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**ETSI IMS Plugtest 2**  
**November 10-14 2008, Bled, Slovenia**  
**Final Test Report**

|                                             |            |                                                                                                              |
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## 1 Summary

This report presents the results of ETSI IMS interoperability event 2 held in Bled, Slovenia from November 10<sup>th</sup> to 14<sup>th</sup> 2008 at Hotel Golf. The Plugtests assessed the interoperability as well as conformance of IMS core networks (composed of P/I/S-CSCF, IBCF, AS, DNS and HSS) which are implemented on the basis of ETSI ES 283 003 (V1.8.0) [3GPP TS 24.229 Release 7 (Version 7.2.0), modified]. The tests executed at the event were related to basic IMS call functionality, messaging and roaming and were taken from the ETSI IMS NNI interoperability test specification ETSI TS 186 011-2 Version 2.1.8<sup>1</sup>.

It is important to remember that the main goal of this IMS plugtest has been to *assess the base specification* of IMS core networks, i.e., not the quality of IMS core network implementations. Therefore, the results are presented in this report purely from a test specification point of view, i.e., they are not related to the participating IMS vendors.

Six IMS core network vendors participated at this event. During the event 410 of 1110 potential tests were executed. Overall results show a very high level of interoperability (82%) of IMS core networks but a lower level of overall conformance to the 3GPP base standard (51 %) in the tests executed. Also note that 29% of all potential tests could not be executed due to issues outside of the IMS core networks, e.g., issues with remote connections and clarity of event configuration information, as well as lack of the support for a feature by a participating IMS core network.

The main interoperability issues encountered were related to call hold/resume functionality, roaming scenarios for basic call and the use of AS in roaming scenarios. Most issues encountered in conformance assessment were related to handling of header tokenization for topology hiding, handling of roaming scenarios (with and without AS involvement), as well as use of P-Charging-Vector and P-Asserted-Identity headers in various SIP requests and responses.

For more detailed results the reader should check the remainder of this document.

## 2 Event Organization

In the event participating vendors had their IMS network either locally installed in a private room in Bled, i.e., with access restricted to the IMS network vendor only, or remotely connected via a VPN connection. One vendor provided a simulated IMS

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<sup>1</sup> Note that the initial basis for the tests was the version 2.0.0 of this document. Before and during the event a number of errors were found and corrected in the document leading to versions up to 2.1.8. Version 2.1.8 was used as the basis for conformance analysis. Note that this version will be submitted to ETSI INT for approval and eventual publishing. In addition, the revision of the published version may differ from the current working version.

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network, i.e. a “black box” that represented emulations of all IMS components to the connected peer IMS networks.

DNS equipment was provided by vendors and also located with the IMS network installation. User equipment selected to drive core network interoperability tests was the TISPAN OpenIC client by Fraunhofer Focus. Commercial clients by RADVISION and Smith Micro Software participated at the event in ad-hoc testing sessions. Application servers were provided by most vendors, either locally or remotely.

Tests, i.e., the test sequence part of Test Descriptions specified in the test specification, were executed in match sessions from the public room, i.e., with presence of match session chairs appointed by ETSI, IMS network vendors and operators. For each test executed, a member of the IMS network vendor team operated user equipment connected to their IMS network based on instructions from a test session chair. During each test, IMS network traffic at Gm and Mw, ISC and Ic interfaces was captured and saved by the test session chair. Due to limitations by the event test network it was not possible to capture remote Mw/IC interfaces and local Gm interfaces at the same time. Also remote ISC interfaces could not be traced.

During the first 1.5 h each test session 37 tests were attempted to be executed from one IMS network vendor playing the role of IMS\_A to the another IMS network vendor playing the role of IMS\_B. In the next 1.5h the roles were reversed and all 37 tests were again attempted to be executed. Note that during the first 3 hours of the test session no conformance analysis was performed. Only interoperability results were recorded in a Test Session Report based on mutual agreement of all involved parties. Two Test Session Reports were filled in during each test session.

After 3 hours into the test session all test execution was stopped and a selected number of tests (as many as possible) were reviewed for conformance for one hour during test session wrap-up. Conformance verdicts were assigned for each reviewed test. The remaining tests (which could not be analyzed due to time limitations) were reviewed and assigned verdicts by ETSI representatives. The final Test Session Reports with all interoperability results and conformance verdicts were handed out to IMS vendors a first review and approved at the end of the event. Note that at this point there has not been any final agreement by IMS network vendors to the final results.

Since the test specification only assessed SIP messaging it was agreed to not check bi-directional voice as part of interoperability test results. Also 6 tests from the test specification ETSI TS 186 011-2 were not taken into account since they either required functionality not part of the event test configuration, i.e. forced loss of connectivity of a UE, or were not supported by the user equipment used in the event, i.e. call hold and resume using the UPDATE method.

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### 3 Overall Results

Table 1, Figure 1, and Figure 2 summarize interoperability as well as conformance results collected over all test sessions performed during this event.

For interoperability results there are four possible observations: “OK”, “not OK”, “Not Applicable” or “Out Of Time”. Whereas the first two results are self-explanatory, the “Not Applicable” result has been given in case the test could not be performed due to limitations of the event setup or by one of the IMS core networks participating in a test, e.g., missing support for registration of a roaming user. The “Out Of Time” result was given for all tests not executed due to lack of time in each three hour test session.

For conformance results there are three possible verdicts: “Pass”, “Fail”, “Inconclusive”. Here, the “Pass” verdict has been given in cases that the analysis of the test execution trace show that both the IMS core networks participating in a test fulfilled all of the verdict criteria specified in the test specification for that test. The “Fail” verdict has been given in cases that the analysis of the test execution trace show that one of the IMS core networks participating in a test violated one or more of the verdict criteria specified in the test specification for that test. The “Inconclusive” verdict was assigned in cases where some non-conformant condition had been observed which was either not part of the verdict criteria, e.g., the test never got to through its preamble, or could not be contributed to the participating IMS core networks, e.g., the user equipment failed to send a large message to the originating network although it had been asked to do so. So in both latter cases the verdict criteria can not be checked – therefore the test is assigned an “Inconclusive” verdict.

**Table 1. Overall interoperability and conformance event results**

|                                                              |                                                                                                                                                    |
|--------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Specification under test</b>                              | <b>ETSI ES 283 003 (V1.8.0), [3GPP TS 24.229 Release 7 (Version 7.2.0), modified]</b>                                                              |
| <b>Test Specification used</b>                               | <b>ETSI 186 011-2 2.1.8<sup>2</sup></b>                                                                                                            |
| <b>Number of potential Test Descriptions in the Plugtest</b> | <b>37 of 43 (TDs not tested were TD_IMS_0019, TD_IMS_0020, TD_IMS_0026, TD_IMS_0027 (UPDATE), TD_IMS_0021, TD_IMS_0023 (Loss of connectivity))</b> |
| <b>Number of participating IMS core network vendors</b>      | <b>6</b>                                                                                                                                           |
| <b>Number of test sessions</b>                               | <b>30</b>                                                                                                                                          |
| <b>Number of tests executed</b>                              | <b>410 of 1110</b>                                                                                                                                 |
| <b>Average number of tests executed per session</b>          | <b>14 of 37</b>                                                                                                                                    |

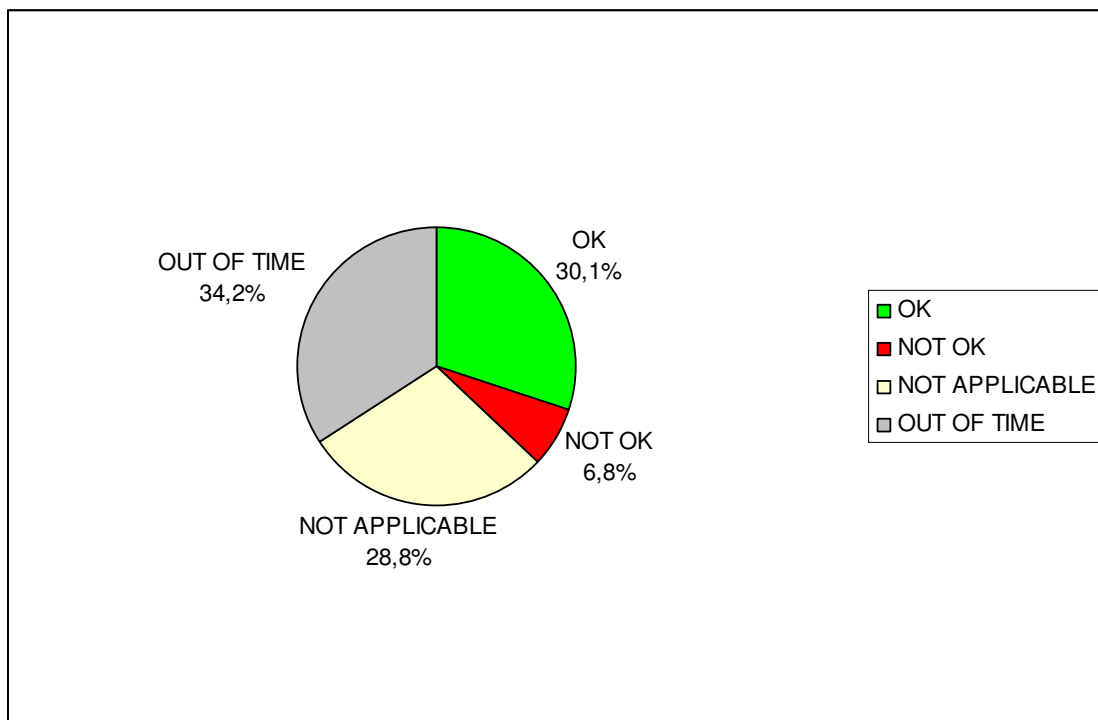
<sup>2</sup> See footnote 1

|                                             |            |                                                                                                              |
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| Interoperability testing                                       |       |
|----------------------------------------------------------------|-------|
| Overall percentage of IOP OK                                   | 81.5% |
| Overall percentage of IOP not OK                               | 18.5% |
| Overall percentage of IOP Not Applicable (over total possible) | 28.8% |
| Overall percentage of IOP Out Of Time (over total possible)    | 34.2% |
| Conformance testing                                            |       |
| Overall percentage of Pass Verdicts                            | 51.2% |
| Overall percentage of Fail Verdicts                            | 36.6% |
| Overall percentage of Inconclusive Verdicts                    | 12.2% |

Note that the numbers for overall interoperability in Table 1 exclude tests with “Not OK” results for which the verdict was found to be inconclusive, i.e., failed due to reasons beyond the IMS core networks. Also percentages for “OK” and “not OK” or “Pass”, “Fail” and “Inconclusive” are computed based on the total *executed* tests, whereas the percentage of “Not Applicable” and “Out Of Time” are based on the total of all *potential* tests. Where the number of “Out Of Time” seems to appear relatively high, it has to be noted, that the test scenarios in this second IMS Plugtest were of significantly higher complexity than during the earlier event in 2007. Therefore execution and interoperability analysis of the individual test scenarios were more time consuming.

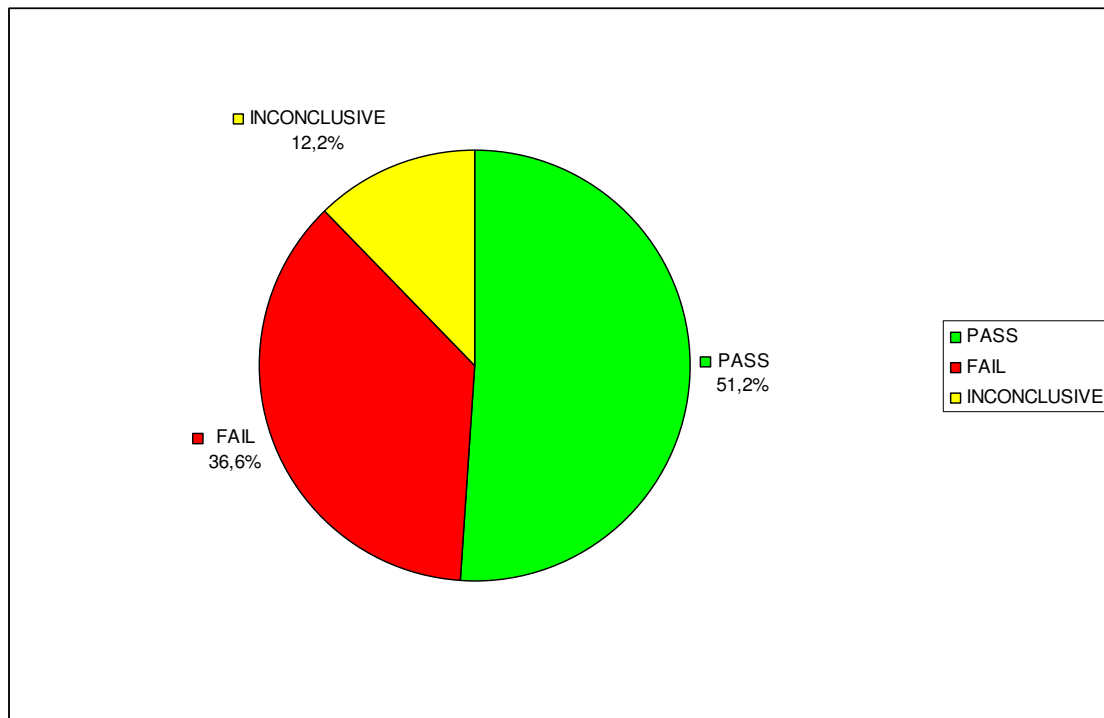
|                                             |            |                                                                                     |
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**Figure 1. Pie chart of overall interoperability figures**

Note that in Figure 2 “Pass”, “Fail”, and “Inconclusive” percentages are based on the number of all executed tests.

|                                             |            |                                                                                                              |
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**Figure 2. Pie chart of conformance figures**

### 3 More Detailed Interoperability Results

This section presents the overall interoperability results based on the executed Test Description identifier from ETSI TS 186 011-2. The column “Runs” refers to the total number of executions during the entire event. Table 2 shows interoperability results in percentages and Table 3 in number of test execution runs. Note again that the percentages in Table 2 for “OK” and “not OK” are computed based on the total *executed* tests, whereas the percentage of “Not Applicable” and “Out Of Time” are based on the total of all *potential* tests.

Tables 4 and 5 show the same figures summarized for each test group to enable a faster understanding on to where the most issues still occur.

A first analysis shows that the tests for ISC based supplementary services Call Hold and OIP/OIR (TD\_IMS\_0037, TD\_IMS\_0041) have had the most interoperability issues. It should be noted that tests related to topology hiding (TD\_IMS\_0003H, TD\_IMS\_0008, TD\_IMS\_0028, TD\_IMS\_0029, TD\_IMS\_0030, TD\_IMS\_0004H) have not been executed often and therefore cannot be considered to give a realistic picture on the status of topology hiding.

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**Table 2. Interoperability Results per Test Description in percent**

| Test Id     | Summary                                                                                             | Runs | OK     | NOT   | NA    | OoT   |
|-------------|-----------------------------------------------------------------------------------------------------|------|--------|-------|-------|-------|
| TD_IMS_0002 | First time registration in a visited IMS network                                                    | 20   | 85,0%  | 15,0% | 26,7% | 6,7%  |
| TD_IMS_0004 | IMS network sends 403 response from a different trust domain without topology hiding                | 16   | 100,0% | 0,0%  | 26,7% | 20,0% |
| TD_IMS_0006 | IMS network can initiate user de-registration                                                       | 17   | 70,6%  | 29,4% | 26,7% | 16,7% |
| TD_IMS_0003 | IMS network chooses a second entry point without topology hiding.                                   | 10   | 80,0%  | 20,0% | 40,0% | 26,7% |
| TD_IMS_0005 | IMS network supports network initiated re-registration                                              | 7    | 85,7%  | 14,3% | 33,3% | 43,3% |
| TD_IMS_0007 | IMS network can initiate user re-authentication                                                     | 0    | 0,0%   | 0,0%  | 43,3% | 56,7% |
| TD_IMS_0034 | IMS network handles messaging while roaming                                                         | 14   | 57,1%  | 42,9% | 26,7% | 26,7% |
| TD_IMS_0031 | IMS network handles messaging with SIP identity without topology hiding                             | 25   | 80,0%  | 20,0% | 3,3%  | 13,3% |
| TD_IMS_0035 | IMS network handles messaging when receiving user is not registered                                 | 20   | 95,0%  | 5,0%  | 13,3% | 20,0% |
| TD_IMS_0036 | IMS network handles messaging when receiving user has been barred                                   | 16   | 100,0% | 0,0%  | 30,0% | 16,7% |
| TD_IMS_0001 | IMS network shall support SIP messages greater than 1500 bytes                                      | 6    | 83,3%  | 16,7% | 20,0% | 60,0% |
| TD_IMS_0011 | IMS network does not establish call to barred user                                                  | 16   | 100,0% | 0,0%  | 26,7% | 20,0% |
| TD_IMS_0012 | IMS network rejects call to non existing user                                                       | 21   | 90,5%  | 9,5%  | 6,7%  | 23,3% |
| TD_IMS_0013 | IMS network does not establish a call for unavailable user                                          | 19   | 100,0% | 0,0%  | 10,0% | 26,7% |
| TD_IMS_0014 | IMS network can handle call to non-registered user and unreachable AS                               | 15   | 100,0% | 0,0%  | 23,3% | 26,7% |
| TD_IMS_0022 | IMS network handles calling user canceling call before its establishment                            | 23   | 87,0%  | 13,0% | 3,3%  | 20,0% |
| TD_IMS_0024 | IMS network ends call in case calling UE is forcefully de-registered in IMS network                 | 19   | 84,2%  | 15,8% | 10,0% | 26,7% |
| TD_IMS_0015 | IMS network handles call while UE_B is roaming without topology hiding                              | 13   | 46,2%  | 53,8% | 36,7% | 20,0% |
| TD_IMS_0017 | IMS network handles routing information received from the UE before forwarding them                 | 13   | 69,2%  | 30,8% | 36,7% | 20,0% |
| TD_IMS_0009 | IMS network can establish dialogs for users with default SIP URIs and resolve Tel URI E.164 numbers | 18   | 83,3%  | 16,7% | 16,7% | 23,3% |
| TD_IMS_0010 | IMS network can handle establishment of dialogs for users with default TEL URIs                     | 8    | 100,0% | 0,0%  | 50,0% | 23,3% |
| TD_IMS_0032 | IMS network handles messaging with TEL URI identities                                               | 7    | 100,0% | 0,0%  | 50,0% | 26,7% |
| TD_IMS_0033 | IMS network handles messaging with DNS/ENUM lookup                                                  | 11   | 100,0% | 0,0%  | 40,0% | 23,3% |
| TD_IMS_0037 | IMS network supports ISC based on HOLD                                                              | 9    | 33,3%  | 66,7% | 36,7% | 33,3% |

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|--------------|-------------------------------------------------------------------------------------------------------------------|----|--------|--------|-------|-------|
| TD_IMS_0038  | IMS network supports ISC based on OIP                                                                             | 8  | 75,0%  | 25,0%  | 36,7% | 36,7% |
| TD_IMS_0039  | IMS network supports ISC based on OIR/ACR                                                                         | 7  | 57,1%  | 42,9%  | 50,0% | 26,7% |
| TD_IMS_0040  | IMS network supports ISC based on CFU                                                                             | 8  | 62,5%  | 37,5%  | 43,3% | 30,0% |
| TD_IMS_0041  | IMS network supports ISC based on OIP/OIR                                                                         | 6  | 33,3%  | 66,7%  | 53,3% | 26,7% |
| TD_IMS_0025  | IMS network handles user initiated call hold when home caller puts another home user on hold and resumes call     | 15 | 73,3%  | 26,7%  | 0,0%  | 50,0% |
| TD_IMS_0016  | IMS network handles user initiated call hold when home caller puts roaming user on hold and resumes call          | 7  | 71,4%  | 28,6%  | 23,3% | 53,3% |
| TD_IMS_0018  | IMS network handles user initiated call hold when roaming caller puts a home user on hold and resumes call        | 7  | 57,1%  | 42,9%  | 23,3% | 53,3% |
| TD_IMS_0003H | IMS network chooses a second entry point with topology hiding.                                                    | 1  | 100,0% | 0,0%   | 46,7% | 50,0% |
| TD_IMS_0008  | First time registration via a visited IMS network with topology hiding                                            | 2  | 100,0% | 0,0%   | 43,3% | 50,0% |
| TD_IMS_0028  | IMS network handles basic call with topology hiding correctly                                                     | 3  | 33,3%  | 66,7%  | 20,0% | 70,0% |
| TD_IMS_0029  | IMS network handles calling user canceling call correctly before its establishment with topology hiding           | 1  | 100,0% | 0,0%   | 23,3% | 73,3% |
| TD_IMS_0030  | IMS network handles user initiated call hold when a home caller puts a roaming user on hold and resumes call with | 1  | 100,0% | 0,0%   | 23,3% | 73,3% |
| TD_IMS_0004H | IMS network sends 403 response from a different trust domain with topology hiding                                 | 1  | 0,0%   | 100,0% | 43,3% | 53,3% |

|                                             |            |                                                                                                              |
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**Table 3. Interoperability Results per Test Description in number of test executions**

| Test Id     | Summary                                                                                             | Runs | OK | NOT | NA | OoT |
|-------------|-----------------------------------------------------------------------------------------------------|------|----|-----|----|-----|
| TD_IMS_0002 | First time registration in a visited IMS network                                                    | 20   | 17 | 3   | 8  | 2   |
| TD_IMS_0004 | IMS network sends 403 response from a different trust domain without topology hiding                | 16   | 16 | 0   | 8  | 6   |
| TD_IMS_0006 | IMS network can initiate user de-registration                                                       | 17   | 12 | 5   | 8  | 5   |
| TD_IMS_0003 | IMS network chooses a second entry point without topology hiding.                                   | 10   | 8  | 2   | 12 | 8   |
| TD_IMS_0005 | IMS network supports network initiated re-registration                                              | 7    | 6  | 1   | 10 | 13  |
| TD_IMS_0007 | IMS network can initiate user re-authentication                                                     | 0    | 0  | 0   | 13 | 17  |
| TD_IMS_0034 | IMS network handles messaging while roaming                                                         | 14   | 8  | 6   | 8  | 8   |
| TD_IMS_0031 | IMS network handles messaging with SIP identity without topology hiding                             | 25   | 20 | 5   | 1  | 4   |
| TD_IMS_0035 | IMS network handles messaging when receiving user is not registered                                 | 20   | 19 | 1   | 4  | 6   |
| TD_IMS_0036 | IMS network handles messaging when receiving user has been barred                                   | 16   | 16 | 0   | 9  | 5   |
| TD_IMS_0001 | IMS network shall support SIP messages greater than 1500 bytes                                      | 6    | 5  | 1   | 6  | 18  |
| TD_IMS_0011 | IMS network does not establish call to barred user                                                  | 16   | 16 | 0   | 8  | 6   |
| TD_IMS_0012 | IMS network rejects call to non existing user                                                       | 21   | 19 | 2   | 2  | 7   |
| TD_IMS_0013 | IMS network does not establish a call for unavailable user                                          | 19   | 19 | 0   | 3  | 8   |
| TD_IMS_0014 | IMS network can handle call to non-registered user and unreachable AS                               | 15   | 15 | 0   | 7  | 8   |
| TD_IMS_0022 | IMS network handles calling user canceling call before its establishment                            | 23   | 20 | 3   | 1  | 6   |
| TD_IMS_0024 | IMS network ends call in case calling UE is forcefully de-registered in IMS network                 | 19   | 16 | 3   | 3  | 8   |
| TD_IMS_0015 | IMS network handles call while UE_B is roaming without topology hiding                              | 13   | 6  | 7   | 11 | 6   |
| TD_IMS_0017 | IMS network handles routing information received from the UE before forwarding them                 | 13   | 9  | 4   | 11 | 6   |
| TD_IMS_0009 | IMS network can establish dialogs for users with default SIP URIs and resolve Tel URI E.164 numbers | 18   | 15 | 3   | 5  | 7   |
| TD_IMS_0010 | IMS network can handle establishment of dialogs for users with default TEL URIs                     | 8    | 8  | 0   | 15 | 7   |
| TD_IMS_0032 | IMS network handles messaging with TEL URI identities                                               | 7    | 7  | 0   | 15 | 8   |
| TD_IMS_0033 | IMS network handles messaging with DNS/ENUM lookup                                                  | 11   | 11 | 0   | 12 | 7   |
| TD_IMS_0037 | IMS network supports ISC based on HOLD                                                              | 9    | 3  | 6   | 11 | 10  |
| TD_IMS_0038 | IMS network supports ISC based on OIP                                                               | 8    | 6  | 2   | 11 | 11  |
| TD_IMS_0039 | IMS network supports ISC based on OIR/ACR                                                           | 7    | 4  | 3   | 15 | 8   |
| TD_IMS_0040 | IMS network supports ISC based on CFU                                                               | 8    | 5  | 3   | 13 | 9   |
| TD_IMS_0041 | IMS network supports ISC based on OIP/OIR                                                           | 6    | 2  | 4   | 16 | 8   |

|                                             |            |                                                                                                                   |
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|              |                                                                                                                                   |    |    |   |    |    |
|--------------|-----------------------------------------------------------------------------------------------------------------------------------|----|----|---|----|----|
| TD_IMS_0025  | IMS network handles user initiated call hold when home caller puts another home user on hold and resumes call                     | 15 | 11 | 4 | 0  | 15 |
| TD_IMS_0016  | IMS network handles user initiated call hold when home caller puts roaming user on hold and resumes call                          | 7  | 5  | 2 | 7  | 16 |
| TD_IMS_0018  | IMS network handles user initiated call hold when roaming caller puts a home user on hold and resumes call                        | 7  | 4  | 3 | 7  | 16 |
| TD_IMS_0003H | IMS network chooses a second entry point with topology hiding.                                                                    | 1  | 1  | 0 | 14 | 15 |
| TD_IMS_0008  | First time registration via a visited IMS network with topology hiding                                                            | 2  | 2  | 0 | 13 | 15 |
| TD_IMS_0028  | IMS network handles basic call with topology hiding correctly                                                                     | 3  | 1  | 2 | 6  | 21 |
| TD_IMS_0029  | IMS network handles calling user canceling call correctly before its establishment with topology hiding                           | 1  | 1  | 0 | 7  | 22 |
| TD_IMS_0030  | IMS network handles user initiated call hold when a home caller puts a roaming user on hold and resumes call with topology hiding | 1  | 1  | 0 | 7  | 22 |
| TD_IMS_0004H | IMS network sends 403 response from a different trust domain with topology hiding                                                 | 1  | 0  | 1 | 13 | 16 |

|                                             |            |                                                                                                                      |
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**Table 4. Interoperability Results per Test Group in percent**

| Test Group Id                        | Runs | OK     | NOT OK | NA    | OoT   |
|--------------------------------------|------|--------|--------|-------|-------|
| Roaming Registration                 | 70   | 84,3%  | 15,7%  | 32,8% | 28,3% |
| Messaging                            | 81   | 84,0%  | 16,0%  | 18,7% | 27,3% |
| Interworking Basic Call              | 126  | 88,1%  | 11,9%  | 16,7% | 23,3% |
| Roaming Basic Call                   | 26   | 57,7%  | 42,3%  | 36,7% | 20,0% |
| Interworking Tel URI & ENUM          | 44   | 93,2%  | 6,8%   | 39,2% | 24,2% |
| Application Server with roaming      | 38   | 52,6%  | 47,4%  | 44,0% | 30,7% |
| User Hold & Resume                   | 29   | 69,0%  | 31,0%  | 15,6% | 52,2% |
| Roaming Registration with TH (IMS_A) | 3    | 100,0% | 0,0%   | 45,0% | 50,0% |
| Interworking Basic Call with TH      | 4    | 50,0%  | 50,0%  | 21,7% | 71,7% |
| Roaming User Hold & Resume with TH   | 1    | 100,0% | 0,0%   | 23,3% | 73,3% |
| Roaming Registration with TH (IMS_B) | 1    | 0,0%   | 100,0% | 43,3% | 53,3% |

**Table 5. Interoperability Results per Test Group in number of test executions**

| Test Group Id                        | Runs | OK  | NOT OK | NA | OoT |
|--------------------------------------|------|-----|--------|----|-----|
| Roaming Registration                 | 70   | 59  | 11     | 59 | 51  |
| Messaging                            | 81   | 68  | 13     | 28 | 41  |
| Interworking Basic Call              | 126  | 111 | 15     | 35 | 49  |
| Roaming Basic Call                   | 26   | 15  | 11     | 22 | 12  |
| Interworking Tel URI & ENUM          | 44   | 41  | 3      | 47 | 29  |
| Application Server with roaming      | 38   | 20  | 18     | 66 | 46  |
| User Hold & Resume                   | 29   | 20  | 9      | 14 | 47  |
| Roaming Registration with TH (IMS_A) | 3    | 3   | 0      | 27 | 30  |
| Interworking Basic Call with TH      | 4    | 2   | 2      | 13 | 43  |
| Roaming User Hold & Resume with TH   | 1    | 1   | 0      | 7  | 22  |
| Roaming Registration with TH (IMS_B) | 1    | 0   | 1      | 13 | 16  |

|                                             |            |                                                                                                                   |
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## 4 More Detailed Conformance Results

This section presents the overall conformance verdicts based on the executed Test Description identifier from ETSI TS 186 011-2. The column “Runs” refers to the total number of executions during the entire event. Table 6 shows conformance results in percentages and Table 7 in number of test execution runs. Note again that the percentages in Table 4 for “PASS”, “FAIL”, and “INCONC(LUSIVE)” are computed based on the total *executed* tests. Tables 8 and 9 summarize the conformance results per test group.

A first analysis shows that the tests for basic call and hold/resume for roaming users (TD\_IMS\_0015, TD\_IMS\_0018) and roaming user registration test (TD\_IMS\_0002) have had the most conformance issues. In general, we see that also a number of messaging tests (TD\_IMS\_0031, TD\_IMS\_00034) have conformance issues. A good result to see is the relatively low amount of “Inconclusive” verdicts. The exception here are the tests on Application Server with roaming (TD\_IMS\_0037, TD\_IMS\_0038, TD\_IMS\_0039, TD\_IMS\_0040, TD\_IMS\_0041) where the common issue has been either the user equipment used in the tests or the unavailability of traces from the (remote) AS.

|                                             |            |                                                                                                              |
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**Table 6. Conformance Verdicts per Test Description in percent**

| Test Id     | Summary                                                                                             | Runs | PASS   | FAIL  | INCONC |
|-------------|-----------------------------------------------------------------------------------------------------|------|--------|-------|--------|
| TD_IMS_0002 | First time registration in a visited IMS network                                                    | 20   | 25,0%  | 65,0% | 10,0%  |
| TD_IMS_0004 | IMS network sends 403 response from a different trust domain without topology hiding                | 16   | 81,3%  | 18,8% | 0,0%   |
| TD_IMS_0006 | IMS network can initiate user de-registration                                                       | 17   | 17,6%  | 76,5% | 5,9%   |
| TD_IMS_0003 | IMS network chooses a second entry point without topology hiding.                                   | 10   | 80,0%  | 10,0% | 10,0%  |
| TD_IMS_0005 | IMS network supports network initiated re-registration                                              | 7    | 28,6%  | 42,9% | 28,6%  |
| TD_IMS_0007 | IMS network can initiate user re-authentication                                                     | 0    | 0,0%   | 0,0%  | 0,0%   |
| TD_IMS_0034 | IMS network handles messaging while roaming                                                         | 14   | 21,4%  | 64,3% | 14,3%  |
| TD_IMS_0031 | IMS network handles messaging with SIP identity without topology hiding                             | 25   | 36,0%  | 64,0% | 0,0%   |
| TD_IMS_0035 | IMS network handles messaging when receiving user is not registered                                 | 20   | 90,0%  | 5,0%  | 5,0%   |
| TD_IMS_0036 | IMS network handles messaging when receiving user has been barred                                   | 16   | 93,8%  | 0,0%  | 6,3%   |
| TD_IMS_0001 | IMS network shall support SIP messages greater than 1500 bytes                                      | 6    | 83,3%  | 16,7% | 0,0%   |
| TD_IMS_0011 | IMS network does not establish call to barred user                                                  | 16   | 100,0% | 0,0%  | 0,0%   |
| TD_IMS_0012 | IMS network rejects call to non existing user                                                       | 21   | 85,7%  | 14,3% | 0,0%   |
| TD_IMS_0013 | IMS network does not establish a call for unavailable user                                          | 19   | 89,5%  | 5,3%  | 5,3%   |
| TD_IMS_0014 | IMS network can handle call to non-registered user and unreachable AS                               | 15   | 100,0% | 0,0%  | 0,0%   |
| TD_IMS_0022 | IMS network handles calling user canceling call before its establishment                            | 23   | 87,0%  | 13,0% | 0,0%   |
| TD_IMS_0024 | IMS network ends call in case calling UE is forcefully de-registered in IMS network                 | 19   | 52,6%  | 36,8% | 10,5%  |
| TD_IMS_0015 | IMS network handles call while UE_B is roaming without topology hiding                              | 13   | 0,0%   | 76,9% | 23,1%  |
| TD_IMS_0017 | IMS network handles routing information received from the UE before forwarding them                 | 13   | 46,2%  | 38,5% | 15,4%  |
| TD_IMS_0009 | IMS network can establish dialogs for users with default SIP URIs and resolve Tel URI E.164 numbers | 18   | 27,8%  | 55,6% | 16,7%  |
| TD_IMS_0010 | IMS network can handle establishment of dialogs for users with default TEL URIs                     | 8    | 37,5%  | 62,5% | 0,0%   |
| TD_IMS_0032 | IMS network handles messaging with TEL URI identities                                               | 7    | 42,9%  | 57,1% | 0,0%   |
| TD_IMS_0033 | IMS network handles messaging with DNS/ENUM lookup                                                  | 11   | 45,5%  | 45,5% | 9,1%   |
| TD_IMS_0037 | IMS network supports ISC based on HOLD                                                              | 9    | 0,0%   | 11,1% | 88,9%  |
| TD_IMS_0038 | IMS network supports ISC based on OIP                                                               | 8    | 12,5%  | 25,0% | 62,5%  |

|                                             |            |                                                                                                              |
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|              |                                                                                                                                   |    |        |        |       |
|--------------|-----------------------------------------------------------------------------------------------------------------------------------|----|--------|--------|-------|
| TD_IMS_0039  | IMS network supports ISC based on OIR/ACR                                                                                         | 7  | 0,0%   | 57,1%  | 42,9% |
| TD_IMS_0040  | IMS network supports ISC based on CFU                                                                                             | 8  | 12,5%  | 50,0%  | 37,5% |
| TD_IMS_0041  | IMS network supports ISC based on OIP/OIR                                                                                         | 6  | 0,0%   | 50,0%  | 50,0% |
| TD_IMS_0025  | IMS network handles user initiated call hold when home caller puts another home user on hold and resumes call                     | 15 | 26,7%  | 46,7%  | 26,7% |
| TD_IMS_0016  | IMS network handles user initiated call hold when home caller puts roaming user on hold and resumes call                          | 7  | 28,6%  | 42,9%  | 28,6% |
| TD_IMS_0018  | IMS network handles user initiated call hold when roaming caller puts a home user on hold and resumes call                        | 7  | 28,6%  | 71,4%  | 0,0%  |
| TD_IMS_0003H | IMS network chooses a second entry point with topology hiding.                                                                    | 1  | 100,0% | 0,0%   | 0,0%  |
| TD_IMS_0008  | First time registration via a visited IMS network with topology hiding                                                            | 2  | 0,0%   | 100,0% | 0,0%  |
| TD_IMS_0028  | IMS network handles basic call with topology hiding correctly                                                                     | 3  | 0,0%   | 100,0% | 0,0%  |
| TD_IMS_0029  | IMS network handles calling user canceling call correctly before its establishment with topology hiding                           | 1  | 0,0%   | 100,0% | 0,0%  |
| TD_IMS_0030  | IMS network handles user initiated call hold when a home caller puts a roaming user on hold and resumes call with topology hiding | 1  | 0,0%   | 100,0% | 0,0%  |
| TD_IMS_0004H | IMS network sends 403 response from a different trust domain with topology hiding                                                 | 1  | 0,0%   | 100,0% | 0,0%  |

|                                             |            |                                                                                                              |
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**Table 7. Conformance Verdicts per Test Description in number of test executions**

| Test Id     | Summary                                                                                             | Runs | PASS | FAIL | INCONC |
|-------------|-----------------------------------------------------------------------------------------------------|------|------|------|--------|
| TD_IMS_0002 | First time registration in a visited IMS network                                                    | 20   | 5    | 13   | 2      |
| TD_IMS_0004 | IMS network sends 403 response from a different trust domain without topology hiding                | 16   | 13   | 3    | 0      |
| TD_IMS_0006 | IMS network can initiate user de-registration                                                       | 17   | 3    | 13   | 1      |
| TD_IMS_0003 | IMS network chooses a second entry point without topology hiding.                                   | 10   | 8    | 1    | 1      |
| TD_IMS_0005 | IMS network supports network initiated re-registration                                              | 7    | 2    | 3    | 2      |
| TD_IMS_0007 | IMS network can initiate user re-authentication                                                     | 0    | 0    | 0    | 0      |
| TD_IMS_0034 | IMS network handles messaging while roaming                                                         | 14   | 3    | 9    | 2      |
| TD_IMS_0031 | IMS network handles messaging with SIP identity without topology hiding                             | 25   | 9    | 16   | 0      |
| TD_IMS_0035 | IMS network handles messaging when receiving user is not registered                                 | 20   | 18   | 1    | 1      |
| TD_IMS_0036 | IMS network handles messaging when receiving user has been barred                                   | 16   | 15   | 0    | 1      |
| TD_IMS_0001 | IMS network shall support SIP messages greater than 1500 bytes                                      | 6    | 5    | 1    | 0      |
| TD_IMS_0011 | IMS network does not establish call to barred user                                                  | 16   | 16   | 0    | 0      |
| TD_IMS_0012 | IMS network rejects call to non existing user                                                       | 21   | 18   | 3    | 0      |
| TD_IMS_0013 | IMS network does not establish a call for unavailable user                                          | 19   | 17   | 1    | 1      |
| TD_IMS_0014 | IMS network can handle call to non-registered user and unreachable AS                               | 15   | 15   | 0    | 0      |
| TD_IMS_0022 | IMS network handles calling user canceling call before its establishment                            | 23   | 20   | 3    | 0      |
| TD_IMS_0024 | IMS network ends call in case calling UE is forcefully de-registered in IMS network                 | 19   | 10   | 7    | 2      |
| TD_IMS_0015 | IMS network handles call while UE_B is roaming without topology hiding                              | 13   | 0    | 10   | 3      |
| TD_IMS_0017 | IMS network handles routing information received from the UE before forwarding them                 | 13   | 6    | 5    | 2      |
| TD_IMS_0009 | IMS network can establish dialogs for users with default SIP URIs and resolve Tel URI E.164 numbers | 18   | 5    | 10   | 3      |
| TD_IMS_0010 | IMS network can handle establishment of dialogs for users with default TEL URIs                     | 8    | 3    | 5    | 0      |
| TD_IMS_0032 | IMS network handles messaging with TEL URI identities                                               | 7    | 3    | 4    | 0      |

|                                             |            |                                                                                                                   |
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|              |                                                                                                              |    |   |   |   |
|--------------|--------------------------------------------------------------------------------------------------------------|----|---|---|---|
| TD_IMS_0033  | IMS network handles messaging with DNS/ENUM lookup                                                           | 11 | 5 | 5 | 1 |
| TD_IMS_0037  | IMS network supports ISC based on HOLD                                                                       | 9  | 0 | 1 | 8 |
| TD_IMS_0038  | IMS network supports ISC based on OIP                                                                        | 8  | 1 | 2 | 5 |
| TD_IMS_0039  | IMS network supports ISC based on OIR/ACR                                                                    | 7  | 0 | 4 | 3 |
| TD_IMS_0040  | IMS network supports ISC based on CFU                                                                        | 8  | 1 | 4 | 3 |
| TD_IMS_0041  | IMS network supports ISC based on OIP/OIR                                                                    | 6  | 0 | 3 | 3 |
| TD_IMS_0025  | IMS network handles user initiated call hold when home caller puts another home user on hold and             | 15 | 4 | 7 | 4 |
| TD_IMS_0016  | IMS network handles user initiated call hold when home caller puts roaming user on hold and resumes call     | 7  | 2 | 3 | 2 |
| TD_IMS_0018  | IMS network handles user initiated call hold when roaming caller puts a home user on hold and resumes call   | 7  | 2 | 5 | 0 |
| TD_IMS_0003H | IMS network chooses a second entry point with topology hiding.                                               | 1  | 1 | 0 | 0 |
| TD_IMS_0008  | First time registration via a visited IMS network with topology hiding                                       | 2  | 0 | 2 | 0 |
| TD_IMS_0028  | IMS network handles basic call with topology hiding correctly                                                | 3  | 0 | 3 | 0 |
| TD_IMS_0029  | IMS network handles calling user canceling call correctly before its establishment with topology hiding      | 1  | 0 | 1 | 0 |
| TD_IMS_0030  | IMS network handles user initiated call hold when a home caller puts a roaming user on hold and resumes call | 1  | 0 | 1 | 0 |
| TD_IMS_0004H | IMS network sends 403 response from a different trust domain with topology hiding                            | 1  | 0 | 1 | 0 |

|                                             |            |                                                                                                                      |
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**Table 8. Conformance Verdicts per Test Group in percent**

| Test Group Id                        | Runs | PASS  | FAIL   | INCONC |
|--------------------------------------|------|-------|--------|--------|
| Roaming Registration                 | 70   | 44,3% | 47,1%  | 8,6%   |
| Messaging                            | 81   | 61,7% | 33,3%  | 4,9%   |
| Interworking Basic Call              | 126  | 76,2% | 19,0%  | 4,8%   |
| Roaming Basic Call                   | 26   | 23,1% | 57,7%  | 19,2%  |
| Interworking Tel URI & ENUM          | 44   | 36,4% | 54,5%  | 9,1%   |
| Application Server with roaming      | 38   | 5,3%  | 36,8%  | 57,9%  |
| User Hold & Resume                   | 29   | 27,6% | 51,7%  | 20,7%  |
| Roaming Registration with TH (IMS_A) | 3    | 33,3% | 66,7%  | 0,0%   |
| Interworking Basic Call with TH      | 4    | 0,0%  | 100,0% | 0,0%   |
| Roaming User Hold & Resume with TH   | 1    | 0,0%  | 100,0% | 0,0%   |
| Roaming Registration with TH (IMS_B) | 1    | 0,0%  | 100,0% | 0,0%   |

**Table 9. Conformance Verdicts per Test Group in number of test executions**

| Test Group Id                        | Runs | PASS | FAIL | INCONC |
|--------------------------------------|------|------|------|--------|
| Roaming Registration                 | 70   | 31   | 33   | 6      |
| Messaging                            | 81   | 50   | 27   | 4      |
| Interworking Basic Call              | 126  | 96   | 24   | 6      |
| Roaming Basic Call                   | 26   | 6    | 15   | 5      |
| Interworking Tel URI & ENUM          | 44   | 16   | 24   | 4      |
| Application Server with roaming      | 38   | 2    | 14   | 22     |
| User Hold & Resume                   | 29   | 8    | 15   | 6      |
| Roaming Registration with TH (IMS_A) | 3    | 1    | 2    | 0      |
| Interworking Basic Call with TH      | 4    | 0    | 4    | 0      |
| Roaming User Hold & Resume with TH   | 1    | 0    | 1    | 0      |
| Roaming Registration with TH (IMS_B) | 1    | 0    | 1    | 0      |

|                                             |            |                                                                                                              |
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## 5 Collected Comments

In order to understand the results shown in previous sections better, this section presents some of the comments specified in cases of conformance “Fail” and “Inconclusive” verdicts. These comments have been extracted from relevant Test Session Reports.

| Test Description | Verdict | Comment                                                                      |
|------------------|---------|------------------------------------------------------------------------------|
| TD_IMS_0002      | F       | No path header is contained in 200OK from IMS_B                              |
|                  | I       | 401 not received                                                             |
|                  | F       | P-charging-vector header is missing                                          |
|                  | F       | Path header missing in 200 OK from IMS_B                                     |
|                  | F       | Path header from IMS_A does not contain SIP-URI of P-CSCF                    |
|                  | F       | No P-Charging-Vector header in SUBSCRIBE                                     |
|                  | F       | No response value in Authorization header of "protected" REGISTER from IMS_A |
|                  | F       | IMS_B rejects protected REGISTER with 482                                    |
| TD_IMS_0004      | F       | IMS_B does not send 403 Forbidden to IMS_A                                   |
|                  | F       | IMS_B sends a 404 instead of 403 response                                    |
| TD_IMS_0006      | F       | Incorrect XML from IMS_B                                                     |
|                  | F       | NOTIFY with Request-URI indicating UE_B not received from IMS_B              |
|                  | F       | NOTIFY with Request line indicating P-CSCF not received from IMS_B           |
|                  | F       | No Route header in NOTIFY from IMS_B                                         |
| TD_IMS_0005      | F       | Incorrect request URI                                                        |
|                  | F       | NOTIFY from IMS_B without Route header                                       |
| TD_IMS_0034      | F       | IMS_B does not send the MESSAGE to UE_B                                      |
|                  | F       | No Route and no P-Charging-Vector header in MESSAGE from IMS_A               |
|                  | F       | IMS_B rejects MESSAGE with 400                                               |
|                  | F       | No P-Charging-Vector header in 200 OK from IMS_B                             |
|                  | F       | P-Charging-Vector header contains ioi parameter.                             |

|                                             |            |                                                                                                                      |
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| Test Description | Verdict | Comment                                                                                                                                      |
|------------------|---------|----------------------------------------------------------------------------------------------------------------------------------------------|
| TD_IMS_0031      | F       | 200OK is not sent by IMS_B                                                                                                                   |
|                  | F       | IMS_A MESSAGE missing P-Charging-Vector and P-Asserted-ID header                                                                             |
|                  | F       | IMS_B 200 OK missing P-Charging-Vector                                                                                                       |
|                  | F       | IMS_B rejects MESSAGE with 400                                                                                                               |
|                  | F       | IMS_B rejects MESSAGE with 482                                                                                                               |
|                  | F       | MESSAGE from IMS_A: tel URI is not present in P-Asserted-Identity header                                                                     |
|                  | F       | MESSAGE does not contain Record header                                                                                                       |
| TD_IMS_0035      | F       | IMS_B sends 183 instead of 4xx response                                                                                                      |
| TD_IMS_0001      | F       | IMS_B does not receive any message                                                                                                           |
| TD_IMS_0022      | F       | INVITE from IMS_A P-CSCF is rejected by IMS_B I-CSCF with 480                                                                                |
|                  | F       | CANCEL from IMS_A is rejected by IMS_B with 405                                                                                              |
| TD_IMS_0024      | F       | No Route header present and Cseq with invalid value in BYE from IMS_A                                                                        |
|                  | F       | Request URI does not contain value of UE_B and Route header is not present                                                                   |
| TD_IMS_0015      | F       | No INVITE from IMS_A to IMS_B                                                                                                                |
|                  | F       | orig-IOI parameter in INVITE from IMS_B                                                                                                      |
|                  | F       | INVITE from IMS_B without Record-Route header and with ioi-parameter in P-Charging-Vector header                                             |
|                  | I       | BYE from UE_A is not forwarded by IMS_A                                                                                                      |
|                  | F       | INVITE: Service-Route header is not present<br>P-Asserted-ID contain UE_B value instead of UE_A<br>Via header does not contain P-CSCF values |
|                  | F       | ACK from UE_B is not forwarded by IMS_A                                                                                                      |
|                  | F       | IMS_A rejects INVITE from UE_B with 403                                                                                                      |
|                  | F       | No Record-Route header in BYE/180 from IMS_A                                                                                                 |
| TD_IMS_0017      | F       | No INVITE from IMS_A to IMS_B                                                                                                                |
|                  | F       | ACK from UE_B is not forwarded by IMS_A                                                                                                      |
|                  | I       | orig-IOI parameter in INVITE from IMS_B                                                                                                      |
|                  | I       | BYE from IMS_A contains no Record-Route header and contains Route-header indicating its own P-CSCF                                           |

|                                             |            |                                                                                                              |
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| Test Description | Verdict | Comment                                                                                                          |
|------------------|---------|------------------------------------------------------------------------------------------------------------------|
| TD_IMS_0009      | F       | "," missing between orig-ioi and term-ioi from IMS_B                                                             |
|                  | F       | INVITE should not contain P-Access-Network-Info                                                                  |
|                  | F       | Only one identity in P-Asserted-Identity header in INVITE from IMS_A                                             |
|                  | F       | Bye contains P-Access-Network-Info header                                                                        |
|                  | F       | Only one identity in P-Asserted-Identity header in 180/200 from IMS_B                                            |
|                  | F       | IMS_A sends no ACK                                                                                               |
|                  | F       | INVITE does not contain Route header, P-Charging-Vector and Record-Route header is IBCF address instead of SCSCF |
| TD_IMS_0010      | F       | "," missing between orig-ioi and term-ioi from IMS_B                                                             |
|                  | F       | INVITE should not contain P-Access-Network-Info                                                                  |
|                  | F       | Only one identity in P-Asserted-Identity header in INVITE from IMS_A                                             |
|                  | F       | Bye contains P-Access-Network-Info header                                                                        |
|                  | F       | Only one identity in P-Asserted-Identity header in 180/200 from IMS_B                                            |
| TD_IMS_0032      | F       | No P-Charging-Vector in 200 OK from IMS_B and no P-Asserted-Identity in 200 OK from IMS_B                        |
| TD_IMS_0033      | F       | No P-Asserted-Identity header in 200 OK from IMS_B                                                               |
| TD_IMS_0037      | F       | P-Charging-Vector header missing in the INVITE                                                                   |
|                  | F       | P-Charging-Vector header missing in the 200 OK                                                                   |
| TD_IMS_0038      | F       | no Tel URI of UE_A in INVITE<br>Check 2- no Tel derive SIP URI in INVITE                                         |
| TD_IMS_0039      | F       | IMS_A does not send 433 to UE                                                                                    |
|                  | F       | IMS_B receives a 403 response instead of 433                                                                     |
| TD_IMS_0040      | F       | INVITE does not contain access-network-charging-info parameter in the p-charging vector header                   |
|                  | F       | Via header does not contain P-CSCF via port number                                                               |
|                  | F       | Record route header does not contain p-cscf port number                                                          |
|                  | F       | IMS_A rejects call with 480                                                                                      |
|                  | F       | No P-Charging-Vector header in INVITE                                                                            |
|                  | F       | no invite is sent to IMS_B                                                                                       |
| TD_IMS_0041      | F       | IMS_A rejects call with 503                                                                                      |
|                  | F       | P-Charging-Vector does not contain orig-ioi and term-ioi parameters                                              |

|                                             |            |                                                                                                              |
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| Test Description | Verdict | Comment                                                                   |
|------------------|---------|---------------------------------------------------------------------------|
| TD_IMS_0025      | F       | No P-Charging-Vector in 200 from IMS_B                                    |
|                  | F       | Re-NVITE from IMS_A without Record-Route and P-Charging-Vector            |
| TD_IMS_0016      | F       | Initial INVITE is rejected by IMS_A P-CSCF with 483                       |
|                  | F       | No P-Charging-Vector header in 200 OK from IMS_B                          |
| TD_IMS_0018      | F       | Initial INVITE is rejected by IMS_A P-CSCF with 483                       |
|                  | F       | Record-Route and P-Charging-Vector header missing in Re-INVITE from IMS_A |
|                  | F       | Record-Route and P-Charging-Vector header missing in Re-INVITE from IMS_A |
| TD_IMS_0008      | F       | All messages without tokenized-by parameters!                             |
| TD_IMS_0028      | F       | All messages without tokenized-by parameters!                             |
| TD_IMS_0029      | F       | All messages without tokenized-by parameters!                             |
| TD_IMS_0030      | F       | All messages without tokenized-by parameters!                             |
| TD_IMS_0004H     | F       | 403 from IMS_B not received                                               |

|                                             |            |                                                                                                              |
|---------------------------------------------|------------|--------------------------------------------------------------------------------------------------------------|
| Report                                      | 19.11.2008 | <br>World Class Standards |
| Stephan Schulz                              |            | 24 of 24                                                                                                     |
| Centre for Testing & Interoperability (CTI) |            | Version (1.0.1)                                                                                              |

## Version History

|        |               |                    |
|--------|---------------|--------------------|
| V1.0.0 | November 2008 | First version      |
| V1.0.1 | November 2008 | Minor improvements |
|        |               |                    |