



Core Network and Interoperability Testing (INT); Small Cell LTE Interoperability Test Specification

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Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Core Network and Interoperability Testing (INT).

Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**may not**", "**need**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the [ETSI Drafting Rules](#) (Verbal forms for the expression of provisions).

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1 Scope

The present document represents an interoperability test specification with the purpose of supporting the Small Cell LTE Remote Plugfest 2016 by covering the following features:

- Regression testing (Registration, setup, data transfer, CMAS)
- Carrier Aggregation
- LIPA and SIPTO
- VoLTE
- Closed Subscriber Group

The main focus is on Small Cell-LTE interoperability, i.e. on signaling messages over the S1 interface.

2 References

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the reference document (including any amendments) applies.

Referenced documents which are not found to be publicly available in the expected location might be found at <http://docbox.etsi.org/Reference>.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

2.1 Normative references

The following referenced documents are necessary for the application of the present document.

- [1] 3GPP TS 22.220 10.10.0: "3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Service requirements for Home Node B (HNB) and Home eNode B (HeNB) (Release 10)".
- [2] 3GPP TS 23.401 10.13.0: "3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; General Packet Radio Service (GPRS) enhancements for Evolved Universal Terrestrial Radio Access Network (E-UTRAN) access (Release 10)".
- [3] 3GPP TS 24.008 10.15.0: "3rd Generation Partnership Project; Technical Specification Group Core Network and Terminals; Mobile radio interface Layer 3 specification; Core network protocols; Stage 3 (Release 10)".
- [4] 3GPP TS 24.301 10.15.0: "3rd Generation Partnership Project; Technical Specification Group Core Network and Terminals; Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS); Stage 3 (Release 10)".
- [5] 3GPP TS 25.367 10.0.0: "3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Mobility procedures for Home Node B (HNB); Overall description; Stage 2 (Release 10)".
- [6] 3GPP TS 25.467 10.6.0: "3rd Generation Partnership Project; Technical Specification Group Radio Access Network; UTRAN architecture for 3G Home Node B (HNB); Stage 2 (Release 10)".
- [7] 3GPP TS 36.300 10.12.0: "3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Universal Terrestrial Radio Access Network (E-UTRAN); Overall description; Stage 2 (Release 10)".
- [8] 3GPP TS 24.229 10.18.0: "3rd Generation Partnership Project; Technical Specification Group Core Network and Terminals; IP multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP); Stage 3 (Release 10)".
- [9] 3GPP TS 36.300 10.12.0: "3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Universal Terrestrial Radio Access Network (E-UTRAN); Overall description; Stage 2 (Release 10)".

- [10] 3GPP TS 36.331 10.16.0: "3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC); Protocol specification (Release 10)".
- [11] 3GPP TS 36.412 10.1.0: "3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access Network (E-UTRAN); S1 signalling transport (Release 10)".
- [12] 3GPP TS 36.413 10.9.0: "3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access Network (E-UTRAN); S1 Application Protocol (S1AP) (Release 10)".
- [13] 3GPP TS 36.423 10.7.0: "3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access Network (E-UTRAN); X2 application protocol (X2AP) (Release 10)".
- [14] 3GPP TS 29.168 10.2.0 - "Universal Mobile Telecommunications System (UMTS); LTE; Cell Broadcast Centre interfaces with the Evolved Packet Core; Stage 3 (Release 10)"
- [15] GSMA IR.92 - IMS Profile for Voice and SMS Version 8.0
- [16] IETF RFC4960: "Stream Control Transmission Protocol".
- [17] Small Cell Forum: "Test Specification Revision 19".

2.2 Informative references

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

- [i.1] 3GPP TR 23.829 10.0.1: "3rd Generation Partnership Project; Local IP Access and Selected IP Traffic Offload (Release 10)".

3 Abbreviations

3GPP	3rd Generation Partnership Project
APN	Access Point Name
CA	Carrier Aggregation
CMAS	Commercial Mobile Alert System
CSG	Closed Subscriber Group
EPC	Extended Packet Core
GBR	Guaranteed Bit Rate
HeNB	Home eNodeB
HeNB-GW	Home eNodeB Gateway
IMS	Internet protocol Multimedia Subsystem
LIPA	Local IP Access
LTE	Long Term Evolution (of 3 rd generation radio technology)
MME	Mobility Management Entity
P-GW	Packet Data Network GateWay
QCI	Quality of Service Class Indicator
SeGW	Security GateWay
S-GW	Serving GateWay
UE	User Equipment

4 Conventions

4.1 The test description proforma

A Test Description (TD) is a detailed description of the process that needs to be followed to test one or more interoperable functionalities between two or more vendor implementations.

A TD should include as a minimum the following elements:

Table 1: Interoperability test description template

Interoperability Test Description			
Identifier	Unique test description ID: TD_AB_XXX_00. Should follow a well-defined naming convention		
Test Objective	a concise summary of the test, which should reflect its purpose and allow readers to easily distinguish this test from any other test in the document		
Configuration	List of all the required equipment for running this test, possibly also including a (reference to) an illustration of a test architecture or test configuration		
References	List of references to the base specification section(s), use case(s), requirement(s), etc. which are either used in the test or define the functionality being tested		
Applicability	List of features and capabilities in the IFS which are required to be supported by the SUT in order to execute this test (e.g. if this list contains an optional feature to be supported, then the test is optional).		
Pre-test conditions	List of test specific pre-conditions that need to be met by the SUT including information about equipment configuration, i.e. precise description of the initial state of the SUT prior to start executing the test sequence • •		
Test Sequence	Step	Type	Description
	1	<Type>	Step description
	2		
	3		
	4		
	5		
	6		
Notes	Optional list of explanatory notes.		

The following different types are defined:

- A **stimulus** corresponds to an event that triggers an EUT to proceed with a specific protocol action, like sending a message for instance.
- A **check** step consists of verifying that the EUT behaves according to the expected behaviour (for instance the EUT behaviour shows that it receives the expected message).
- A **configure** corresponds to an action to modify the EUT configuration.
- Each **check** step consists of the receipt of protocol messages on reference points, with valid content. The check should be performed using a trace created by a monitor tool.

4.2 Interoperable Feature Statement

The "Interoperable Functions Statement" (IFS) identifies the standardised functions of a DUT. These functions can be mandatory, optional or conditional (depending on other functions), and depend on the role played by the DUT. The IFS can also be used as a pro-forma by a vendor to identify the functions that its DUT will support when interoperating with corresponding functions from other vendors.

5 Configurations

5.1 CFG_eNB

CFG_eNB is shown in the figure below. UE, eNB and EPC are required. SeGW is part of the configuration, but its behaviour is not tested. This configuration is used for tests of eNB registration.

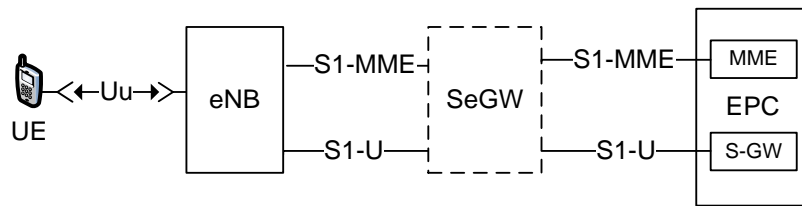


Figure 1: CFG_eNB

5.2 CFG_HeNB

CFG_HeNB is shown in the figure below. UE, HeNB, HeNB-GW and EPC are required. SeGW is part of the configuration, but its behaviour is not tested. This configuration is used for tests of HeNB registration.

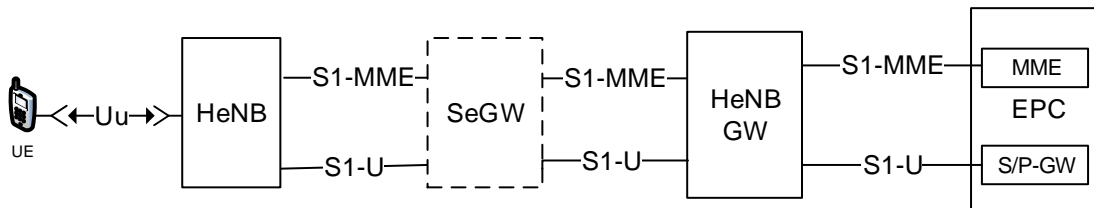


Figure 2: CFG_HeNB

5.3 CFG_(H)eNB

CFG_(H)eNB is shown in the figure below. UE, (H)eNB and EPC are required. In case eNB is used then HeNB-GW is not required. In case a HeNB is used then HeNB-GW is required. SeGW is part of the configuration, but its behaviour is not tested.

Note: For CSG tests UE1 (IMSI1) is an allowed member of the CSG and UE2 (IMSI2) is an allowed member of the CSG.

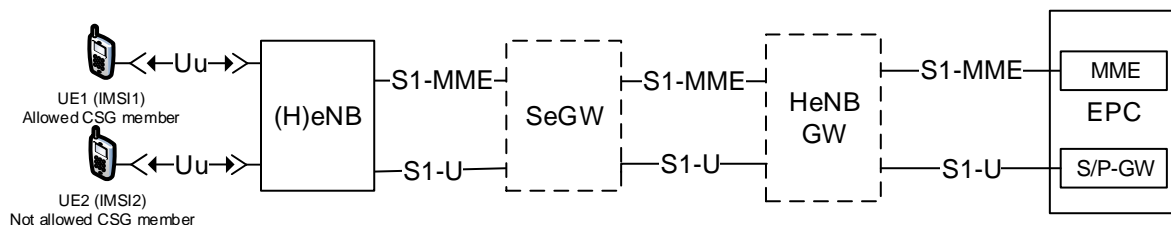


Figure 3: CFG_(H)eNB

5.4 CFG_LIPA

CFG_LIPA is shown in the figure below. UE, HeNB with collocated L-GW and EPC are required. . In case eNB is used then HeNB-GW is not required. In case a HeNB is used then HeNB-GW is required. SeGW is part of the configuration, but its behaviour is not tested.

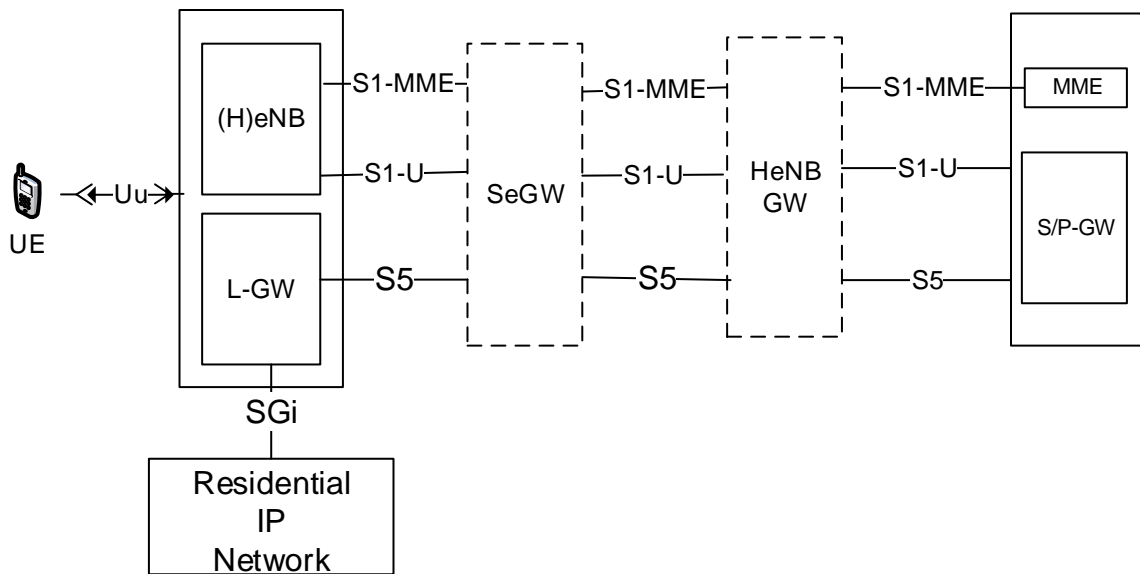


Figure 4: CFG_LIPA

5.5 CFG_CMAS

CFG_CMAS is shown in the figure below. It is based on CFG_(H)eNB with the addition of the CBC.

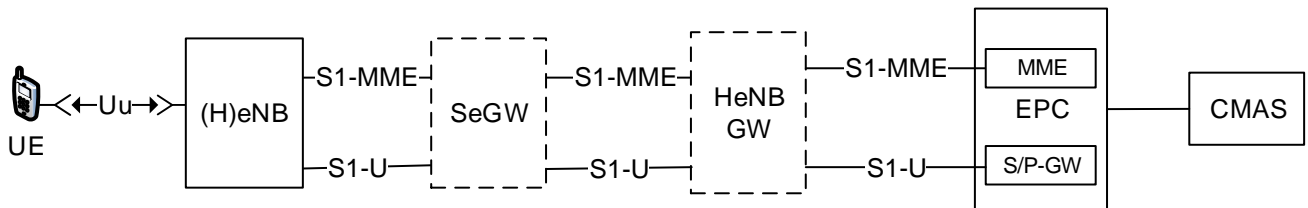


Figure 5: CFG_CMAS

5.6 CFG_IMS

CFG_IMS is shown in the figure below. It is based on CFG_(H)eNB with the addition of the IMS Core. It also allows for multi-vendor IMS calls as the UEs may connect via two separate (H)eNBs.

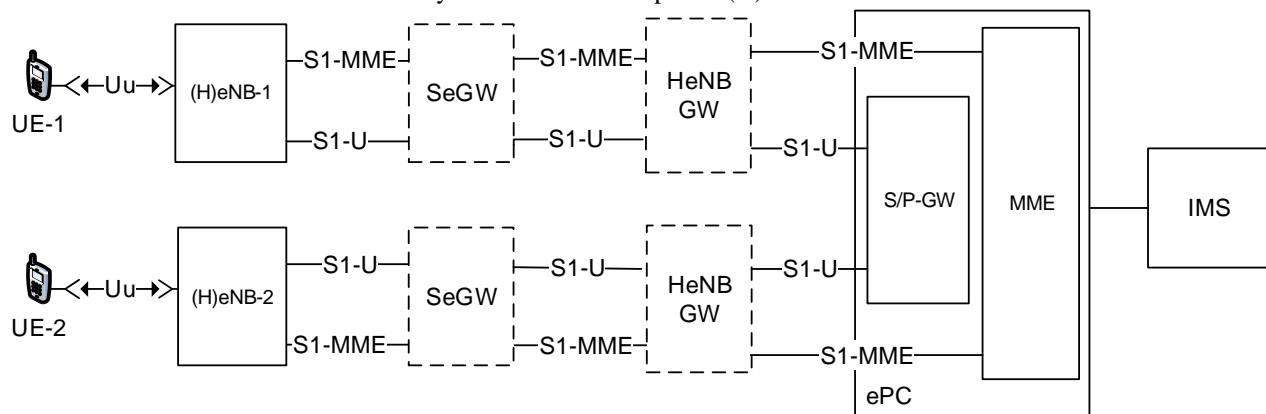


Figure 6: CFG_IMS

5.7 CFG_S1_MOB

CFG_S1_MOB is shown in the figure below. It is based on CFG_(H)eNB with the addition of the Target (H)eNB and is used for handover testing via the S1 interface.

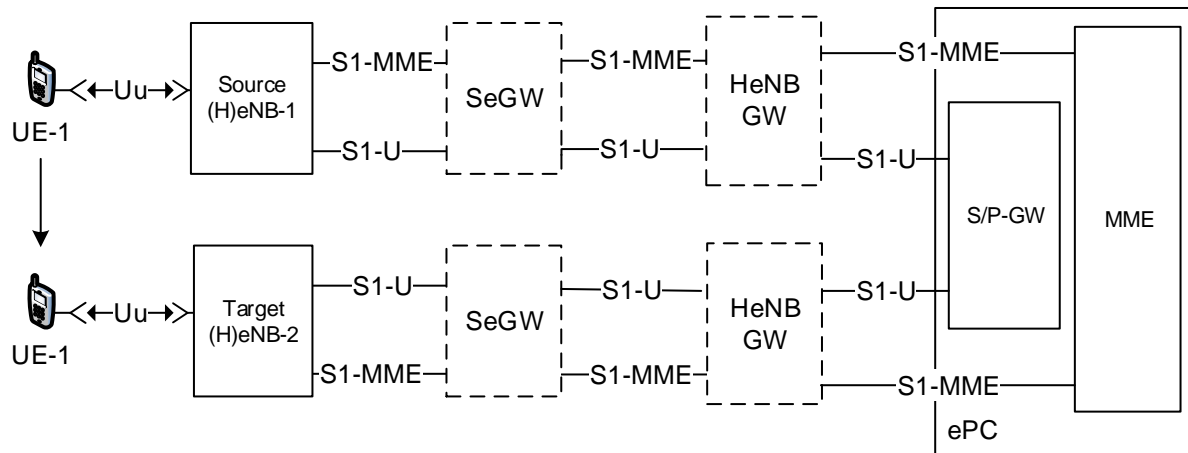


Figure 7: CFG_S1_HO

5.8 CFG_S1_MOB_LOCAL

CFG_S1_MOB_LOCAL is shown in the figure below. It is based on CFG_HeNB with the addition of the Target HeNB and is used for local handover testing via the S1 interface when the handover is locally managed by the HeNB-GW to which both source and target HeNB connect.

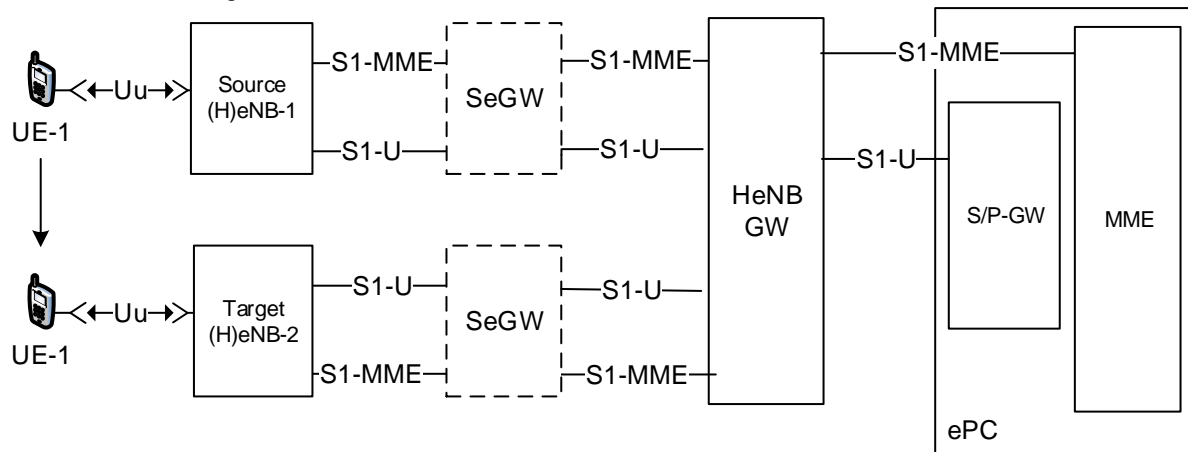


Figure 8: CFG_S1_HO_LOCAL

5.9 CFG_X2

CFG_X2 is shown in the figure below. It is based on CFG_S1_MOB with the addition of the X2 interface.

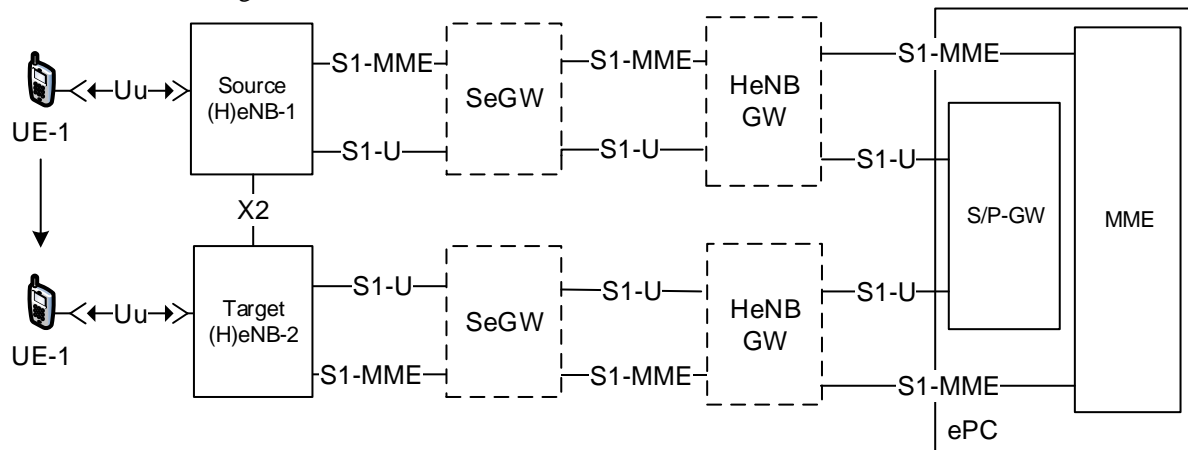


Figure 9: CFG_X2

6 Interoperable Feature Statement (IFS)

Table 2: Entities

Item	Which entity do you provide?	Status	Support
1	UE	o	
2	HeNB	o	
3	eNB	o	
4	HeNB-GW	o	
5	SeGW	o	
6	L-GW	o	
7	EPC	o	

Table 3: MME features

Item	Entity	IFS_ID	Status	Support
1	Does MME support to include 'Time to Wait IE' in S1 Setup Failure message, when it replies to a received a Setup Request message with unknown PLMN identities?	MME_TTW	o	
2	Does MME support LIPA procedures?	MME_LIPA	o	
3	Does MME support SIPTO procedures?	MME_SIPTO	o	
4	Does MME support CSG procedures?	MME_CSG	o	
5	Does MME support CMAS procedures?	MME_CMAS	o	
6	Does MME support X2 procedures?	MME_X2	o	
7	Does MME support VoLTE procedures?	MME_VOLTE	o	

Table 4: UE features

Item	Feature	IFS_ID	Status	Support
1	Does UE provision CSG white list via the SIM card?	UE_WL_SIM	o	
2	Does UE build the white list based on attempts during manual selections?	UE_WL_MAN	o	
3	Does UE support Rel-10 CA capabilities to simultaneously receive and/or transmit on multiple CCs corresponding to multiple serving cells?	UE_CA	o	
4	Does the UE support video calls?	UE_VIDEO	o	

A Rel-10 UE with reception and/or transmission capabilities for CA can simultaneously receive and/or transmit on multiple CCs corresponding to multiple serving cells.

Table 5: (H)eNB configuration

Item	Entity	IFS_ID	Status	Support
1	Does (H)eNB support CA procedures?	HENB_CA	o	
2	Does (H)eNB support LIPA procedures?	HENB_LIPA	o	
3	Does (H)eNB support SIPTO procedures?	HENB_SIPTO	o	
4	Does (H)eNB support CSG procedures?	HENB_CSG	o	
5	Does (H)eNB support CMAS procedures?	HENB_CMAS	o	
6	Does (H)eNB support X2 procedures?	HENB_X2	o	
7	Does (H)eNB support VoLTE procedures?	HENB_VOLTE	o	

Table 6: HeNB-GW features

Item	Which feature is supported?	Reference	Status	Support
1	update TAC list when unknown TAC	HENBGW_UPD ATE_TAC	o	
2	block unknown TAC	HENBGW_BLO CK_UNKNOW_ TAC	o	
3	distinct bearer establishment	HENBGW_DIST INCT_BEARER	o	
4	combined bearer establishment (default and dedicated bearers are established simultaneously)	HENBGW_COM BINED_BEARE R	o	
5	local S1 HO handling	HENBGW_LOC AL_S1	o	

7 Test Descriptions

7.1 Test Groups

7.1.1 Regression

7.1.1.1 Regression eNB

The Regression Test Group included two test cases specific to small cells behaving like eNBs, i.e. connecting directly to the EPC. This group applies to the CFG_eNB configuration.

Table 7: Regression eNB test cases

Test ID	Summary
REG/ENB/01	eNB Registration with EPC
REG/ENB/02	eNB Registration with EPC – Failure

7.1.1.2 Regression HeNB

The Regression Test Group included five test cases specific to small cells behaving like HeNBs, i.e. connecting to the ePC through a HeNB-GW. This group applies to the CFG_HeNB configuration.

Table 8: Regression HeNB test cases

Test ID	Summary
REG/HENB/01	HeNB-GW Registration with EPC - Success
REG/HENB/02	HeNB Registration with HeNB-GW (pre-registered TAC) – Success
REG/HENB/03	HeNB Registration with HeNB-GW (not pre-registered TAC) - Success (optional)
REG/HENB/04	Registration with HeNB-GW (not pre-registered TAC) – Failure (optional)
REG/HENB/05	HeNB Registration with HeNB-GW (unknown PLMN) – Failure

7.1.1.3 Regression Common

The Regression Test Group included six test cases applicable to both eNB and HeNB type Small Cells. This group applies to the CFG_(H)eNB configuration.

Table 9: Common regression test cases

Test ID	Summary
REG/UE/01	UE Registration / Default Bearer Setup / Downlink-Uplink Traffic Flow
REG/UE/02	UE Deregistration / Network Detach
PS/01	Paging
PS/03	Network initiated E-RAB setup - Distinct Bearer (optional)
PS/04	Network initiated E-RAB setup - Combined Bearer (optional)
PS/05	Network initiated E-RAB release
PS/06	E-RAB modification by the network

7.1.1.4 CMAS

The CMAS Test Group included four test cases applicable to both eNB and HeNB type Small Cells. This group applies to the CFG_CMAS configuration.

Table 10: CMAS test cases

Test ID	Summary
CMAS/01	CMAS Warning Start to List of (H)eNBs
CMAS/02	CMAS Warning Start to TAI List
CMAS/03	CMAS Warning Stop to List of (H)eNBs
CMAS/04	CMAS Warning Stop to TAI List

7.1.2 Local IP Access Group (LIPA)

The LIPA Test Group included one test case applicable to HeNB type Small Cells. This group applies to the CFG_LIPA configuration.

Table 11: LIPA test cases

Test ID	Summary
LIPA/01	Downlink Traffic Flow through L-GW

7.1.3 Closed Subscriber Group (CSG)

The CSG Test Group included five test cases applicable to both eNB and HeNB type Small Cells. This group applies to the CFG_(H)eNB configuration.

Table 12: CSG test cases

Test ID	Summary
CSG/01	UE Registration with CSG (H)eNB
CSG/02	UE no longer allowed to access the CSG cell
CSG/03	Manual CSG selection - allowed UE
CSG/04	Manual CSG selection - not allowed UE
CSG/05	UE Registration with hybrid (H)eNB

7.1.4 IMS

The IMS Test Group included five test cases applicable to both eNB and HeNB type Small Cells. This group applies to the CFG_IMS configuration.

Table 13: IMS test cases

Test ID	Summary
IMS/01	UE SIP Registration
IMS/02	UE SIP Originating Call (VoLTE)
IMS/03	UE SIP Terminating Call (VoLTE)
IMS/04	UE Originating Video Call
IMS/05	UE SIP Terminating Video Call

7.1.5 Mobility (MOB)

7.1.5.1 X2 Mobility

The X2 Mobility Test Group included four test cases applicable to both eNB and HeNB type Small Cells. This group applies to CFG_X2 configuration.

Table 14: X2 mobility test cases

Test ID	Summary
MOB/X2/01	X2 Setup
MOB/X2/02	X2 based Handover
MOB/X2/03	X2 Reset
MOB/X2/04	X2 Load Indication

7.1.5.2 S1 Mobility

The S1 Mobility Test Group included two test cases applicable to both eNB and HeNB type Small Cells. This group applies to the CFG_S1_HO and CFG_S1_HO_LOCAL configurations.

Table 15: S1 mobility test cases

Test ID	Summary
MOB/S1/01	S1 based Handover
MOB/S1/02	Local S1 based Handover

7.2 Regression Tests

7.2.1 REG/ENB/01 – eNB Registration with EPC - Success

Interoperability Test Description			
Identifier	REG/ENB/01		
Test Objective	Successful S1 interface setup between eNB and EPC		
Configuration	<ul style="list-style-type: none"> CFG_eNB 		
References	<ul style="list-style-type: none"> 3GPP TS 36.300 [9] clause 19.2.2.8 3GPP TS 36.412 [11] 3GPP TS 36.413 [12] clause 9.1.8.4 		
Applicability			
Pre-test conditions	<ul style="list-style-type: none"> eNB is configured with EPC IP address and PLMN id eNB is configured with a 20 BIT Macro eNB ID, see 3GPP 36.413 [12] clause 9.2.1.37 EPC supports eNB's TAC SCTP association established between eNB and EPC 		
Test Sequence	Step	Type	Description
	1	stimulus	Trigger eNB to send S1 Setup Request message to EPC
	2	check	S1 Setup Request message contains eNB ID, supported TAC and broadcasted PLMN Identity.
	3	check	EPC sends S1 Setup Response Successful message to eNB
	4	verify	eNB is successfully attached to the EPC
	5	verify	S1 interface is up

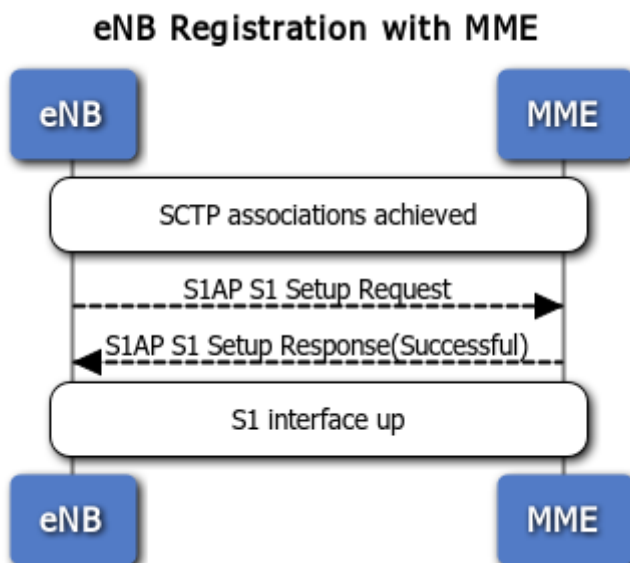
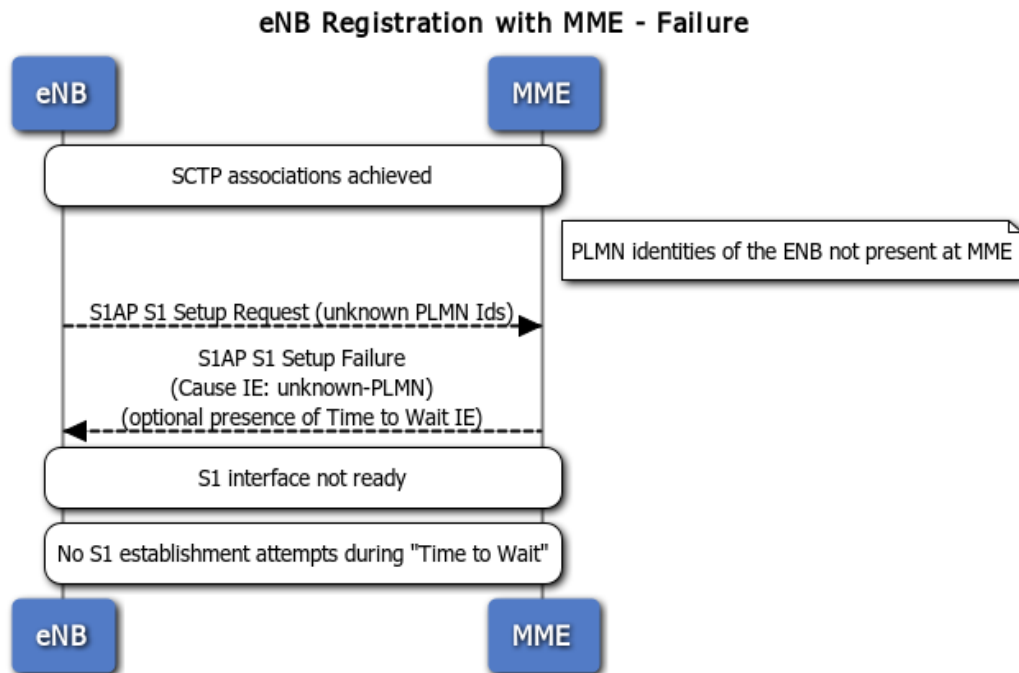


Figure 1: REG/ENB/01

7.2.2 REG/ENB/02 – eNB Registration with EPC – Failure

Interoperability Test Description			
Identifier	REG/ENB/02		
Test Objective	Unsuccessful S1 interface setup between eNB and EPC		
Configuration	<ul style="list-style-type: none"> CFG_eNB 		
References	<ul style="list-style-type: none"> 3GPP TS 36.300 [9] clause 19.2.2.8 3GPP TS 36.412 [11] 3GPP TS 36.413 [12] clause 8.7.3.3, clause 9.1.8.4 		
Applicability	MME_TTW		
Pre-test conditions	<ul style="list-style-type: none"> eNB is configured with EPC IP address eNB is configured with a 20 BIT Macro eNB ID, see 3GPP 36.413 [12] clause 9.2.1.37 EPC does not support eNB's PLMN identities SCTP association established between eNB and EPC 		
Test Sequence	Step	Type	Description
	1	stimulus	Trigger eNB to send S1 Setup Request message to EPC
	2	check	S1 Setup Request message contains PLMN identities that are not identified by EPC
	3	check	EPC sends to eNB S1 Setup Failure message containing "Cause IE" indicating "unknown-PLMN" and optionally containing "Time to Wait IE"
	4	verify	eNB is not attached to the EPC
	5	verify	S1 interface is not ready for further operation (UE attach, etc)
	6	verify	If "Time to Wait IE" was received ENB does not reattempt the S1 setup before the expiry of the indicated waiting period

**Figure 2: REG/ENB/02**

7.2.3 REG/HENB/01 – HeNB-GW Registration with EPC - Success

Interoperability Test Description			
Identifier	REG/HENB/01		
Test Objective	Successful S1 interface setup between HeNB-GW and EPC		
Configuration	<ul style="list-style-type: none"> CFG_HeNB 		
References	<ul style="list-style-type: none"> 3GPP TS 36.300 [9] clause 19.2.2.8 3GPP TS 36.412 [11] 3GPP TS 36.413 [12] clause 9.1.8.4 and 9.1.8.5 		
Applicability			
Pre-test conditions	<ul style="list-style-type: none"> HeNB-GW is configured with EPC IP address HeNB-GW is configured with a 20 BIT Macro eNB ID, see 3GPP 36.413 [12] clause 9.2.1.37 SCTP association established between HeNB-GW and EPC 		
Test Sequence	Step	Type	Description
	1	stimulus	Trigger HeNB-GW to send S1 Setup Request message to EPC
	2	check	S1 Setup Request message to the MME contains its HeNB Global ID, TAC and PLMN Identity
	3	check	MME sends a S1 Setup Response Successful message to the HeNB-GW indicating the MME Name, Served GUMMEIs, and its Relative MME Capacity
	6	verify	S1 interface is up between the HeNB-GW and the EPC

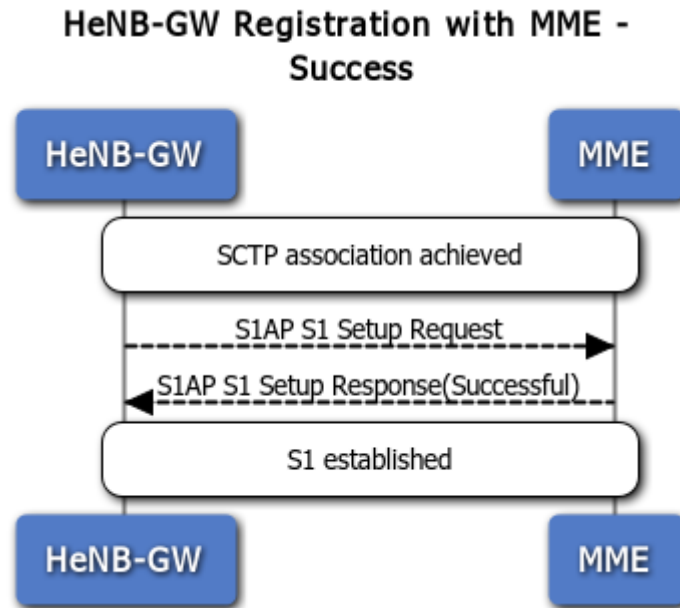


Figure 3: REG/HENB/01

7.2.4 REG/HENB/02 – HeNB Registration with HeNB-GW (pre-registered TAC) – Success

Interoperability Test Description			
Identifier	REG/HENB/02		
Test Objective	Successful S1 interface setup between HeNB and HeNB-GW, TAC registered in EPC		
Configuration	<ul style="list-style-type: none"> CFG_HeNB 		
References	<ul style="list-style-type: none"> 3GPP TS 36.300 [9] clause 19.2.2.8 3GPP TS 36.412 [11] 3GPP TS 36.413 [12] clause 9.1.8.4 and 9.1.8.5 		
Applicability			
Pre-test conditions	<ul style="list-style-type: none"> HeNB is configured with EPC IP address HeNB is configured with a 28 BIT Home eNB ID, see 3GPP 36.413 [12] clause 9.2.1.37 SCTP association establishment between HeNB-GW and EPC S1 interface establishment between HeNB-GW and EPC SCTP association establishment between HeNB and HeNB-GW HeNB TAC registered in EPC 		
Test Sequence	Step	Type	Description
	1	stimulus	Trigger HeNB to send S1 Setup Request message to HeNB-GW
	2	check	S1 Setup Request message to the HeNB-GW contains Home eNB ID, TAC and PLMN Identity
	3	check	HeNB-GW sends a S1 Setup Response Successful message to the HeNB
	4	verify	S1 interface is up between the HeNB and HeNB-GW, and between the HeNB-GW and the EPC

HeNB Registration with HeNB-GW - Success with registered TAC

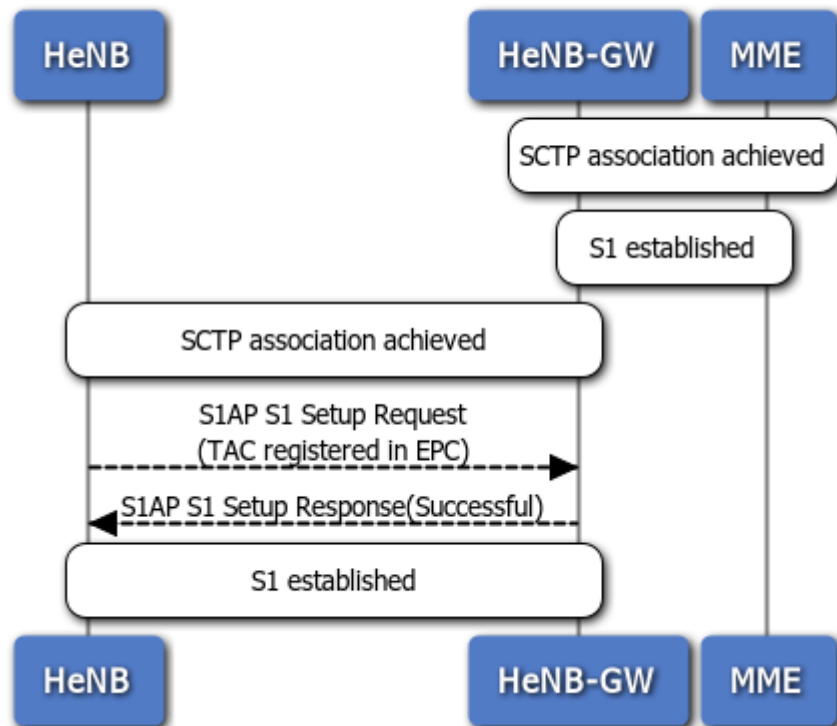


Figure 4: REG/HENB/02

7.2.5 REG/HENB/03 – HeNB Registration with HeNB-GW (not pre-registered TAC) - Success (optional)

Interoperability Test Description			
Identifier	REG/HENB/03		
Test Objective	Successful S1 interface setup between HeNB and HeNB-GW with TAC not yet registered in EPC		
Configuration	<ul style="list-style-type: none"> CFG_HeNB 		
References	<ul style="list-style-type: none"> 3GPP TS 36.300 [9] clause 19.2.2.8 3GPP TS 36.412 [11] 3GPP TS 36.413 [12] clause 9.1.8.7 and 9.1.8.8 		
Applicability	HENBGW_UPDATE_TAC		
Pre-test conditions	<ul style="list-style-type: none"> HeNB is configured with EPC IP address HeNB is configured with a 28 BIT Home eNB ID, see 3GPP 36.413 [12] clause 9.2.1.37 SCTP association established between HeNB-GW and EPC S1 interface establishment between HeNB-GW and EPC with pre-registration of TACs SCTP association establishment between HeNB and HeNB-GW HeNB TAC not registered in EPC 		
Test Sequence	Step	Type	Description
	1	stimulus	Trigger HeNB to send S1 Setup Request message to HeNB-GW
	2	check	S1 Setup Request message to the HeNB-GW contains Home eNB ID, not registered TAC and PLMN Identity
	3	check	HeNB-GW sends eNB Configuration Update to the EPC
	4	check	EPC sends eNB Configuration Update Acknowledge to the

Interoperability Test Description			
			HeNB-GW
	5	check	HeNB-GW sends a S1 Setup Response Successful message to the HeNB
	6	verify	S1 interface is up between the HeNB and HeNB-GW, and between the HeNB-GW and the EPC

HeNB Registration with HeNB-GW - Success without registered TAC

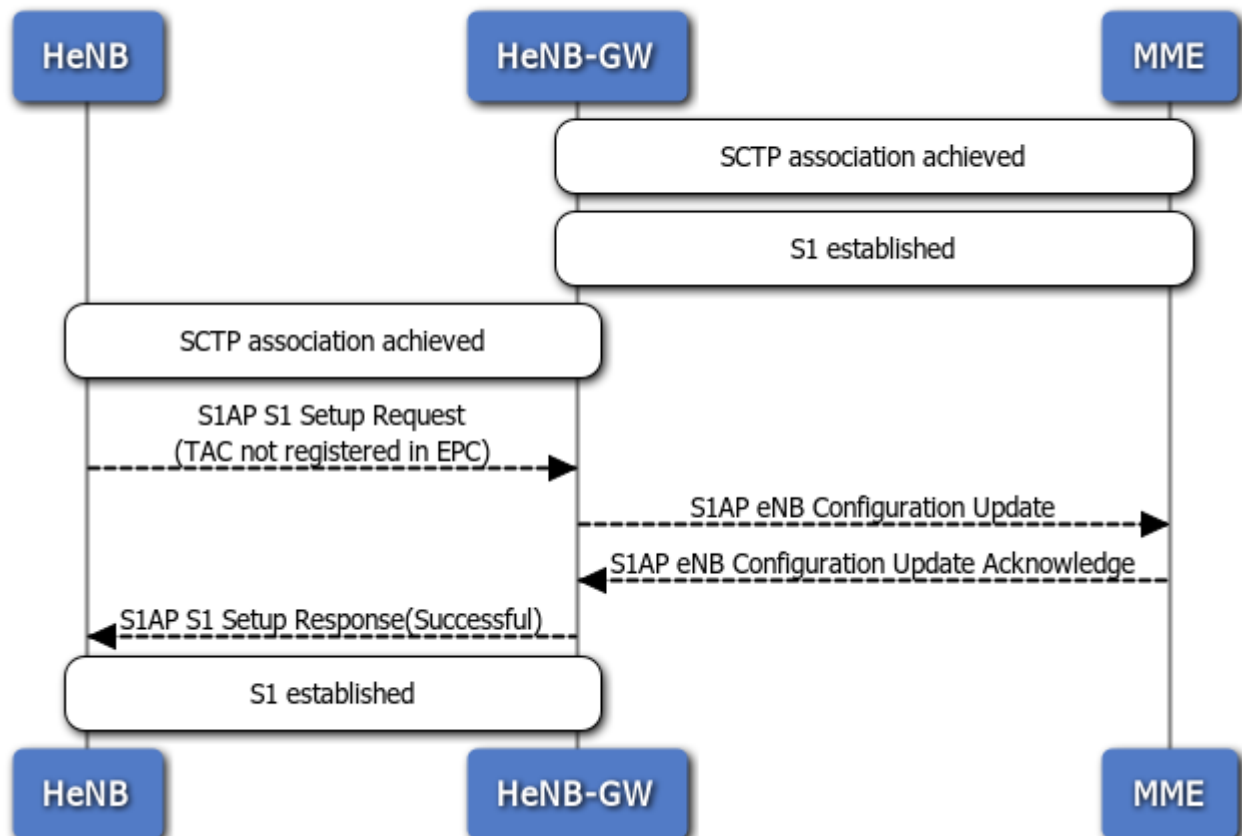


Figure 5: REG/HENB/03

7.2.6 REG/HENB/04 – Registration with HeNB-GW (not pre-registered TAC) – Failure (optional)

Interoperability Test Description			
Identifier	REG/HENB/04		
Test Objective	Unsuccessful S1 interface setup between HeNB and HeNB-GW with TAC not yet pre-registered in EPC		
Configuration	<ul style="list-style-type: none"> CFG_HeNB 		
References	<ul style="list-style-type: none"> 3GPP TS 36.300 [9] clause 19.2.2.8 3GPP TS 36.412 3GPP TS 36.413 [12] clause 9.1.8.4 and 9.1.8.6 		
Applicability	HENBGW_BLOCK_UNKNOW_TAC		
Pre-test conditions	<ul style="list-style-type: none"> HeNB is configured with EPC IP address HeNB is configured with a 28 BIT Home eNB ID, see 3GPP 36.413 [12] clause 9.2.1.37 SCTP association established between HeNB-GW and EPC S1 interface establishment between HeNB-GW and EPC with pre-registration of allowed TACs SCTP association establishment between HeNB and HeNB-GW HeNB TAC not registered in EPC 		
Test Sequence	Step	Type	Description
	1	stimulus	Trigger HeNB to send S1 Setup Request message to HeNB-GW
	2	check	S1 Setup Request message to the HeNB-GW contains Home eNB ID, not registered TAC and known PLMN Identity
	3	check	HeNB-GW sends to HeNB S1 Setup Failure message optionally containing "Time to Wait IE"
	4	verify	HeNB is not successfully attached to the HeNB-GW
	5	verify	S1 interface is not ready for further operation (UE attach, etc)
	6	verify	If "Time to Wait IE" was received HeNB does not reattempt the S1 setup before the expiry of the indicated waiting period

7.2.7 REG/HENB/05 - HeNB Registration with HeNB-GW (unknown PLMN) – Failure

Interoperability Test Description			
Identifier	REG/HENB/05		
Test Objective	Unsuccessful S1 interface setup between HeNB and HeNB-GW		
Configuration	<ul style="list-style-type: none"> CFG_HeNB 		
References	<ul style="list-style-type: none"> 3GPP TS 36.300 [9] clause 19.2.2.8 3GPP TS 36.412 [11] 3GPP TS 36.413 [12] clause 8.7.3.3, clause 9.1.8.4, 9.1.8.5 and 9.2.1.61 		
Applicability	MME_TTW		
Pre-test conditions	<ul style="list-style-type: none"> HeNB is configured with HeNB-GW IP address HeNB is configured with a 28 BIT Home eNB ID, see 3GPP 36.413 [12] clause 9.2.1.37 HeNB-GW is configured with EPC IP address HeNB-GW is configured with a 20 BIT Macro eNB ID, see 3GPP 36.413 [12] clause 9.2.1.37 HeNB-GW does not support HeNB's PLMN identities SCTP association establishment between HeNB and HeNB-GW 		
Test Sequence	Step	Type	Description
	1	stimulus	Trigger HeNB to send S1 Setup Request message to

Interoperability Test Description			
			HeNB-GW
	2	check	S1 Setup Request message contains PLMN identities that are not identified by HeNB-GW
	3	check	HeNB-GW sends to HeNB S1 Setup Failure message containing "Cause IE" indicating "unknown-PLMN" and optionally containing "Time to Wait IE"
	4	verify	HeNB is not successfully attached to the HeNB-GW
	5	verify	S1 interface is not ready for further operation (UE attach, etc)
	6	verify	If "Time to Wait IE" was received HeNB does not reattempt the S1 setup before the expiry of the indicated waiting period

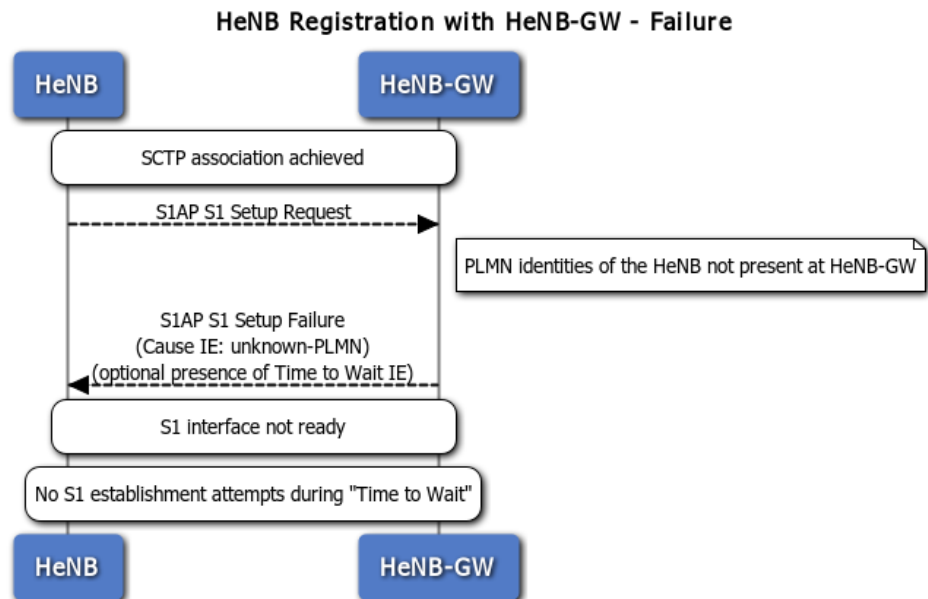


Figure 6: REG/HENB/05

7.2.8 REG/UE/01 - UE Registration / Default Bearer Setup / Downlink-Uplink Traffic Flow

Interoperability Test Description			
Identifier	REG/UE/01		
Test Objective	UE registration (Initial Network Attachment, Default EPS bearer establishment) and Downlink / Uplink traffic flow between UE and EPC (S-GW).		
Configuration	<ul style="list-style-type: none"> CFG_eNB / CFG_(H)eNB 		
References	<ul style="list-style-type: none"> 3GPP TS 36.300 [9] clause 19.2.2.8 3GPP TS 36.331 [10] clause 5.3.3 3GPP TS 36.413 [12] clause 9.1.8.4 		
Applicability			
Pre-test conditions	<ul style="list-style-type: none"> (H)eNB is an open access cell (H)eNB / HeNB-GW S1 connection established UE (IMSI) is provisioned in the HSS APN to connect to a web server and the default PDN are provisioned on the UE 		
Test Sequence	Step	Type	Description
	1	stimulus	Switch on UE
	2	verify	UE cell selection / RRC connection establishment towards HeNB
	3	verify	UE and EPC mutual authentication procedure

Interoperability Test Description			
	4	verify	NAS Security establishment procedure between UE and EPC
	5	verify	UE capability enquiry procedure
	6	verify	Default EPS Bearer establishment procedure
	7	verify	DL/UL traffic flow between UE and EPC (S-GW)

UE Registration / Default Bearer Setup / Downlink-Uplink Traffic Flow

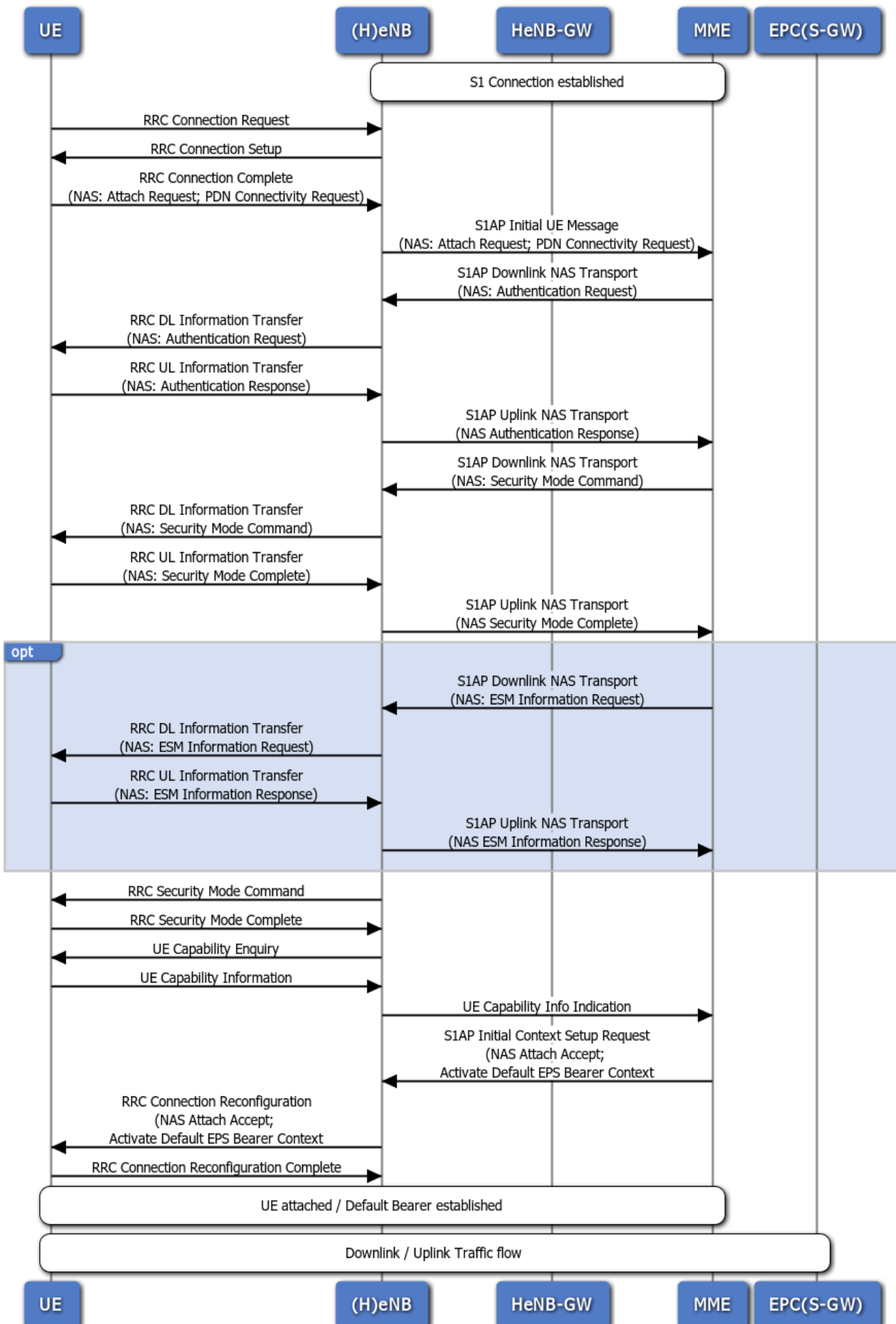


Figure 7: REG/UE/01

7.2.9 REG/UE/02 - UE Deregistration / Network Detach

Interoperability Test Description			
Identifier	REG/UE/02		
Test Objective	UE deregistration (Network Detach – powering off)		
Configuration	<ul style="list-style-type: none"> CFG_eNB / CFG_(H)eNB 		
References	<ul style="list-style-type: none"> 3GPP TS 36.300 [9] clause 19.2.2.2 3GPP TS 36.331 [10] clause 5.3.3 3GPP TS 36.413 [12] clause 8.3.2, 9.1.4.6, 9.1.4.7 		
Applicability			
Pre-test conditions	<ul style="list-style-type: none"> (H)eNB / HeNB-GW S1 connection established UE attached, default EPS bearer established and in IDLE MODE 		
Test Sequence	Step	Type	Description
	2	stimulus	Switch off the UE or set to "flight mode" or "offline" (RF part is switched off)
	3	verify	RRC connection establishment towards (H)eNB (NAS: Detach Request)
	4	verify	UE and EPC NAS Detach message exchange
	5	verify	S1 UE Context Release procedure between (H)eNB and EPC
	6	verify	RRC connection release towards the UE
	7	verify	UE is successfully detached from the LTE network
	8	verify	Packet service connection is not available at the UE

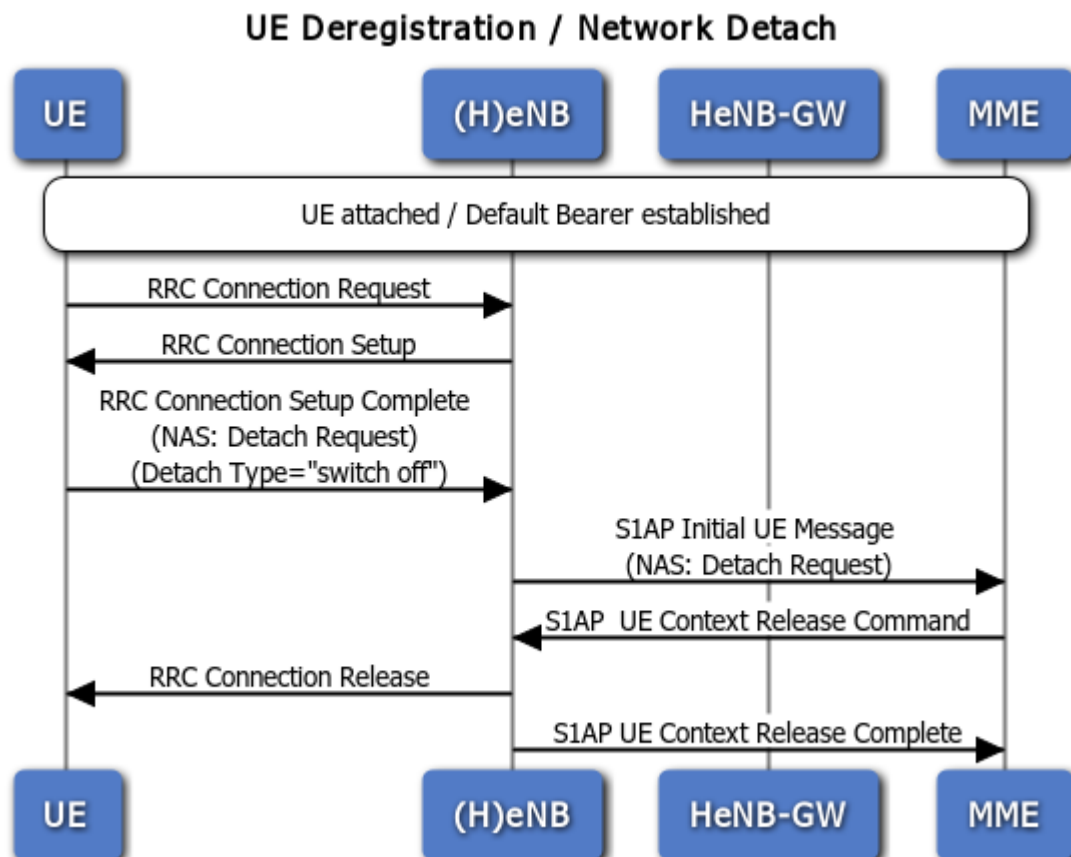
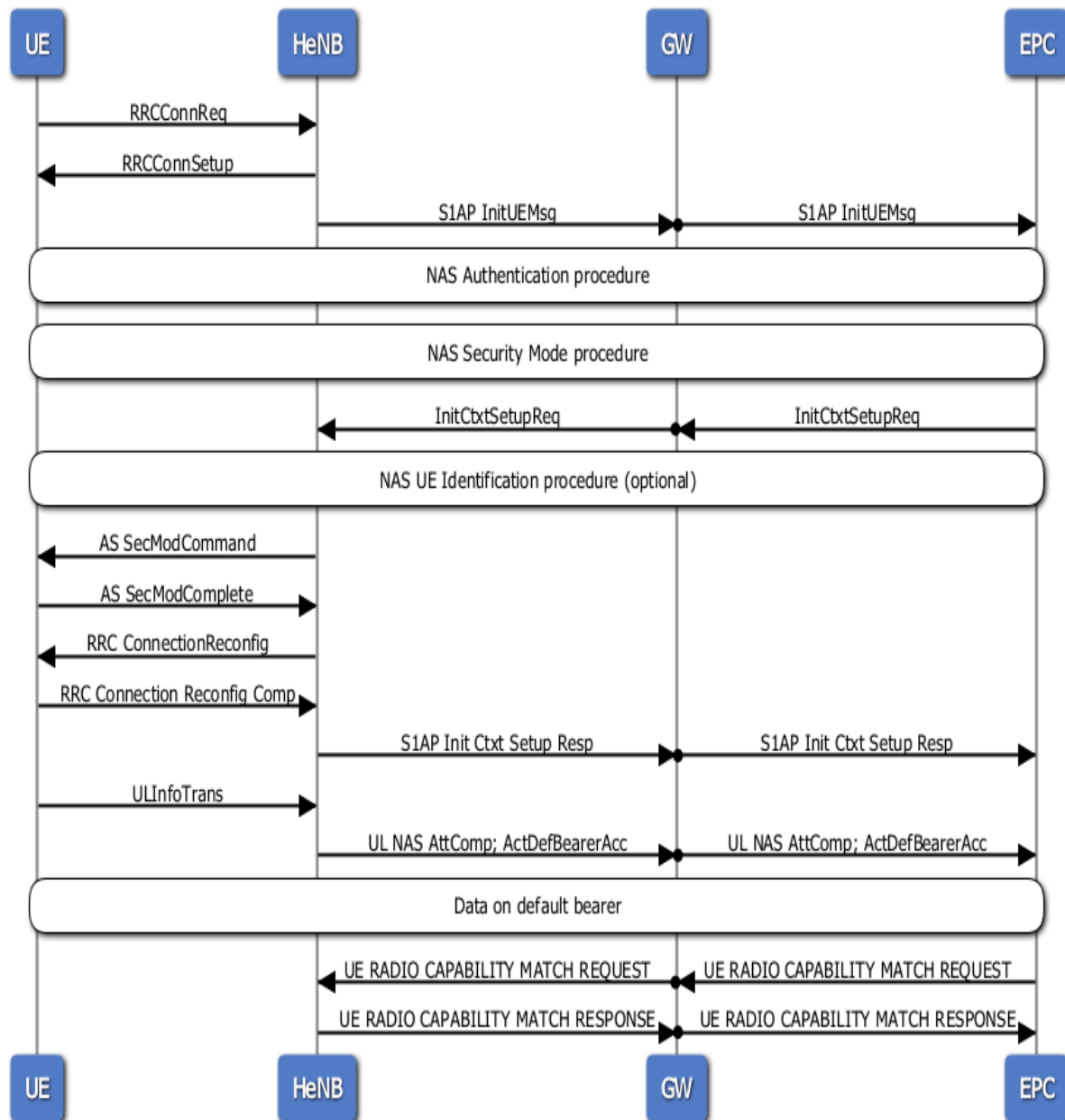


Figure 8: REG/UE/02

7.2.10 REG/UE/03 - UE Registration / Default Bearer Setup / UE Radio Capability Match

Interoperability Test Description			
Identifier	REG/UE/03		
Test Objective	The purpose of the UE Radio Capability Match procedure is for the MME to request the eNB to derive and provide an indication to the MME whether the UE radio capabilities are compatible with the network configuration for voice continuity.		
Configuration	<ul style="list-style-type: none">CFG_eNB / CFG_(H)eNB		
References	<ul style="list-style-type: none">3GPP TS 36.300 [9] clause 19.2.2.83GPP TS 36.331 [10] clause 5.3.33GPP TS 36.413 [12] clause 8.3.5.2		
Applicability			
Pre-test conditions	<ul style="list-style-type: none">eNB / eNB-GW S1 connection establishedUE (IMSI) is provisioned in the HSSAPN to connect to a web server and the default PDN are provisioned on the UE		
Test Sequence	Step	Type	Description
	1	stimulus	Switch on UE
	2	verify	UE cell selection / RRC connection establishment towards HeNB
	3	verify	UE and EPC mutual authentication procedure
	4	verify	NAS Security establishment procedure between UE and EPC
	5	verify	UE capability enquiry procedure
	6	verify	Default EPS Bearer establishment procedure
	7	Check	The EPC (MME) initiates the procedure by sending a UE RADIO CAPABILITY MATCH REQUEST message.
	8	Verify	eNB shall act as defined in the TS 23.401 [11] and respond with a UE RADIO CAPABILITY MATCH RESPONSE message.

UE Registration / Default Bearer Setup / UE Radio Capability Match



7.2.11 PS/01 - Paging

Interoperability Test Description			
Identifier	PS/01		
Test Objective	Paging message is delivered from (H)eNB to UE		
Configuration	<ul style="list-style-type: none"> CFG_eNB / CFG_(H)eNB 		
References	<ul style="list-style-type: none"> 3GPP TS 23.401 [2] clause 5.3.4.3 3GPP TS 36.413 [12] clause 8.5.2, 9.1.6 3GPP TS 36.300 [9] clause 19.2.2.1 		
Applicability			
Pre-test conditions	<ul style="list-style-type: none"> (H)eNB / HeNB-GW S1 connection established UE attached, default EPS bearer established and in Idle Mode UE (IMSI) is provisioned in the HSS Download data can be provided to the UE 		
Test Sequence	Step	Type	Description

Interoperability Test Description			
	1	stimulus	Generate downlink traffic for UE
	2	verify	MME sends S1AP PAGING to (H)eNB
	3	verify	UE is paged

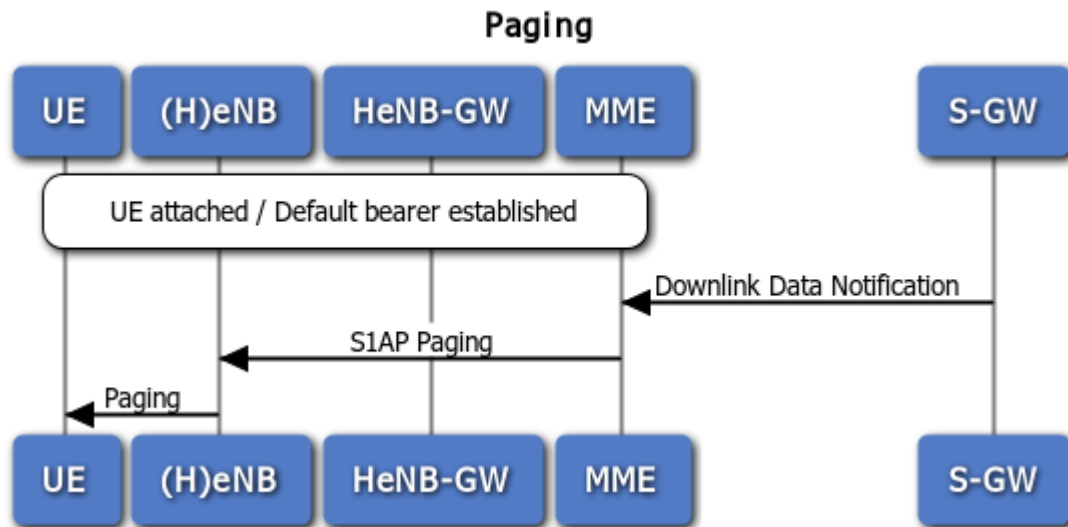


Figure 9: PS/01

7.2.12 PS/03 - Network initiated E-RAB setup – Distinct Bearer (optional)

Interoperability Test Description			
Identifier	PS/03		
Test Objective	Network initiated E-RAB setup with GBR bearer		
Configuration	<ul style="list-style-type: none"> CFG_eNB / CFG_(H)eNB 		
References	<ul style="list-style-type: none"> 3GPP TS 24.301 [4] clause 6.4.2 3GPP TS 36.300 [9] clause 19.2.2.4.1 3GPP TS 36.413 [12] clause 9.1.3.1, 9.1.3.2 		
Applicability	HENBGW_DISTINCT_BEARER		
Pre-test conditions	<ul style="list-style-type: none"> (H)eNB / HeNB-GW S1 connection established UE attached, default EPS bearer established and in IDLE MODE UE (IMSI) is provisioned in the HSS APN to connect to a web server and the default PDN are provisioned on the UE 		
Test Sequence	Step	Type	Description
	1	stimulus	From the EPC trigger an E-RAB setup procedure with a GBR bearer
	2	verify	Dedicated bearer with the requested QoS and a valid data path between UE and S-GW is established
	3	verify	Data transfer between UE and S-GW on the dedicated bearer with requested QoS set

Network initiated E-RAB setup ♦ Distinct Bearer

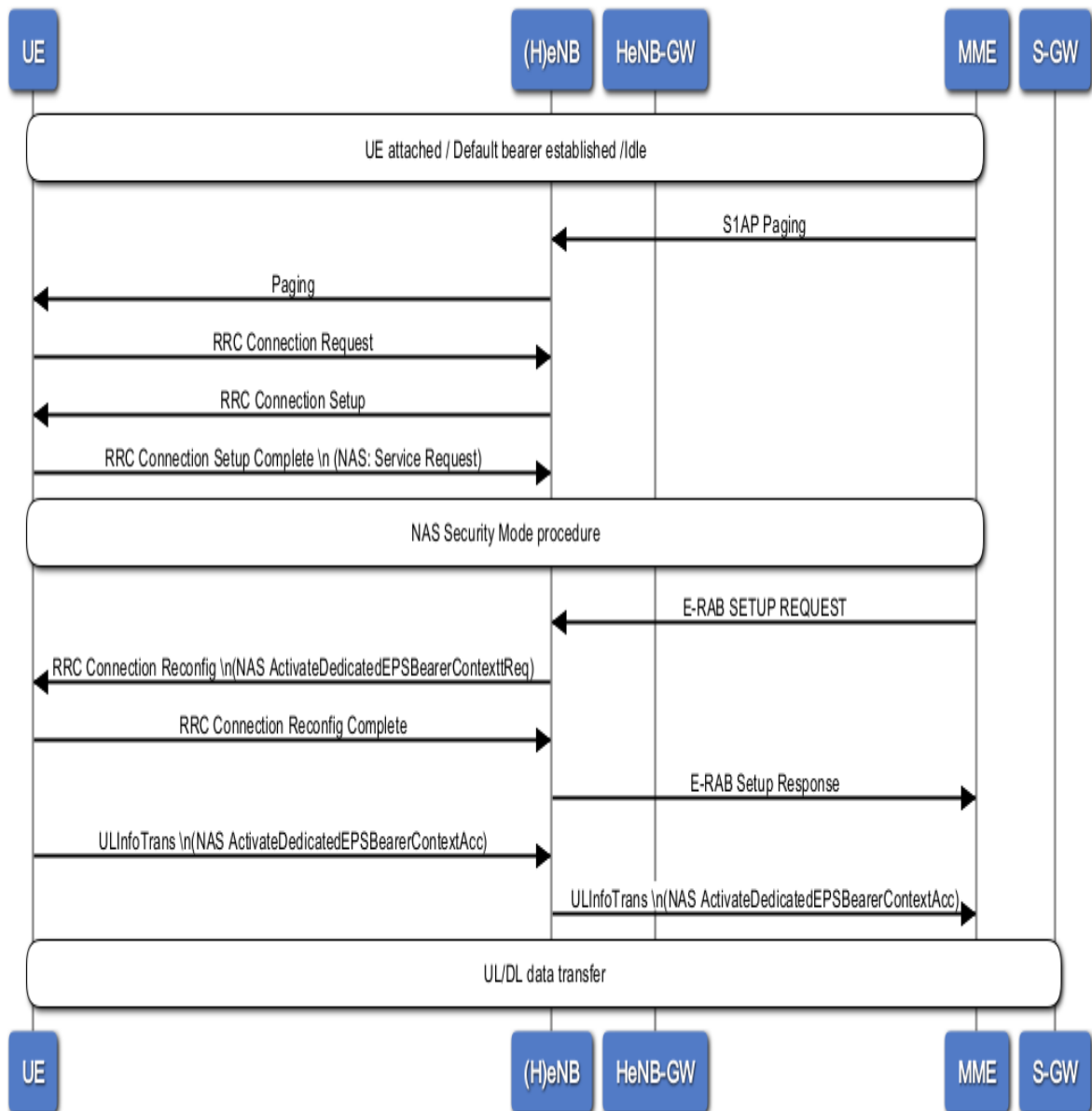


Figure 10: PS/03

7.2.13 PS/04 - Network initiated E-RAB setup – Combined Bearer (optional)

Interoperability Test Description			
Identifier	PS/04		
Test Objective	Network initiated E-RAB setup with GBR bearer (default and dedicated bearer)		
Configuration	<ul style="list-style-type: none"> • CFG_eNB / CFG_(H)eNB 		
References	<ul style="list-style-type: none"> • 3GPP TS 24.301 clause 6.4.2 • 3GPP TS 36.300 clause 19.2.2.4.1 • 3GPP TS 36.413 clause 9.1.3.1, 9.1.3.2 		
Applicability	HENB_COMBINED_BEARER		
Pre-test conditions	<ul style="list-style-type: none"> • (H)eNB / HeNB-GW S1 connection established • UE (IMSI) is provisioned in the HSS • APN to connect to a web server and the default PDN are provisioned on the UE 		
Test Sequence	Step	Type	Description
	1	stimulus	The UE attaches to the EPC and is in IDLE Mode. This triggers the establishment of a default and a dedicated bearer.
	2	verify	Default and Dedicated bearer with the requested QoS and a valid data path between UE and S-GW is established
	3	verify	Data transfer between UE and S-GW on the dedicated bearer with requested QoS set

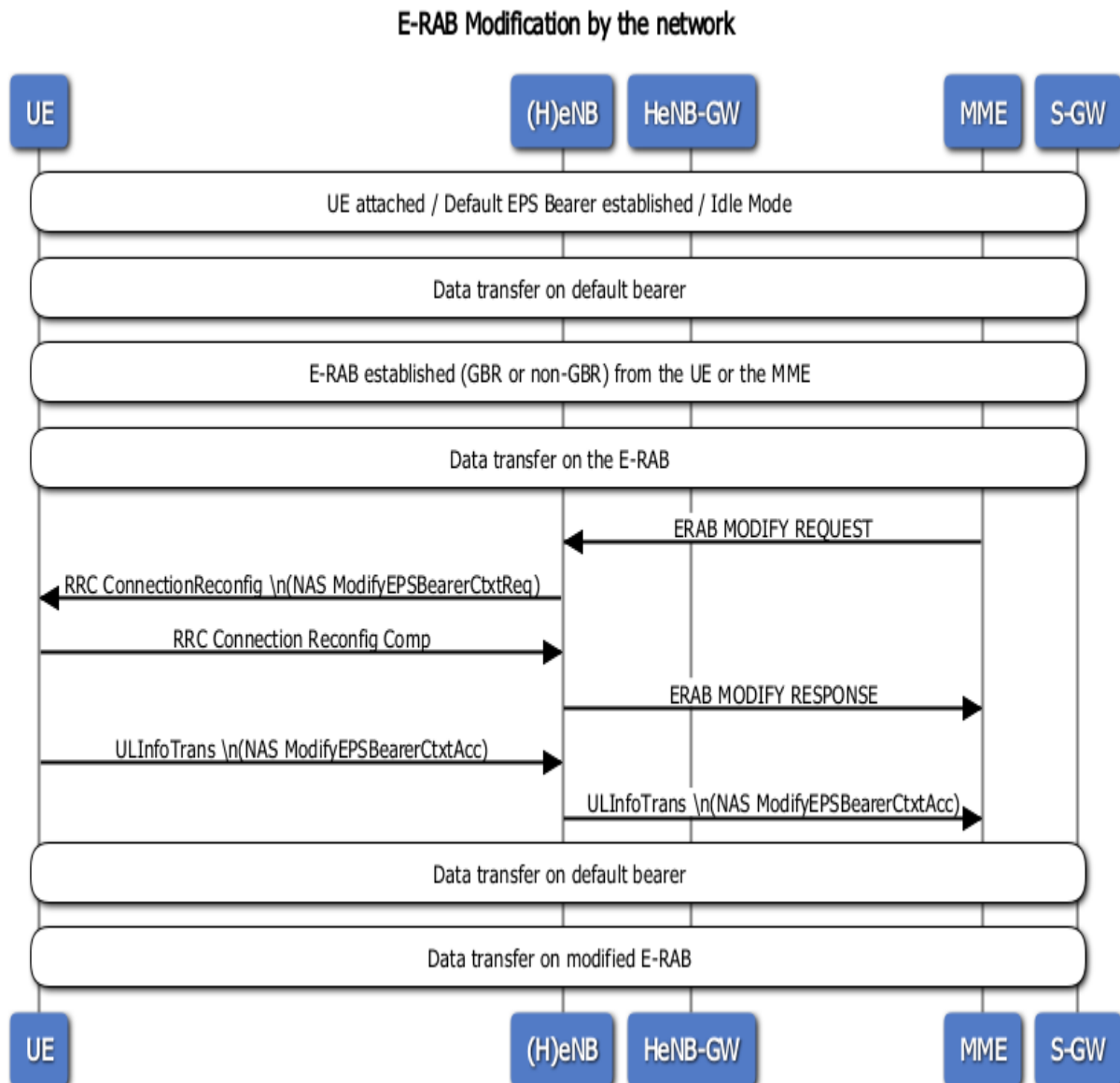


Figure 11: PS/04

7.2.14 PS/05 - Network initiated E-RAB release

Interoperability Test Description			
Identifier	PS/05		
Test Objective	Network initiated ERAB release		
Configuration	<ul style="list-style-type: none"> CFG_eNB / CFG_(H)eNB 		
References	<ul style="list-style-type: none"> 3GPP TS 24.301 [4] clause 6.4.4 3GPP TS 36.300 [9] clause 19.2.2.4.3 3GPP TS 36.413 [12] clause 9.1.3.5, 9.1.3.6 		
Applicability			
Pre-test conditions	<ul style="list-style-type: none"> (H)eNB / HeNB-GW S1 connection established UE attached, default EPS bearer established and ongoing data transfer on default bearer E-RAB established (GBR or non-GBR) from the UE or the EPC UE (IMSI) is provisioned in the HSS APN to connect to the IMS server and the default PDN are provisioned on the UE 		
Test Sequence	Step	Type	Description

Interoperability Test Description			
	1	stimulus	Trigger data transfer on E-RAB
	2	verify	Data transfer between UE and S-GW on the dedicated bearer
	3	stimulus	Trigger E-RAB release from the network
	4	verify	E-RAB is released and packet service connection is not available at the UE
	5	verify	The on-going data session on the default bearer is not affected

Network initiated E-RAB release

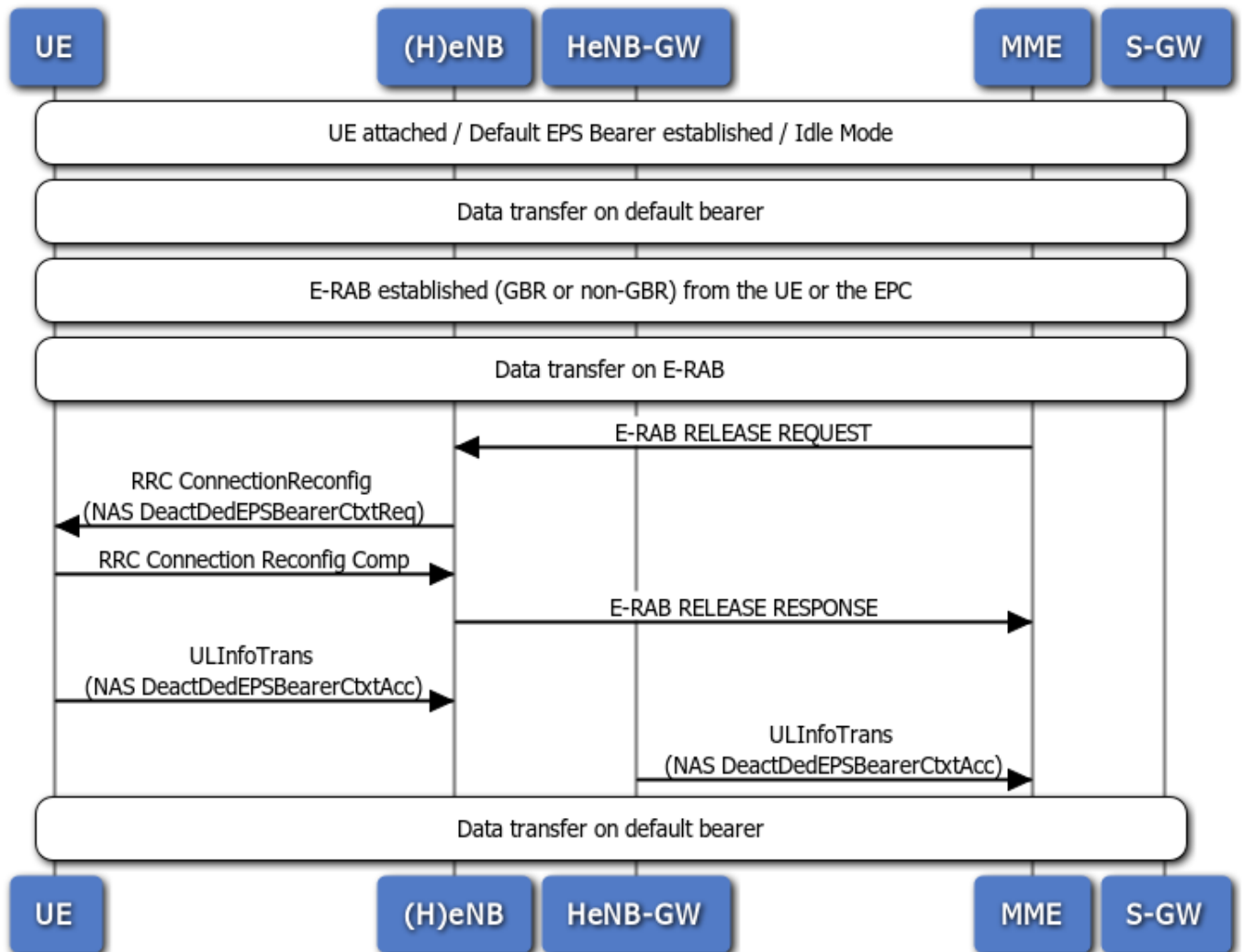


Figure 12: PS/05

7.2.15 PS/06 – E-RAB modification by the network

Interoperability Test Description			
Identifier	PS/04		
Test Objective	ERAB modification by the network.		
Configuration	<ul style="list-style-type: none"> CFG_eNB / CFG_(H)eNB 		
References	<ul style="list-style-type: none"> 3GPP TS 24.301 [4] clause 6.4.3 3GPP TS 36.300 [9] clause 19.2.2.4.2 3GPP TS 36.413 [12] clause 9.1.3.3, 9.1.3.4 		
Applicability			
Pre-test conditions	<ul style="list-style-type: none"> (H)eNB / HeNB-GW S1 connection established UE attached, default EPS bearer established and ongoing data transfer on default bearer E-RAB established (GBR or non-GBR) from the UE or the EPC UE (IMSI) is provisioned in the HSS APN to connect to the IMS server and the default PDN are provisioned on the UE 		
Test Sequence	Step	Type	Description
	1	stimulus	Trigger data transfer on E-RAB
	2	verify	Data transfer between UE and S-GW on the dedicated bearer
	3	stimulus	Trigger E-RAB modification
	4	verify	Data transfer on E-RAB and on the default bearer is not stalled at any point in time during modifications
	5	verify	Confirm that the QoS on E-RAB is as per the modification

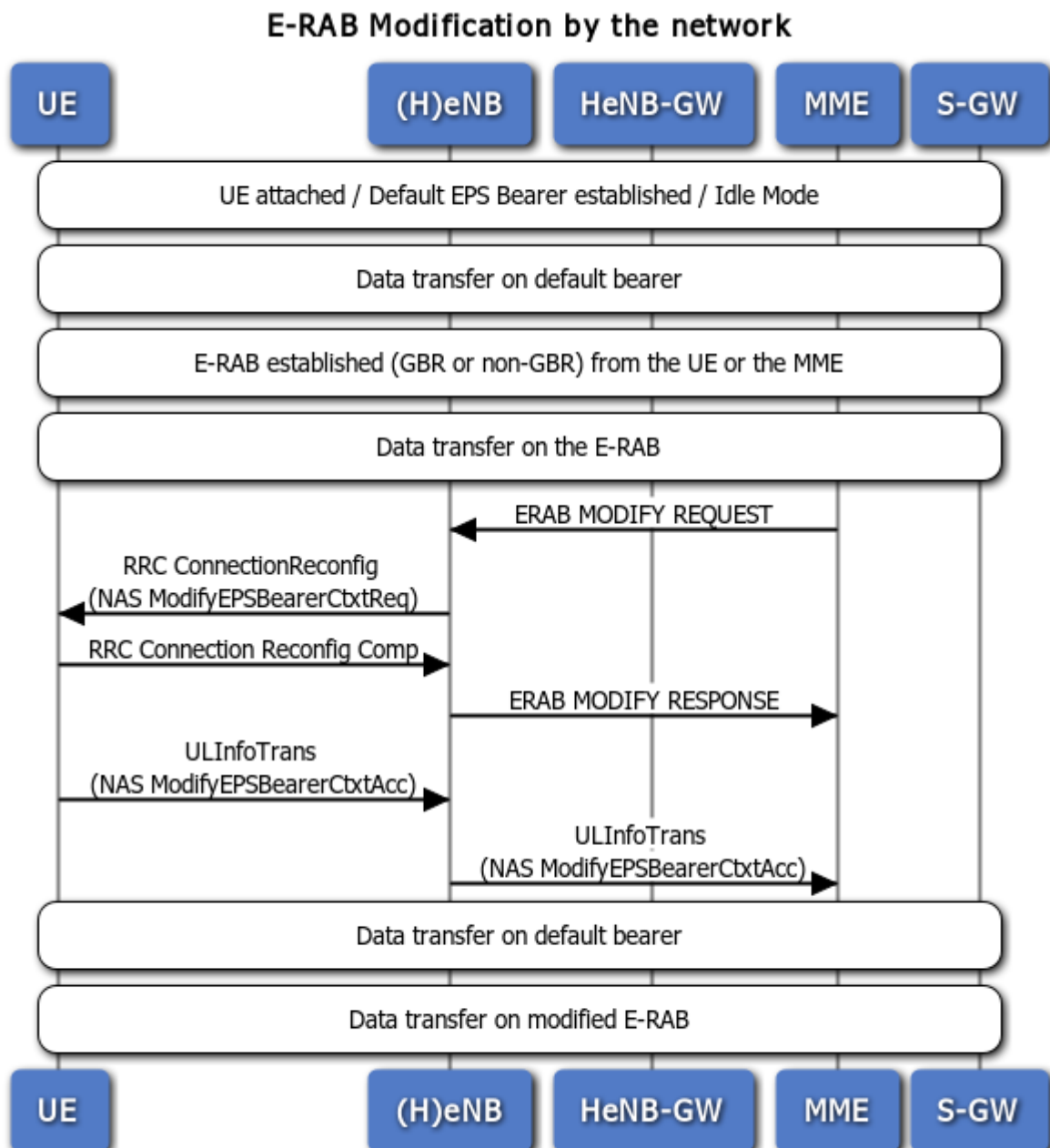
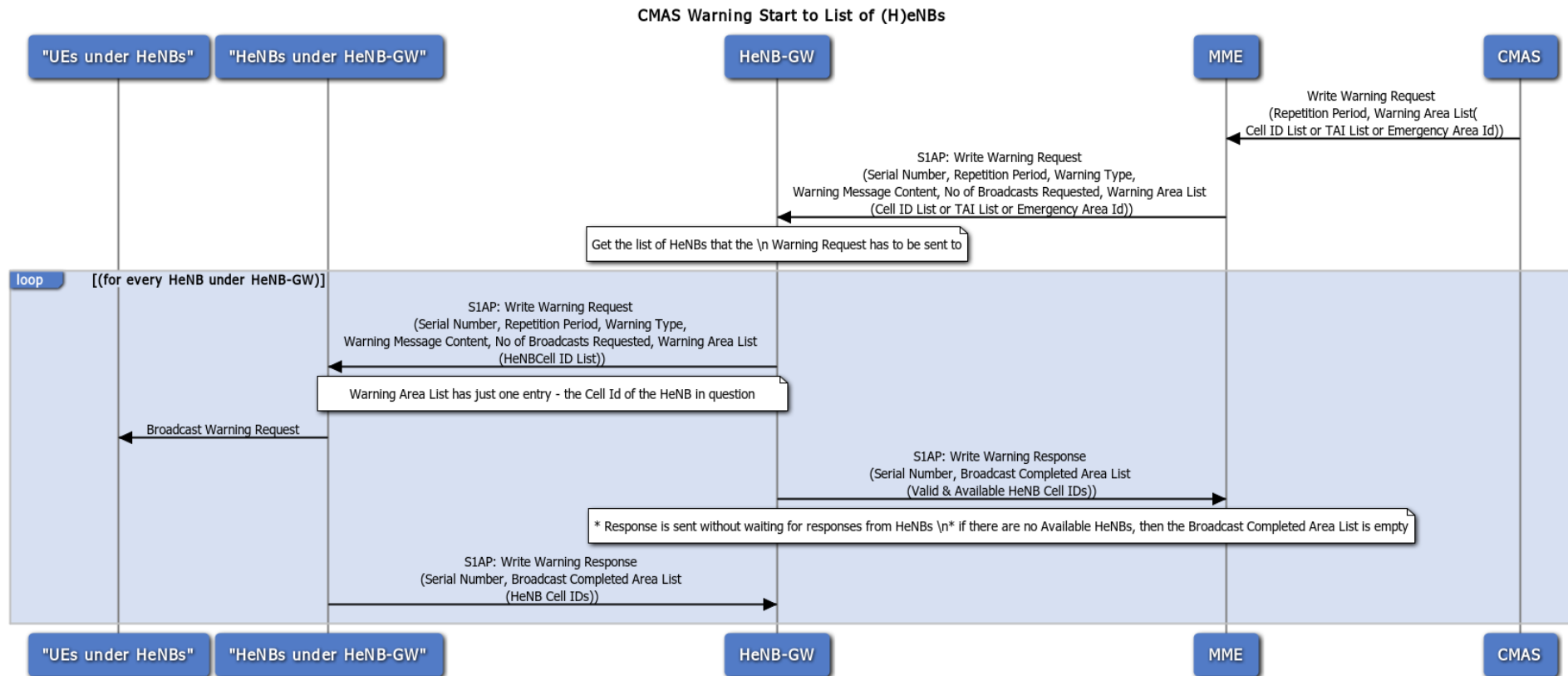


Figure 13: PS/06

7.2.16 CMAS/01 - CMAS Warning Start to List of (H)eNBs

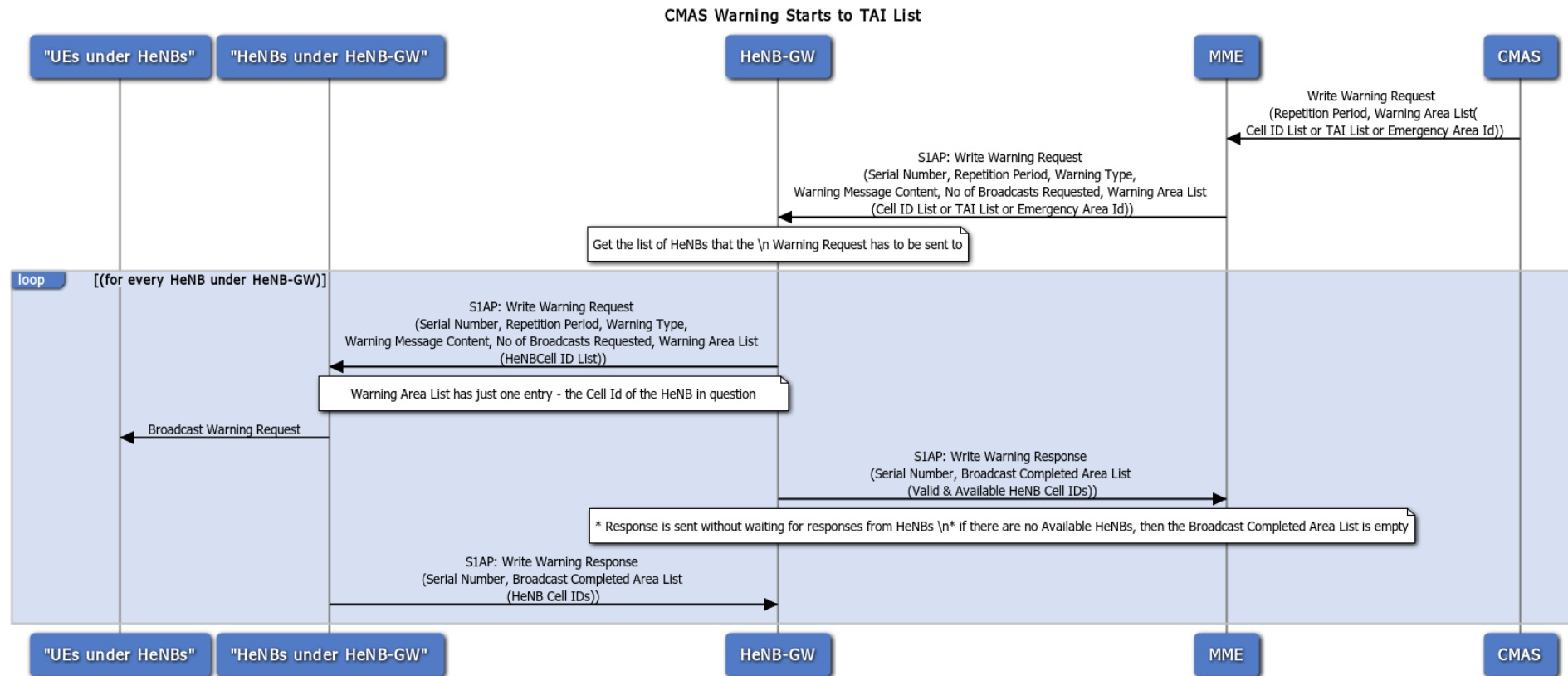
Interoperability Test Description			
Identifier	CMAS/01		
Test Objective	Delivery of Warning messages from CMAS Server to a list of HeNBs and distribution to attached UEs		
Configuration	<ul style="list-style-type: none"> CFG_CMAS 		
References	<ul style="list-style-type: none"> 3GPP TS 36.300 [9] clause 19.2.2.13 3GPP TS 36.413 [12] clause 8.12.1 3GPP TS 29.168 [14] clause 4.3.3 		
Applicability	HENB_CMAS AND MME_CMAS		
Pre-test conditions	<ul style="list-style-type: none"> One or more HeNBs connected to a HeNB-GW which in turn is connected to the CMAS server via an MME One or more UEs connected to the HeNBs CMAS connected to the MME 		
Test Sequence	Step	Type	Description
	1	stimulus	The CMAS server sends a Write-Replace Warning request with the Warning Area List set to a list of HeNBs and the TAI list has the TAI of the HeNB-GW in it
	2	check	The MME uses the TAI in the TAI list to select the HeNB-GW and sends the S1AP Write-Replace Warning request to the appropriate HeNB-GW
	3	check	The HeNB-GW sends the S1AP Write-Replace Warning request to the list of HeNBs specified in the Warning Area List
	4	check	The HeNBs that receive the Write-Replace Warning request send the message to the UEs under them
	5	verify	All the UEs under the affected HeNBs get the Warning message



7.2.17 CMAS/02 - CMAS Warning Start to TAI List

Interoperability Test Description			
Identifier	CMAS/02		
Test Objective	Delivery of Warning messages from CMAS Server to a TAI list and distribution to attached UEs		
Configuration	<ul style="list-style-type: none"> CFG_CMAS 		
References	<ul style="list-style-type: none"> 3GPP TS 36.300 [9] clause 19.2.2.13 3GPP TS 36.413 [12] clause 8.12.1 3GPP TS 29.168 [14] clause 4.3.3 		
Applicability	HENB_CMAS AND MME_CMAS		
Pre-test conditions	<ul style="list-style-type: none"> One or more HeNBs connected to a HeNB-GW which in turn is connected to the CMAS server via an MME One or more UEs connected to the HeNBs CMAS connected to the MME At least one TA with 2 or more HeNB connected 		
Test Sequence	Step	Type	Description
	1	stimulus	The CMAS server sends a Write-Replace Warning request with the Warning Area List set to a list of TAIs and the TAI list has the TAI of the HeNB-GW in it
	2	check	The MME uses the TAI in the TAI list to select the HeNB-GW and sends the S1AP Write-Replace Warning request to the appropriate HeNB-GW
	3	check	The HeNB-GW sends the S1AP Write-Replace Warning to the list of HeNBs specified in the Warning Area List
	4	check	The HeNBs that receive the Write-Replace Warning request send the message to the UEs under them
	5	verify	All the UEs under the affected HeNBs get the Warning message

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7.2.18 CMAS/03 - CMAS Warning Stop to List of HeNBs

Interoperability Test Description			
Identifier	CMAS/03		
Test Objective	Delivery of Kill messages from CMAS Server to a list of HeNBs and distribution to attached UEs		
Configuration	<ul style="list-style-type: none"> CFG_CMAS 		
References	<ul style="list-style-type: none"> 3GPP TS 36.300 [9] clause 19.2.2.17 3GPP TS 36.413 [12] clause 8.12.2 3GPP TS 29.168 [14] clause 4.3.3A 		
Applicability	HENB_CMAS AND MME_CMAS		
Pre-test conditions	<ul style="list-style-type: none"> One or more HeNBs connected to a HeNB-GW which in turn is connected to the CMAS server via an MME One or more UEs connected to the HeNBs CMAS connected to the MME 		
Test Sequence	Step	Type	Description
	1	stimulus	The CMAS server sends the Stop Warning request with the Warning Area List set to a list of HeNBs and the TAI list has the TAI of the HeNB-GW in it
	2	check	The MME uses the TAI in the TAI list to select the HeNB-GW and sends an S1AP Kill request to the appropriate HeNB-GW
	3	check	The HeNB-GW sends the S1AP Kill request to the list of HeNBs specified in the Warning Area List
	4	check	The HeNBs that receive the Kill request send the message to the UEs under them
	5	verify	All the UEs under the affected HeNBs stop receiving the Warning message being sent out at regular intervals

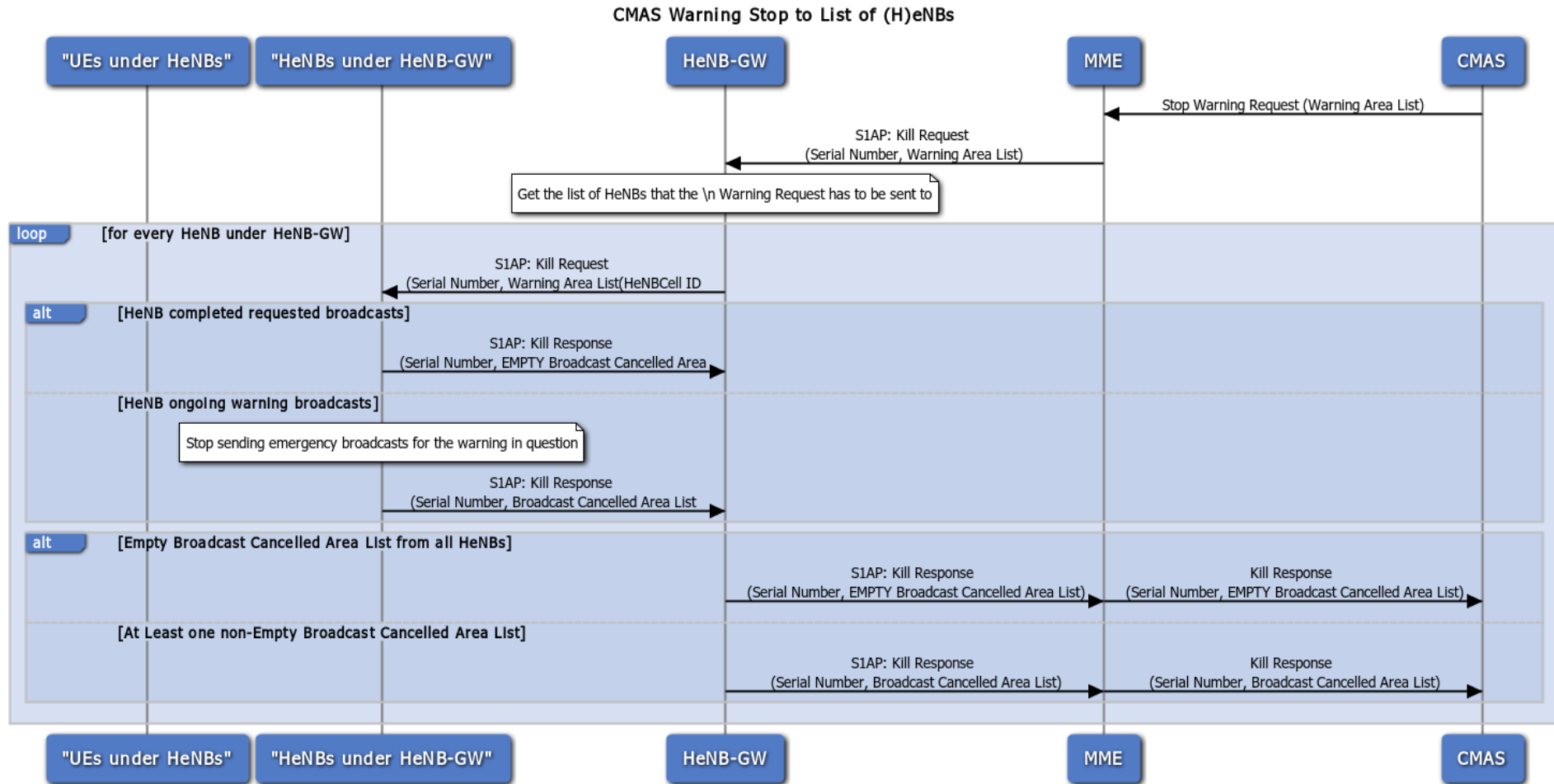


Figure 16: CMAS/03

7.2.19 CMAS/04 - CMAS Warning Stop to TAI List

Interoperability Test Description			
Identifier	CMAS/04		
Test Objective	Delivery of Kill messages from CMAS Server to a TAI list and distribution to attached UEs		
Configuration	<ul style="list-style-type: none"> CFG_CMAS 		
References	<ul style="list-style-type: none"> 3GPP TS 36.300 [9] clause 19.2.2.17 3GPP TS 36.413 [12] clause 8.12.2 3GPP TS 29.168 [14] clause 4.3.3A 		
Applicability	HENB_CMAS AND MME_CMAS		
Pre-test conditions	<ul style="list-style-type: none"> One or more HeNBs connected to a HeNB-GW which in turn is connected to the CMAS server via an MME One or more UEs connected to the HeNBs CMAS connected to the MME At least one TA with 2 or more HeNB connected 		
Test Sequence	Step	Type	Description
	1	stimulus	The CMAS server sends the Stop Warning request with the Warning Area List set to a list of TAIs and the TAI list has the TAI of the HeNB-GW in it
	2	check	The MME uses the TAI in the TAI list to select the HeNB-GW and sends an S1AP Kill request to the appropriate HeNB-GW
	3	check	The HeNB-GW sends the S1AP Kill request to the list of HeNBs specified in the Warning Area List
	4	check	The HeNBs that receive the Kill request send the message to the UEs under them
	5	verify	All the UEs under the affected HeNBs stop receiving the Warning message being sent out at regular intervals

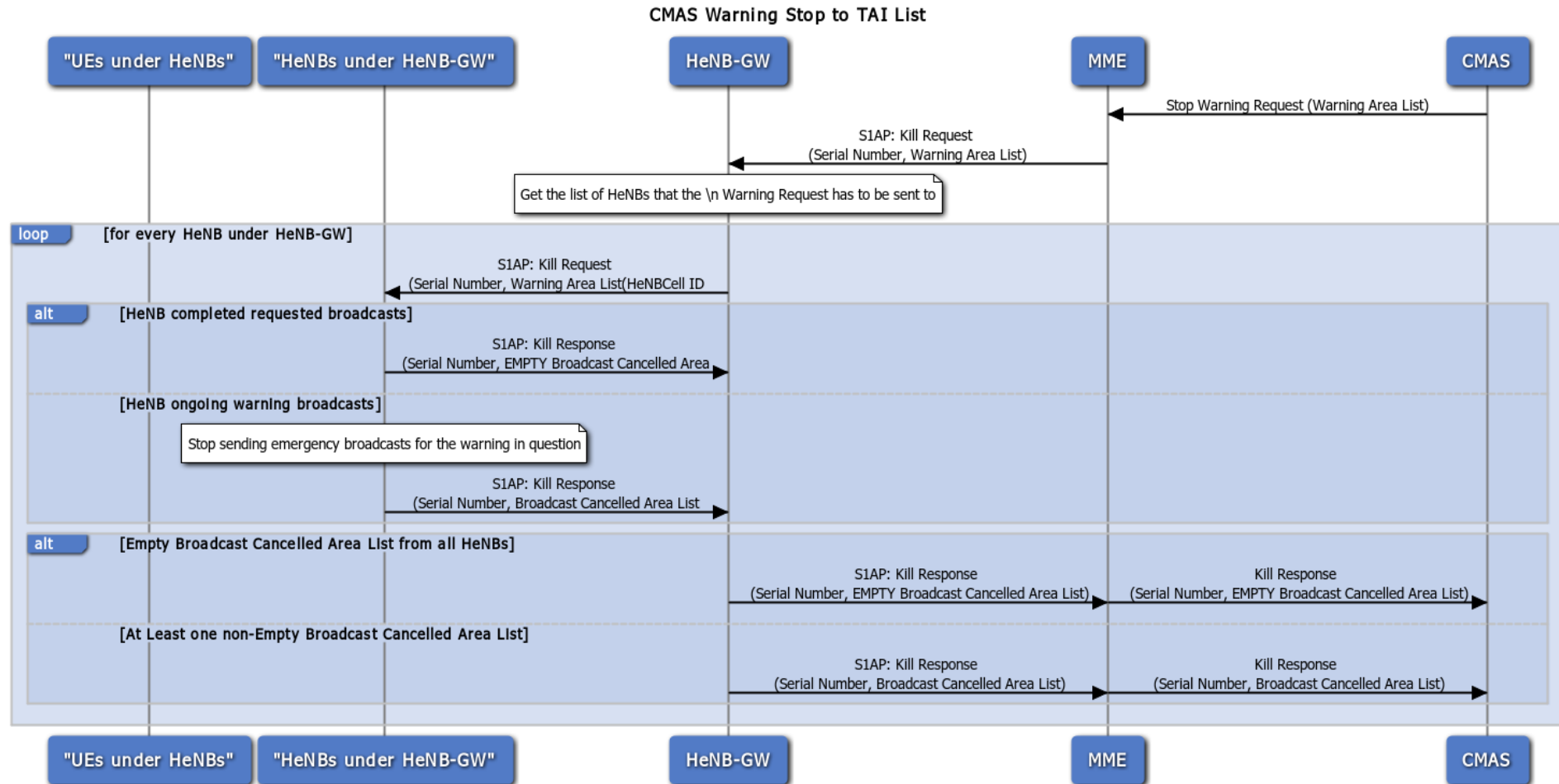


Figure 17: CMAS/04

7.3 Test Description for Small Cell LTE Remote Plugfest 2015

7.3.1 LIPA/01 - Downlink Traffic Flow through L-GW

Interoperability Test Description			
Identifier	LIPA/01		
Test Objective	UE requests connectivity to an APN that is LIPA enabled. Downlink traffic is routed through the L-GW.		
Configuration	<ul style="list-style-type: none">CFG_LIPA		
References	<ul style="list-style-type: none">3GPP TS 36.401 [2] clause 5.3.4.13GPP TS 36.300 [9] clause 19.2.2.3, 19.2.2.63GPP TS 36.413 [12] clause 8.3.1.2, 8.6.2.13GPP TR 23.829 [i.1] clause 5.2.3.1		
Applicability	HENB_LIPA AND MME_LIPA		
Pre-test conditions	<ul style="list-style-type: none">HeNB/ HeNB-GW Normal Operation Mode (S1 Interface connection to HeNB-GW/EPC established, Radio Connection Established)L-GW collocated with HeNB.S5 interface connection from L-GW to S-GW establishedUE registered with the network (default bearer is established)		
Test Sequence	Step	Type	Description
	1	stimulus	UE cell selection / RRC connection establishment towards HeNB
	2	stimulus	UE request PDN connectivity to LIPA enabled APN
	3	check	HeNB sends to MME S1AP INITIAL UE MESSAGE with L-GW address
	4	check	HeNB sends to MME S1AP UPLINK NAS TRANSPORT with L-GW address
	5	check	MME sends to HeNB S1AP INITIAL CONTEXT SETUP REQUEST with LIPA Correlation Id
	6	check	HeNB sends to UE NAS ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message with Connectivity type IE indicating "the PDN connection is considered a LIPA PDN connection"
	7	verify	Downlink Traffic flow between UE and L-GW

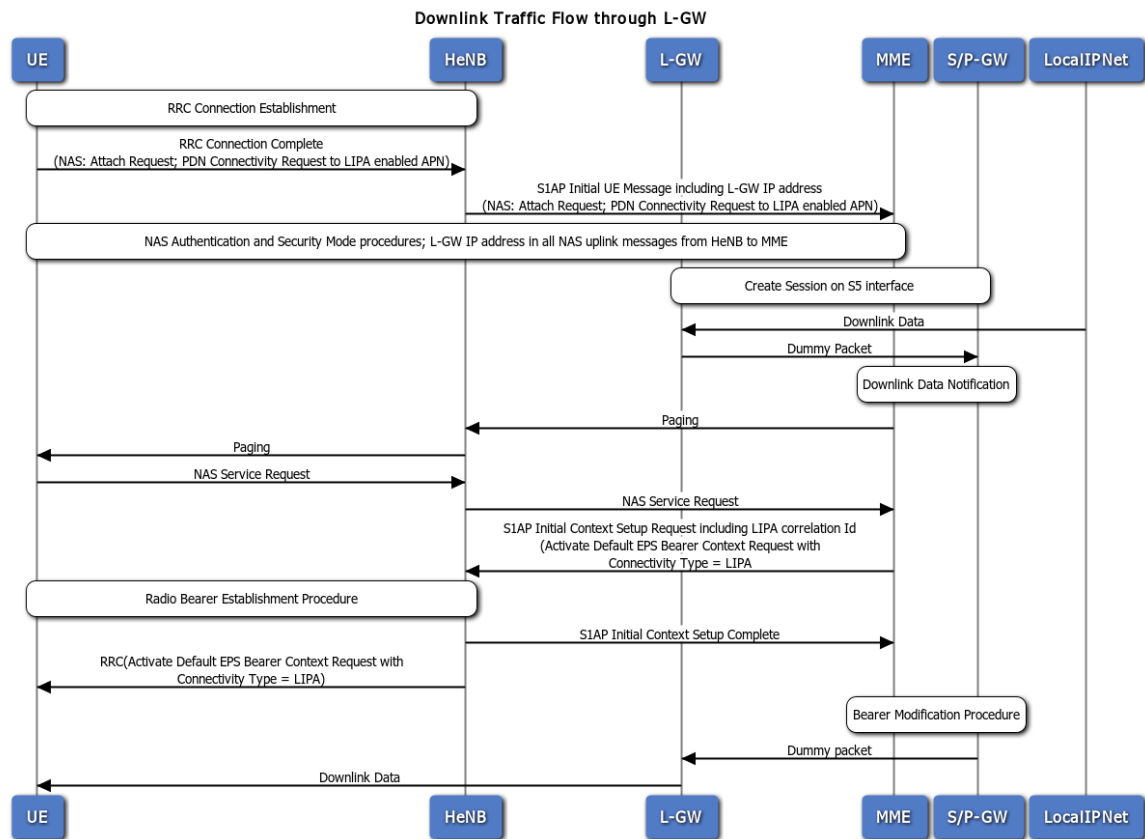


Figure 18: LIPA/01

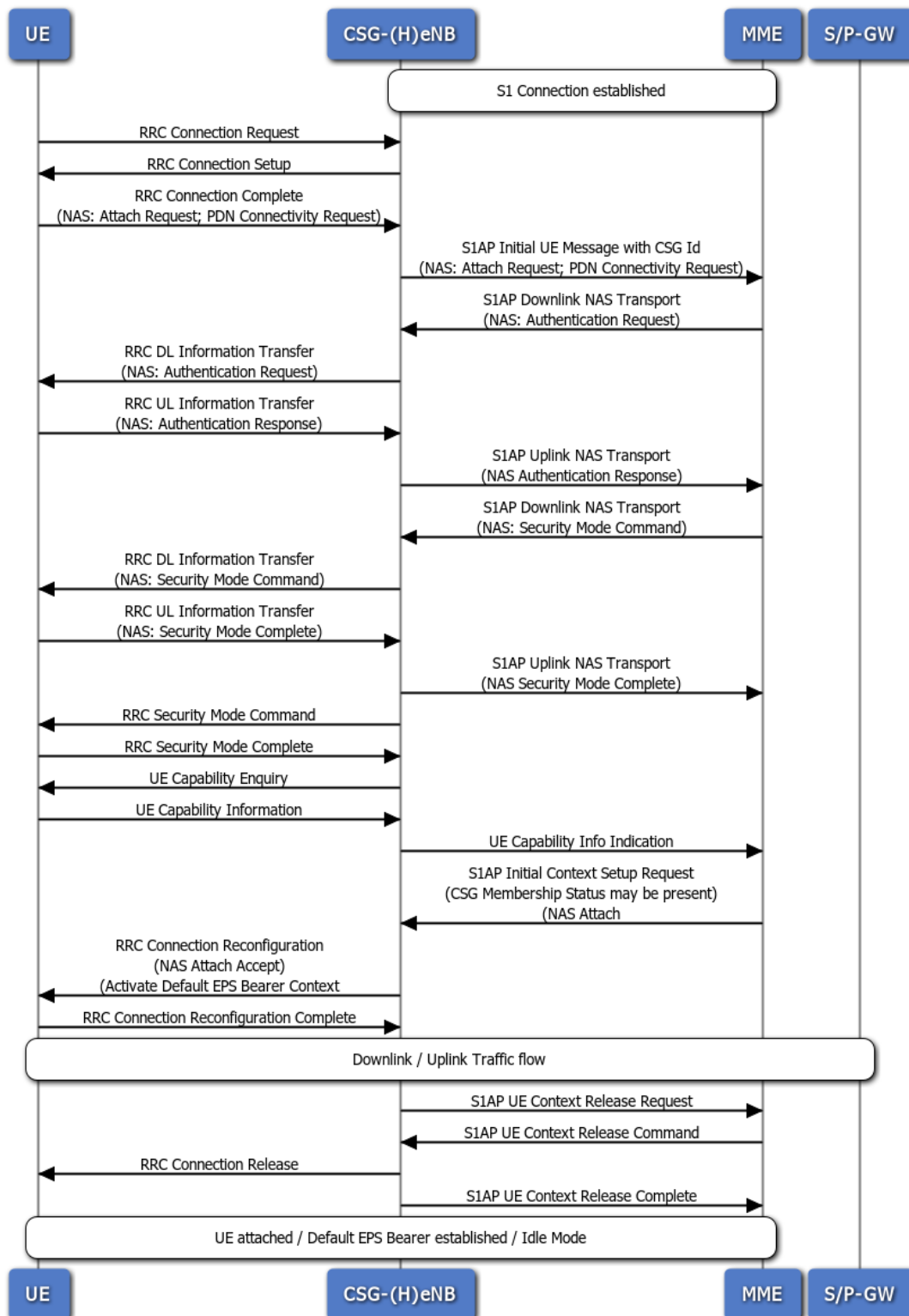
7.3.2 CSG/01 – UE Registration with CSG (H)eNB

Interoperability Test Description			
Identifier	CSG/01		
Test Objective	Allowed UE registers with the LTE network via a CSG (H)eNB.		
Configuration	<ul style="list-style-type: none"> CFG_(H)eNB 		
References	<ul style="list-style-type: none"> 3GPP TS 25.467 [6] clause 5.1.3 3GPP TS 36.413 [12] clause 9.1.4.1, 9.1.7.1 		
Applicability	HENB_CSG AND MME_CSG		
Pre-test conditions	<ul style="list-style-type: none"> HeNB / HeNB-GW S1 connection established UE (IMSI) is provisioned in the HSS APN to connect to a web server and the default PDN are provisioned on the UE CSG (H)eNB broadcasting a CSG Indicator set to TRUE and a specific CSG identity UE is an allowed member of CSG UE's CSG whitelist contains broadcast specific CSG Identity 		
Test Sequence	Step	Type	Description
	1	stimulus	Switch on UE
	2	verify	UE cell selection / RRC connection establishment towards CSG HeNB
	3	check	CSG (H)eNB sends to MME S1AP INITIAL UE MESSAGE containing CSG Id (and containing the Access Mode IE in case of hybrid cell)
	4	verify	UE and EPC mutual authentication procedure
	5	verify	NAS Security establishment procedure between UE and EPC
	6	verify	UE capability enquiry procedure

Interoperability Test Description			
	7	check	During Default EPS Bearer establishment procedure, MME sends to CSG (H)eNB S1AP INITIAL CONTEXT SETUP REQUEST (containing CSG Membership Status in case of hybrid cell)
	8	verify	DL/UL traffic flow between UE and EPC

Figure 19: CSG/01

UE Registration with CSG (H)eNB



7.3.3 CSG/02 – UE is no longer allowed to access the CSG cell

Interoperability Test Description			
Identifier	CSG/02		
Test Objective	Allowed UE has registered with the LTE network via a CSG (H)eNB. After that it becomes a non member and S1 connection is released.		
Configuration	<ul style="list-style-type: none"> CFG_(H)eNB 		
References	<ul style="list-style-type: none"> 3GPP TS 36.413 [12] clause 8.3.3.1 3GPP TS 25.467 [6] clause 5.1.3, clause 5.10 		
Applicability	HENB_CSG AND MME_CSG		
Pre-test conditions	<ul style="list-style-type: none"> HeNB / HeNB-GW S1 connection established UE (IMSI) is provisioned in the HSS APN to connect to a web server and the default PDN are provisioned on the UE CSG (H)eNB broadcasting a CSG Indicator set to TRUE and a specific CSG identity UE is an allowed member of CSG UE's CSG whitelist contains broadcast specific CSG Identity UE attached, default EPS bearer established and in Active Mode (DL/UL traffic flow between UE and S-GW) 		
Test Sequence	Step	Type	Description
	1	stimulus	Configure HSS so that UE is no longer member of CSG; HSS will inform MME about UE membership status change
	2	verify	MME sends to CSG (H)eNB S1AP UE Context Release command containing cause 'CSG Subscription Expiry'
	3	verify	RRC connection release towards the UE
	4	check	CSG (H)eNB sends to MME S1AP UE Context Release Complete
	5	verify	UE is successfully detached from the LTE network
	6	verify	Packet service connection is not available at the UE

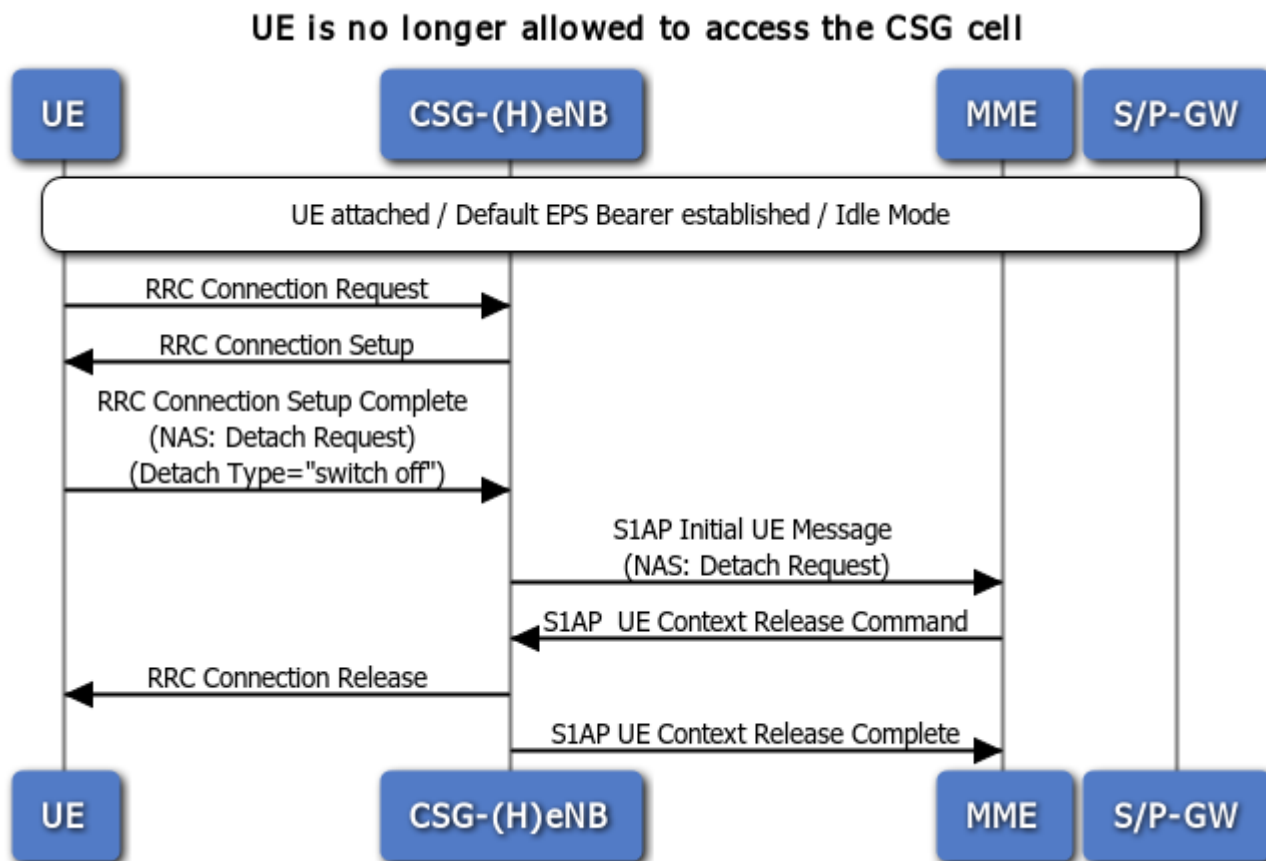


Figure 20: CSG/02

7.3.4 CSG/03 – Manual CSG selection – allowed UE

Interoperability Test Description			
Identifier	CSG/03		
Test Objective	Allowed UE selects manually a CSG and registers with the LTE network.		
Configuration	<ul style="list-style-type: none"> CFG_(H)eNB 		
References	<ul style="list-style-type: none"> 3GPP TS 22.220 [1] clause 5.5.4 3GPP TS 25.467 [6] clause 5.1.3 		
Applicability	HENB_CSG AND MME_CSG AND UE_WL_MAN		
Pre-test conditions	<ul style="list-style-type: none"> HeNB / HeNB-GW S1 connection established UE (IMSI) is provisioned in the HSS APN to connect to a web server and the default PDN are provisioned on the UE CSG (H)eNB broadcasting a CSG Indicator set to TRUE and a specific CSG identity UE is an allowed member of CSG UE's CSG whitelist contains broadcast specific CSG Identity 		
Test Sequence	Step	Type	Description
	1	stimulus	Switch on UE and do manual CSG selection
	2	verify	RRC connection establishment towards CSG HeNB
	3	check	CSG (H)eNB sends to MME S1AP INITIAL UE MESSAGE containing CSG Id (and containing the Access Mode IE in case of hybrid cell)
	4	verify	UE and EPC mutual authentication procedure
	5	verify	NAS Security establishment procedure between UE and EPC
	6	verify	UE capability enquiry procedure

Interoperability Test Description			
	7	check	During Default EPS Bearer establishment procedure, MME sends to CSG (H)eNB S1AP INITIAL CONTEXT SETUP REQUEST (containing CSG Membership Status in case of hybrid cell)
	8	verify	DL/UL traffic flow between UE and EPC

Manual CSG selection ◆ allowed UE

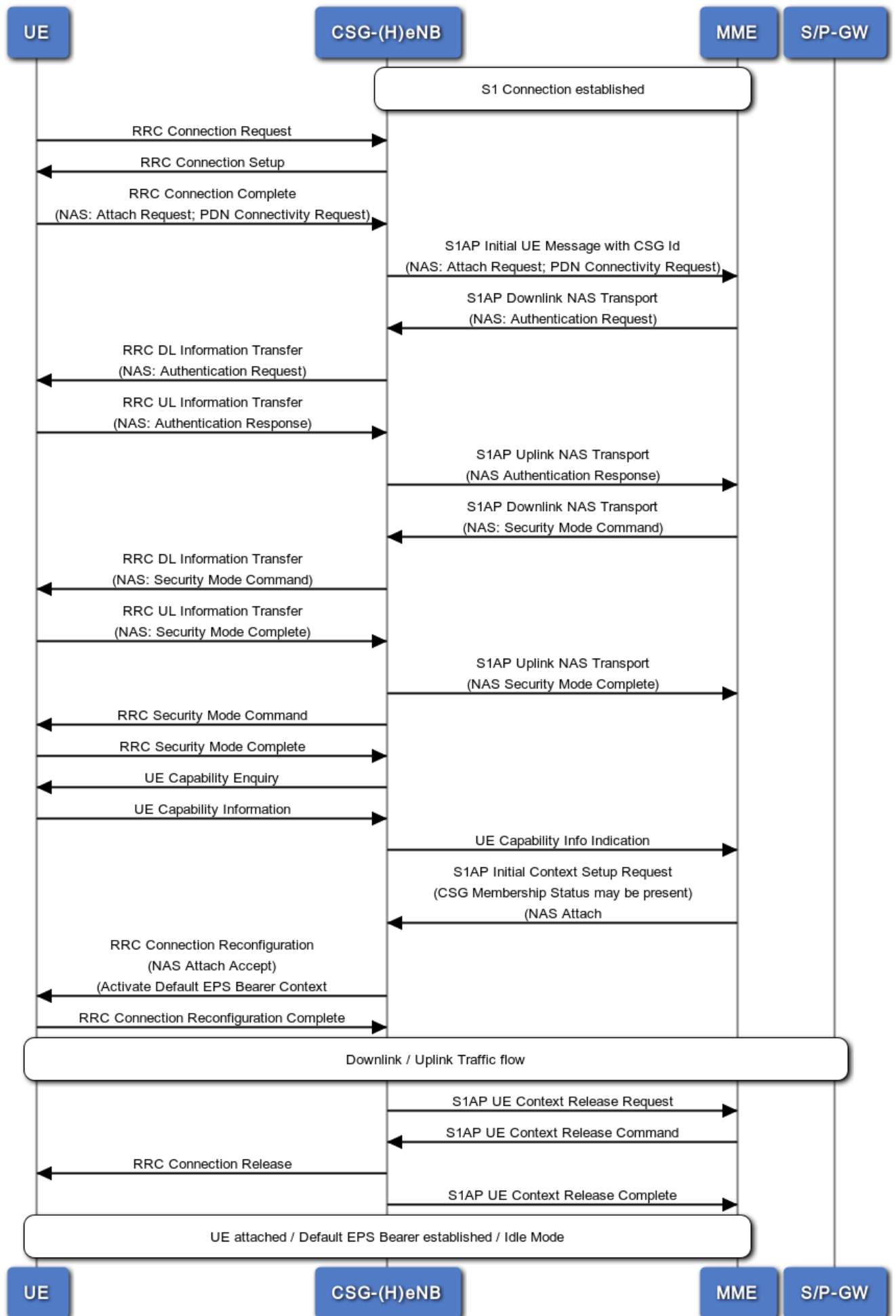


Figure 21: CSG/03**7.3.5 CSG/04 – Manual CSG selection – not allowed UE**

Interoperability Test Description			
Identifier	CSG/04		
Test Objective	Not allowed UE selects manually a CSG and attempts to register with the LTE network.		
Configuration	<ul style="list-style-type: none"> CFG_(H)eNB 		
References	<ul style="list-style-type: none"> 3GPP TS 22.220 [1] clause 5.5.4 3GPP TS 25.467 [6] clause 5.1.3 3GPP TS 36.413 [12] clause 9.2.1.3 		
Applicability	HENB_CSG AND MME_CSG AND UE_WL_MAN		
Pre-test conditions	<ul style="list-style-type: none"> HeNB / HeNB-GW S1 connection established UE (IMSI) is provisioned in the HSS APN to connect to a web server and the default PDN are provisioned on the UE CSG (H)eNB broadcasting a CSG Indicator set to TRUE and a specific CSG identity UE is not an allowed member of CSG 		
Test Sequence	Step	Type	Description
	1	stimulus	Switch on UE and do manual CSG selection
	2	verify	RRC connection establishment towards CSG HeNB
	3	check	CSG (H)eNB sends to MME S1AP INITIAL UE MESSAGE containing CSG Id (and containing the Access Mode IE in case of hybrid cell)
	4	verify	MME sends to CSG (H)eNB S1AP UE Context Release command containing cause 'invalid CSG Id'
	5	verify	RRC connection release towards the UE
	6	check	CSG (H)eNB sends to MME S1AP UE Context Release Complete.
	7	verify	UE enter RRC_IDLE mode
	8	verify	Packet service connection is not available at the UE

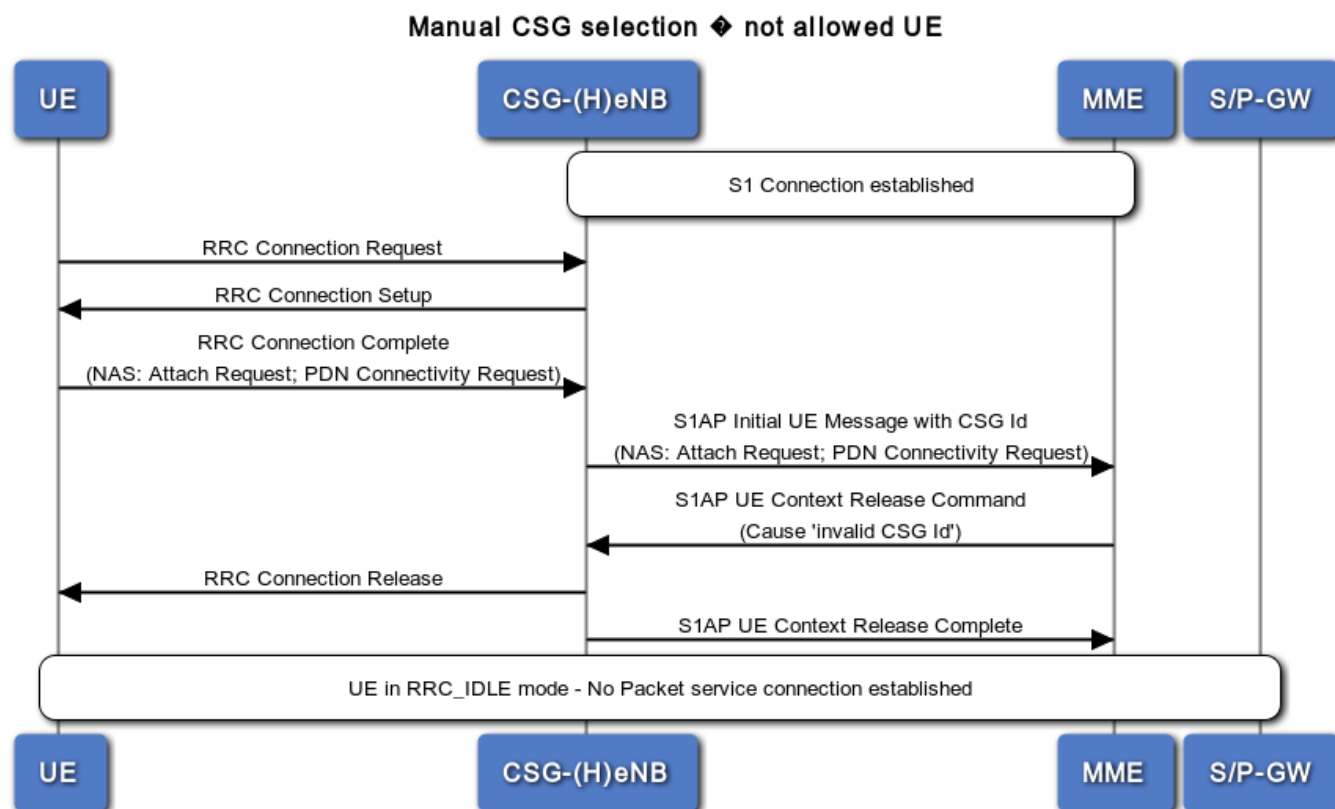


Figure 22: CSG/04

7.3.6 CSG/05 - UE Registration with hybrid (H)eNB

Interoperability Test Description			
Identifier	CSG/05		
Test Objective	Member UE1 and non-member UE2 register with the LTE network via a hybrid (H)eNB.		
Configuration	<ul style="list-style-type: none"> CFG_(H)eNB 		
References	<ul style="list-style-type: none"> 3GPP TS 25.467 [6] clause 5.1.3 		
Applicability	HENB_CSG AND MME_CSG		
Pre-test conditions	<ul style="list-style-type: none"> HeNB / HeNB-GW S1 connection established UE (IMSI) is provisioned in the HSS APN to connect to a web server and the default PDN are provisioned on the UE CSG (H)eNB broadcasting a CSG Indicator set to FALSE and a specific CSG identity UE1 is an allowed member of CSG UE's CSG whitelist contains broadcast specific CSG Identity UE2 is not an allowed member of CSG HSS/MME configured/programmed to release a non-member UE 10 seconds after UE context establishment 		
Test Sequence	Step	Type	Description
	1	stimulus	Switch on UE1
	2	verify	UE cell selection / RRC connection establishment towards hybrid CSG (H)eNB
	3	check	hybrid CSG (H)eNB sends to MME S1AP INITIAL UE MESSAGE containing CSG Id and containing Cell Access Mode indicating hybrid
	4	verify	UE and EPC mutual authentication procedure

Interoperability Test Description			
	5	verify	NAS Security establishment procedure between UE and EPC
	6	verify	UE capability enquiry procedure
	7	check	During Default EPS Bearer establishment procedure, MME sends to hybrid CSG (H)eNB S1AP INITIAL CONTEXT SETUP REQUEST containing CSG Membership Status with value 'member' for UE1 and 'non-member' for UE2
	8a	verify	DL/UL traffic flow between UE1 and EPC
	8b	verify	DL/UL traffic flow between UE2 and EPC
	9	verify	After 10s S1 UE Context Release and RRC Connection Release procedure for UE2 Switch on UE2 Repeat steps 2 – 7 and step 8b with UE2

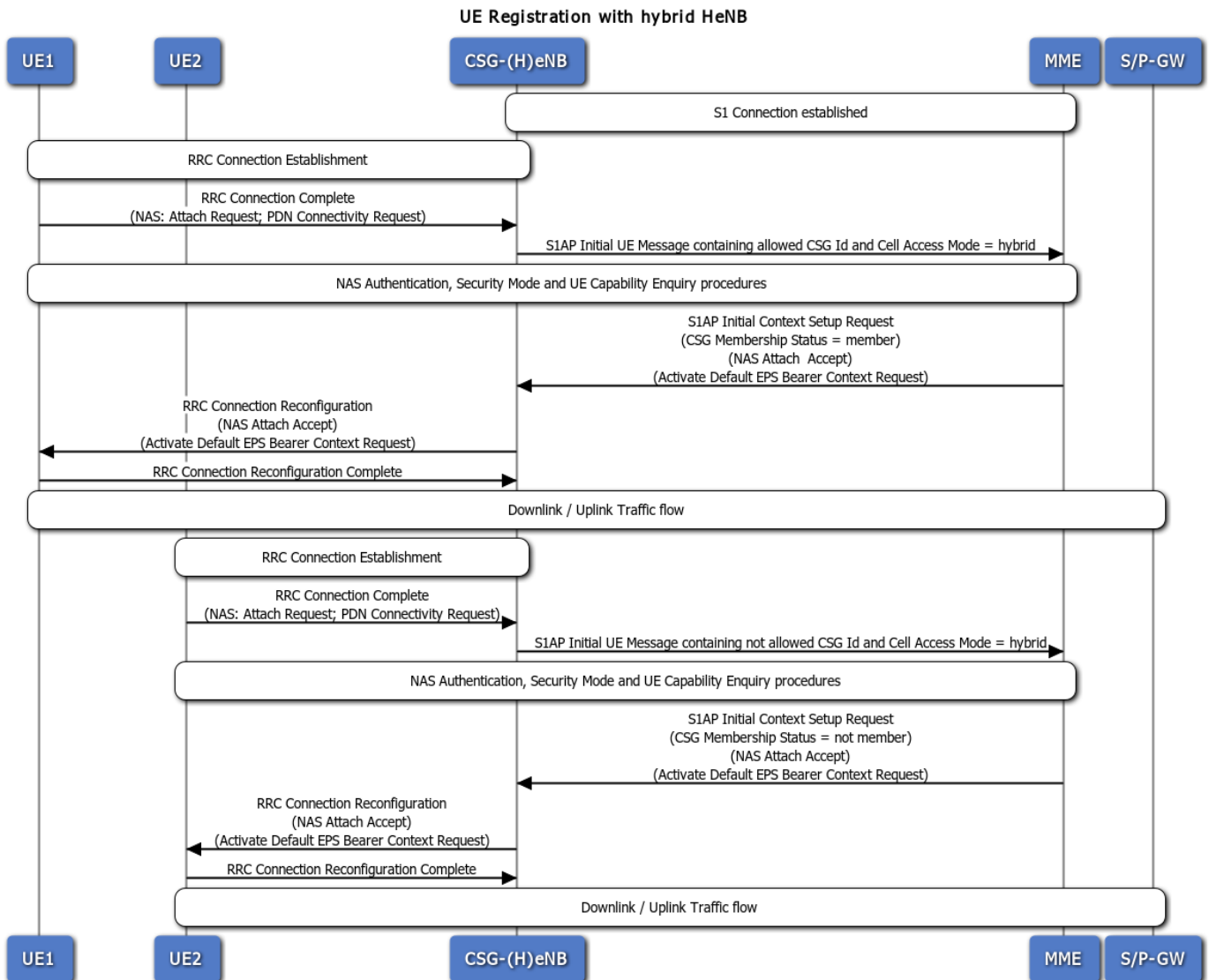


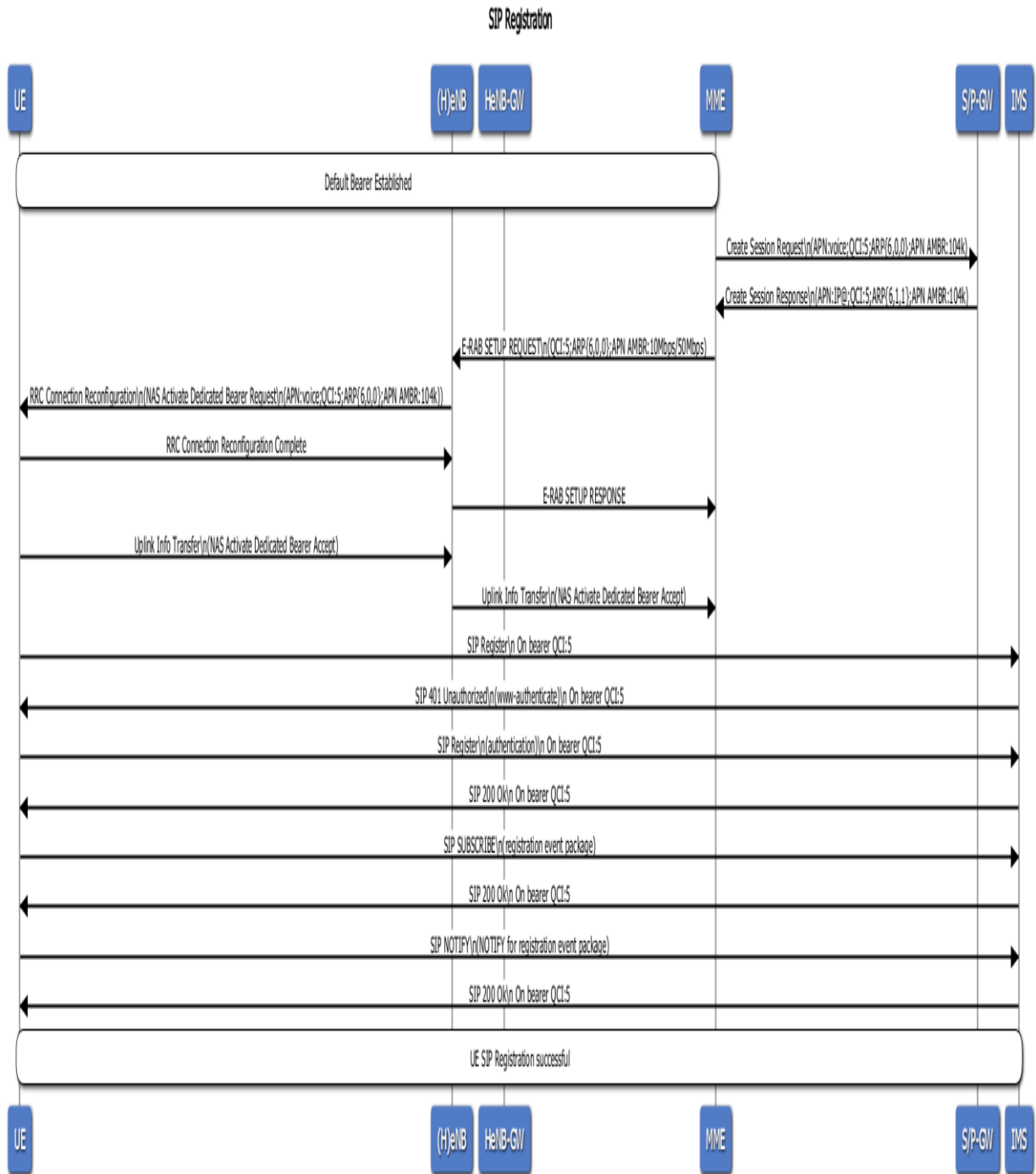
Figure 23: CSG/05

7.3.7 IMS/01 – UE SIP Registration

Interoperability Test Description			
Identifier	IMS/01		
Test Objective	UE registers with the LTE network to receive services that require registration (Initial Network Registration). Default EPS bearer is also established as part of Network Attachment procedure. UE performs an IMS SIP Registration.		
Configuration	<ul style="list-style-type: none"> CFG_IMS 		
References	<ul style="list-style-type: none"> 3GPP 24.229 [8] subclause 5.1.1 3GPP 34.229 subclause 8.1, Annex A.1 Default messages for IMS Registration 		
Applicability	HENB_VOLTE AND MME_VOLTE		
Pre-test conditions	<ul style="list-style-type: none"> eNB / eNB-GW S1 connection established UE (IMSI) is provisioned in the HSS At least IMS APN configured in UE SIP client on UE ready to start Registration procedure 		
Test Sequence	Step	Type	Description
	1	stimulus	Switch on UE
	2	verify	UE initiates LTE registration / RRC connection establishment towards HeNB
	3	verify	UE and EPC mutual authentication procedure
	4	verify	NAS Security establishment procedure between UE and EPC
	5	verify	UE capability enquiry procedure
	6	verify	Default EPS Bearer establishment procedure
	7	check	eNB activates dedicated bearer (QCI:5)(Optional) Note:IMS Registration can be performed on default bearer .
	8	verify	UE SIP Registration successful

Expected sequence for SIP Registration

	Direction		Message	Comment
	UE	CFG_IMS		
1	→		REGISTER	UE sends initial registration for IMS services.
2	←		401 Unauthorized	The IMS Server responds with a valid AKAv1-MD5 authentication challenge and security mechanisms supported by the network.
3	→		REGISTER	UE completes the security negotiation procedures, sets up a temporary set of SAs and uses those for sending another REGISTER with AKAv1-MD5 credentials.
4	←		200 OK	The IMS Server responds with 200 OK.
5	→		SUBSCRIBE	UE subscribes to its registration event package.
6	←		200 OK	The IMS Server responds SUBSCRIBE with 200 OK
7	←		NOTIFY	The IMS Server sends initial NOTIFY for registration event package, containing full registration state information for the registered public user identity in the XML body
8	→		200 OK	The UE responds the NOTIFY with 200 OK

**Figure 24: IMS/01**

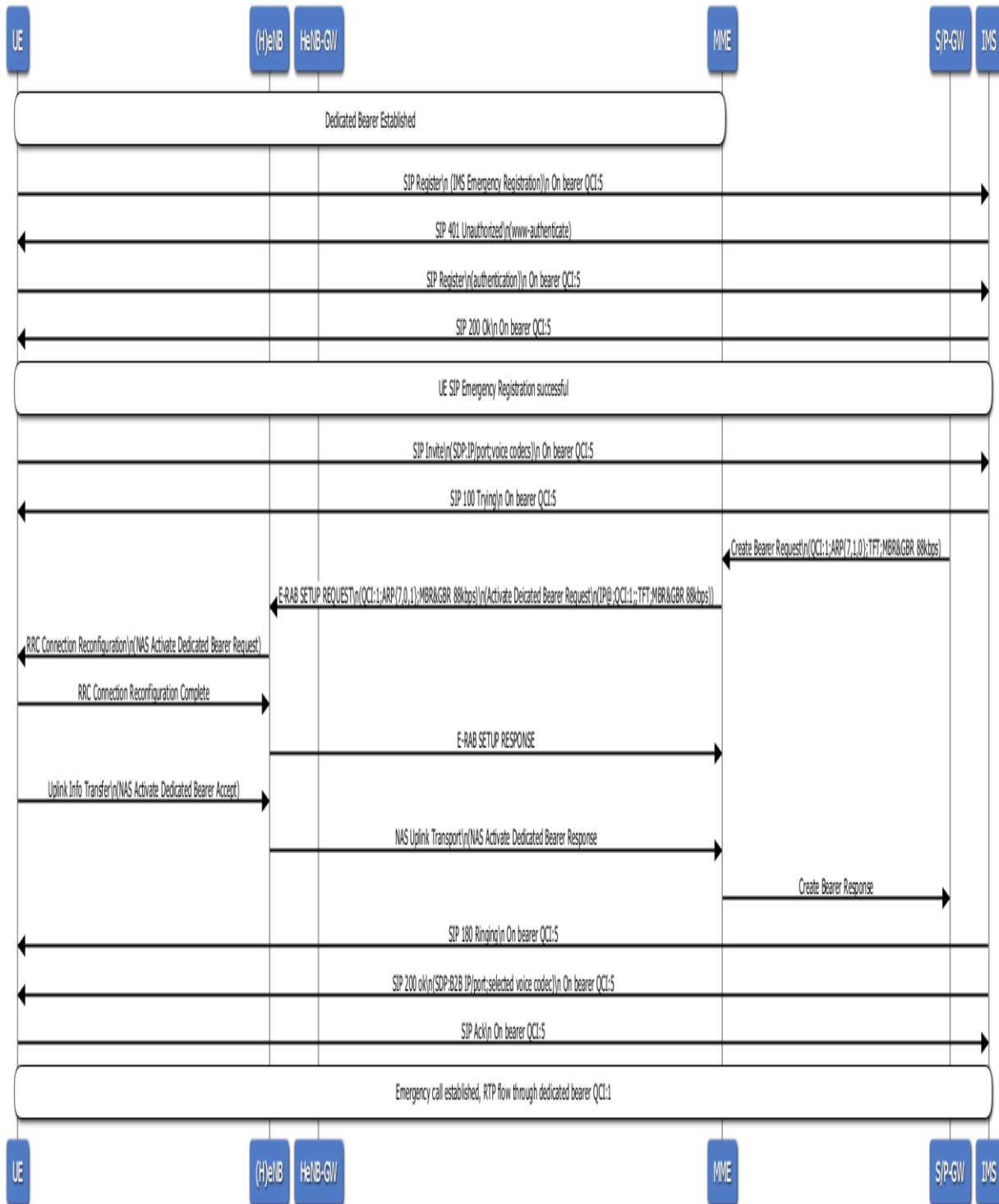
7.3.8 IMS/02 – UE SIP Emergency Registration and Emergency Call

Interoperability Test Description			
Identifier	IMS/02		
Test Objective	To verify that the UE can correctly register to IMS emergency services and initiate an IMS emergency call when UE is registered to IMS non-emergency services of the HPLMN.		
Configuration	<ul style="list-style-type: none"> CFG_IMS 		
References	<ul style="list-style-type: none"> 3GPP TS 24.229 [10] clause 5.1.6.1 3GPP TS 34.229 [8] clause 19.1.1 3GPP TS 34.229 annex C 20 3GPP TS 34.229 annex C.22 3GPP TS 34.229 annex A.1 Default messages for IMS Registration 		
Applicability	HENB_VOLTE AND MME_VOLTE		
Pre-test conditions	<ul style="list-style-type: none"> Support for IMS emergency services / speech (H)eNB / HeNB-GW S1 connection established UE (IMSI) is provisioned in the HSS At least IMS APN configured in UE SIP client on UE ready to start IMS Emergency Registration procedure 		
Test Sequence	Step	Type	Description
	1	stimulus	UE initiates LTE registration/Default Bearer is established
	2	check	IMS SIP Emergency Registration is successful
	3	stimulus	Use SIP agent to start Emergency call
	4	verify	Dedicated EPS Bearer establishment procedure (QCI:1 voice)
	5	verify	Emergency call is established
	6	verify	Bidirectional RTP channel established using the dedicated voice bearer

Expected sequence for Emergency Registration and Emergency Call:

	Direction		Message	Comment
	UE	CFG_IMS		
1		→	REGISTER	The UE sends initial IMS emergency registration
2		←	401 Unauthorized	The IMS Server responds with a valid AKAv1-MD5 authentication challenge and security mechanisms supported by the network.
3		→	REGISTER	The UE completes the security negotiation procedures, sets up a temporary set of SAs and uses those for sending another REGISTER with AKAv1-MD5 credentials.
4		←	200 OK	The IMS Server responds with 200 OK.
5		→	INVITE	UE sends INVITE with the first SDP offer.
6		←	100 Trying	IMS Server sends a 100 Trying provisional response.
7		←	180 Ringing	IMS Server sends a 180 Ringing.
8		←	200 OK	IMS Server responds INVITE with 200 OK.
9		→	ACK	UE acknowledges.

UE SIP Emergency Registration and Emergency Call



7.3.9 IMS/03 – UE SIP Originating Call (VoLTE)

Interoperability Test Description			
Identifier	IMS/03		
Test Objective	SIP registered UE starts VoLTE call to other UE.		
Configuration	<ul style="list-style-type: none"> CFG_IMS 		
References	<ul style="list-style-type: none"> 3GPP TS 24.229 [8] clause 5.1.3, 3GPP TS 34.229 clause 12.12, 3GPP TS 36.508 clause 4.5A.6.3 		
Applicability	HENB_VOLTE AND MME_VOLTE		
Pre-test conditions	<ul style="list-style-type: none"> Support for speech (H)eNB / HeNB-GW S1 connection established UE (IMSI) is provisioned in the HSS At least IMS APN configured in UE <ul style="list-style-type: none"> SIP client on UE ready to start Registration procedure UE (UE1) registered in IMS Second UE (UE2) registered in IMS and reachable to terminate call 		
Test Sequence	Step	Type	Description
	1	stimulus	UE performs LTE registration/Default Bearer is established
	2	check	SIP Registration is successful
	3	stimulus	Use SIP agent to start VoLTE call to other UE
	4	verify	Dedicated EPS Bearer establishment procedure (QCI:1 voice)
	5	verify	VoLTE call to UE2 is established
	6	verify	Bidirectional RTP channel established using the dedicated voice bearer between UEs

Expected sequence for IMS Call:

	Direction		Message	Comment
	UE	CFG_IMS		
1			Make the UE attempt an IMS speech call	
2		→	INVITE	UE sends INVITE with the first SDP offer.
3		←	100 Trying	IMS Server sends a 100 Trying provisional response.
4		←	183 Session Progress	IMS Server sends an SDP answer.
5		→	PRACK	UE acknowledges and optionally offers a second SDP if a dedicated EPS bearer is established by the network.
6		←	200 OK	IMS Server sends a 200 OK and answers the second SDP if present.
7		→	UPDATE	Optional step: UE sends a second SDP if a dedicated EPS bearer is established by the network.
8		←	200 OK	Optional step: IMS Server sends a 200 OK.
9		←	180 Ringing	IMS Server sends a 180 Ringing.
10		→	PRACK	UE acknowledges.
11		←	200 OK	IMS Server responds PRACK with 200 OK.
12		←	200 OK	IMS Server responds INVITE with 200 OK.
13		→	ACK	UE acknowledges.

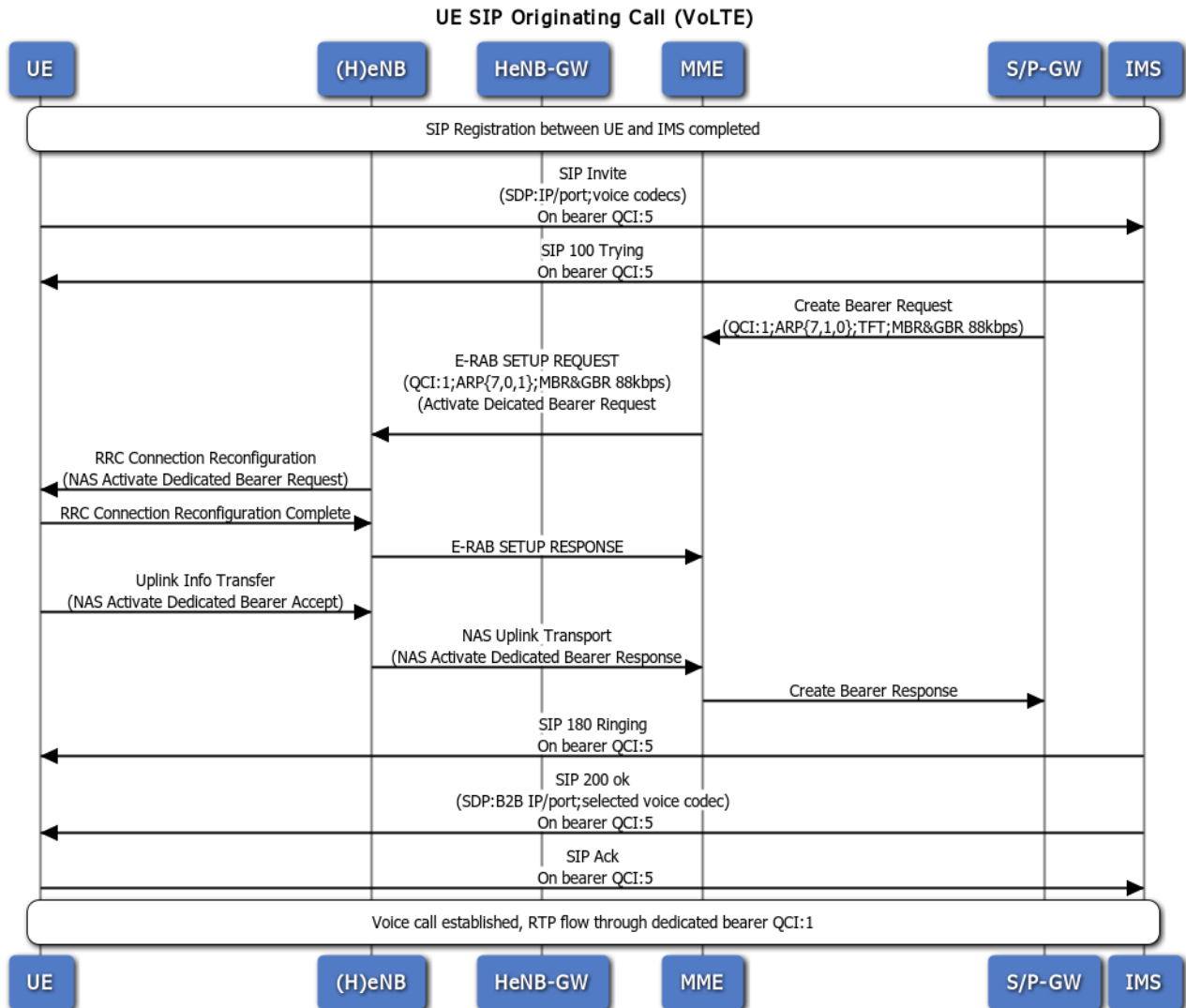


Figure 25: IMS/02

7.3.10 IMS/04 – UE SIP Terminating Call (VoLTE)

Interoperability Test Description			
Identifier	IMS/04		
Test Objective	SIP registered UE receives VoLTE call to other UE.		
Configuration	<ul style="list-style-type: none"> CFG_IMS 		
References	<ul style="list-style-type: none"> 3GPP TS 24.229 [8] clause 5.1.4 ,3GPP TS 34.229 clause 12.13 , 3GPP TS 36.508 clause 4.5A.7.3 		
Applicability	HENB_VOLTE AND MME_VOLTE		
Pre-test conditions	<ul style="list-style-type: none"> Support for speech (H)eNB / HeNB-GW S1 connection established UE (IMSI) is provisioned in the HSS At least IMS APN configured in UE SIP client on UE ready to start Registration procedure UE (UE1) registered in IMS Second UE (UE2) registered in IMS and ready to originate call 		
Test Sequence	Step	Type	Description
	1	stimulus	UE performs LTE registration/Default Bearer is established
	2	check	SIP Registration is successful

Interoperability Test Description			
	3	stimulus	Use SIP agent on UE2 to originate VoLTE call
	4	stimulus	Accept incoming VoLTE call
	5	verify	Dedicated EPS Bearer establishment procedure (QCI:1 voice)
	6	verify	VoLTE call from UE2 is established
	7	verify	Bidirectional RTP channel established using the dedicated voice bearer between UEs

Expected sequence for IMS MT call

	Direction		Message	Comment
	UE	CFG_I MS		
1		←	INVITE	IMS Server sends INVITE with the first SDP offer.
2				Void
3		→	100 Trying	(Optional) The UE responds with a 100 Trying provisional response
4		→	183 Session Progress	The UE sends 183 response reliably with the SDP answer to the offer in INVITE
5		←	PRACK	IMS Server acknowledges the receipt of 183 response from the UE.
6		→	200 OK	The UE responds to PRACK with 200 OK.
7		←	UPDATE	IMS Server sends an UPDATE with SDP offer indicating IMS Server reserved resources.
8		→	200 OK	The UE acknowledges the UPDATE with 200 OK and includes SDP answer to acknowledge its current precondition status.
9		→	180 Ringing	(Optional) The UE responds to INVITE with 180 Ringing.
10		←	PRACK	(Optional) IMS Server shall send PRACK only if the 180 response contains 100rel option tag within the Require header.
11		→	200 OK	(Optional) The UE acknowledges the PRACK with 200 OK.
11A				Make UE accept the speech AMR offer.
12		→	200 OK	The UE responds to INVITE with a 200 OK final response after the user answers the call.
13		←	ACK	The IMS Server acknowledges the receipt of 200 OK for INVITE.
14		←	BYE	The IMS Server sends BYE to release the call.
15		→	200 OK	The UE sends 200 OK for the BYE request and ends the call.

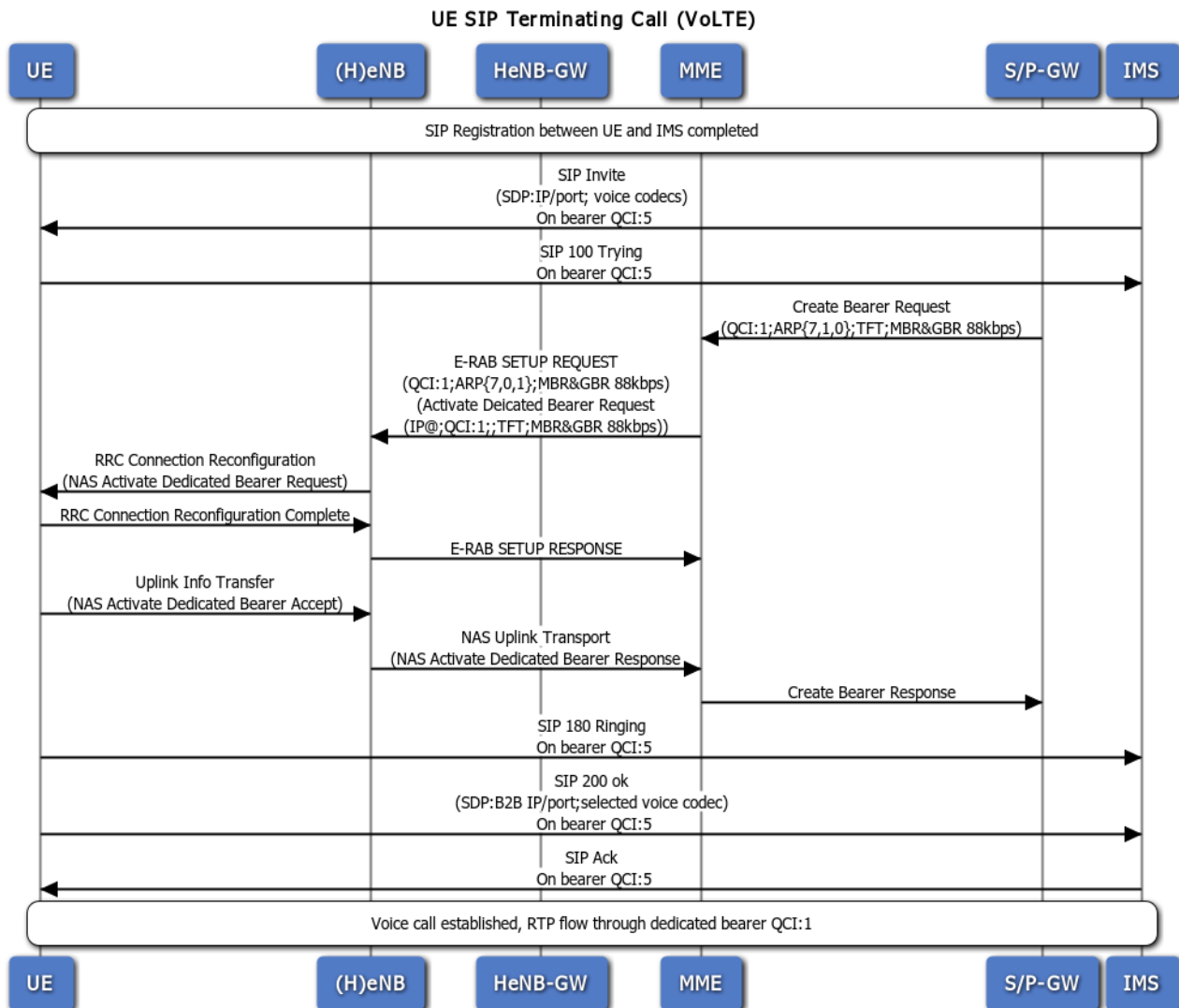


Figure 26: IMS/03

7.3.11 IMS/05 – UE Originating Video Call

Interoperability Test Description			
Identifier	IMS/05		
Test Objective	SIP registered UE starts video call to other UE.		
Configuration	<ul style="list-style-type: none"> CFG_IMS 		
References	<ul style="list-style-type: none"> 3GPP TS 24.229 [8] clause 5.1.3 		
Applicability	HENB_VOLTE AND MME_VOLTE AND UE_VIDEO		
Pre-test conditions	<ul style="list-style-type: none"> (H)eNB / HeNB-GW S1 connection established UE (IMS) is provisioned in the HSS At least IMS APN configured in UE SIP client on UE ready to start Registration procedure UE (UE1) registered in IMS Second UE (UE2) registered in IMS and reachable to terminate call Both UEs capable for video calls 		
Test Sequence	Step	Type	Description
	1	stimulus	UE performs LTE registration/Default Bearer is established
	2	check	SIP Registration is successful
	3	stimulus	Use SIP agent to start video call to other UE (UE2)

Interoperability Test Description			
	4	verify	Dedicated EPS Bearer establishment procedure (QCI:2 video)
	5a	verify	Video call to UE2 is established (5b step occurs parallelly)
	5b	stimulus	eNB configures two new RLC-UM data radio bearers with condition DRB (0,2), associated with the dedicated EPS bearer context.
	6	verify	Bidirectional RTP channel established using the dedicated video bearer between UEs
Note: Please refer to 3GPP TS 36.508 subclause 4.5A.8.			

Expected sequence for MO IMS video call

	Direction		Message	Comment
	UE	CFG IMS		
1			Make the UE attempt an IMS video call	
2	→		INVITE	UE sends INVITE with the first SDP offer.
3	←		100 Trying	IMS Server sends a 100 Trying provisional response.
4	←		183 Session Progress	IMS Server sends an SDP answer.
5	→		PRACK	UE acknowledges and optionally offer a second SDP if a dedicated EPS bearer is established by the network.
6	←		200 OK	IMS Server sends a 200 OK and answers the second SDP if present.
7	→		UPDATE	Optional step: UE sends a second SDP if a dedicated EPS bearer is established by the network.
8	←		200 OK	Optional step: IMS Server sends a 200 OK.
9	←		180 Ringing	IMS Server sends a 180 Ringing.
10	→		PRACK	UE acknowledges.
11	←		200 OK	IMS Server responds PRACK with 200 OK.
12	←		200 OK	IMS Server responds INVITE with 200 OK.
13	→		ACK	UE acknowledges.

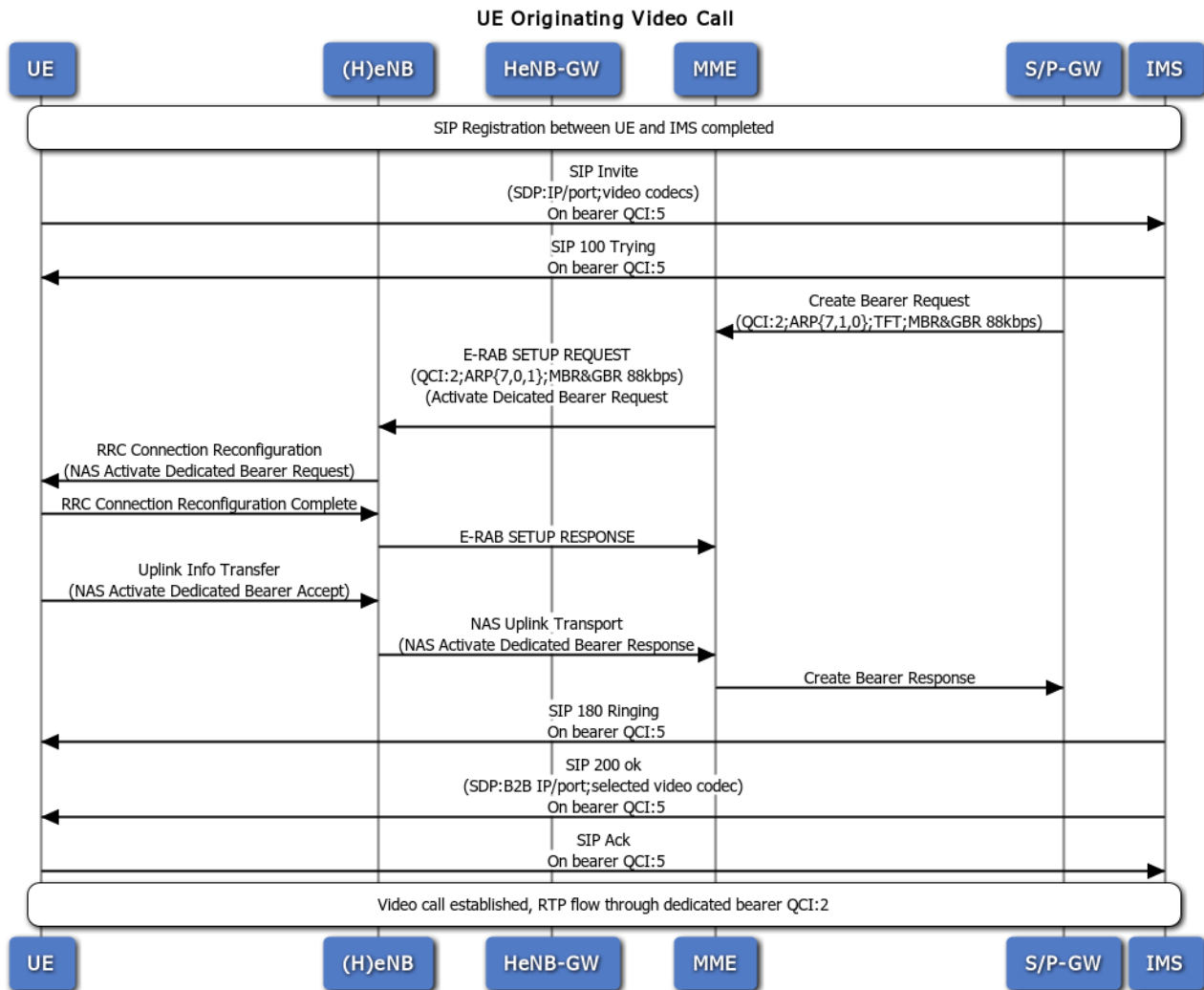


Figure 27: IMS/04

7.3.12 IMS/06 – UE Terminating Video Call

Interoperability Test Description			
Identifier	IMS/06		
Test Objective	SIP registered UE receives video call to other UE.		
Configuration	<ul style="list-style-type: none"> CFG_IMS 		
References	<ul style="list-style-type: none"> 3GPP TS 24.229 [8] clause 5.1.4 , 3GPP TS 34.229 annex C 26 		
Applicability	HENB_VOLTE AND MME_VOLTE AND UE_VIDEO		
Pre-test conditions	<ul style="list-style-type: none"> (H)eNB / HeNB-GW S1 connection established UE (IMSI) is provisioned in the HSS At least IMS APN configured in UE <ul style="list-style-type: none"> SIP client on UE ready to start Registration procedure UE (UE1) registered in IMS Second UE (UE2) registered in IMS and ready to originate call Both UEs capable for video calls 		
Test Sequence	Step	Type	Description
	1	stimulus	UE performs LTE registration/Default Bearer is established
	2	check	SIP Registration is successful
	3	stimulus	Use SIP agent on UE2 to originate video call
	4	stimulus	Accept incoming video call
	5	verify	Dedicated EPS Bearer establishment procedure (QCI:2 video)

Interoperability Test Description			
	6a	verify	Video call from UE2 is established
	6b	stimulus	eNB configures two new RLC-UM data radio bearers with condition DRB (0,2), associated with the dedicated EPS bearer context.
	7	verify	Bidirectional RTP channel established using the dedicated video bearer between UEs
Note: Please refer to 3GPP TS 36.508 subclause 4.5A.9.			

Expected sequence for IMS MT video call

	Direction		Message	Comment
	UE	CFG_IMS		
1	←		INVITE	IMS Server sends INVITE with the first SDP offer.
2				Void
3	→		100 Trying	(Optional) The UE responds with a 100 Trying provisional response
4	→		183 Session Progress	The UE sends 183 response reliably with the SDP answer to the offer in INVITE
5	←		PRACK	IMS Server acknowledges the receipt of 183 response from the UE.
6	→		200 OK	The UE responds to PRACK with 200 OK.
7	←		UPDATE	IMS Server sends an UPDATE with SDP offer indicating IMS Server reserved resources.
8	→		200 OK	The UE acknowledges the UPDATE with 200 OK and includes SDP answer to acknowledge its current precondition status.
9	→		180 Ringing	(Optional) The UE responds to INVITE with 180 Ringing.
10	←		PRACK	(Optional) IMS Server shall send PRACK only if the 180 response contains 100rel option tag within the Require header.
11	→		200 OK	(Optional) The UE acknowledges the PRACK with 200 OK.
11A				Make UE accept the video offer.
12	→		200 OK	The UE responds to INVITE with a 200 OK final response after the user answers the call.
13	←		ACK	The IMS Server acknowledges the receipt of 200 OK for INVITE.
14	←		BYE	The IMS Server sends BYE to release the call.
15	→		200 OK	The UE sends 200 OK for the BYE request and ends the call.

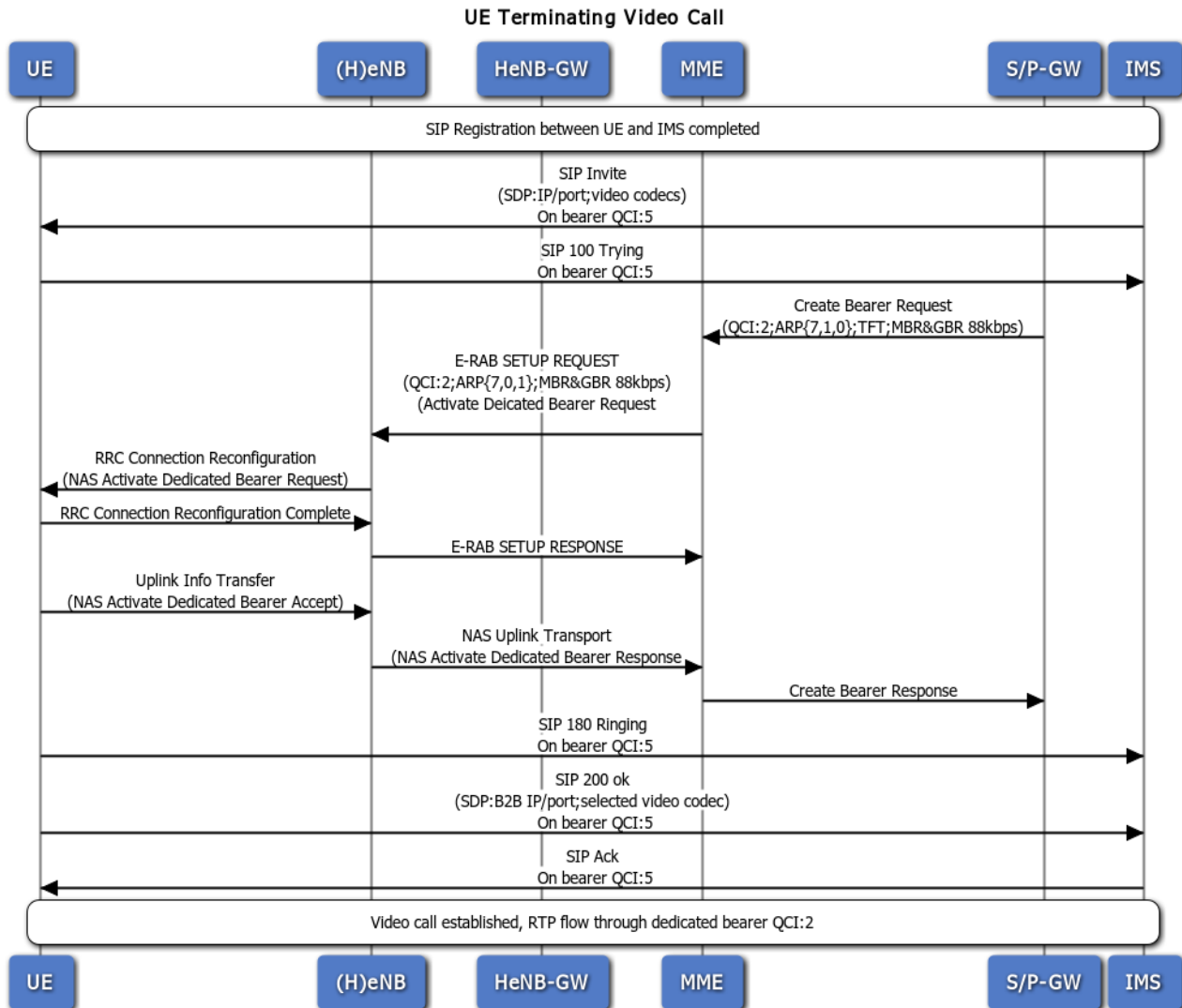


Figure 28: IMS/05

7.3.13 IMS/07 – MO SMS over IMS

Interoperability Test Description			
Identifier	IMS/07		
Test Objective	To verify that the UE1 is able to send a Mobile Originating SMS over IMS to UE2		
Configuration	<ul style="list-style-type: none"> CFG_IMS 		
References	<ul style="list-style-type: none"> 3GPP TS 24.229 [8] clause 5.1.4 , 3GPP TS 34.229 clause 18.1 		
Applicability	HENB_VOLTE AND MME_VOLTE AND UE_VIDEO		
Pre-test conditions	<ul style="list-style-type: none"> (H)eNB / HeNB-GW S1 connection established UE (IMSI) is provisioned in the HSS At least IMS APN configured in UE SIP client on UE ready to start Registration procedure 		
Test Sequence	Step	Type	Description
	1	stimulus	UE performs LTE registration/Default Bearer is established
	2	verify	SIP registration is successful
	3	stimulus	Use SIP agent on UE1 to send MO SMS
	4	verify	UE recieves a status report

Expected sequence for MO SMS over IMS

	Direction		Message	Comment
	UE	CFG IMS		
1		→	SIP MESSAGE request	UE sends a SIP MESSAGE request including a vnd.3gpp.sms payload that contains a short message
2		←	202 Accepted	IMS Server responds with 202 Accepted
3		←	SIP MESSAGE request	IMS Server sends a SIP MESSAGE request including a vnd.3gpp.sms payload that contains the short message submission report indicating a positive acknowledgement of the short message sent by the UE at Step 1
4		→	200 OK	UE responds with 200 OK
5		←	SIP MESSAGE request	IMS Server sends a SIP MESSAGE request including a vnd.3gpp.sms payload that contains a status report
6		→	200 OK	UE responds with 200 OK
7		→	SIP MESSAGE request	UE sends a SIP MESSAGE request including a vnd.3gpp.sms payload that contains a delivery report for the status report received at Step 5
8		←	202 Accepted	IMS Server responds with 202 Accepted

UE MO SMS over IMS

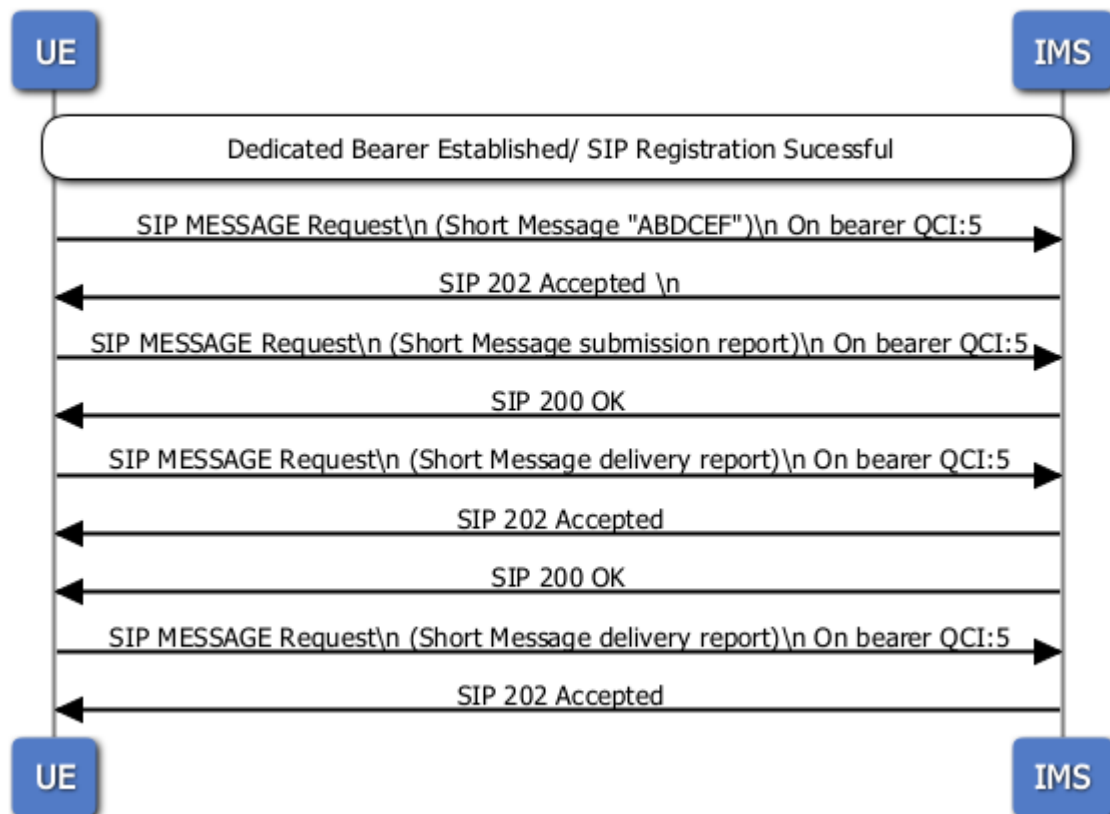


Figure 7.3.13

7.3.14 IMS/08 – MT SMS over IMS

Interoperability Test Description			
Identifier	IMS/08		
Test Objective	SIP registered UE receives SMS from other UE.		
Configuration	<ul style="list-style-type: none"> CFG_IMS 		
References	<ul style="list-style-type: none"> 3GPP TS 24.229 [8] clause 5.1.4 , 3GPP TS 34.229 annex C 26 		
Applicability	HENB_VOLTE AND MME_VOLTE AND UE_VIDEO		
Pre-test conditions	<ul style="list-style-type: none"> (H)eNB / HeNB-GW S1 connection established UE (IMSI) is provisioned in the HSS At least IMS APN configured in UE SIP client on UE ready to start Registration procedure 		
Test Sequence	Step	Type	Description
	1	stimulus	UE performs LTE registration/Default Bearer is established
	2	verify	SIP registration is successful
	3	stimulus	Use eNB to send MT SMS over IMS
	4	verify	UE responds with a delivery report

Expected sequence for MT SMS over IMS

	Direction		Message	Comment
	UE	CFG_IMS		
1	←		MESSAGE	The IMS Server sends a Short Message.
2	→		200 OK	The UE responds with 200 OK.
3	→		MESSAGE	The UE responds with a delivery report.
4	←		202 ACCEPTED	The IMS Server sends an accepted response.

UE MO SMS over IMS

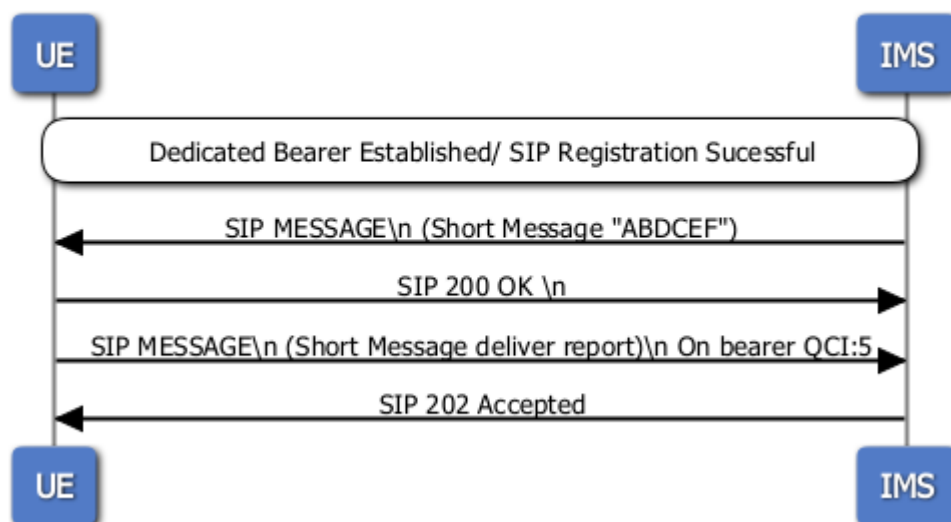


Figure 7.3.14

7.3.15.1 MOB/X2/01 – X2 Setup

Interoperability Test Description			
Identifier	MOB/X2/01		
Test Objective	Establishment of X2 connection between two (H)eNBs		
Configuration	<ul style="list-style-type: none"> CFG_X2 		
References	<ul style="list-style-type: none"> 3GPP TS 36.423 [13] clause 8.3.3 3GPP TS 36.413 [12] clause 8.15, clause 8.16 		
Applicability	HENB_X2 AND MME_X2		
Pre-test conditions	<ul style="list-style-type: none"> The Source (H)eNB-1 and Target (H)eNB-2 are connected to the same MME and S/P-GW MME supports the eNB Config Transfer capability UE attached, default EPS bearer established and in Idle Mode 		
Test Sequence	Step	Type	Description
	1	stimulus	Trigger Source (H)eNB-1 to initiate TNL Discovery – eNB Config Transfer with MME
	2	check	(H)eNB-1 sends eNB Configuration Transfer to MME
	3	check	MME sends MME Configuration Transfer to (H)eNB-2
	4	check	(H)eNB-2 replies with eNB Configuration Transfer with SON Configuration Transfer IE (Transport Layer Address)
	5	check	MME sends a MME Configuration Transfer with same SON Configuration Transfer IE to (H)eNB-1
	6	verify	(H)eNB-1 establishes the SCTP association with the received IP address of (H)eNB-2
	7	check	((H)eNB-2 sends X2 setup request towards (H)eNB-2 with its serving cell id
	8	check	(H)eNB-2 responds with X2 setup response with its serving cell id
	9	verify	X2 is established between (H)eNB-1 and (H)eNB-2

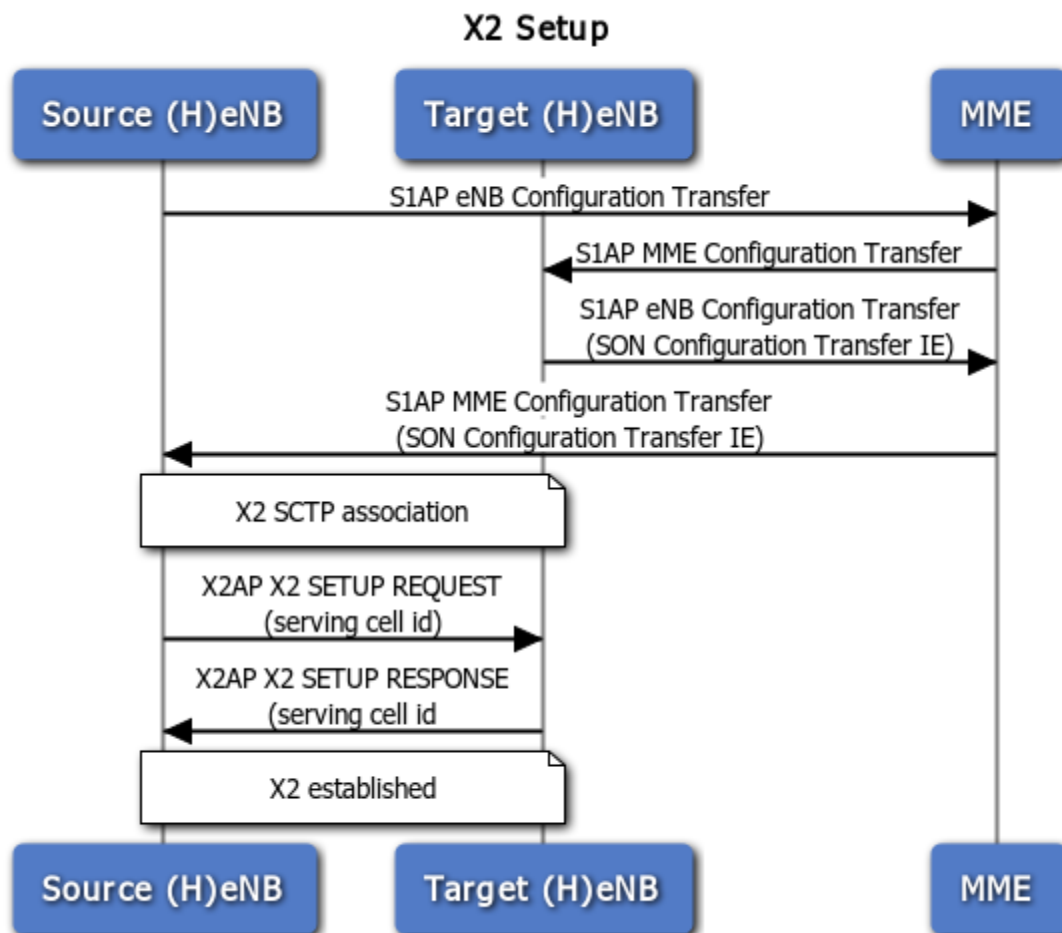


Figure 29: MOB/X2/01

7.3.15.2 MOB/X2/02 – X2 Setup Partial Served Cells

Interoperability Test Description			
Identifier	MOB/X2/02		
Test Objective	eNB advertises only the triggering/neighbouring cells in Served Cells List in X2 Setup Request to the Macro		
Configuration	<ul style="list-style-type: none"> CFG_X2 		
References	<ul style="list-style-type: none"> 3GPP TS 36.423 [13] clause 8.3.3 3GPP TS 36.413 [12] clause 8.15, clause 8.16 		
Applicability	ENB_X2 AND MME_X2 / HENB_X2 AND MME_X2		
Pre-test conditions	<ul style="list-style-type: none"> The Source (H)eNB-1 and Target (H)eNB-2 are connected to the same MME and S/P-GW MME supports the eNB Config Transfer capability UE attached, default EPS bearer established and in Idle Mode 		
Test Sequence	Step	Type	Description
	1	stimulus	Bring up one eNB1 with two cell (C1 and C2)
	2	stimulus	Bring up Macro eNB (M1)
	3	check	Attach UE1 to C1 (simulate condition in order to see only C1)
	4	stimulus	Simulate condition so that UE1 discovers M1 (but not SC2) and sends UE Measurement Report for the same
	5	check	eNB1 will trigger X2 Setup towards Macro (M1) with only C1 as served cell.
	6	stimulus	Simulate condition to attach UE1 to M1 and to discover C2
	7	check	Macro eNB will trigger eNB Config Update X2 message on the same X2 association with the discovered Cell C2

Interoperability Test Description			
	8	verify	Macro should send eNB Config Update X2 message on the same X2 association since a new neighbour has been discovered with the same peer

7.3.16 MOB/X2/03 – X2 based Handover

Interoperability Test Description			
Identifier	MOB/X2/03		
Test Objective	UE connected to Source (H)eNB successfully hands over to a Target (H)eNB using X2 messages		
Configuration	<ul style="list-style-type: none"> CFG_X2 		
References	<ul style="list-style-type: none"> 3GPP TS 36.423 [13] 		
Applicability	HENB_X2 AND MME_X2		
Pre-test conditions	<ul style="list-style-type: none"> The Source (H)eNB-1 and Target (H)eNB-2 are connected to the same MME and S/P-GW MME supports the eNB Config Transfer capability The Source and Target (H)eNBs have established a X2 link APN to connect to a web server and the default PDN are provisioned on the UE UL/DL data transfer between UE and Source (H)eNB-1 		
Test Sequence	Step	Type	Description
	1	stimulus	Raise attenuation towards Source (H)eNB-1 and lower attenuation towards Target (H)eNB-2-Simu
	2	verify	When the RSRP of the Target (H)eNB-2-Simu at the UE is better than the Source (H)eNB by the configured amount, then the UE sends a measurement report to the Source (H)eNB
	3	check	The Source (H)eNB-1 initiates UE handover to the Target (H)eNB-2 using X2AP HANDOVER REQUEST
	4	check	The Target (H)eNB-2 responds with X2AP HANDOVER REQUEST ACKNOWLEDGE
	5	check	The Source (H)eNB sends the RRCConnectionReconfigurationRequest with the Target (H)eNB-2 information to the UE
	6	check	The Source (H)eNB also sends SN STATUS TRANSFER with the relevant PDCP SN information to the Target (H)eNB-2 and starts forwarding the data traffic to the Target (H)eNB-2
	7	check	After the UE synchronizes and successfully accesses the Target (H)eNB, the UE sends RRCConnectionReconfigurationComplete to the Target (H)eNB
	8	check	The Target (H)eNB sends PATH SWITCH REQUEST to the MME to inform the MME that the UE has switched cells
	9	check	The MME informs the S/PGW to move the data path of the UE to the Target (H)eNB and sends PATH SWITCH REQUEST ACK
	10	check	Now that the UE has successfully moved to the Target (H)eNB, the Target (H)eNB sends UE CONTEXT RELEASE to the Source (H)eNB to clear the UE context information
	11	verify	The UE is able to successfully continue the PS call via the Target (H)eNB

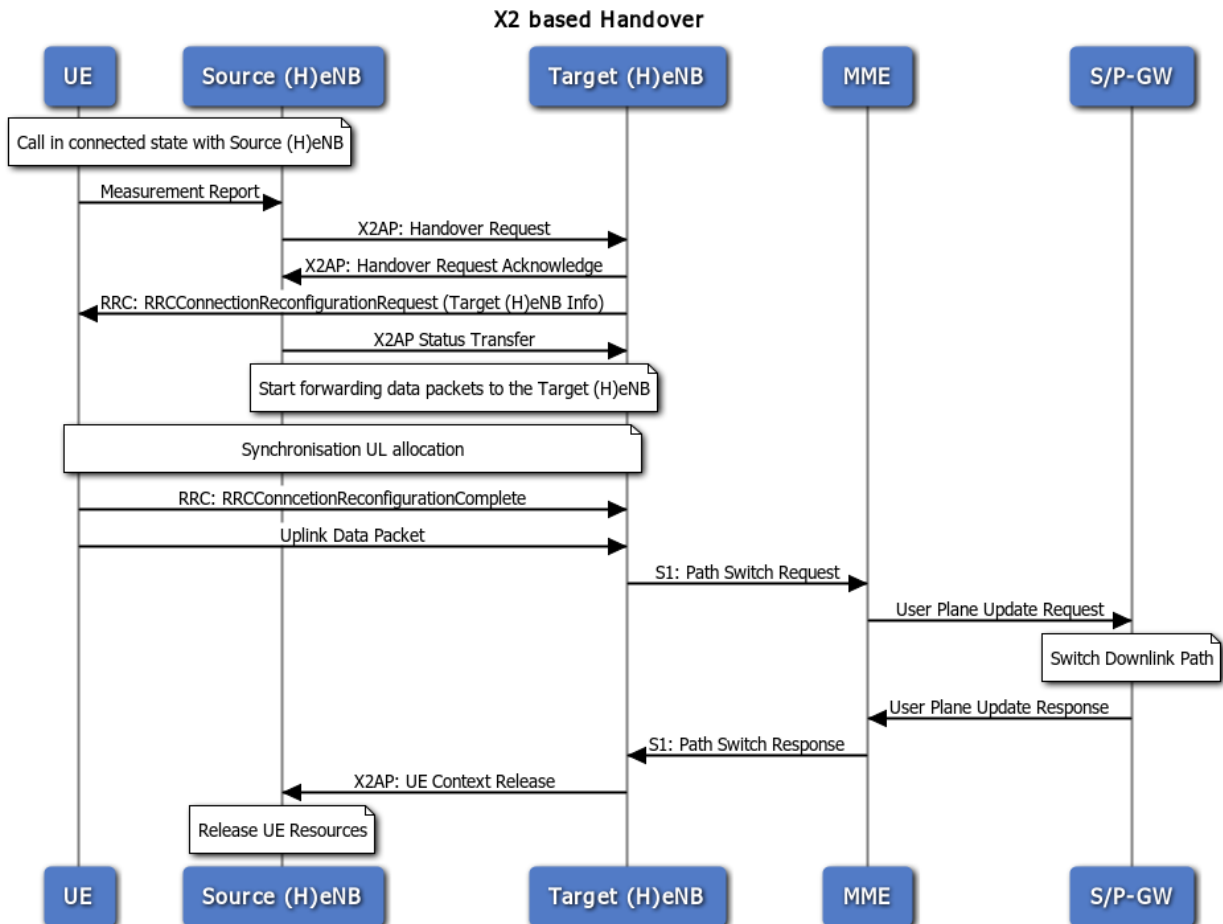


Figure 30: MOB/X2/02

7.3.17 MOB/X2/04 – X2 Reset

Interoperability Test Description			
Identifier	MOB/X2/04		
Test Objective	Reset of X2 connection between two (H)eNBs		
Configuration	<ul style="list-style-type: none"> CFG_X2 		
References	<ul style="list-style-type: none"> 3GPP TS 36.423 [13] clause 8.3.4 		
Applicability	HENB_X2 AND MME_X2		
Pre-test conditions	<ul style="list-style-type: none"> The Source (H)eNB-1 and Target (H)eNB-2 are connected to the same MME and S/P-GW MME supports the eNB Config Transfer capability UE attached, default EPS bearer established and in Idle Mode (H)eNBs have completed X2 setup 		
Test Sequence	Step	Type	Description
	1	stimulus	Trigger Source (H)eNB-1 to reset X2 connection to (H)eNB-2
	2	check	(H)eNB-1 sends Reset Request to neighbouring (H)eNB-2
	3	check	(H)eNB-2 sends Reset Response to (H)eNB-1
	4	verify	X2 is disconnected between (H)eNB-1 and (H)eNB-2

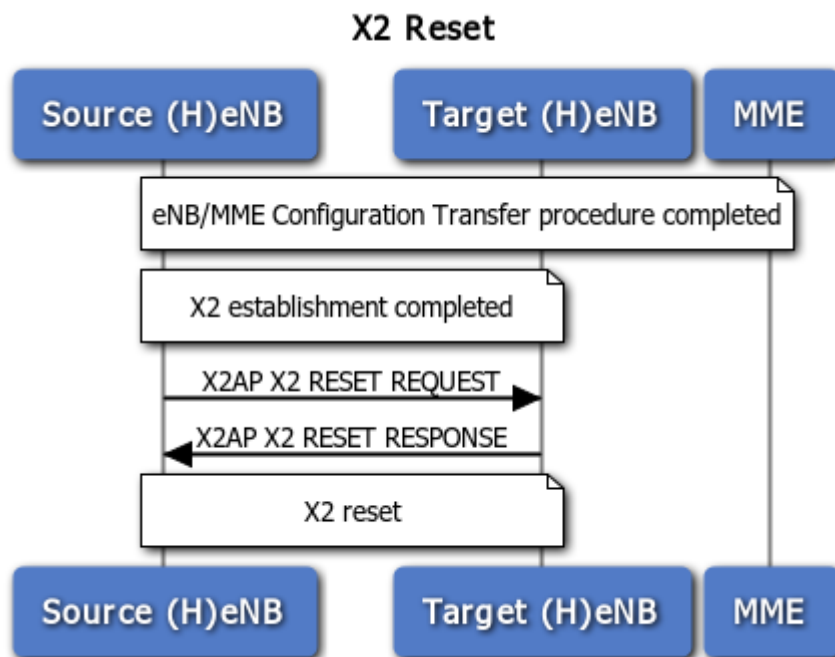


Figure 31: MOB/X2/03

7.3.18 MOB/X2/05 – X2 Load Indication

Interoperability Test Description			
Identifier	MOB/X2/05		
Test Objective	X2 load indication procedure between two (H)eNBs		
Configuration	<ul style="list-style-type: none"> CFG_X2 		
References	<ul style="list-style-type: none"> 3GPP TS 36.423 [13] clause 8.3.1 		
Applicability	HENB_X2 AND MME_X2		
Pre-test conditions	<ul style="list-style-type: none"> The Source (H)eNB-1 and Target (H)eNB-2 are connected to the same MME and S/P-GW MME supports the eNB Config Transfer capability UE attached, default EPS bearer established and in Idle Mode (H)eNBs have completed X2 setup 		
Test Sequence	Step	Type	Description
	1	stimulus	Trigger Source (H)eNB-1 to start load indication procedure towards (H)eNB-2
	2	check	(H)eNB-1 sends Load Information to neighbouring (H)eNB-2
	3	verify	(H)eNB-2 successfully receives load information and integrates information into its behaviour.

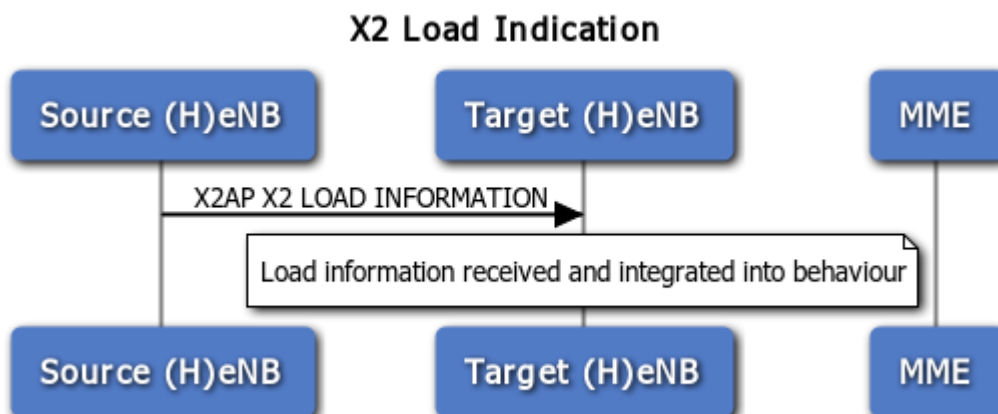


Figure 32: MOB/X2/04

7.3.19 MOB/S1/01 – S1 based Handover

Interoperability Test Description			
Identifier	MOB/S1/01		
Test Objective	UE connected to Source (H)eNB successfully hands over to a Target (H)eNB using S1 messages		
Configuration	<ul style="list-style-type: none"> CFG_S1_MOB 		
References	<ul style="list-style-type: none"> 3GPP TS 36.413 [12] clause 8.4 		
Applicability			
Pre-test conditions	<ul style="list-style-type: none"> The Source (H)eNB-1 and Target (H)eNB-2 are connected to the same MME and S/P-GW The Source and Target (H)eNBs do not have an X2 link between themselves APN to connect to a web server and the default PDN are provisioned on the UE UL/DL data transfer between UE and Source (H)eNB-1 		
Test Sequence	Step	Type	Description
	1	stimulus	Raise attenuation towards Source (H)eNB-1 and lower attenuation towards Target (H)eNB-2-Simu
	2	verify	When the RSRP of the Target (H)eNB-2-Simu at the UE is better than the Source (H)eNB by the configured amount, then the UE sends a measurement report to the Source (H)eNB
	3	check	The Source (H)eNB initiates UE handover to the Target (H)eNB by sending a HANDOVER REQUIRED message to the MME
	4	check	The MME sends the HANDOVER REQUEST message to the Target (H)eNB
	5	check	The Target (H)eNB sends a HANDOVER REQUEST ACKNOWLEDGE to the MME
	6	check	The MME sends a HANDOVER COMMAND to the Source (H)eNB
	7	check	The Source (H)eNB sends the HANDOVER COMMAND with the Target (H)eNB information to the UE
	8	check	The Source (H)eNB also sends an SN STATUS TRANSFER with the relevant PDCP SN information to the Target The Source (H)eNB also sends SN STATUS TRANSFER with the relevant PDCP SN information to the Target (H)eNB via the MME
	9	check	The UE sends HANDOVER CONFIRM to the Target (H)eNB
	10	check	The MME sends a Modify Bearer Request to the S/P-GW to move the data path of the UE to the Target (H)eNB
	11	check	The MME sends UE CONTEXT RELEASE with Cause IE indication "Successful Handover" to the Source (H)eNB
	12	verify	The UE is able to successfully continue the PS call via the Target (H)eNB

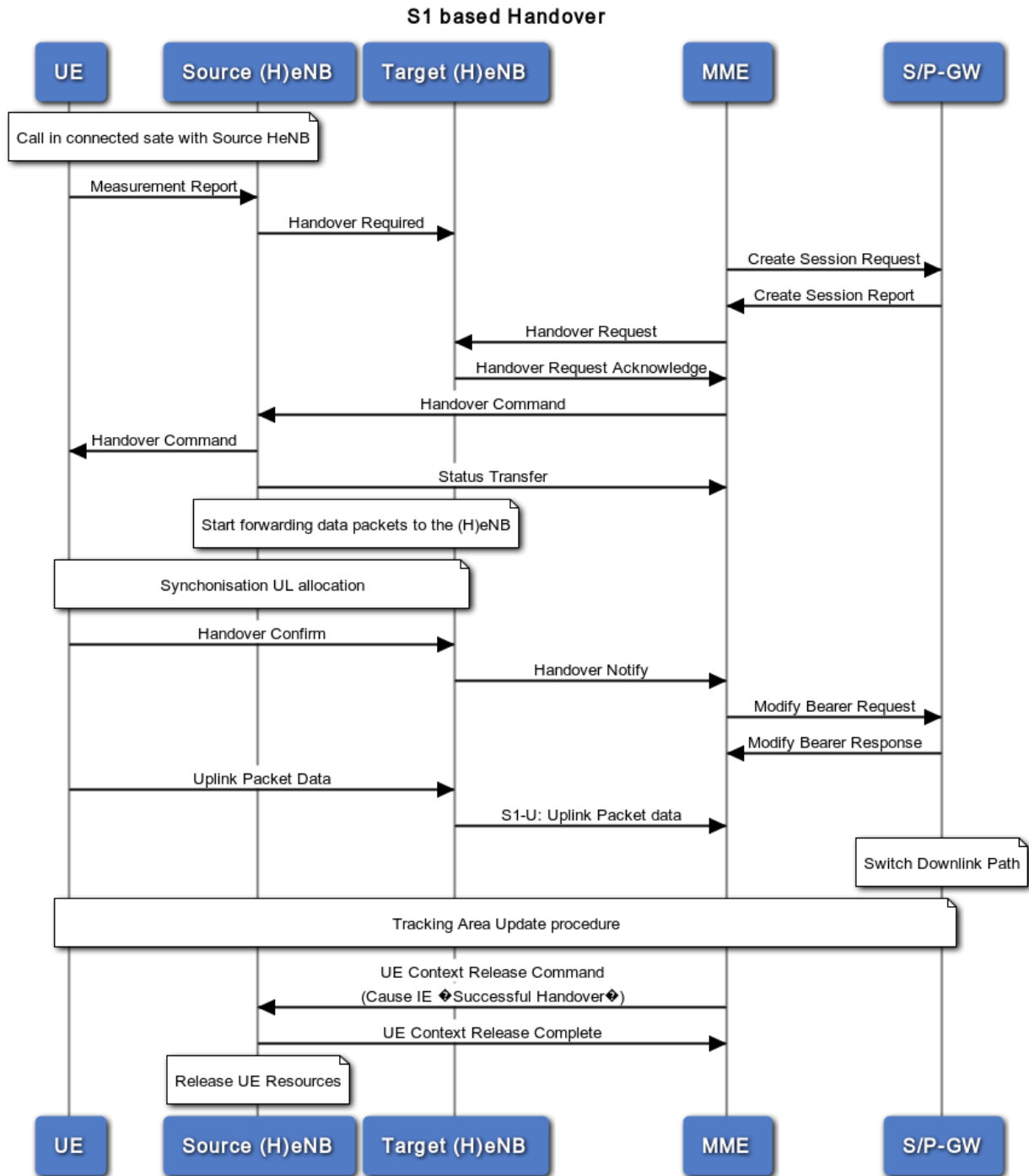


Figure 33: MOB/S1/01

7.3.20 MOB/S1/02 – Local S1 based Handover

Behaviour described in this test is not 3GPP standards compliant, but it is based on a valid SmallCell Forum Enterprise Deployment configuration.

Interoperability Test Description	
Identifier	MOB/S1/02
Test Objective	UE connected to Source HeNB successfully hands over locally to a Target HeNB using S1 messages via the HeNB-GW
Configuration	<ul style="list-style-type: none"> CFG_S1_MOB_LOCAL
References	

Interoperability Test Description			
Applicability			
Pre-test conditions	<ul style="list-style-type: none">• The Source HeNB-1 and Target HeNB-2 are connected to the same HeNB-GW• The Source and Target (H)eNBs do not have an X2 link between themselves• The Source and Target (H)eNBs must have the same tracking area code (otherwise MME needs to be updated)• APN to connect to a web server and the default PDN are provisioned on the UE• UL/DL data transfer between UE and Source HeNB-1		
Test Sequence	Step	Type	Description
	1	stimulus	Raise attenuation towards Source HeNB-1 and lower attenuation towards Target HeNB-2-Simu
	2	verify	When the RSRP of the Target HeNB-2-Simu at the UE is better than the Source HeNB by the configured amount, then the UE sends a measurement report to the Source HeNB
	3	check	The Source HeNB initiates UE handover to the Target HeNB by sending a HANDOVER REQUIRED message to the HeNB-GW
	4	check	The HeNB-GW sends the HANDOVER REQUEST message to the Target HeNB
	5	check	The Target HeNB sends a HANDOVER REQUEST ACKNOWLEDGE to the HeNB-GW
	6	check	The HeNB-GW sends a HANDOVER COMMAND to the Source HeNB
	7	check	The Source HeNB sends the HANDOVER COMMAND with the Target HeNB information to the UE
	8	check	The Source HeNB also sends an SN STATUS TRANSFER with the relevant PDCP SN information to the Target The Source HeNB also sends SN STATUS TRANSFER with the relevant PDCP SN information to the Target HeNB via the HeNB-GW
	9	check	The UE sends HANDOVER CONFIRM to the Target HeNB
	10	check	The HeNB-GW sends a Modify Bearer Request to the S/P-GW to move the data path of the UE to the Target HeNB
	11	check	The HeNB-GW sends UE CONTEXT RELEASE with Cause IE indication “Successful Handover” to the Source HeNB
	12	verify	The UE is able to successfully continue the PS call via the Target HeNB

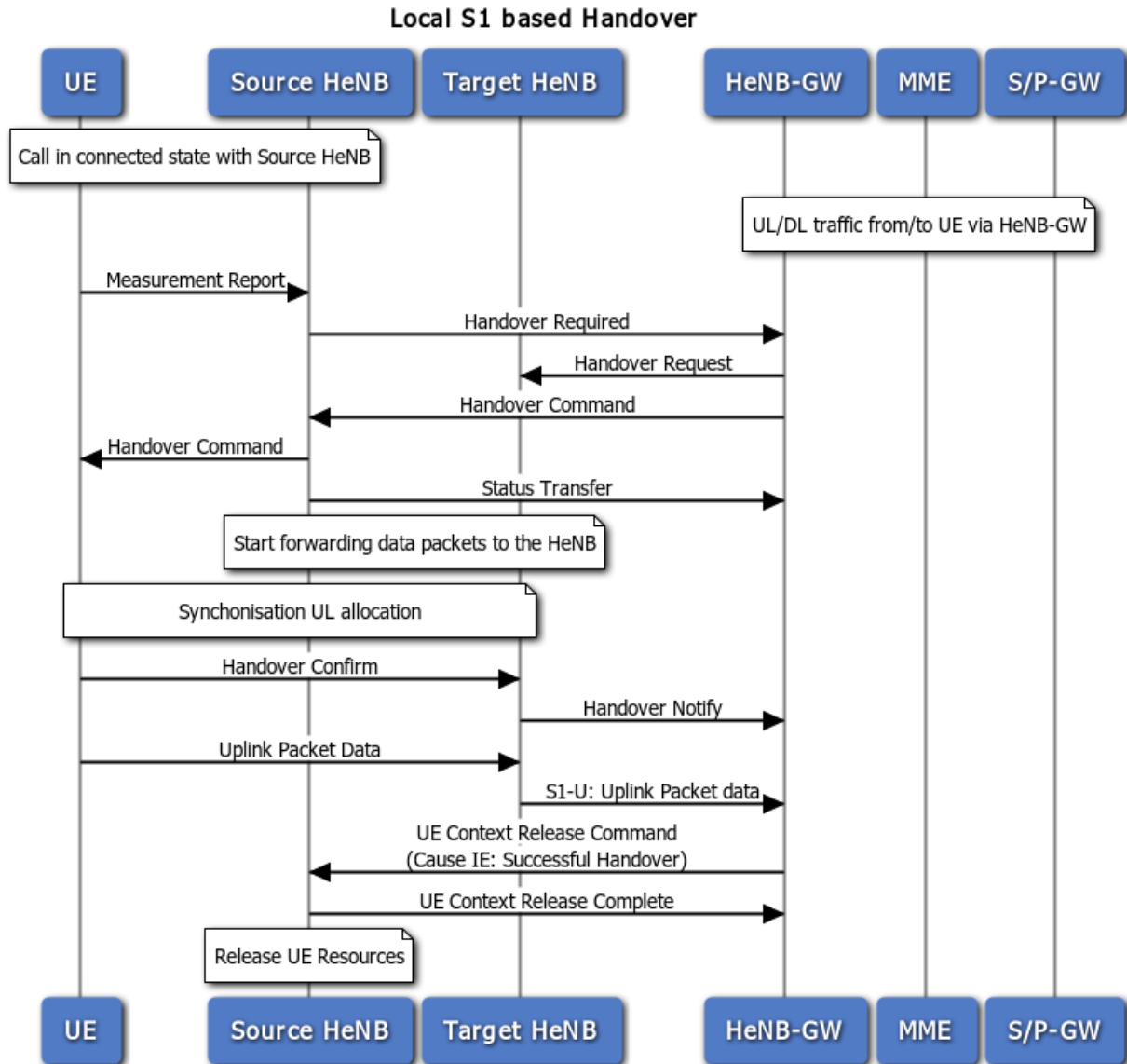


Figure 34: MOB/S1/02

7.3.21 CA/UE/01 – SCell addition - Success - Interband/Intraband

Interoperability Test Description			
Identifier	CA/UE/01		
Test Objective	SCell addition		
Configuration	<ul style="list-style-type: none"> CFG_eNB 		
References	<ul style="list-style-type: none"> 3GPP TS 36.300 [9] clause 19.2.2.8 3GPP TS 36.331 [10] clause 5.3.3 3GPP TS 36.413 [12] clause 9.1.8.4 3GPP TS 36.523 clause 8.2.2.3.2 		
Applicability			
Pre-test conditions	<ul style="list-style-type: none"> eNB / eNB-GW S1 connection established UE (IMSI) is provisioned in the HSS Cell 1 is the PCell, Cell3 is the SCell to be added. APN to connect to a web server and the default PDN are provisioned on the UE 		
Test Sequence	Step	Type	Description
	1	stimulus	Switch on UE
	2	verify	UE cell selection / RRC connection establishment towards HeNB
	3	verify	UE and EPC mutual authentication procedure
	4	verify	NAS Security establishment procedure between UE and EPC
	5	verify	UE capability enquiry procedure
	6	verify	Default EPS Bearer establishment procedure
	7	stimulus	The eNB transmits an RRCConnectionReconfiguration message containing an sCellToAddModList with SCell 3 addition.
	8	verify	UE transmit an RRCConnectionReconfigurationComplete message

SCell addition - Success - InterBand

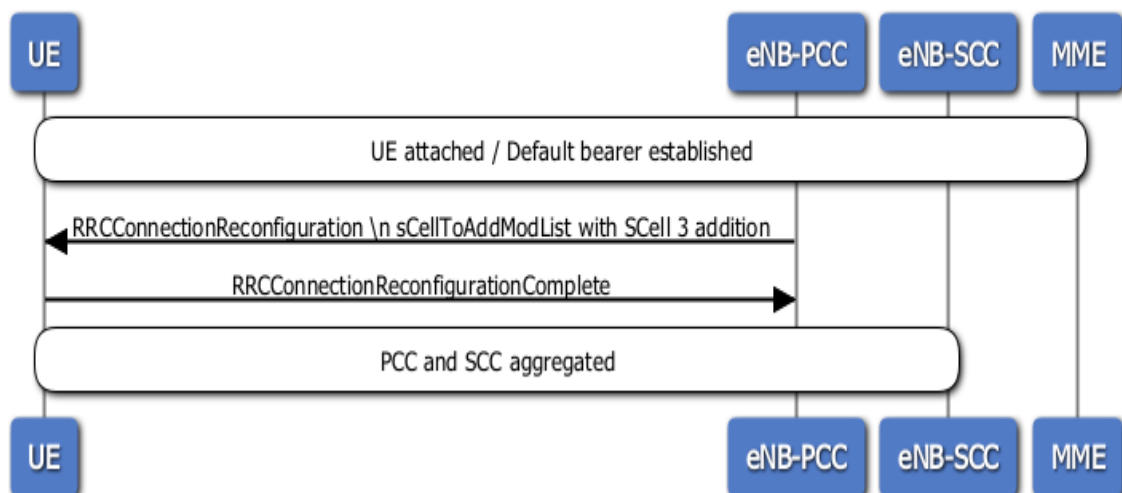


Figure 7.3.21

7.3.22 CA/UE/02 – Handover / SCell release

Interoperability Test Description			
Identifier	CA/UE/02		
Test Objective	To test handover and SCell release		
Configuration	<ul style="list-style-type: none"> CFG_eNB 		
References	<ul style="list-style-type: none"> 3GPP TS 36.300 [9] clause 19.2.2.8 3GPP TS 36.331 [10] clause 5.3.3 3GPP TS 36.413 [12] clause 9.1.8.4 3GPP TS 36.523 clause 8.2.4.18.1 		
Applicability			
Pre-test conditions	<ul style="list-style-type: none"> Cell 1 is PCell, Cell 2 is intra-frequency cell of PCell, and Cell 3 is SCell to be added eNB / eNB-GW S1 connection established UE (IMSI) is provisioned in the HSS APN to connect to a web server and the default PDN are provisioned on the UE The UE is in state Generic RB Established state 3 (defined in 3GPP TS 36.508 subclause 4.5.1) on Cell 1. 		
Test Sequence	Step	Type	Description
	1	stimulus	eNB transmits an <i>RRConnectionReconfiguration</i> message on Cell 1 to configure Cell 3 as a SCell. (refer to 3GPP TS 36.523-1 clause 8.2.4.18.1 for specific messages)
	2	verify	UE transmit an <i>RRConnectionReconfigurationComplete</i> message on cell 1.
	3	check	eNB setup intra-frequency measurement reporting for event A3 on Cell 1. (refer to 3GPP TS 36.523-1 clause 8.2.4.18.1 for specific messages)
	4	stimulus	Cell 1 = -85 Cell 2 = -79 Cell 3 = -97 (dBm/15kHz). The power level values are such that measurement results for Cell 1 (M1) and Cell 2 (M2) satisfy entry condition for event A3 (M2 > M1).
	5	verify	UE transmits a <i>MeasurementReport</i> message on Cell 1 to report event A3. (refer to 3GPP TS 36.523-1 clause 8.2.4.18.1 for specific messages)
	6	check	eNB transmits an <i>RRConnectionReconfiguration</i> message to perform intra-frequency handover and SCell release on Cell 1. (refer to 3GPP TS 36.523-1 clause 8.2.4.18.1 for specific messages)
	7	verify	UE transmit an <i>RRConnectionReconfigurationComplete</i> message on Cell 2

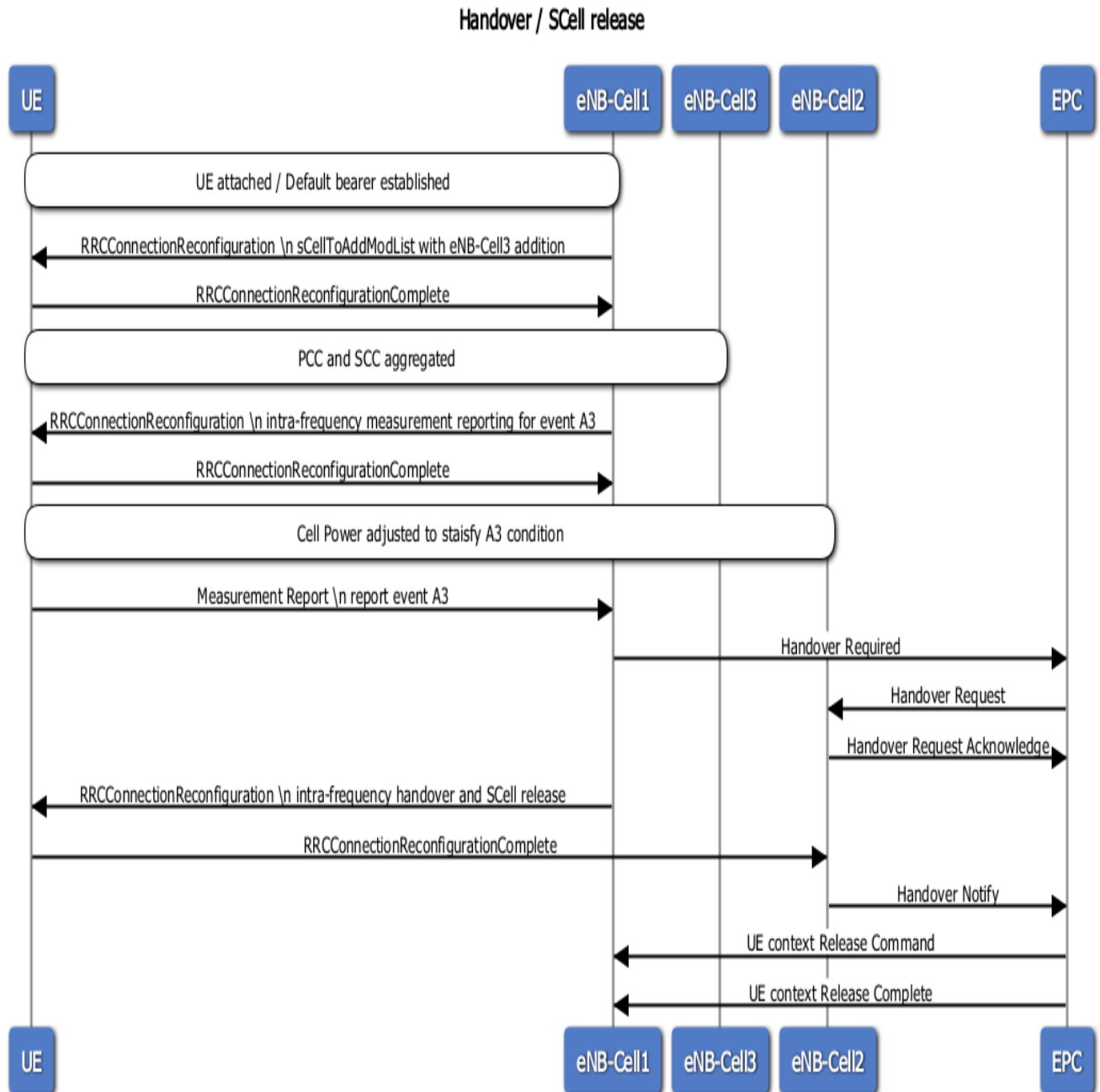


Figure 7.3.22

7.3.23 CA/UE/03 – Handover / SCell change

Interoperability Test Description			
Identifier	CA/UE/03		
Test Objective	To test handover and changing of pCell		
Configuration	<ul style="list-style-type: none"> CFG_eNB 		
References	<ul style="list-style-type: none"> 3GPP TS 36.300 [9] clause 19.2.2.8 3GPP TS 36.331 [10] clause 5.3.3 3GPP TS 36.413 [12] clause 9.1.8.4 3GPP TS 36.523 clause 8.2.4.20.1 		
Applicability			
Pre-test conditions	<ul style="list-style-type: none"> Cell 1 is the PCell, Cell 3 is the SCell to be added and Cell 12 is the intra-frequency neighbour cell of Cell 3 (Inactive) eNB / eNB-GW S1 connection established UE (IMSI) is provisioned in the HSS APN to connect to a web server and the default PDN are provisioned on the UE 		
Test Sequence	Step	Type	Description
	1	stimulus	Switch on UE
	2	verify	UE cell selection / RRC connection establishment towards HeNB
	3	verify	UE and EPC mutual authentication procedure
	4	verify	NAS Security establishment procedure between UE and EPC
	5	verify	UE capability enquiry procedure
	6	verify	Default EPS Bearer establishment procedure
	7	stimulus	eNB transmits an <i>RRConnectionReconfiguration</i> message on Cell 1 to configure Cell 3 as a SCell.(refer to 3GPP TS 36.523-1 clause 8.2.4.20.1 for specific messages)
	8	verify	UE transmit an <i>RRConnectionReconfigurationComplete</i> message on cell 1.
	9	check	eNB setup intra-frequency measurement reporting for event A6 on Cell 1. (refer to 3GPP TS 36.523-1 clause 8.2.4.20.1 for specific messages)
	10	stimulus	Cell 1 = -85 Cell 3 = -85 Cell 12 = -79 (dBm/15kHz). The power level values are such that measurement results for Cell 12 (M12) and Cell 3 (M3) satisfy entry condition for event A6.
	11	verify	UE transmits a <i>MeasurementReport</i> message on Cell 1 to report event A6. (refer to 3GPP TS 36.523-1 clause 8.2.4.20.1 for specific messages)
	12	check	eNB transmits an <i>RRConnectionReconfiguration</i> message to perform inter-frequency handover to Cell 12 with original SCell Cell 3 release and new SCell Cell1addition. (refer to 3GPP TS 36.523-1 clause 8.2.4.20.1 for specific messages)
	13	verify	UE transmit an <i>RRConnectionReconfigurationComplete</i> message on Cell 12.
	14	verify	UE performs Tracking Area Update Procedure

Handover / SCell Change

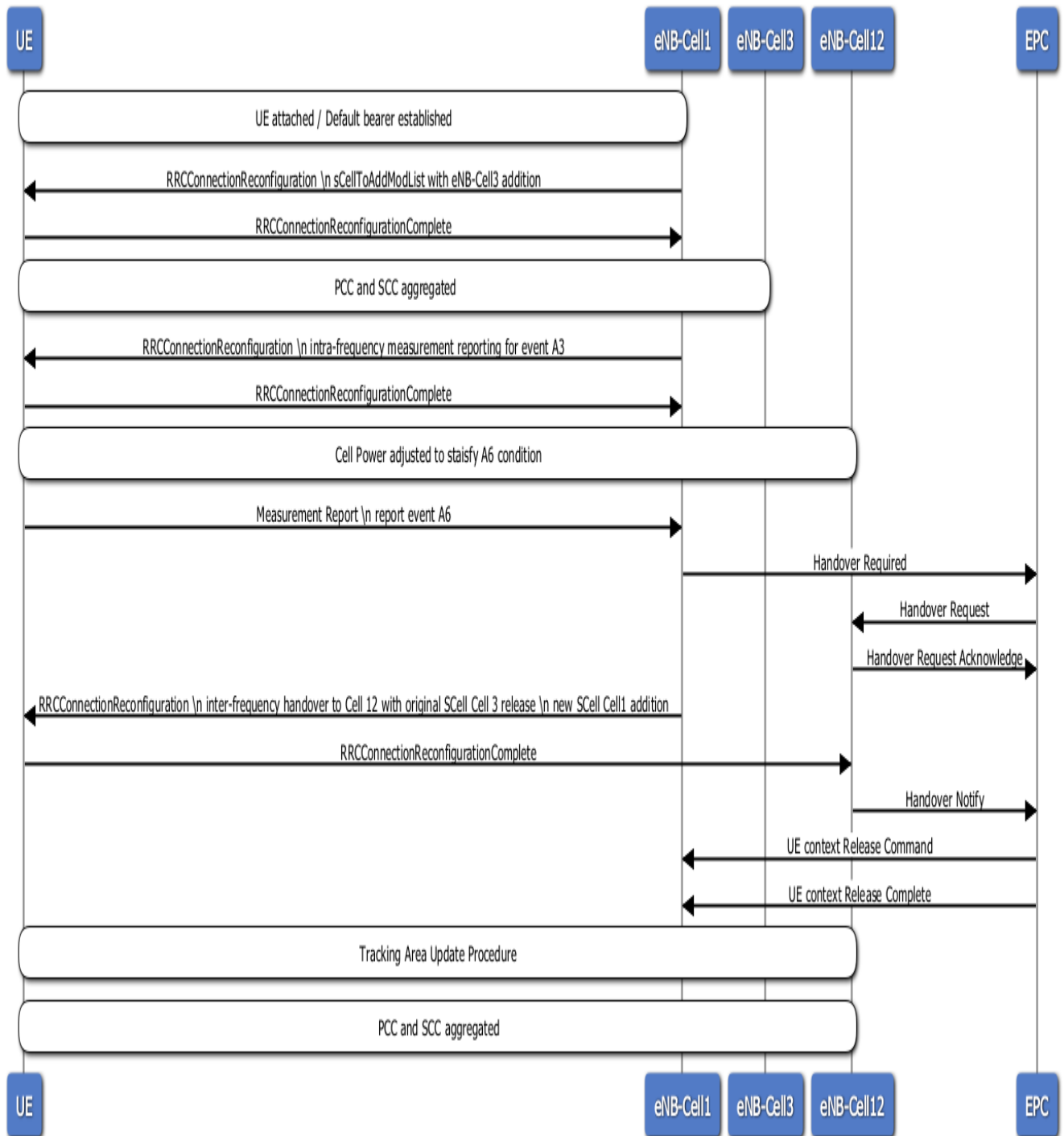


Figure 7.3.23

7.3.24 CSFB/01 – Call setup from E-UTRAN RRC_IDLE / CS fallback to UTRAN with redirection / MO call

Interoperability Test Description			
Identifier	CSFB/01		
Test Objective	To test when the user initiates a CS voice call, UE transmits an EXTENDED SERVICE REQUEST message with Service Type IE set to "mobile originating CS fallback". UE receives an RRCConnectionRelease message with redirection to a UMTS cell which belongs to the LA allocated to the UE during the previous registration procedure in E-UTRAN then UE establishes a connection to the designated UMTS cell, performs a RA update procedure and establishes a CS call.		
Configuration	<ul style="list-style-type: none"> CFG_eNB / CFG_HeNB 		
References	<ul style="list-style-type: none"> 3GPP TS 24.301 subclauses 5.6.1.1. 3GPP TS 24.008, subclause 4.5.1.1. 3GPP TS 36.523 subclause 13.1.2. 		
Applicability			
Pre-test conditions	<ul style="list-style-type: none"> Cell 1 is EUTRA and Cell 5 is UTRA (NMO-1). eNB / eNB-GW S1 connection established UE (IMSI) is provisioned in the HSS APN to connect to a web server and the default PDN are provisioned on the UE the UE is in state Registered, Idle Mode (state 2 defined in 3GPP TS 36.508 subclause 4.5.1) on Cell 1. Cell1 = -75(dBm/15kHz) and Cell5 CPICH_Ec = 70 (dBm/3.84 MHz), P-CCPCH=-72(dBm/1.28 MHz). 		
Test Sequence	Step	Type	Description
	1	Check	A CS call is initiated.
	2	Verify	The UE transmits an <i>RRCConnectionRequest</i> message.
	3	Check	The eNB transmits an <i>RRCConnectionSetup</i> message
	4	Verify	Does the UE transmit an EXTENDED SERVICE REQUEST message?
	5	Check	The eNB transmits an <i>RRCConnectionRelease</i> message indicating redirection to cell 5
	6	Verify	The UE transmits an RRC CONNECTION REQUEST with an establishment cause indicating ' Originating Conversational Call '.
	7	stimulus	CFG_eNB adjusts cell levels Cell 1 =-110(dBm/15kHz) and Cell 5 remains the same.
	8	Check	Call should be completed as per the generic test procedure in TS 36.508 subclause 6.4.3.7.2(steps 2 to 19).

Call setup from E-UTRAN RRC_IDLE / CS fallback to UTRAN with redirection / MO call

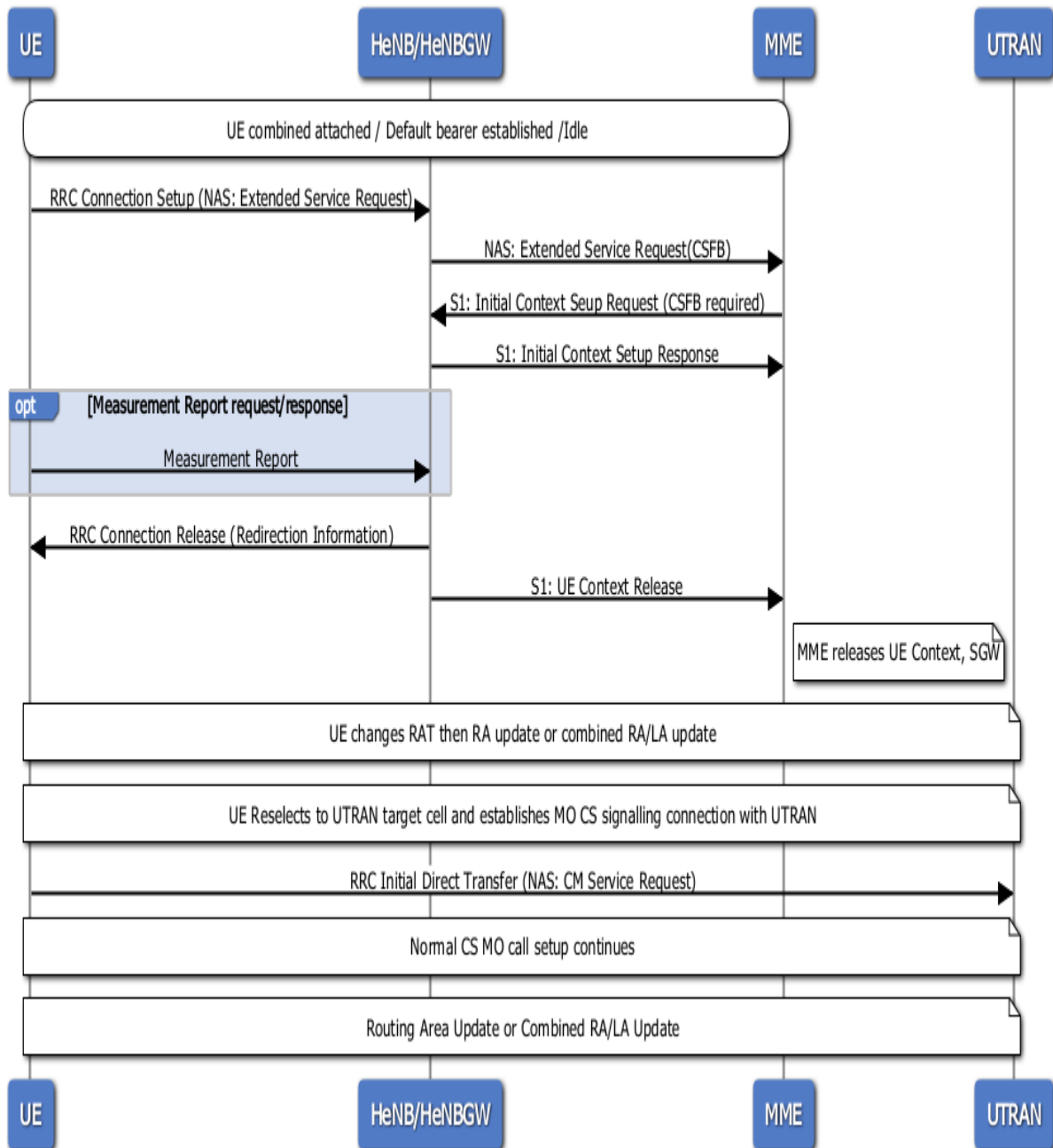


Figure 7.3.24

7.3.25 CSFB/02 – Call setup from E-UTRA RRC_IDLE / CS fallback to GSM with CCO without NACC / MO call

Interoperability Test Description			
Identifier	CSFB/02		
Test Objective	To test when the user initiates a CS voice call, UE receives a <i>MobilityFromEUTRACommand</i> message including a <i>cs-FallbackIndicator</i> set to 'true', a <i>targetRAT-Type</i> set to 'geran' and purpose set to 'cellChangeOrder' and no 'networkControlOrder' then UE acquires networkControlOrder and establishes the connection to the target cell indicated in the <i>CellChangeOrder</i>		
Configuration	<ul style="list-style-type: none"> CFG_eNB / CFG_HeNB 		
References	<ul style="list-style-type: none"> 3GPP TS 23.272, subclauses 6.4 and 6.3, 3GPP TS 36.331, subclause 5.4.3.3, 5.3.9.2, 5.3.12 and B.1 3GPP TS 36.523 subclause 13.1.9. 		
Applicability			
Pre-test conditions	<ul style="list-style-type: none"> Cell 1 is EUTRA and Cell 24 is GERAN. eNB / eNB-GW S1 connection established UE (IMSI) is provisioned in the HSS APN to connect to a web server and the default PDN are provisioned on the UE the UE is in state Registered, Idle Mode (state 2 defined in 3GPP TS 36.508 subclause 4.5.1) on Cell 1. Cell1 = -85(dBm/15kHz) and Cell24 will be Suitable Neighbour Cell. 		
Test Sequence	Step	Type	Description
	1	Check	A CS call is initiated.
	2	Verify	Generic test procedure 'UE triggered CS call' as described in 3GPP TS 36.508, subclause 6.4.3.5.
	3	Check	eNB transmits a <i>MobilityFromEUTRACommand</i> message on Cell 1 including a <i>cs-FallbackIndicator</i> set to 'true', a <i>targetRAT-Type</i> set to 'geran', <i>purpose</i> set to 'cellChangeOrder' and no 'networkControlOrder'
	4	stimulus	CFG_eNB changes cell 1 power level to -115 dBm/15kHz
	5	Verify	Call should be completed as per the generic test procedure in TS 36.508 subclause 6.4.3.8.2(steps 2 to 32)

Call setup from E-UTRA RRC_IDLE / CS fallback to GSM with CCO without NACC / MO call

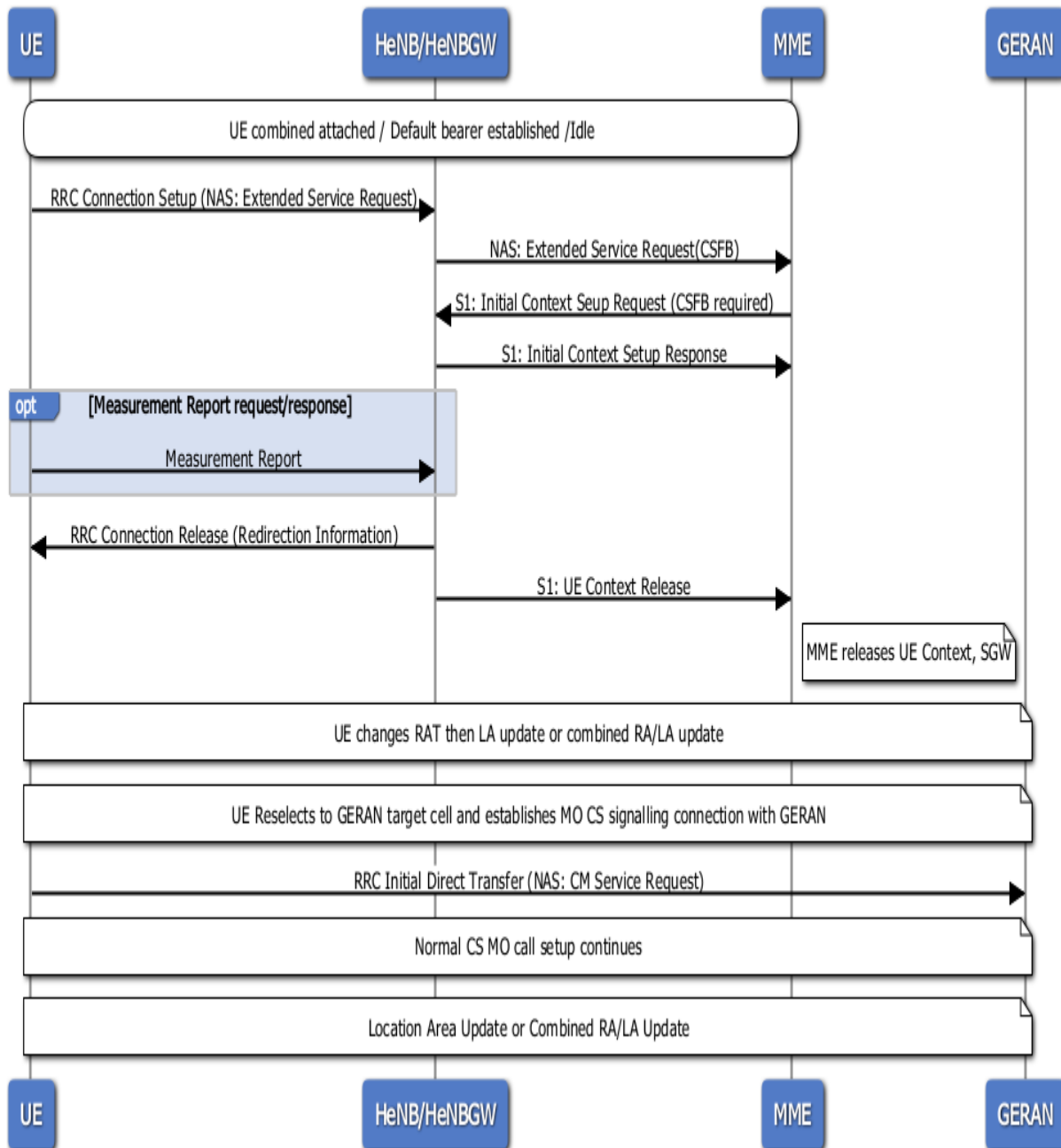


Figure 7.3.25

Annex A (informative): Standardized QCI characteristics

Default bearers are of type non-guaranteed bit rate (non-GBR). For services that do not require IMS, the QoS parameter stems from the HSS configuration. For example Internet access will use a priority with QCI 9 (see Table below) . For services based on IMS, there is a link between the Application Server and the PCRF (which manages the QoS and billing policy.) Through this link, and the configuration associated with the requested service, the LTE network can establish the necessary dedicated bearers with the appropriate QoS (QCI value). The Default Bearer is obtained during the attach process, and ensures continuous IP connectivity.

Dedicated bearers are obtained on demand, when it is required to carry GBR for certain delay-sensitive services, such as voice or video. The same dedicated bearer is used in case of multiple concurrent voice sessions (as in call waiting, conference supplementary services, etc...).

In a IMS session, four bearers are used:

- Bearer with QCI9: Default bearer created when connecting to the network.
- Bearer with QCI5: Bearer created for IMS signalling (SIP messages) as soon as the connection to the IMS APN is established.
- Bearer with QCI1: This bearer is created once the voice session has been successfully initiated, to ensure audio transport (RTP messages)
- Bearer with QCI2: This bearer is created once the video session has been successfully initiated, to ensure video and audio transport (RTP messages)

Annex B (informative): Mapping of test description identifiers

The interoperability test descriptions for regression testing in clause 7.2 of the present document have been derived from a test specification previously produced by the Small Cell Forum. To allow for a consistent naming of the test description identifiers the original identifiers have been changed. The table below shows the mapping between the Small Cell Forum test description identifiers and the ones used in the present document.

Table 16: Test description identifier mapping

Test description identifier in present document/clause number		Small Cell Forum identifier
REG/ENB/01	clause 7.2.1	FIC/ENB/01
REG/ENB/02	clause 7.2.2	FIC/ENB/02
REG/HENB/01	clause 7.2.3	FIC/HENB/01
REG/HENB/02	clause 7.2.4	FIC/HENB/02
REG/HENB/03	clause 7.2.5	FIC/HENB/03
REG/HENB/04	clause 7.2.6	FIC/HENB/03a
REG/HENB/05	clause 7.2.7	FIC/HENB/04
REG/UE/01	clause 7.2.8	FIC/UE/01
REG/UE/02	clause 7.2.9	FIC/UE/02
REG/UE/03	clause 7.2.10	FIC/UE/03
PS/01	clause 7.2.11	SVC/LTEPS/01
PS/03	clause 7.2.12	SVC/PS/03
PS/04	clause 7.2.13	SVC/PS/03a
PS/05	clause 7.2.14	SVC/PS/04
PS/06	clause 7.2.15	SVC/PS/06
CMAS/01	clause 7.2.16	PWS/CMAS/01
CMAS/02	clause 7.2.17	PWS/CMAS/02
CMAS/03	clause 7.2.18	PWS/CMAS/03
CMAS/04	clause 7.2.19	PWS/CMAS/04
LIPA/01	clause 7.3.1	FIC/LIPA/01
CSG/01	clause 7.3.2	FIC/CSG/01
CSG/02	clause 7.3.3	FIC/CSG/02
CSG/03	clause 7.3.4	FIC/CSG/03
CSG/04	clause 7.3.5	FIC/CSG/04
CSG/05	clause 7.3.6	FIC/CSG/05
IMS/01	clause 7.3.7	FIC/IMS/01
IMS/02	clause 7.3.8	FIC/IMS/02
IMS/03	clause 7.3.9	FIC/IMS/03
IMS/04	clause 7.3.10	FIC/IMS/04
IMS/05	clause 7.3.11	FIC/IMS/05
IMS/06	clause 7.3.12	FIC/IMS/06
IMS/07	clause 7.3.13	FIC/IMS/07
IMS/08	clause 7.3.14	FIC/IMS/08
MOB/X2/01	clause 7.3.15	FIC/X2/01
MOB/X2/02	clause 7.3.16	FIC/X2/02
MOB/X2/03	clause 7.3.17	FIC/X2/03
MOB/X2/04	clause 7.3.18	FIC/X2/04
MOB/S1/01	clause 7.3.19	FIC/S1/01
MOB/S1/02	clause 7.3.20	FIC/S1/02
CA/UE/01	clause 7.3.21	FIC/CA/01
CA/UE/02	clause 7.3.22	FIC/CA/02
CA/UE/03	clause 7.3.23	FIC/CA/03
eICIC/01	clause 7.3.24	FIC/eICIC/01

History

Document history		
		‘SCTP Association / S1 Interface Setup / Successful Operation’ split in two new tests 1) eNB Registration with MME 2) HeNB Registration with HeNB-GW MSCs corrected and text corrected
		‘SCTP Association / S1 Interface Setup / Failure without reattempt’ split in two new tests 1) eNB Registration with MME – Failure without reattempt 2) HeNB Registration with HeNB-GW – Failure without reattempt MSCs corrected and text corrected
		REG/UELTE/01 updated with (H)eNB and HeNB-GW MSC
		LIPA test added
		SCTP Association / S1 Interface Setup / Failure with reattempt’ split in two new tests 1) eNB Registration with MME – Failure with reattempt 2) HeNB Registration with HeNB-GW – Failure with reattempt MSCs corrected and text corrected
		Created REG/UE/01 - UE Registration and REG/UE/02 - UE De-Registration (formerly REG/S1/01)
	v0.0.4	SVC/PS/01 – Paging deleted because it is covered by SVC/PS/03 - Network initiated ERAB setup - GBR
20 and 23/03/2015	V07 PS	Style and References clean-up
30/03/2015	V08	Comment resolution, REG/HENB group modified
01/04/2015	V09	Some resolutions after conf call of 31/03
01/04/2015	V10	Work on REG/HENB and further cleanup
07/04/2015	V11	X2 modified, S1 handover added, IFS added to <i>applicability</i> field, move regression tests to the top
10/04/2015	V12	Collecting feedback from plugfest participants
14/04/2015	V13	Comments from Plugtest Conf Call #1 included SVC/PS/02 and 05 removed REG/HENB/03 clarified
14/04/2015	V14	SVC/PS/03a added
15/04/2015	V15	Annex A Standardized QCI characteristics added QCI values added in tests
04-06/2015	V16-17	Intermediate versions

03-06/06/2015	V18	FIC/ -> REG/ FIC/HENB/03a->04 FIC/HENB/04->05 SVC/PS/03a ->04 SVC/PS/04->05 PWS/CMAS -> CMAS SVC/PS -> PS MOB/PS -> MOB/S1 Complete cleanup and comment resolution
09/06/2015	V19	Included Silvia's e-mail comments
01/07/2015	V20	corrected a cross –reference to a bookmark in LIPA test deleted CA test replaced config drawings of type unknown with VSDX files