

APPLICATION NOTE





Establish 5G / 4G connection to *lab*CORE via Keysight E7515B UXM 5G Wireless Test Platform

Application Note

Establish 5G / 4G connection to *lab*CORE via Keysight E7515B UXM 5G Wireless Test Platform

Revision 0

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1 Introduction

1.1 Brief description

The application note describes a procedure to establish a voice call in a 5G network (VoNR) / 4G network (VoLTE) from HEAD acoustics hardware platform *lab*CORE to a 5G / 4G compatible device under test via Keysight E7515B UXM 5G Wireless Test Platform. The device under test registers via 5G / 4G network at the IMS server of the Keysight Test Platform. *lab*CORE connects to the Keysight Test Platform via wired Ethernet and also registers at its IMS server. Then, HEAD acoustics' analysis software ACQUA establishes a voice call between *lab*CORE and the device under test.

The document is written assuming that the user has an advanced knowledge of handling HEAD acoustics equipment and Keysight E7515B UXM 5G. HEAD acoustics will not respond to support requests concerning general handling and technical configuration of Keysight E7515B UXM 5G.

1.2 Reference documentation

Document name
labCORE Manual
HMS II Manual
ACQUA Online Help
Keysight E7515B UXM 5G Wireless Test Platform User Manual

1.3 Acronyms and abbreviations

Acronym / abbreviation	Description
ACQUA	Advanced Communication Quality Analysis
AMR	Adaptive multi-rate
dB	Decibel
dBm	Decibel-milliwatts
DUT	Device under test
GBit	Gigabit
IMS	IP Multimedia Subsystem
IP	Internet Protocol
kHz	Kilohertz
LTE	Long Term Evolution
NR	New Radio
NSA	Non-Standalone
RF	Radio frequency
RTP	Real-time protocol
SA	Standalone
SIM	Subscriber identity module
VolP	Voice over Internet Protocol
VoNR	Voice over New Radio

1.4 Applied interfaces at *lab*CORE & Keysight E7515B UXM 5G

1.4.1 *lab*CORE interfaces



1.4.2 Keysight E7515B UXM 5G Wireless Test Platform interfaces front panel



Type N RF antenna connector



1.4.3 Keysight E7515B UXM 5G Wireless Test Platform interfaces back panel

- ETH2 (RJ45) of VDTAMC card in slot 4
- GbE4 (RJ45) of ICM connectors
- Set IP address of ICM_GbE4 to 192.168.2.1 at the Windows network connections of Keysight E7515B UXM 5G

1.5 Equipment list

1.5.1 HEAD acoustics equipment

Required

- labCORE (Code 7700), Modular multi-channel hardware platform
 - coreBUS (Code 7710), I/O bus mainboard
 - coreOUT-Amp2 (Code 7720), Power amplifier board
 - coreIN-Mic4 (Code 7730), Microphone input board
 - coreIP (Code 7770), VoIP software extension with at least one of the following voice codecs
 - ► coreIP-AMR (Code 7772), AMR extension
 - ► coreIP-EVS (Code 7773), EVS extension
- ACQUA (Code 6810), Advanced Communication Quality Analysis software
- HMS II.3 (Code 1230), HEAD measurement system with ear simulator and artificial mouth

Optional

- labCORE extensions depending on device under test and/or application case
 - coreIP-IMP (Code 7771), VoIP impairment extension
 - coreBEQ (Code 7741), Binaural equalization
- Any HEAD acoustics handset positioner
 - HHP IV (Code 1406), Motorized handset positioner
 - HHP III.1 (Code 1403), Handset positioner

1.5.2 Keysight equipment

- Keysight E7515B UXM 5G Wireless Test Platform
- Keysight C8700200A Test Application Framework
- Keysight C8700201A IMS-SIP Server Emulator running

1.5.3 Third party equipment

- Ethernet switch (100/1000 Mbit/s)
- 3 x Ethernet cable
- RF antenna
- PC for ACQUA software
- DUT
- Test SIM card

1.6 Configuration example (exemplary)



1.7 Cabling

1.7.1 Antenna



Attach the main antenna to one of the Type N connectors (e.g. RF1 is used for NR SA by default) on the front panel of the UXM5G.

If RFIO port mapping is defined in Keysight's HCCU web interface, then ensure that the selected RF port matches that used for the NR main TxRx antenna.

1.7.2 labCORE to Keysight E7515B UXM 5G



- Connect one Ethernet cable to the Ethernet socket at the front panel of *lab*CORE and to one random RJ45 socket of the Ethernet switch.
- Connect one Ethernet cable to ETH2 of VDTAMC card in slot 4 at the back panel of Keysight E7515B UXM 5G and to one random RJ45 socket of the Ethernet switch.
- Connect one Ethernet cable to ICM GbE4 at the back panel of Keysight E7515B UXM 5G and to one random RJ45 socket of the Ethernet switch.

2 Keysight E7515B UXM 5G configuration

2.1 5G NR connection establishment

2.1.1 Preparations

- Interconnect the hardware according to chapter 1.6 and chapter 1.7
- Boot up Keysight E7515B UXM 5G
- Open Keysight HCCU on Keysight E7515B UXM 5G and select the appropriate NR Standalone scenario
- Open 5G NR Test App on Keysight E7515B UXM 5G
- Boot up PC and start ACQUA
- Boot up labCORE
- Insert test SIM card into DUT and boot up DUT

2.1.2 5G NR connection procedure – IPv4

Keysight E7515B UXM 5G

- 1. Select Utility.
- 2. Select TA Mode Switch.
- 3. Select 5G NR Standalone.



4. Select Export/Import SCPI.

🚾 Keysight C8700200A Test Application Framework – 5G NR (15.1807.1618.10081)	– ø ×
NR SA BE SA DOC 677 NR SA BE SA DOC 677 NR S	Utility
Offer Offer <th< td=""><td>Export / Import SCPI</td></th<>	Export / Import SCPI
Config Impairments Message Summary Error Log RUI Log Logging App Info	
Config Mode: Manual	
56 Cell 1 (PCC) 56 Cell 2	

5. Select Import.

Keysight C8700200A Test Application Framework – 50 NR (15.1807,1618.10081)	_	٥	×
NR SA PCC n77		SCPI Fi	le
Talkes Of F U 335001 Of F U No No	•	E	export
Config Impairments Message Summary Error Log RUI Log Logging App Info			moort
Config Mode: Manual			mport
50 Cell 1 (PCC) 50 Cell 2			

Function Te Mol Resource Allocation Link to X-App

Appl

6. Browse to the directory of the SCPI file and select Import.

lame	Туре	Date Modified
	Parent Folder	
SA_Huawei_P40_GL.scpi	SCPI File	10/21/2020 04:11
SA_Huawei_P40_VoNR.scpi	SCPI File	10/09/2020 08:45

UE Po

Refresh Hex

PHY Beam Mgmt MAC/RLC/PDCP RRC/NAS UE Info IMS BLER/Tput CSI Assisted Tx Meas

View...

/Enum/:pduAddress
/Enum/:pduSessionType : ePDU adress pduSessionType ipv4v6

[] [Sequence]:PacketFilter
 [] [Imt2]:qosRulePrecedence : 2
 [] [Bocken]:segregation :

- V (7 /Boolean):segregation :

[Sequence]:sessionAMBR

[*int32*]:valueDL : <u>4</u> [*int32*]:unitUL : <u>5</u> nt321-valueUI [] [Int32]:nr5gSmCause : 50 luannes

= 🔳 /Se

- 7. Go to tab Cell.
- 8. Got to sub tab NR Procs.
- 9. Expand PDU Session Control.
- 10. Select PDU Session Establishment Accept.
- 11. Select Edit.

- 12. Check nr5gSmCause.
- 13. Set the value to 50.
- 14. Select OK.
- 15. Go to tab RRC/NAS.
- 16. Go to sub tab PDU Session Control.
- 17. Set Session Num to 2.
- 18. Set Session Type to IPv4.
- 19. Set IP Address Type to IPv4.
- 20. Set Parameter View to P-CSCF.
- 21. Set Num Addresses to 1.
- 22. Set P-CSCF Type 1 to IPv4.
- 23. Enter appropriate IP address to IPv4 Address 1.



- 24. Go to sub tab Security.
- 25. Enable and enter the appropriate security settings if necessary.

Keysight C8700200A Test Applicatio	n Framework – 5G I	NR (15.1807.1618.	10081)								- 0 ×
NR SA Tadleas Tadleas SA -19.85 BW: BW: Freq: D: U:	PCC n77 dBm/BW 100 MHz : 3350.01 : 3350.01	SA -19.8 BW: Freq: L	SCC n77 5 dBm/BW 100 MHz 0: 3350.01 J: 3350.01								Main Tx Measurements
RRC PDU Session Con	trol Securit	y CSI Re	porting M	eas Objects	Report Con	nfig N	Aeas Config	CMAS	Quantity Con	ifig 🔍 🗸	Rx Measurements
No USIM											Boom Cuitaba
Authentication Parameters											Beall Switch
Algorithm					AMF Value (He	x)	U555				
Authentication Key	Authentication Key Keysight SIM				Key Value (Hex		00000		000000000000000000000000000000000000000		
Operator Variant					OP/OPc Value	(Hex)	00000	000000000000000000000000000000000000000	000000000000000000000000000000000000000	00	
Security Algorithms											
NAS Ciphering Algorithm			*		RRC Ciphering	Algorithm					
NAS Integrity Algorithm					RRC Integrity A	Ngorithm					
											Apply
System Scheduling Cell	PHY Bea	m Mgmt 🛛 M4	AC/RLC/PDCP	RRC/NAS	UE Info I	IMS BL		CSI Assiste	ed Tx Meas		
BSE:CONFig:NR5G[:SELected]:F	PHY:BWP0:PUCC	h:STATe		-			location	AndBandwidt	h Local	Q Search	More 2/2
🦉 Keysight C8700200A Test Applicatio	n Framework – 5G I	NR (15.1807.1618.	10081)								- o ×
NR SA	PCC n77	SA -19.8	SCC n77 5 dBm/BW								IMS
TxMeas	3350.01 3350.01	OFF	3350.01 3350.01								De-Register UE
UE Info Registered Use	r Info Secu	rity Statu	s Messag	e Summary							
										^	Re-Register UE
Security State											Send 3GPP SMS
Auth Param Sync Source:	NG-Core			•							
Algorithm:											
Authentication Key:											
Operator Variant:	OP										
OP Value (Hex):	000000000000000000000000000000000000000										
Key Value (Hex):											
AMF Value (Hex):	D555										
AKA Algorithm:	AKAv1			•							
IPsec											
Integrity Algorithm:	HMAC_SHA1_S	16		•							
Encryption Algorithm:	DES3_CBC			•							Apply
System Scheduling Cell	РНУ Веа	m Mgmt 📗 M4	AC/RLC/PDCP	RRC/NAS	UE Info			CSI Assiste	ed Tx Meas		
BSE:CONFIG[:SELected][:SELec	ted]:ACTive[:ST/	ATe]							Local	Q Search	Back

DUT (exemplary)

26. Go to tab IMS.

27. Go to sub tab Security.

applied SIM card.

28. Enable and enter appropriate

security settings according to the

- 1. Go to Settings.
- 2. Set NR as preferred network.



3. Set SA+NSA mode as 5G network mode.

Select 5G network mode							
NSA mode (default)	\bigcirc						
SA mode	\bigcirc						
SA+NSA mode	0						

Keysight E7515B UXM 5G

- 1. Go to tab System.
- 2. Go to sub tab Config.
- 3. Change or verify the applied settings.

4. Turn on 5G cell.



- 5. Go to tab IMS.
- 6. Go to sub tab Registered User Info.
- 7. Verify that the DUT has registered at the IMS server.
- 8. The SIP URI of the DUT is required for the call establishment with ACQUA.
- 9. Continue with chapter $3.1 \rightarrow$ chapter $3.2 \rightarrow$ chapter 3.4.

🚟 Keysight C8700200A Test Applica	tion Framewo	rk – 5G NR (15.1807.	.1618.10081)							-	ø ×
NR SA TxMeas	PCC n78 35 dBm/BW 100 MHz D: 3350.01 U: 3350.01	IN2 SM	A SCC n77 -19.85 dBm/BW V: 100 MHz +q: D: 3350.01 U: 3350.01							De-R	IMS egister UE
UE Info Registered Us	ser Info	Security 5	Status Message	Summary				Pafrash	Clayr	Re-R	egister UE
MSISDN 28496095	SIP URI	lclient@keysight	com			AN Type		Call State(s)		Send 3	GPP SMS
2345 001012345678901	sip:2345 sip:0010	@ims.mnc001.mc 12345678901@im	c001.3gppnetwork.or s.mnc001.mcc001.3g	g opnetwork.org		3GPP-NR-TDI		Idle Idle			
System Scheduling Ce		Beam Momt	MAC/RLC/PDCP		IMS	BLER/Tput	CSI	Assisted Tx Meas			Apply
BSE:FUNCtion:NR5G[:SELecte	d]:NAS:REC	Luest[:IMMediate	() IMEI			locat	ionAndBa	andwidth Local	Q Search		Pack

2.1.3 5G NR connection procedure – IPv6

Keysight E7515B UXM 5G

- 1. Select Utility.
- 2. Select TA Mode Switch.
- 3. Select 5G NR Standalone.

- 4. Select Export/Import SCPI.
- 5. Select Import.
- 6. Browse to the directory of the SCPI file and select Import.

Displayed reports are the	e max measured over all appropriate antennas	- Charlot	Link to X-App
			Util
			Ap
m Scheduling Cell PHY Beam Mgmt MAC/RU	C/PDCP RRC/NAS UE Info MS BLER/T	put CSI Assisted Tx Meas	
		Switch	TA Mode Switch
	Mode you want, the Apply.	en click	Search
	Test Application Mo	de:	
	5G LTE-NR IRAT	▼	Start RTT
	5G NR NSA		
	5G NR L1 Test		Start License
Assisted Tx Mass	5G NR Standalone		Manager
Assisted TX Meas	5G LTE-NR IRAT		
	CW	:h	Back
ht C8700200A Test Application Framework – 5G NR (15.1807.1618.10081)			2.27 AM - 0
INI Sk PCG III INI	00 MHz 50.01 50.01		Export / Imp
fig Impairments Message Summary Error Lo	g RUI Log Logging App Info		
Mode: Manual SG Cell 1 (PCC) SG Cell 2			
ht C8700200A Test Application Framework – 5G NR (15.1807.1618.10081)	1		- 0
INI SA PCC n77 IN2 SA SCC -19.85 dbm/BW -19.85 dbm/BW <td< td=""><td>: n77 /6W 00 MHz</td><td></td><td>SCPI File</td></td<>	: n77 /6W 00 MHz		SCPI File
GFF U: 3350.01 OFF U: 33 OFF U: 3350.01	50.01		Ex Ex
Ig Impairments Message Summary Error Lo	g RUI Log Logging App Info		- Im
56 Cell 1 (PCC) 56 Cell 2			
	Import		
Select a SCPI file to import, then select 'Import'			
Current Folder: C:\ProgramData\Keysight\5GTA	\Scpi Files		
Name	Туре	Date Modified	
	Parent Folder		
SA_Huawei_P40_GL.scpi	SCPI File	10/21/2020 04:11	
SA_Huawei_P40_VoNR.scpi	SCPI File	10/09/2020 08:45	
ile name: FakeFile.scpi			

- 7. Go to tab RRC/NAS.
- 8. Go to sub tab PDU Session Control.
- 9. Set Session Num to 2.
- 10. Set Session Type to IPv4v6.
- 11. Set Address Type to IPv4v6.
- 12. Set Parameter View to P-CSCF.
- 13. Set Num Addresses to 2.
- 14. Set P-CSCF Type 1 to IPv6.
- 15. Enter appropriate IP address to IPv6 Address 1.
- 16. Go to sub tab Security.
- 17. Enable and enter appropriate security settings according to the applied SIM card..





- 18. Go to tab IMS.
- 19. Go to sub tab Security.
- 20. Enable and enter the appropriate security settings according to applied SIM card.

🧱 Keysight	C8700200A Test Ap	plication	Framewor	k – 5G NR (15.1807	1618.10081)								-	٥	×
NR SA		A F	ICC n77 IBm/BW	M2 S	SCC n77 19.85 dBm/BW								_	IMS	
TxMeas	OFF F	W: eq: D: U:	100 MHz 3350.01 3350.01		4: D: 3350.01 U: 3350.01								De	Registe	rUE
UE Info	Registere	d User	Info	Security	Status Message	Summary									
Se Se	curity State											^	Re	Registe	TUE
													Send	3GPP	SMS
Auth Pa	ram Sync Source		NG-Core			•									
Algorith															
Authenti	cation Key:		Keysight												
Operato	r Variant:														
OP Valu	e (Hex):														
Key Valı	ue (Hex):														
AMF Va	lue (Hex):														
AKA Alg	jorithm:		AKAv1			•									
IPsec															
Integrity	Algorithm:		HMAC_S	HA1_96		•									
Encrypti	on Algorithm:		DES3_C	BC		•						v		٨	pply
System	Scheduling	Cell	PHY	Beam Mgmt	MAC/RLC/PDCP	RRC/NAS	UE Info	IMS		Assisted	Tx Meas				
BSE:CONF	IG[:SELected][:	SELecte	ed]:ACTiv	e[:STATe]	· · · · · · · · · · · · · · · · · · ·				 		Local	Q Search			Back

DUT (exemplary) 1. Go to Settings. 2. Set NR as preferred network. Preferred network mode NR/LTE/WCDMA/GSM auto ITE/WCDMA/GSM auto ITE/WCDMA/GSM auto 3. Set SA+NSA mode as 5G network mode Select 5G network mode NSA mode (default) SA mode SA+NSA mode

Keysight E7515B UXM 5G

- 1. Go to tab System.
- 2. Go to sub tab Config.

Keysight C8700200A 1	Test Application	Frame	work – 5G NR (15.18	07.1618.10081)								-	σ	×
NR SA	SA P	CC n Rm/RW	"	SA SCC n77 -19.85 dBm/RW									Main	
TxMeas	BW: Freq: D: F U:	100 M 3350. 3350.	HIZ 01 01 01	BW: 100 MHz Freq: D: 3350.01 U: 3350.01									Cel	
Config Impa	airments	Mess	age Summary	Error Log RUI	I Log Log	iging ,	App Info							
Config Mode: Manu	ual 🔻													
	5G Cell 1 (P	CC)	5G Cell 2											
Duplex Mode	TDD	<u> </u>	TDD 🔻											
Freq Range / Band	FR1 / n77	•	FR1/n77 🔻											
DL Bandwidth	100 MHz	•	100 MHz 🛛 🔻									6	inction	Taets
SCS Common	1 (30 kHz)	•	1 (30 kHz) 🛛 🔻										incion	icat-
DL ARFCN	623334		623334									-		
DL Freq (MHz) 🔻	3350.01		3350.01										Mol	oility►
DL Power BW 🔻	-19.85		-19.85											
Input Power	-51		-30										Dooo	
DL MIMO Config	2x2	•	Custom (2x2) V									4	Alloca	tion
UL MIMO Config	1x1	•	Custom (1x1) V											
	Cell On		Cell On									Lin	c to X-A	005
					NR Cell Loc	ations:								
					+2							—		
					100 M	Hz					·		U	tility►
2950.01 MHz											3750.01 MHz			
					+2									
					100 M	Hz	1						A	oply
System Schedul							IMS ,	BLER/Tput	CSI			-		
REPONEICHER AN	to diff REL oats	MIAC	Third PTATAL							Local	O Search			

3. Turn on 5G cell.



- 4. Go to tab IMS.
- 5. Go to sub tab Registered User Info.
- 6. Verify that the DUT has registered at the IMS server.
- 7. The SIP URI of the DUT is required for the call establishment with ACQUA.
- 8. Continue with chapter $3.1 \rightarrow$ chapter $3.3 \rightarrow$ chapter 3.4.

🚟 Keysight C8700200A Test Applicatio	n Framework – 5G NR (15.1807.1618.10081)					_	٥	×
	PCC n78 N2 SA SCC n77						IMS	
TxMeas	dbm/rbw -19.85 dbm/rbw 100 MHz BW: 100 MHz 3350.01 Freq: D: 3350.01 OFF U: 3350.01					De-R	egister	r UE
UE Info Registered Use	Info Security Status Mess	age Summary					Ingiato	e LUE
				Refresh	Clear	Re-R	egistei	UE
MSISDN	SIP URI		AN Type	Call State(s)	<u> </u>	Send :	GPP S	SMS
28496095	sip:virtualclient@keysight.com			Idle				
2345	sip:2345@ims.mnc001.mcc001.3gppnetwork	org		Idle				
001012345678901	sip:001012345678901@ims.mnc001.mcc001	.3gppnetwork.org	3GPP-NR-TDD	Idle				
System Scheduling Cell	PHY Beam Momt MAC/RI C/PDC		IMS BI FR/Tout	CSI Assisted Ty Meas			٩	pply
BSE:FUNCtion:NR5GI:SELected	NAS:REQuestf:IMMediatel IMEI		locatio	onAndBandwidth Local	Q. Search			

2.2 4G connection establishment

2.2.1 Preparations

- Interconnect the hardware according to chapter 1.6 and chapter 1.7
- Boot up Keysight E7515B UXM 5G
- Open Keysight HCCU on Keysight E7515B UXM 5G and select the appropriate LTE scenario
- Open 5G NR Test App on Keysight E7515B UXM 5G
- Boot up PC and start ACQUA
- Boot up labCORE
- Insert test SIM card into DUT and boot up DUT

2.2.2 4G connection procedure – IPv4 & IPv6

Keysight E7515B UXM 5G

- 1. Select Utility.
- 2. Select TA Mode Switch.
- 3. Select 5G NR LTE IRAT.



- 4. Select Export/Import SCPI.
- 5. Select Import.

_		LTE Cell 1	5G Cell 1	5G Cell 2	_								
🔤 к	eysight C8700200A Test A	oplication Framewor	k – 5G NR (15.1807.	1618.9300)								-	ø ×
ſ	E-NR	PCC / FDD 1)									s	SCPI File
Ľ		BW: 10 MHz ARFCN: D: 300 U: 18300											Export
	Config RF Config	g Impairmen	its Messag	e Summary	Error Log	RUI Log	Logging	RF Conne	ctors App Inf				
C	nfig Mode: Optimizati	on v Numbe	r of Cells: 2	•			Contiguos	us Cells	Show Cell Confi	g Diagram	\checkmark	1	Import
		LTE Cell 1	5G Cell 1	5G Cell 2	_								

Error Log RUI Log Logging RF Connectors

App Info

6. Browse to the directory of the SCPI file and select Import.

Name	Туре	Date Modified	
	Parent Folder		
SA_Huawei_P40_GL.scpi	SCPI File	10/21/2020 04:11	
SA_Huawei_P40_VoNR.scpi	SCPI File	10/09/2020 08:45	

- 7. Go to tab RRC/NAS.
- 8. Go to sub tab EPS Bearer Config.
- 9. Set Session Num to 2.
- 10. Set Address Type to IPv4v6.
- 11. Set Protocol Configuration Options to P-CSCF.
- 12. Set Num Addresses to 2.
- 13. Set P-CSCF Type 1 to IPv4.
- 14. Enter appropriate IP address to IPv4 Address 1.
- 15. Set P-CSCF Type 2 to IPv6.
- 16. Enter appropriate IP address to IPv6 Address 2.
- 17. Go to sub tab Security.
- 18. Enable and enter the appropriate security settings if necessary.





- 19. Go to tab IMS.
- 20. Go to sub tab Security.
- 21. Enable and enter the appropriate security settings according to applied SIM card.



- 22. Go to tab System.
- 23. Go to sub tab Config.
- 24. Change or verify the applied settings.

- 25. Go to tab Cell.
- 26. Go to sub tab Config.
- 27. Change or verify the applied settings.

Ref

nal Po



Cyclic Prefix

Exp

stem Scheduling Cell PHY MAC/RLC/PDCP RRC/NAS UE Info IMS BLER/Tput Assisted Tx Meas

Resource

Арр

Link to X-App Utilit

•

Normal

-20.00

- 28. Go to sub tab Identities.
- 29. Change or verify the applied settings.

Keysight C8700200A Test Application Framework – 5G NR (15.1807.1618.9300)		- ø ×
LTE-NR BAT T.MMess		Main Cell On
Config Identities NR Cell Reconfig Global Cell Identity: 1	Mobile Country Code (MCC): 1	Connect►
Physical Cell Identity: 0	Mobile Network Code (MNC): 2 Digits ¥ 1	Function Test
IMSI: Keysight SIM User Defined IMSI: 001012345678901	Iracking Area Code (IAC): 1 Location Area Code (IAC): 1	NR S-Cell Aggregation
		Mobility►
		Resource Allocation
		Link to X-Apps
		Utility►
		Apply
	Local Q Search	More 1/2
Keysinht C87002004 Test Application Framework - SG NR (15 1807 1618 0300)		- n ×

- 30. Go to tab PHY.
- 31. Go to sub tab UE Power Control.
- 32. Change or verify the applied settings.

	Local Q Search	More 1/2
Keysight C8700200A Test Application Framework - 5G NR (15.1807.1618.9300)		- o ×
LTE-NR IRAT III -C0.00 deu/Bolte EW -C0.00 deu/Bolte EW -C0.00 deu/Bolte Tobless UM ENCrub 300 -C0.00 deu/Bolte		Main Cell On
General UE Power Control Boosting		Connect
Ut Power Come Mode Isaget PUCCH Target Rover: 0.0 dBm		Function Test
PUSCH Target Power: 0.0 dBm		NR S-Cell Aggregation
		Mobility►
UL Power Control Parameters		Resource Allocation
P0 (komma PUSCH)25 com Spectrum Emission: 1 P0 (UE-PUSCH SRB); 0 d8		Link to X-Apps
P0 (UE-PUSCH RBC) 0 0B P40ac 23 pmaxEUTRA 23 Accumulation Enabled		Utility►
System Scheduling Cell PHY MACRI CPDCP RBCNAS UE Into M/S BLEPPTour Assisted Tx Meas		Apply
ASE CONFIGNITES EL exterti III. CL PControl MODE	Local O Search	

- 33. Go to tab IMS.
- 34. Go to sub tab Registered User Info.
- 35. Turn on 4G cell.



- 36. The DUT registers at the IMS server.
- 37. Continue with chapter $3.1 \rightarrow$ chapter 3.2 / chapter $3.3 \rightarrow$ chapter 3.4.

3 ACQUA configuration

3.1 General settings

- 1. Start Hardware Configuration.
- 2. Drag and drop the blocks from the left selection area into the right configuration area. Interconnect the blocks according to the applied connections.

Alternatively, use the Hardware Configuration Wizard.



3.2 IPv4 settings

- 1. Open VolP settings.
- 2. Go to tab Network Settings.
- 3. Enable IPv4 Configuration as Internet protocol.
- 4. Enter addresses according to Keysight E7515B UXM 5G.

VolP Settings						
7	-		atwork Impairm	onto		
	•		etwork impairm	ents		
letwork Settings SIP Set	tings RTP	Settings Call	Radio Te	ster Wizard Dia	agnostics	
IPv4 Configuration			№ Configuratio	on		
On Off		(On 🖲 Off			
<u>I</u> P 192 .	168 . 2	. 4 I <u>P</u>				
Subnet <u>M</u> ask 255 .	255 . 255	. 0 Pr	efi <u>x</u> 64			
<u>G</u> ateway 192 .	168 . 2	. 1 <u>G</u> a	ateway 0	. 0 . 0	. 0 🗌 ma	nual
D <u>N</u> S 0.0.0.0						
Apply MAC addr	ess: 00:1f:7b:6	8:01:82				
		- 1		_		
atus: Audio System 🥝 🗌	Reset	VoIPSystem 🥝	Reset	SIP Registration 🥘) SIP Call 🔘	<u>R</u> TP Stream (
-						
VoIP Settings						
		100 🗖 🔍 🛛	etwork Impairm	ents		
			etwork impairin	ents		
etwork Settings SIP Set	ttings RTP	Settings Call	Radio Te	ster Wizard Dia	agnostics	
	- 11		1	1	-	
General Settings			Codec Cor	nfiguration		
Remote Port	7078		AMR-WB,	16 kHz, PT = 96, m	iono	\sim
Local Port	7078		Payload Ty	/pe 9	96	
Media encryption	None	~	Packet Ler	ngth 2	0 ms	\sim
Initial jitter buffer lengt	h	100 ms				
initial jitter barrer lengt			Paramet	ter		
		Apply				-
			Encoder			
			FMTP	octet-align=1		
				Default	Edit	
			Advance	ed		3
			Encoding	delay (RCV): 98,5	ms Appl	v
				datau (CNID), 100.0	appi	
			Decoding	delay (SND): 122,:	5 ms	
			Decoding	delay (SND): 122,:	5 ms	
			Decoding	delay (SND): 122,:	5 ms	
			Decoding	delay (SND): 122,:	o ms	
			Decoding	delay (SND): 122,:	o ms	
			Decoding	Gelay (SND): 122,	5 ms	
			Decoding	delay (SND): 122,	5 ms	
			Decoding	delay (SND): 122,	5 ms	

- 5. Got to tab RTP Settings.
- 6. Set the appropriate voice codec.

7. Go to tab SIP Settings.

9. Select Register to register

LED on screen.

*lab*CORE to the IMS server of Keysight E7515B UXM 5G.10. ACQUA indicates the successful registration via the green virtual

8. Enter the settings according to P-CSCF address and domain from Keysight E7515B UXM 5G.

VoIP Settings	
- 🛄 🖬 🔍	Network Impairments
etwork Settings SIP Settings RTP Settings Ca	all Radio Tester Wizard Diagnostics
General Settings	SIP Registration
Port 7060 UDP ~	Server Address 192.168.2.1:5060
<u>C</u> ontact Sip:2345@192.168.2.4:7060	<u>U</u> ser ID 2345
Firewa <u>l</u> l Policy None ~	Password Show
Fire <u>w</u> all Address	Identity 🄊 sip:2345@ims.mnc001.mcc00
Apply	Contact Parameter
	Outbound Proxy 192.168.2.1
	Status 🔘 Unregistered
	Register Unregister
atus: Audio System 🕘 Reset VolP System 🕘	Reset SIP Registration SIP Call RETP Stream
VoIP System	Reset SIP Registration () SIP Call () <u>R</u> TP Stream Network Impairments Diagnostics
atus: Audio System (Reset VoIP System (VoIP System (VoIP Settings) I I I I I I I I I I I I I I I I I I	Reset SIP Registration () SIP Call () RTP Stream Network Impairments all Radio Tester Wizard Diagnostics SIP Registration SIP Registration
Audio System Reset VoIP System VoIP System VoIP Settings	Reset SIP Registration () SIP Call () ETP Stream Network Impairments all Radio Tester Wizard Diagnostics SIP Registration Super Address 192 168 2 1:5060
Audio System Reset VoIP System VoIP Settings Image: Content of the system Image: Content of the system VoIP Settings SIP Settings RTP Settings Event 7060 UDP Contact Image: Sip: Sip: Sip: Sign: Sig	Reset SIP Registration () SIP Call () <u>B</u> TP Stream Network Impairments all Radio Tester Wizard Diagnostics SIP Registration Server Address 192.168.2.1:5060 User ID 2345
atus: Audio System Reset VoIP System VoIP Settings VoIP Settings SIP Settings RTP Settings Cancer Port Contact Sip:2345@192.168.2.4:7060 Firewall Policy	Reset SIP Registration () SIP Call () RTP Stream Network Impairments all Radio Tester Wizard Diagnostics SIP Registration Server Address 192.168.2.1:5060 User ID 2345 Password Show
atus: Audio System Reset VoIP System VoIP System VoIP System Collection Stress SIP Settings RTP Settings Ca General Settings Port 7060 UDP Contact Sip:2345@192.168.2.4:7060 Firewall Policy None Firewall Address	Reset SIP Registration () SIP Call () BTP Stream Network Impairments Image: SiP Registration Image: SiP Registration Image: SiP Registration Server Address 192.168.2.1:5060 Image: SiP Registration Image: SiP Registration Server Address 192.168.2.1:5060 Image: SiP Registration Image: SiP Registration Image: Server Address 192.168.2.1:5060 Image: SiP Registration Image: SiP Registration Image: Server Address 192.168.2.1:5060 Image: Server Address 192.168.2.1:5060 Image: Server Address 192.168.2.1:5060 Image: Server Address 192.168.2.1:5060 Image: Server Address 192.168.2.1:5060 Image: Server Address Image: Server Address Image: Server Address 192.168.2.1:5060 Image: Server Address Image: Server Address Image: Server Address 192.168.2.1:5060 Image: Server Address Image: Server Address Image: Server Address Image: Server Address 192.168.2.1:5060 Image: Server Address Image: Server Address Image: Server Address Image: Server Address 192.168.2.1:5060 Image: Server Address Image: Server Address Image: Server Address Image: Server
Atus: Audio System Reset VoIP System VoIP System VoIP System Point Sile Settings RTP Settings Ca General Settings Port 7060 UDP Contact Sip:2345@192.168.2.4:7060 Firewall Policy None Voie Sip:2345@192.168.2.4:7060 Firewall Address	Reset SIP Registration () SIP Call () RTP Stream Network Impairments all Radio Tester Wizard Diagnostics all Radio Tester Wizard Diagnostics SiP Registration Server Address 192.168.2.1:5060 User ID 2345 Password Show Identity () sip:2345@ims.mnc001.mcc00' Contact Parameter () () () () ()
Atus: Audio System Reset VoIP System VoIP System VoIP System Point SIP Settings RTP Settings Ca General Settings SIP Settings Ca General Settings RTP Settings RTP Settings Ca Setting RTP Settings RTP Settings RTP Settings Ca Setting RTP Settings RTP Settings RTP Settings Ca Setting RTP Setting RTP Settings RTP	Reset SIP Registration SIP Call ETP Stream Network Impairments all Radio Tester Wizard Diagnostics SIP Registration Server Address 192.168.2.1:5060 User ID 2345 Password show Identity ip:2345@ims.mnc001.mcc00' Contact Parameter
atus: Audio System Reset VoIP System VoIP System VoIP System Collections SIP Settings RTP Settings Ca General Settings Port 7060 UDP ~ Contact Sip:2345@192.168.2.4:7060 Firewall Policy None Firewall Address Apply	Reset SIP Registration SIP Call <u>RTP Stream</u> Network Impairments all Radio Tester Wizard Diagnostics all Radio Tester Wizard Diagnostics SIP Registration Server Address 192.168.2.1:5060 User ID 2345 Password show Identity ? sip:2345@ims.mnc001.mcc00' Contact Parameter
atus: Audio System Reset VoIP System VoIP Settings VoIP Settings Careeral Settings Port 7060 UDP Contact Sip:2345@192.168.2.4:7060 Firewall Policy None Firewall Address	Reset SIP Registration SIP Call <u>RTP Stream</u> Network Impairments all Radio Tester Wizard Diagnostics all Radio Tester Wizard Diagnostics SIP Registration Server Address 192.168.2.1:5060 User ID 2345 Password show Identity Image: sip:2345@ims.mnc001.mcc00' Contact Parameter

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3.3 IPv6 settings

- 1. Open VolP settings.
- 2. Go to tab Network Settings.
- 3. Enable IPv6 Configuration as Internet protocol.
- 4. Enter addresses according to Keysight E7515B UXM 5G.

5. Got to tab RTP Settings.

6. Set the appropriate voice codec.

VoIP Settings		
Keysight_UXM_ipv6	- 🖸 🖬	🔌 Network Impairments
Network Settings SIP Sett	ings RTP Settings	Call Radio Tester Wizard Diagnostics
- IPv4 Configuration		IPv6 Configuration
On Off		● On ◯ Off
<u>I</u> P 0.	0.0.0	I <u>P</u> fd00:3000::4
Subnet Mask 255 . 2	255 . 255 . 0	Prefix 32
<u>G</u> ateway 0 .	0.0.0	Gateway 0.0.0.0 manual
]
D <u>N</u> S 0.0.0.0		
Apply MAC addre	ss: 00:1f:7b:68:01:82	
Status: Audio System 🥝	Reset VoIP System	em 🥝 Reset SIP Registration 🖉 SIP Call 🥥 <u>R</u> TP Stream ⊘
VoIP Settings		:
7	- 💷 🔲	Network Impairments
Network Settings SIP Sett	tings RTP Settings	Call Radio Tester Wizard Diagnostics
General Settings		Codec Configuration
Remote Port	7078	AMR-WB, 16 kHz, PT = 96, mono
Local Port	7078	Payload Type 96
Media encryption	None	✓ Packet Length 20 ms ✓
Initial jitter buffer length	100	ms
		Parameter
	Apply	Y Encoder
		FMTP octet-align=1
		FMTP octet-align=1
		FMTP octet-align=1 Default Edit
		FMTP octet-align=1 Default Edit Advanced (V)
		FMTP octet-align=1 Default Edit Advanced S Example 2 and
		FMTP octet-align=1 Default Edit Advanced (V): 98,5 ms Decoding delay (RCV): 98,5 ms Decoding delay (SND): 122,5 ms Apply
		FMTP octet-align=1 Default Edit Advanced Image: Constraint of the second sec
		FMTP octet-align=1 Default Edit Advanced Image: Constraint of the second sec

Status: Audio System 🥝 Reset VoIP System 🥝 Reset SIP Registration 🔘 SIP Call 🔘 <u>R</u>TP Stream 🔘

- 7. Go to tab SIP Settings.
- 8. Enter the settings according to P-CSCF address and domain from Keysight E7515B UXM 5G.

etwork Settings SIP S General Settings Port 700 Contact Sip: Firewall Policy No Firewall Address	iettings RTP Settings Call i0 UDP i2345@rtd00:3000::4]:7060 ne Apply	Radio Tester Wizard SIP Registration Server Address User ID Password Show Identity Contact Parameter Outbound Proxy Status	d Diagnostics [fd00:3000::1]:5060 2345 2345
General Settings Port 700 Contact sip: Firewall Policy Nor Firewall Address Image: Signature Signate Signature Signature Signate Signate Signate Signature	0 UDP ~ 2345@td00:3000::4]:7060 ne ~ Apply	SIP Registration Server Address User ID Password Show Identity Contact Parameter Outbound Proxy Status	[fd00:3000::1]:5060 2345 sip:2345@ims.mnc001.mcc00 [fd00:3000::1] Unregistered
Port 700 Contact sip: Firewall Policy Nor Firewall Address	0 UDP ~ 2345@fd00:3000::4]:7060 ne ~ Apply	Server Address User ID Password Show Identity P Contact Para <u>m</u> eter Outbound Proxy Status @	[fd00:3000::1]:5060 2345 sip:2345@ims.mnc001.mcc00 [fd00:3000::1] Unregistered
<u>C</u> ontact sip: Firewall Policy No Fire <u>w</u> all Address	2345@fd00:3000::4]:7060	User ID Password Show Identity P Contact Parameter Outbound Proxy Status O	2345 sip:2345@ims.mnc001.mcc00 [fd00:3000::1] Unregistered
Firewall Policy Nor	Apply	Password Show Identity P Contact Parameter Outbound Proxy Status @	sip:2345@ims.mnc001.mcc00 [fd00:3000::1] Unregistered
Fire <u>w</u> all Address	Apply	Identity Contact Parameter Outbound Proxy Status	sip:2345@ims.mnc001.mcc00' [fd00:3000::1] Unregistered
	Apply	Contact Parameter Qutbound Proxy Status	[fd00:3000::1] Unregistered
	Арріу	Outbound Proxy Status	[fd00:3000::1] Unregistered
		Status 🥥	Unregistered
			Register Unregister
t atus: Audio System 🥥	Reset VoIP System 🥥	Reset SIP Registra	ation 🥥 SIP Call ⊘ <u>R</u> TP Stream
VoIP Settings			
Keysight_UXM_ipv6		letwork Impairments	
letwork Settings SIP S	ettings RTP Settings Call	Radio Tester Wizard	d Diagnostics
General Settings		SIP Registration	
<u>P</u> ort 706	i0 UDP ~	Server Address	[fd00:3000::1]:5060
<u>C</u> ontact sip:	2345@fd00:3000::4]:7060	<u>U</u> ser ID	2345
Firewall Policy Nor	ne v	Password 🖌 show	
Fire <u>w</u> all Address		Identity 🔑	sip:2345@ims.mnc001.mcc00 ⁻
	Apply	Contact Parameter	
	1.464.4	Outbound Proxy	[fd00:3000::1]
		Status 🥝	Registered
		Status 🥥	Registered Register Unregister

- Select Register to register labCORE to the IMS server of Keysight E7515B UXM 5G.
- 10. ACQUA indicates the successful registration via the green virtual LED on screen.

3.4 Call establishment

Keysight E7515B UXM 5G

Ensure that all clients are registered at the SIP / IMS server.

🔤 Keysight C8700201A IMS-SIP Server Emulator			-	٥	×
File Configuration Help					
Message Control		Registered Users			
	Address of Record	Contact Address		Expires (s)	
Send a message	sip:virtualclient@keysight.com	sip:10.168.0.1:9000	2	147480517	
Type: Text/Plain	sip:2345@ims.mnc001.mcc001.3gppnetwork.org	sip:2345@192.168.2.4:7060	2	010	
From binary file	sip:001012345678901@ims.mnc001.mcc001.3gpp	net sip:001012345678901@192.168.2.3:31872	5	98180	
Helo World!					
		Subscribers			
	Subscribed To Subsc	riber Contact Address	Event	Expires (s)
Send as hex Send Message	sip:001012345678901@ims.mnc001.mc sip:001	012345678901@192.168.2.3:31872	reg	598180	
Send Default 3gpp sms Send Default 3gpp2 sms					

ACQUA PC

- 1. Go to tab Call.
- 2. Enable Automatic in section Jitter Buffer Reset.
- 3. Enter the SIP URI (SIP address) of the DUT in the textbox Target.
- 4. Select Call.

VoIP Settings	
🔽 🔲 🖬 💘 Network Impairment:	5
twork Settings SIP Settings RTP Settings Call Radio Tester	r Wizard Diagnostics
SIP Call	litter Buffer Reset —
Target sip:001012345678901@ims.mnc001.mcc001. ~	✓ Automatic
Autocomplete sip:001012345678901@ims.mnc001.mcc001.3gp	Manual Reset
Status 🥥 Released	
S Call	
Send DTMF	
RTP Stream	
Remote 🗸	
Status 🙆 Idle	
► Start Stop	
Codec Parameter Adjustment	
Selected Codec: AMR-WB, 16 kHz, PT = 96, mono	
Send Parameter	

5. The status switches from Released to Streams running. The virtual LED switches from gray to green.

The VolP Settings	×
🝸 🛄 🖬 🔍 Network Impairments	
Network Settings SIP Settings RTP Settings Call Radio Tester Wizard Diagnostics	
SIP Call	
Target sip:001012345678901@ims.mnc001.mcc001. V Automatic	
Autocomplete sip:001012345678901@ims.mnc001.mcc001.3gp	
Status G Streams running	
Call 🖙 Terminate	
Send DTMF	
C RTP Stream	
Remote	
Status 🔘 Unavailable	
► Start <u>S</u> top	
Codec Parameter Adjustment	
Selected Codec: AMR-WB, 16 kHz, PT = 96, mono	
Send Parameter	
Status: Audio System 🥥 Reset VoIP System 🥥 Reset SIP Registration 🥥 SIP Call 🥥 <u>R</u> TP Stream	2

Keysight E7515B UXM 5G

The Call State(s) of DUT and *lab*CORE switches to Connected.

5G NR connection

🔄 Keysight C8700200A Test Application Framework – 5G NR (15.1807.1618.10081)							٥	\times	
NR SA FCC n78 -19.85 dBm/8W -19.85 dBm/8W BW: 100 MHz -19.85 dBm/8W BW: 100 MHz -100 MHz Freq. D: 3350.01 OFF OFF U: 3350.01 OFF							IMS De-Register UE		
UE Info Registered User Info Security Status Message Summary									
Refresh Clear						Re-Re		gister DE	
						0	10000		
MSISDN	SIP URI			AN Type	Call State(s)	Send 3GPP SMS			
28496095	sip:virtualclient@keysight.co	m			Idle				
2345	sip:2345@ims.mnc001.mcc0	01.3gppnetwork.org		Connected					
001012345678901	sip:001012345678901@ims.r	nnc001.mcc001.3gppnetwork.org		3GPP-NR-TDD	Connected				

LTE connection

🧧 Keysight C8700200A Test Application Framework – 5G NR (15.1807.1618.9300)									-	٥	\times
LTE-NR	dBm/15kHz									IMS	
TxMeas BW: 10 MHz CONNECTED U: 18300									De-Register Ut		
UE Info Registered Use	r Info Security	Status	Message Summary					ſ			
						Refresh	Clear	^	Re-R	legiste	rUE
MOIODN					AN T	0-10-1-(-)	<u> </u>		0		0140
MSISUN 623403565	SIP URI	aht.com			AN Type				Send (3GPP 3	ымэ
001012345678901	sip:001012345678901@	gim.com gims.mnc001.	mcc001.3gppnetwork.org	3GPP-E-UTRAN-FDD	Connected						
2345	sip:2345@ims.mnc001.mcc001.3gppnetwork.org					Connected					