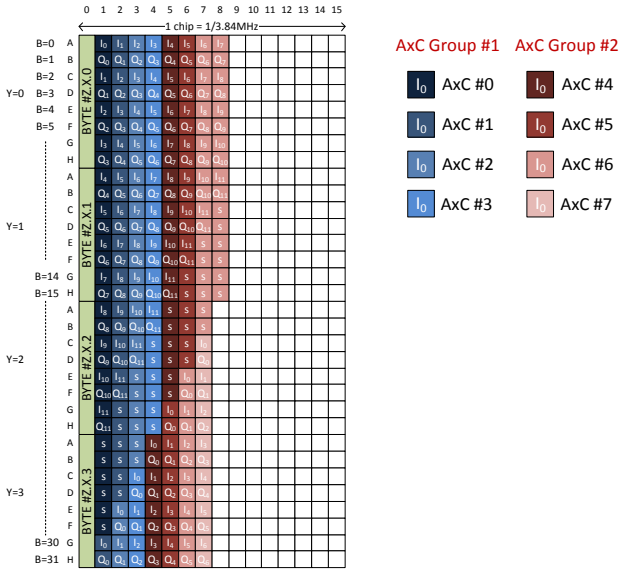
CellAdvisor RFoCPRI

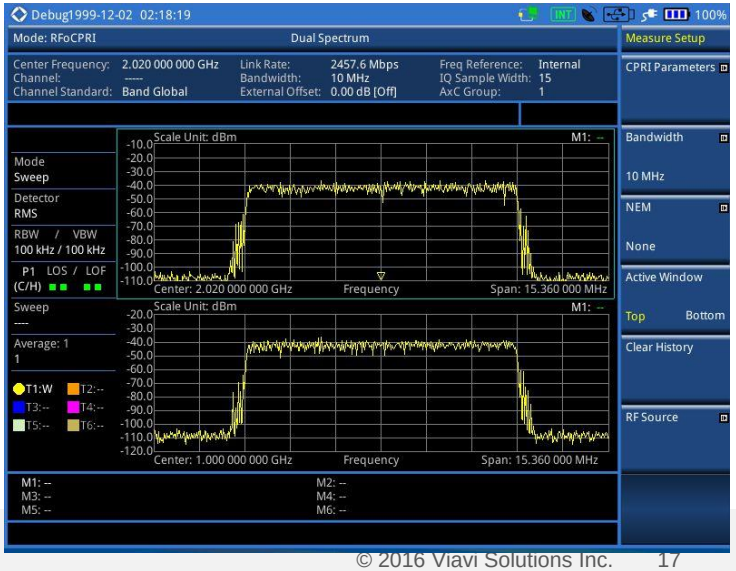
기타 다른 기능

RFoCPRI™ Measurement

Menu Structure: Interference Analyzer – Dual Spectrum

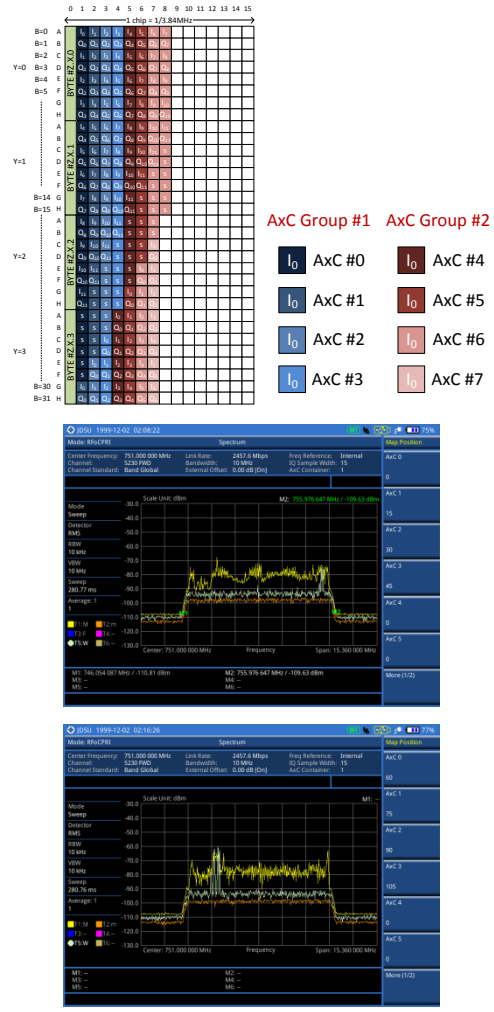






RFoCPRI™ Measurement

Dual Spectrum 측정 화면



- **안테나 0과 동시에 안테나 1을 모니터링 합니다.**

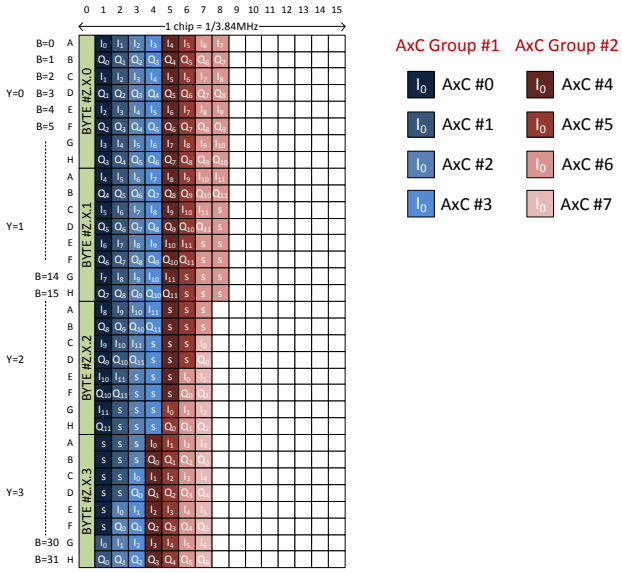
* CPRI link에 두 신호가 동시에 있어야 합니다.

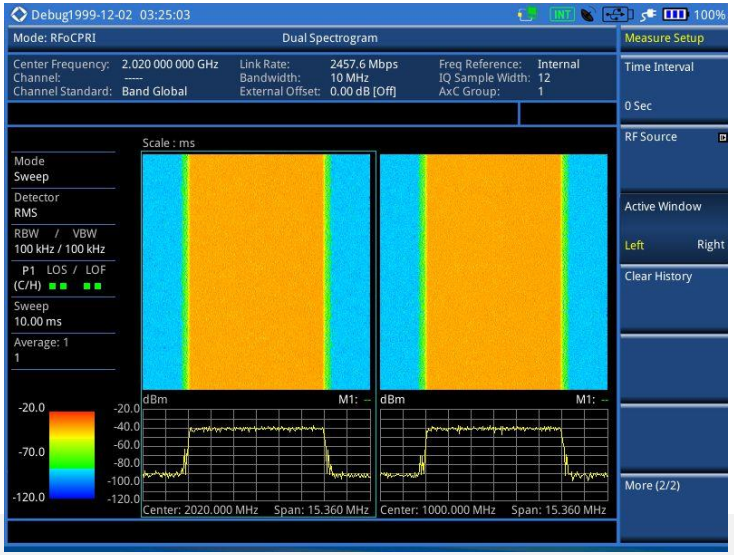
RFoCPRI™ Measurement

Menu Structure: Interference Analyzer – Dual Spectrogram

- Mode
  - RFoFiber
    - RFoCPRI
      - RFoOBSAI
- Measure
  - Layer 2 Monitoring
  - Layer 2 Term
  - Interference Analyzer
    - Spectrum
    - Spectrogram
    - RSSI
    - Spectrum Replayer
    - Dual Spectrum
    - Dual Spectrogram
  - PIM Detection

- Measure Setup
  - CPIR Parameter
  - Bandwidth 10MHz
  - NEM None
  - Reset/Restart
  - Time Cursor On Off
  - Position 0
  - More (1/2)
  - Time Interval 0 sec
  - RF Source
  - Active Window Left Right
  - Clear History
  - More (2/2)





CellAdvisor RFoCPRI

Downlink Signal Analysis for LTE-FDD/TDD

RFoCPRI Downlink Signal Analyzer

Introduction

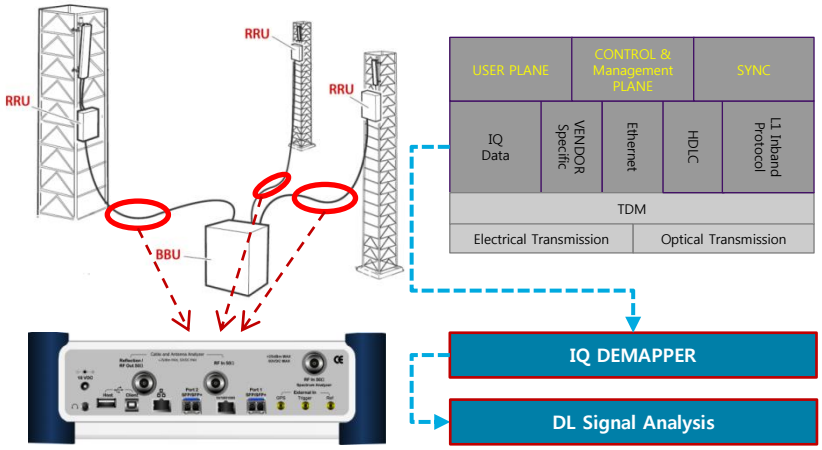
Introduction

RFoC PRI 다운 링크 신호 분석기는 셀 관리자는 CPRI 링크로드 기저 대역 신호에 대해 디 맵핑 IQ 데이터로 변조 정확도 테스트를 수행 할 수 있다.

Value proposition

Modulation quality test over RFoCPRI enables user to verify the signal quality being injected to the RRH.

By comparing the signal quality degradation after passing RRH allows fast isolation of root cause.



Specification

RF Analyzer
- Channel Power
- Occupied Bandwidth

P vs. T

CCDF

Modulation Analyzer
- Constellation
- Data Channel
- Control Channel
- Subframe
- Frame
- Time Alignment Error
- Data Allocation Map

Compatibility
- NEM: Ericsson/ ALU/ Huawei/ Samsung/ ZTE
- Link Rate: 614.4Mbps – 9.8Gbps
- Technology: LTE-FDD

Ordering Information

Opt.091 – RFoCPRI LTE-FDD Signal Analyzer

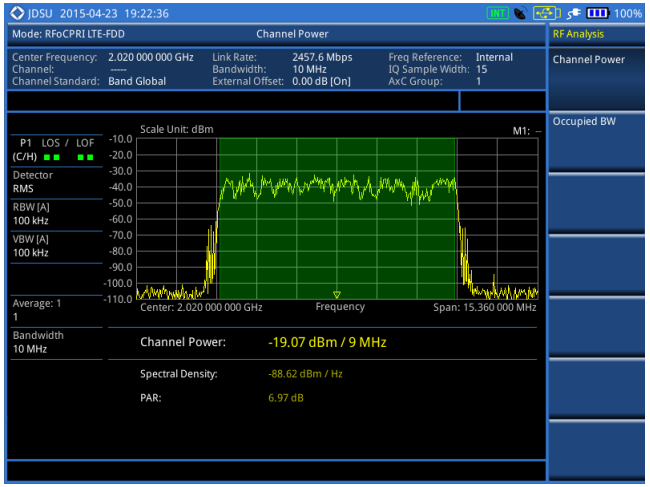
*Available for JD740B and JD780B

*Requires Opt.008 and at least one option out of Opt.060, 061, 062, 063, 064, and 065

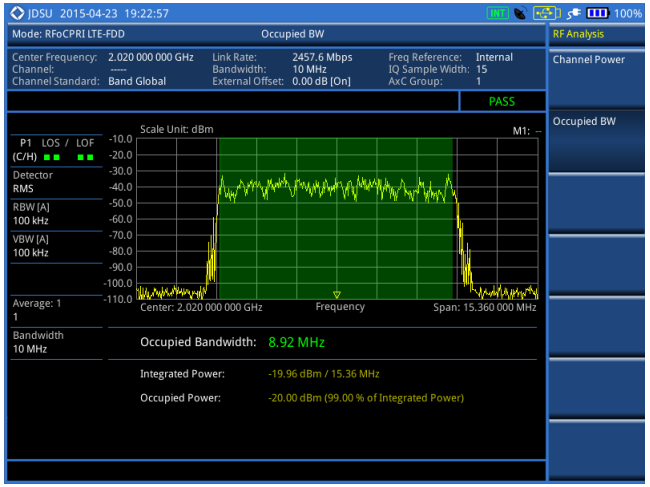
RFoCPRI Downlink Signal Analyzer

RF Conformance Tests: LTE-FDD

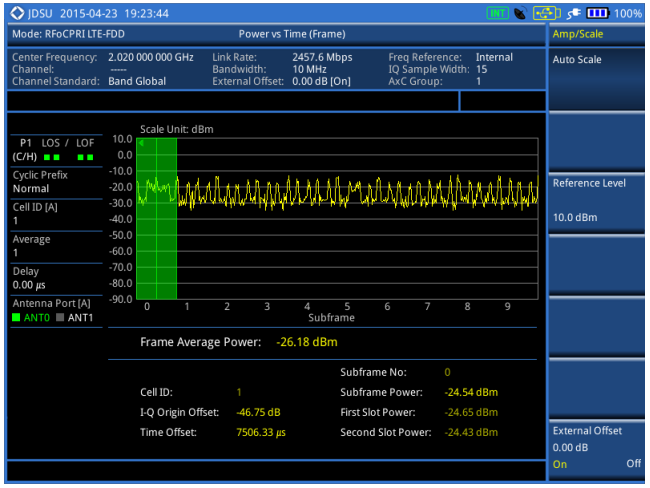
❖ RF Conformance – Channel Power



❖ RF Conformance – Occupied Bandwidth



❖ RF Conformance – P vs. T



❖ RF Conformance – CCDF

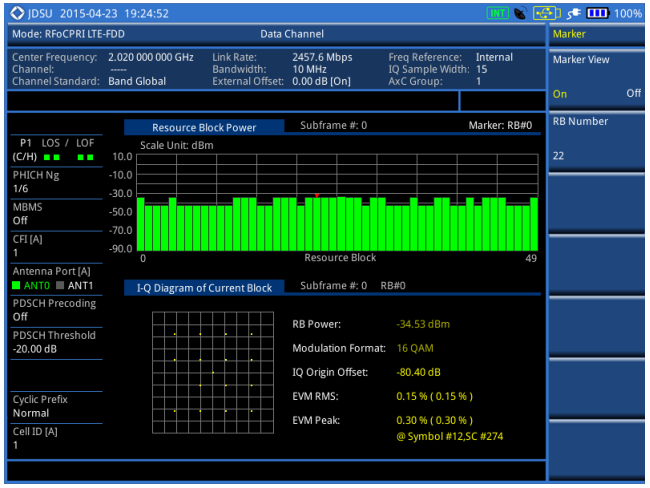
RFoCPRI Downlink Signal Analyzer

Modulation Quality Tests: LTE-FDD

❖ Modulation Quality – Constellation

❖ Modulation Quality– Control Channel

❖ Modulation Quality – Data Channel



❖ Modulation Quality – Subframe

RFoCPRI Downlink Signal Analyzer

Modulation Quality Tests: LTE-FDD

❖ Modulation Quality – Frame

❖ Modulation Quality – Data Allocation Map

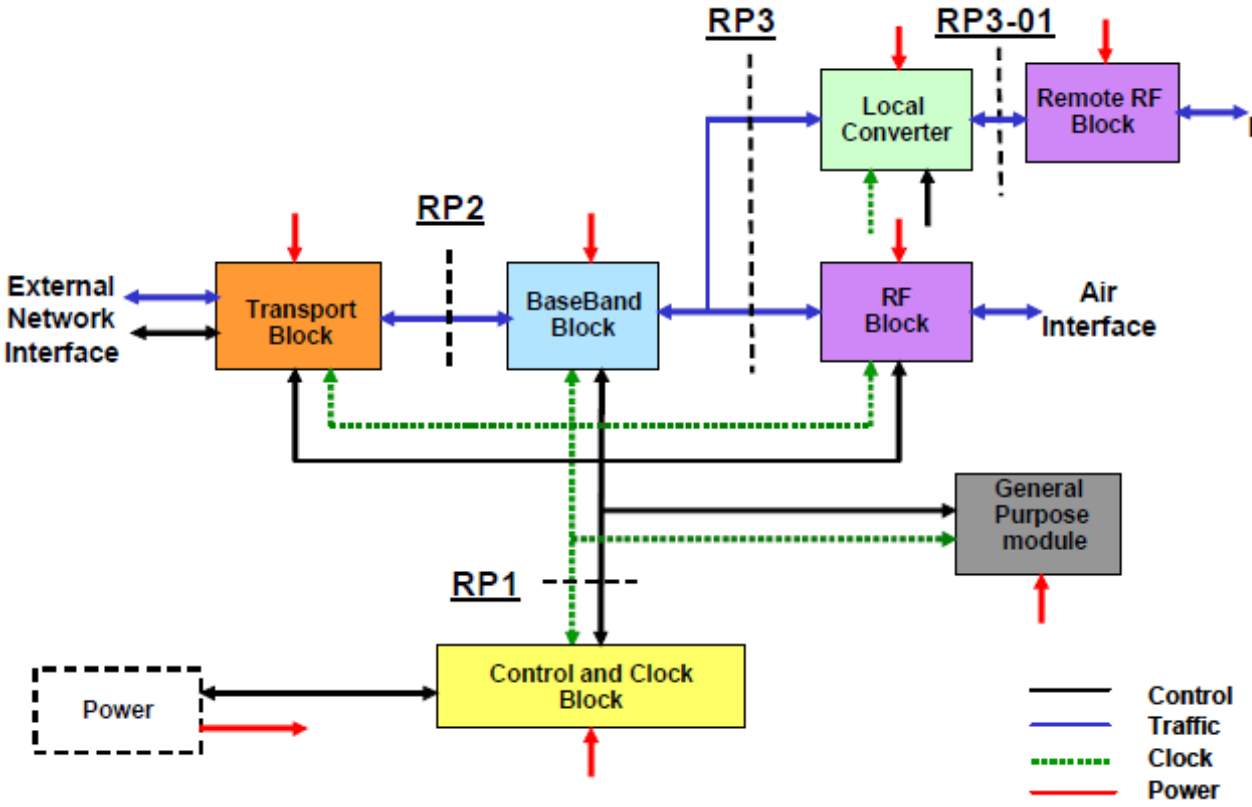
❖ Modulation Quality – Time Alignment Error

VIAVI

www.viavisolutions.com

CellAdvisor RFoOBSAI™

OBSAI 기본
BTS 구조 (참고)



Reference Point 3 (RP3)

- 무선 인터페이스 유저의 상호 교환 포맷, 베이스 밴드 블록과 블록 사이의 RF 신호 사용자 데이터
- 가능한 4개의 회선 속도:
  - 768Mbps (1x)
  - 1536Mbps (2x)
  - 3072Mbps (4x)
  - 6144Mbps (8x)

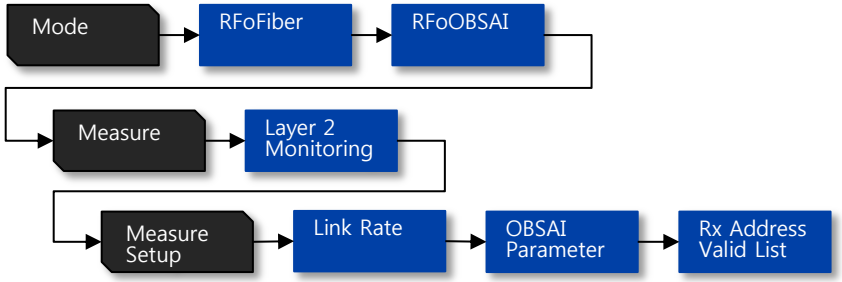
OBSAI Base Station 구조

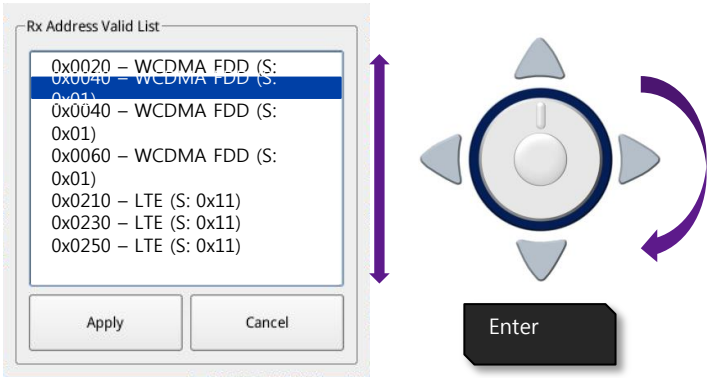
- Transport Block (TB)
- Control and Clock Block (CCB)
- Baseband block (BB)
- RF Block (RFB)
- Optional General Purpose Block

RFoCPRI/RFoOBSAI
RFoOBSAI LTE-FDD

- 측정 순서

Step 1: Detect RP3 Address, Type and Scrambler code (if required) → Step2: Detect signal bandwidth





Auto Configurable parameters
- RP3 Address
- RP3 Type
- Scrambler Code (6.1Gbps only)

Verify signal bandwidth using Message count on Layer2 Monitoring

LTE-FDD 5MHz	LTE-FDD 10MHz	LTE-FDD 20MHz
		
Message Count: 76,800	Message Count: 15,3600	Message Count: 307,200

Manual Configurable parameters
- Bandwidth
- External Offset

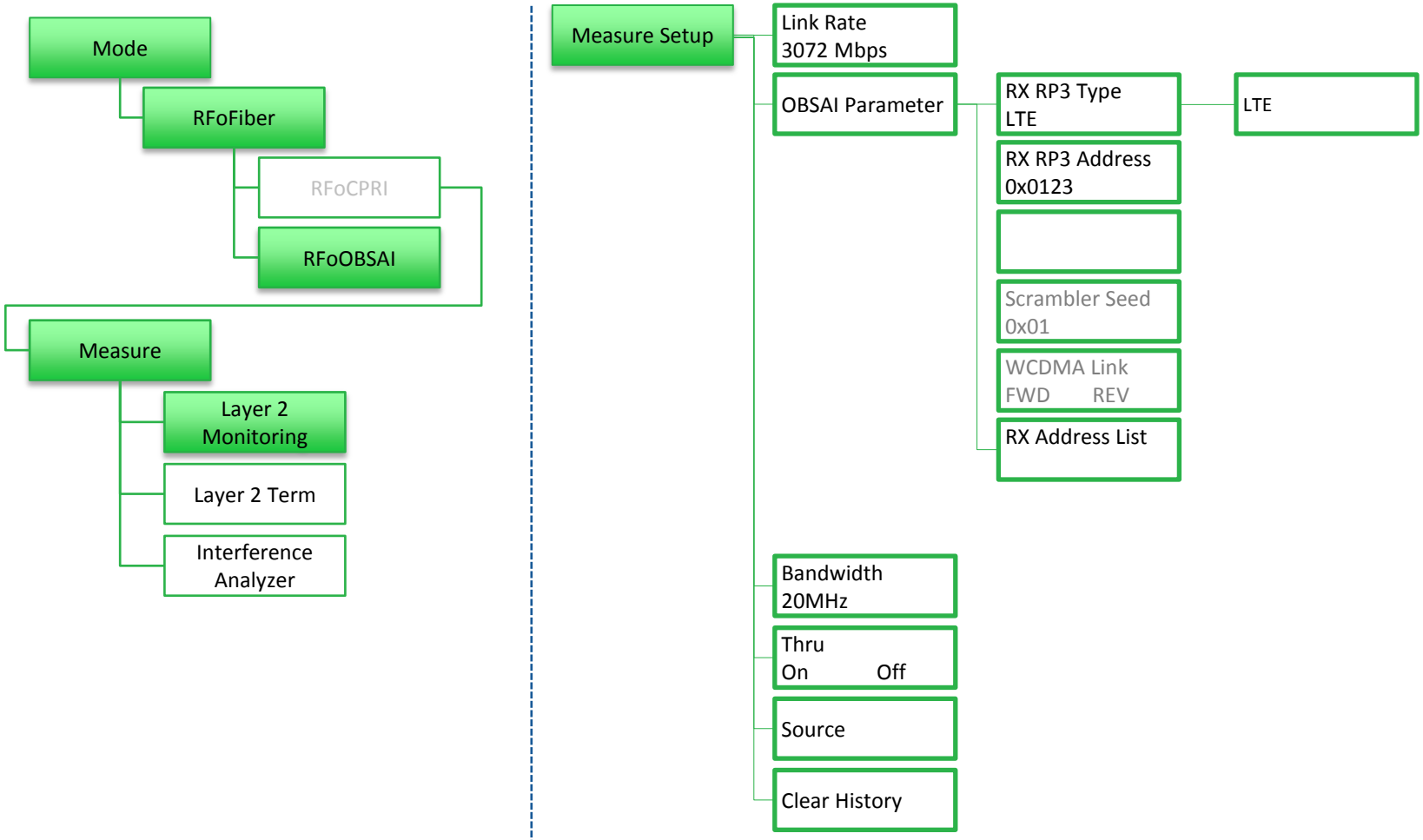
Non configurable parameters
- RBW
- Span

CellAdvisor RFoOBSAI

Layer 2 Monitoring

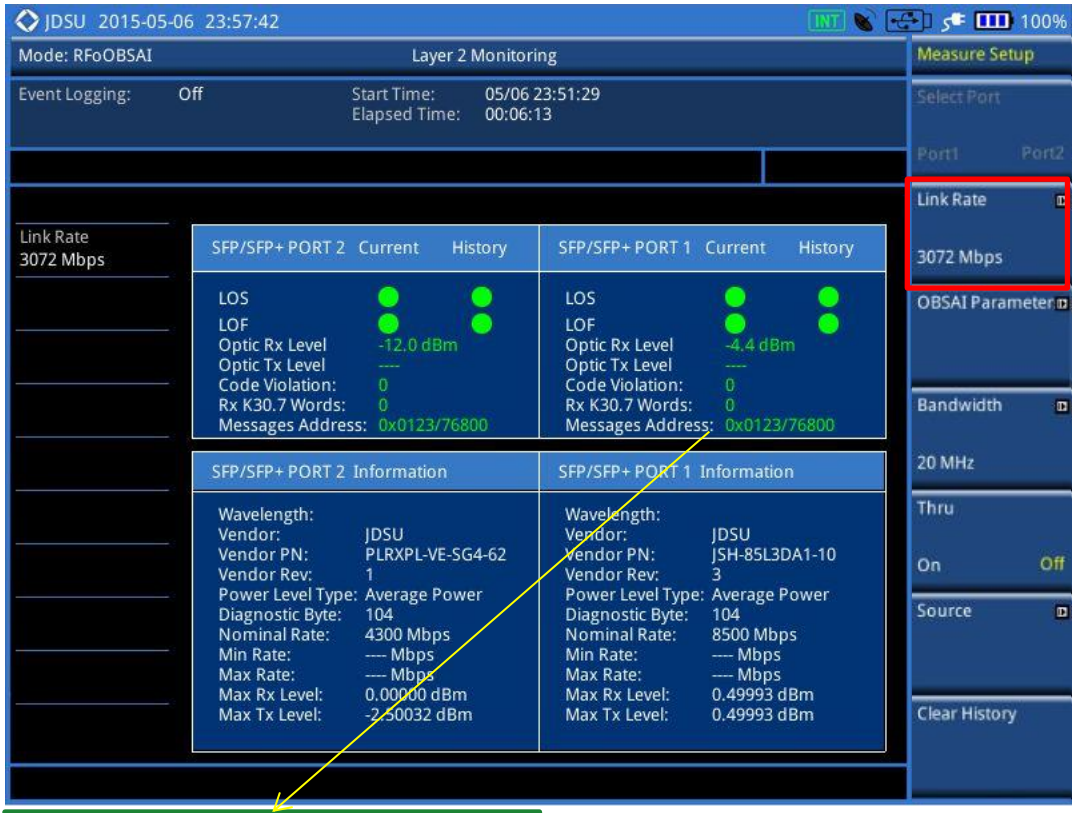
RFoCPRI™ Measurement

Menu 구조 – Layer 2 Monitoring



RFoOBSAI Measurement

Layer-2 Monitoring



Message Address: 0x0040/307200
RP3 Address/ Message counter

적용 장비: NSN
Link Rate: 3.1Gbps
Technology: LTE-FDD
Signal Bandwidth: 20MHz

LOS/LOF 알람 상태와 히스토리를 보여 줍니다.

Code Violation and K30.7 표시 오류 수

Optic RX level and TX level 표시

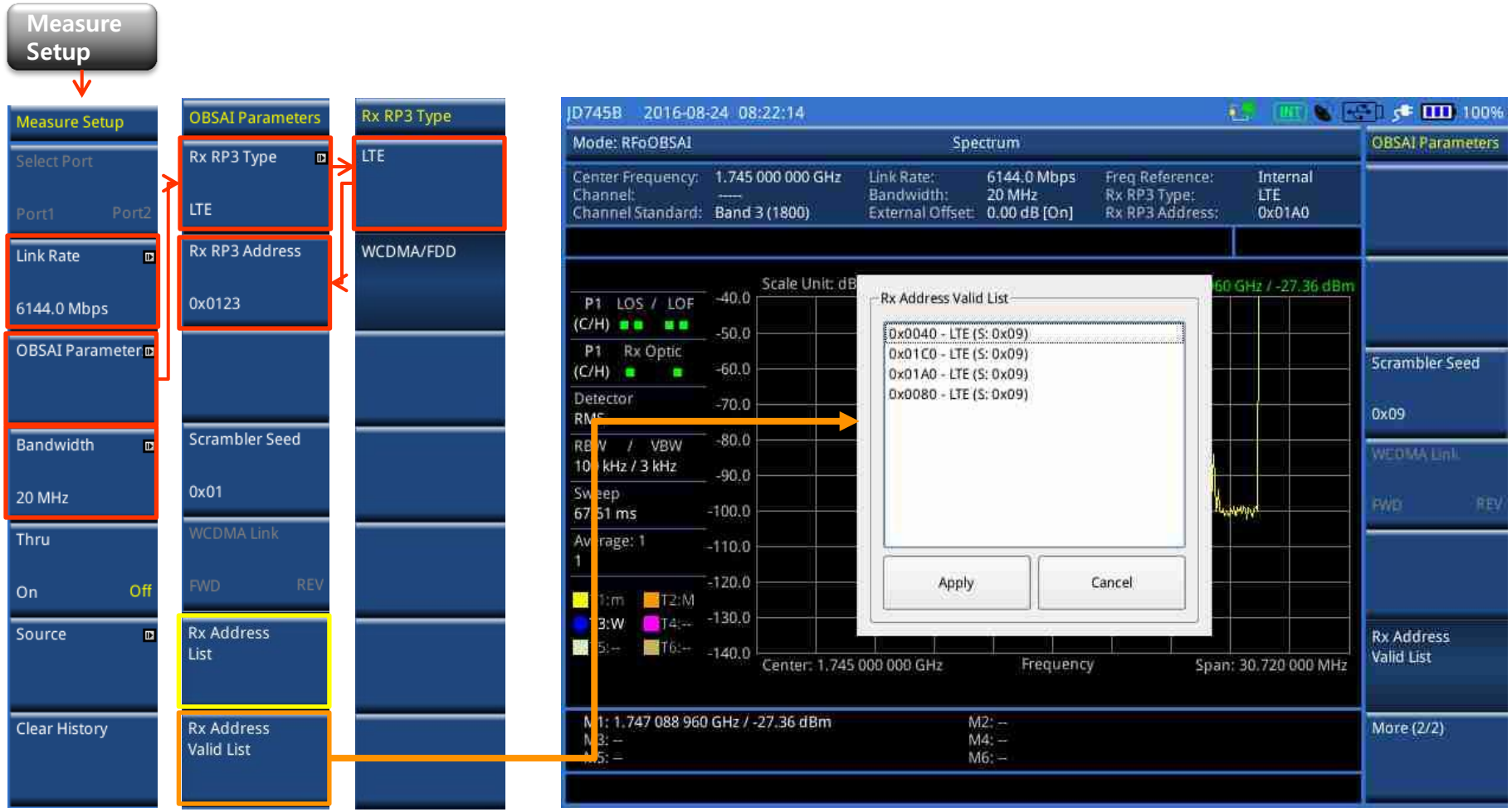
RP3 Address는 OBSAI 링크에 사용 가능한 주소를 보여 줍니다.

RP3 주소를 할당하면 IQ 위치를 구성하고 스펙트럼을 볼 수 있습니다

Number of message 는 대역폭과 관련이 있으며 우리는 이 값으로 대역폭을 가정 할 수 있습니다.

RFoOBSAI Measurement

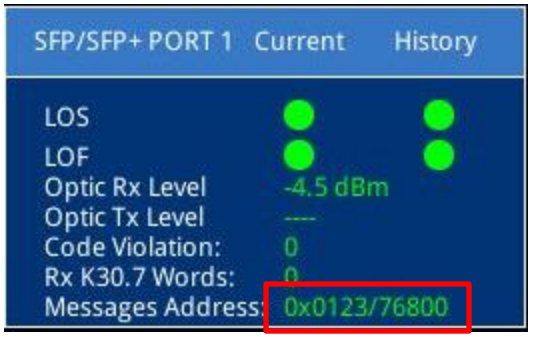
Layer-2 Monitoring: RP3 Address 설정



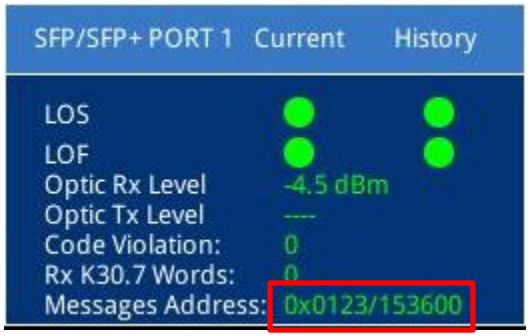
RFoOBSAI Measurement

Layer-2 Monitoring

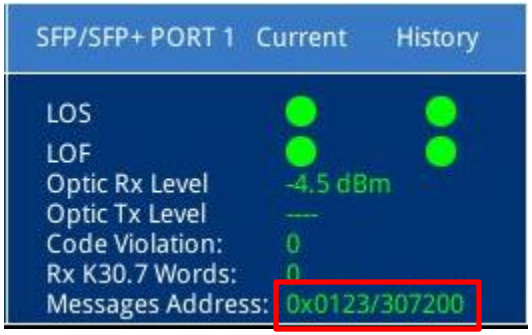
- **LTE-FDD 5 MHz**



- **LTE-FDD 10 MHz**

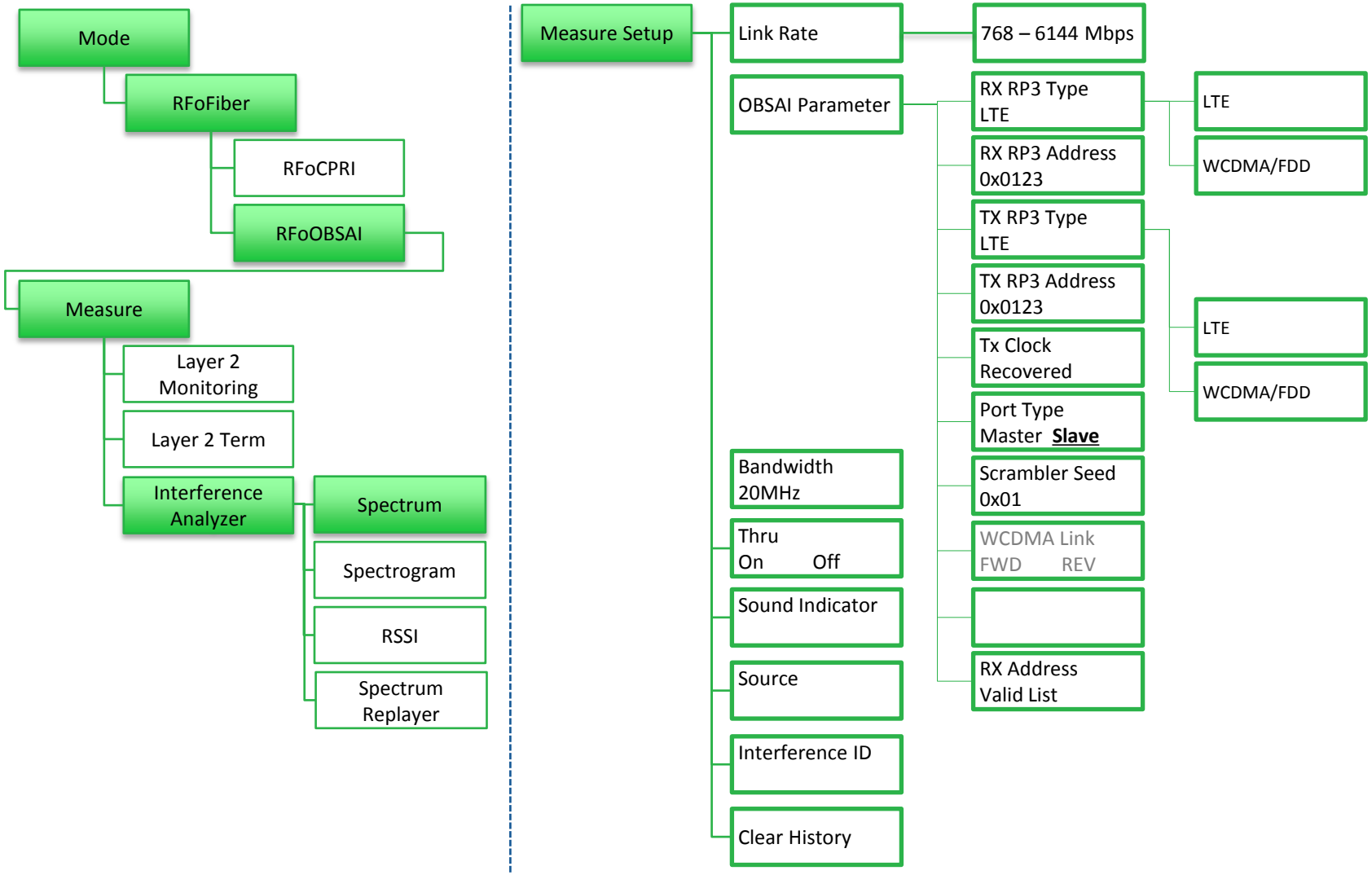


- **LTE-FDD 20 MHz**



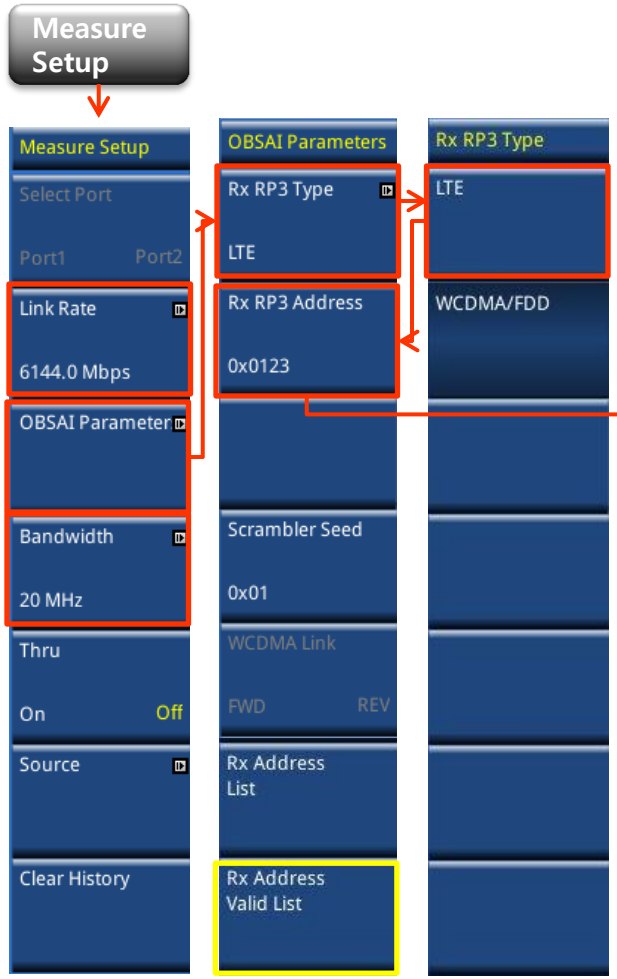
RFoOBSAI™ Measurement

Menu: Interference Analyzer



RFoOBSAI Measurement

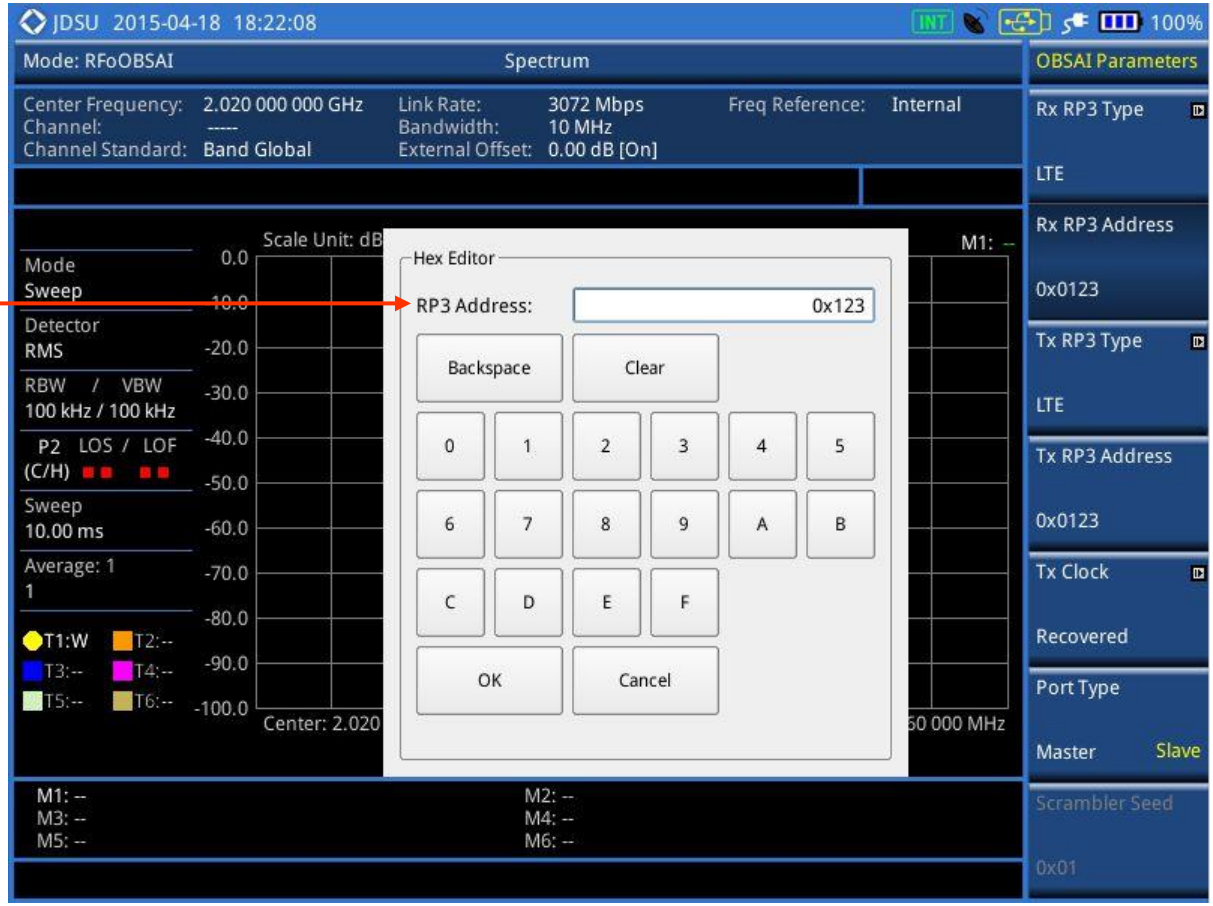
Layer-2 Monitoring: RP3 Address 설정



Available options to pick a carrier/ spectrum

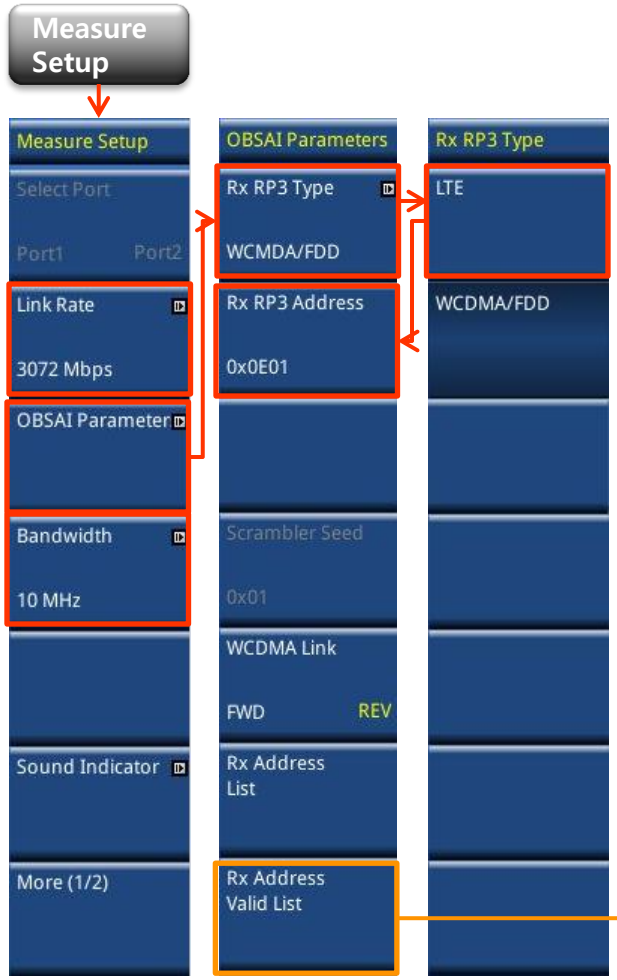
Opt 1: 수동RP3 Address 설정

Opt 2: RX Address Valid List



RFoOBSAI Measurement

Layer-2 Monitoring: RP3 Address 설정



Available options to pick a carrier/ spectrum

Opt 1: 수동RP3 Address 설정

Opt 2: RX Address Valid List

Field Test Data

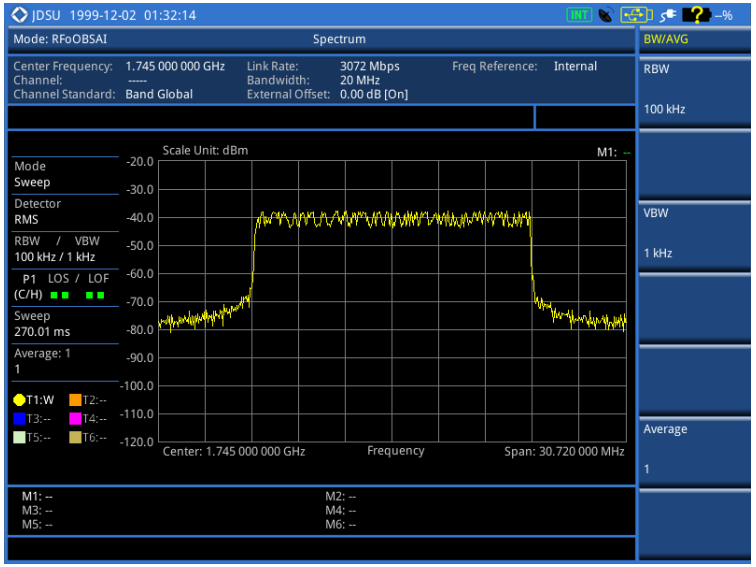
RFoCPRI Interference Analyzer – Uplink Spectrum

Field Test Data

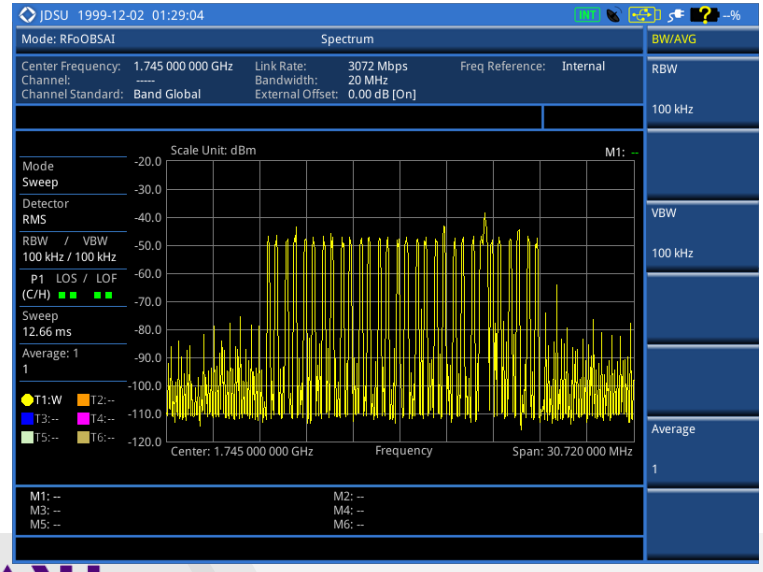
RFoCPRI Interference Analyzer – DL Spectrum

E-TM1.2

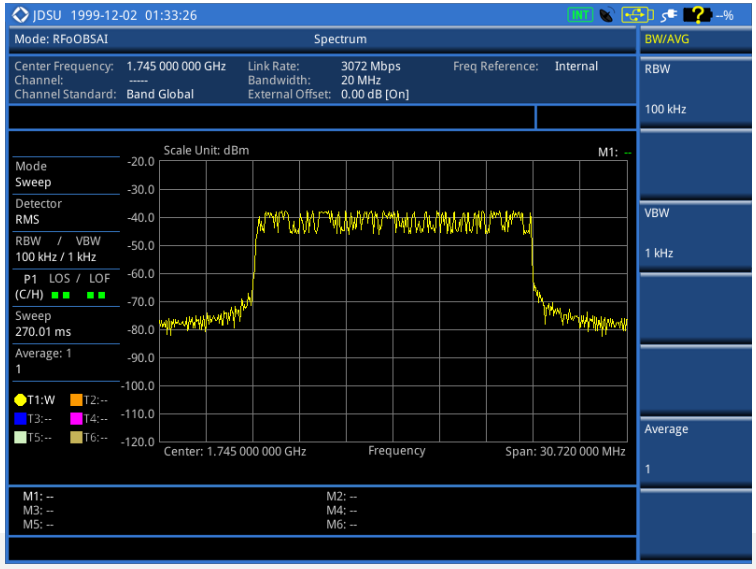
E-TM3.2



E-TM2

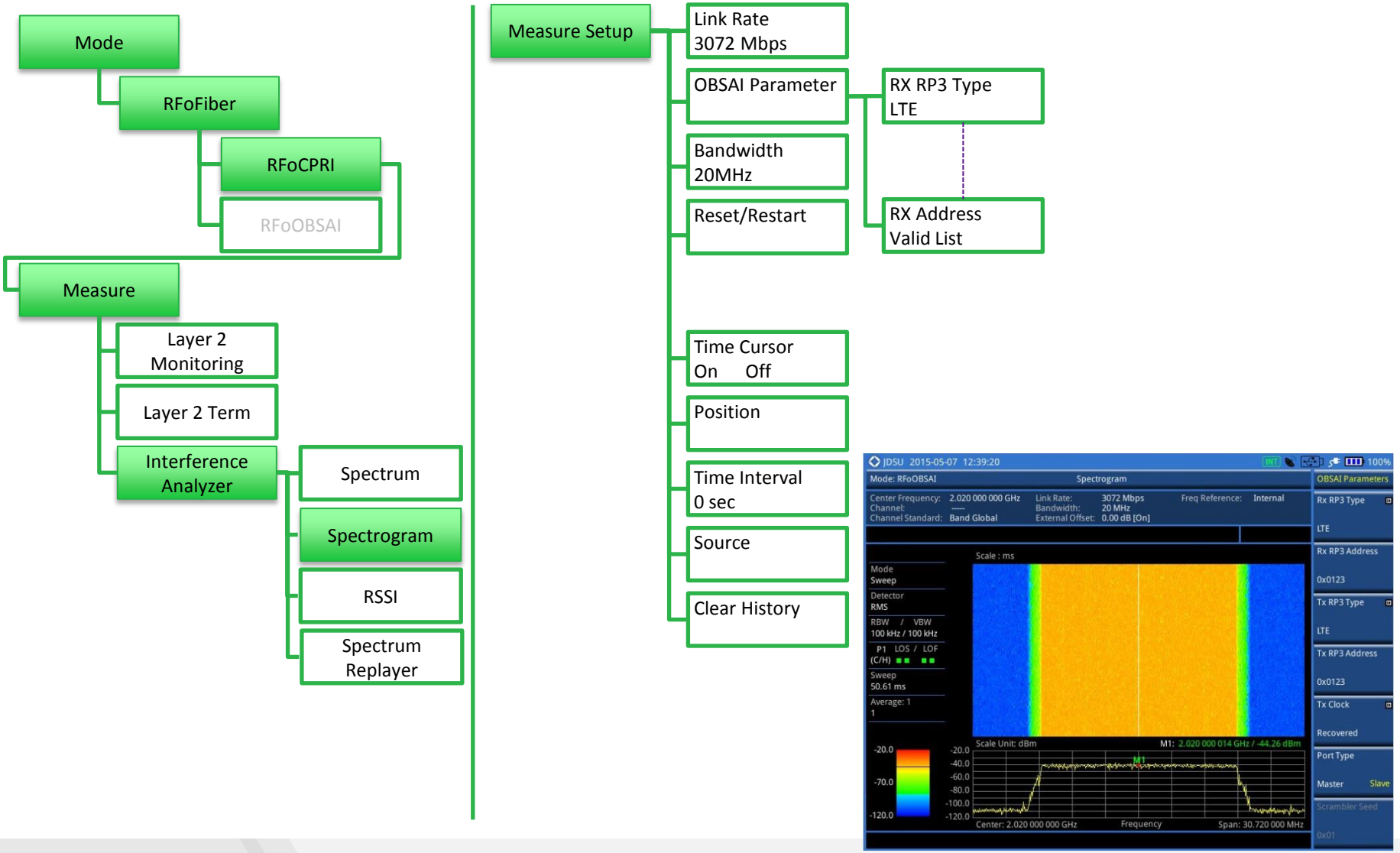


E-TM3.3



RFoCPRI™ Measurement

Menu Structure: Interference Analyzer - Spectrogram



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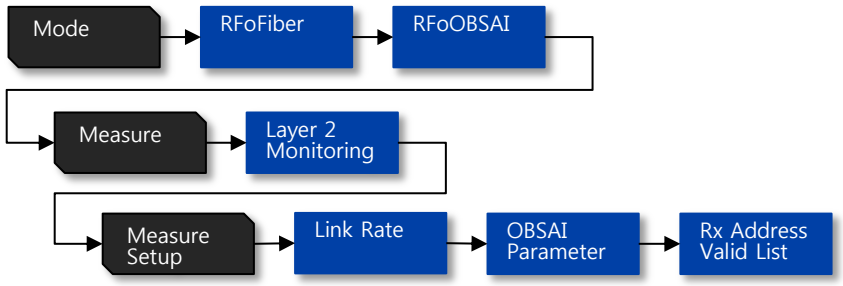
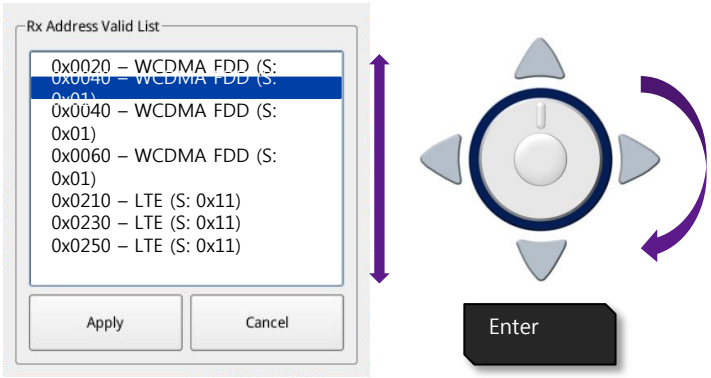
Layer 2 Signal Analyzer

RFoOBSAI
RFoOBSAI LTE-FDD Signal Analyzer

- 측정 순서

Step 1: RP3 Address 검출 → Step2: 신호의 Bandwidth 설정





Auto Configurable parameters
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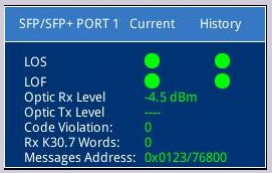
- RP3 Type
- Scrambler Code (6.1Gbps only)

Verify signal bandwidth using Message count on Layer2 Monitoring

LTE-FDD 5MHz	LTE-FDD 10MHz	LTE-FDD 20MHz
		
Message Count: 76,800	Message Count: 15,3600	Message Count: 307,200

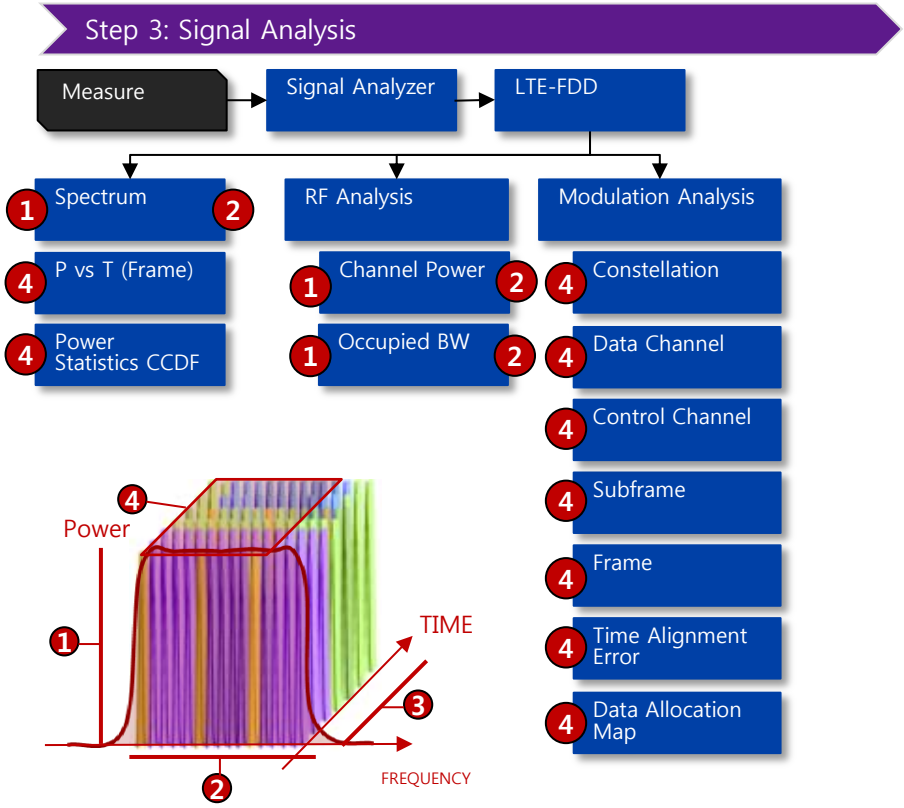
Manual Configurable parameters
- Bandwidth
- External Offset

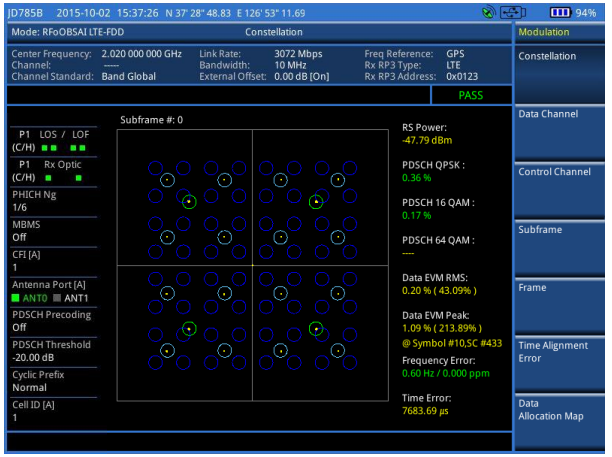
Non configurable parameters
- RBW
- Span

RFoOBSAI

RFoOBSAI LTE-FDD Signal Analyzer

- 측정 순서





IQ Invert

- I 및 Q 비트가 CPRI 페이로드로 반전하면, 변조 품질 측정에 오류가 발생.
- 기본 설정은 "IQ Invert: On" 입니다.
- Antenna Port의 그린 LED가 점등되지 않으면 설정을 바꿔 보세요

VIAVI

감사 합니다.