**3GPP TSG RAN WG2 #118-e R2-22XXXX**

**Electronic Meeting, 9th May – 20th May 2022**

**Source: vivo**

**Title:** **[AT118-e][081][TEI17] Early Measurements for EPS fallback (vivo)**

**Agenda Item:** **6.21.2**

**Document for: Discussion and Decision**

1. Introduction

This contribution is for the following offline discussion.

* [AT118-e][081][TEI17] Early Measurements for EPS fallback (vivo)

Scope: Discuss one more round, verify whether there is impact in other group, verify that the impact in RAN2 can be kept reasonable, collect comments on the CR

Intended outcome: Report

Deadline: For CB W2 Friday (CR by Post discussion if applicable)

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| Company | Email |
| vivo | Yangxiaodong5g@vivo.com |
| LGE | Sunghoon.jung@lge.com |
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1. Discussion
   1. **Background**

During RAN2 118 meeting, EPS fallback enhancement was discussion.

EPS fallback early measurements

Performance estimates are now provided and can be considerd

[R2-2205884](file:///C:\Users\mtk65284\Documents\3GPP\tsg_ran\WG2_RL2\TSGR2_118-e\Docs\R2-2205884.zip) Latency Reduction during EPS Handover Fallback Vodafone GmbH discussion Rel-17

[R2-2206118](file:///C:\Users\mtk65284\Documents\3GPP\tsg_ran\WG2_RL2\TSGR2_118-e\Docs\R2-2206118.zip) Latency Reduction during EPS Handover Fallback Vodafone GmbH discussion Rel-17

* Noted

[R2-2205054](file:///C:\Users\mtk65284\Documents\3GPP\tsg_ran\WG2_RL2\TSGR2_118-e\Docs\R2-2205054.zip) Early measurement for EPS Fallback vivo, China Telecom, CMCC, SoftBank, China Unicom, Vodafone, Ericsson discussion Rel-17 TEI17 R2-2201398

* Noted

DISCUSSION

* The main difference is that 5054 includes SIB broadcast of frequency, while 6118 prescibes that UE just uses stored information.
* QC can accept to have a list of frequencies where VoLTE / EPS fallback is supported but nothing more, no impl in the context of early measurements.
* MTK think redirection is used and think the measured quality doesn’t need to be so good, just voice call. Think the VDF proposal bring limited gain, as the UE would start measure very late. Vdf think this is not late.
* Apple share similar concern as MTK, think that time duration for measurements may be longer than required paging response time. Think there is a risk of waste of measurement. VDF think paging is in most cases paging is for voice. VDF think that measurements are in parallel with the paging reply procedure.
* Nokia agrees that if the measurements are done when paging is received, the result might not be good, but can maybe work if UE measures in the BG. Wonder what is the TS impact of VDF proposal. VDF clarifies that it is just stage-2 text and the text says that the UE can measure when paging is received.
* LGE similar opinion as MTK and Nokia. Similar proposal was proposed to R18 Mob enhancement, UE measuring while connecting, but this was excluded pin R2, resulted only in R4 impact. LGE can accept a list of freq as QC proposed, treated as assistance info with no particular requirements
* ZTE think < 100ms is required to do the access procedure, and no time to do measurements during this time. On the vivo proposal, think that early measurements is not so useful, as Idle mode requirements are so relaxed.
* Huawei agrees that measurements will take 100’s of ms and access procedure is faster.
* QC think the UE need gaps (normally) so once the UE attempts connection there will be measurements done, so there is no time.

Chair: It seems the VDF proposal that the UE start measuring when paging is received will not work for many/most UEs, as the connection procedure is fast and most UEs anyway require gaps.

Chair: THEN what is the interest to support that UE can do measurements in the BG to have measurements available? E.g. following the EMR.

* Apple think RAN4 need to be involved for this.
* Vivo think some UEs may have measurements for cell reselection, or Idle measurements as early measurement for CA/DC. Vivo think most UE can do parallel measurements. Vivo think we can just reuse the RAN4 requirements for EM, no additional impact.
* Ericsson support the use of early measurements for this, but think measurement quality may need to be ensured.
* BT has a concern that the network cannot know which frequency that the UE measures.
* ZTE wonder if this means that EMR is configured all the time. ZTE think this is a waste of battery.

Object: Apple MTK QC would object.

Supporters: 7 companies

Chair wonder if there can be a compromise, e.g. if we just indicate in Stage-2 that UE can do measurement in Idle or Inactive in preparation for EPS fallback, up to UE impl. SIB indication of frequencies. Expect no mandatory requirements.

* MTK would be ok with such compromise.
* Vivo would be ok, VDF would be ok. Softbank would be ok.
* Xiaomi think reporting of measurements is needed. Vivo think not. Xiaomi think redirection need to be guided by measurements. VDF think that measurement reporting is needed.
* Nokia cannot agree anything now unless the proposal is more clear.

Chair: the most promising direction seems to be the reuse of EMR.

* Proponents can get one chance to convince opponents offline (vivo)

[R2-2205055](file:///C:\Users\mtk65284\Documents\3GPP\tsg_ran\WG2_RL2\TSGR2_118-e\Docs\R2-2205055.zip) 38331 CR for Early measurement for EPS Fallback vivo, China Telecom, CMCC, SoftBank, China Unicom, Vodafone CR Rel-17 38.331 17.0.0 2872 2 B TEI17 R2-2201399

* 1. **Compromise solution**

There is compromise proposal for introduction on **candidate EPS fallback target frequencies** in SIB and UE can do measurement in Idle or Inactive in preparation for EPS fallback, up to UE impl. The following is understanding about the compromise solution:

* The NW could broadcast some **candidate EPS fallback target frequencies** in SIB (as assistance information).
* The UE could measure the target frequencies **by implementation**. No reporting in EMR framework.
* After the UE goes to connect mode
  1. If the network want to have measurement report. It can configure normal connected mode measurement on the target frequency.
     1. If the UE has performed measurement on the same target frequency based on SIB configuration. The required time for UE to send the report may be reduced.
     2. However, there is no UE requirement to speed up the process.
  2. If the network want to use blind redirection. It can just redirect the UE to the target frequency.
     1. If the UE has performed measurement on the same target frequency based on SIB configuration. The required time for UE to camp on a cell on that frequency could be reduced.
     2. However, there is no UE requirement to speed up the process.

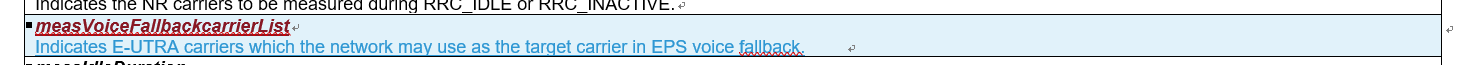
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| **Company** | **What is your understanding about the comproimise soluiton? And any comments?** |
| **BT** | **We have a few concerns about this solution.**   * **It is not clear the cell broadcast information content and why there is no dedicated signalling capable to configure the UE.** * **It is required to define when UE starts/stops E-UTRAN measurements for EPS fallback.** * **We have no discuss the criteria to prioritize E-UTRAN IDLE frequency measurements over NR.** * **If UE has to move to connected to report the results of IDLE measurements, the delay reduction is not clear.** * **BT is not supporting blind redirection as the cell to be redirect is completely unknown for the network.** * **Blind redirection can be problematic if target cell is congested. If blind redirection fails, the result is worse than do nothing.** * **For blind redirection, What is the reasoning behing the proposal “the UE needs to perform measurements in the same target cell”? This solution is really restrictive for operators. What happens if the initial target cell frequency is not supported?** * **Is blind redirection done base on best cell, or any other parameter?** * **It is not discussed the UE power consumption as UE will need to monitor multiple E-UTRAN frequencies. Once it is sent to IDLE, it is constantly monitoring E-UTRAN frequencies just in case?**   **Offline Rapporteur: All the strateagy of EPS fallback are still controlled by network, i.e., blind redirection or not, get measurement report or not. About the UE power, I assume that we would not like to mandate anything (new RRM requirement ). We like to give a UE a possibility to measure if it can and report the results.** |
| **vivo** | First I agree with the description about the compromise solution. It is totally controlled by network.  1 Now it seems clear about the compromise proposal.  I have similar understanding with Felix, and I also use it as official offline discussion paper which I have send in email reflector.  2 For “EMR” , It may not same with EMR for CA/DC, however it can be “EMR” based on network assistance information i.e. EPS frequency indication.  In idle state the UE can give early measurement for it, it can speed up RRC connection measurement and also cell reselection measurement. And also it is helpful for EPS handover failure like Masato said.  3 For EMR reporting, it is totally controlled by network.  If the UE have EMR for CA/DC or some EMR due to cell reselection, the EMR reporting framework can still be used, e.g., measurement availability indication. It is totally UE implementation and no specification change.  If the UE has no “EMR” the network can still configure normal RRC connection state measurement if the network want.  4 About connection state measurement gap, if the network wants to have RRM measurement in RRC connection state, the network can use gap or not based on the UE capability, it is totally legacy operation. For non-RRC connection state UE, I assume parallel measurement is quite ok for DC UE. Even for normal UE, the UE still has to do idle measurement for cell re-selection purpose based on 331. It is kind of parallel witch RACH.  The UE shall continue cell re-selection related measurements as well as cell re-selection evaluation. If the conditions for cell re-selection are fulfilled, the UE shall perform cell re-selection as specified in 5.3.3.6.  5 For blind redirection, it is still controlled by network. If the network does not want to have blind redirection,  it will not happen.  However it is strategy of network. Our production line told me if there was no LTE measurement for long time, the UE will be given blind handover or blind redirection in real field.  6 I also copy the ZTE’S comment  in this thread.  I have to say the highlight in yellow part is not a note, It is procedure text.  I agreed with VDF that we would not like to mandate anything (new RRM requirement ). We like to give a UE a possibility to measure if it can and report the results. Like claimed before, let us not focus on measurement during the RRC connection state and gap needed UE. We still have the UE which has had background measurement in idle. It can be used for speeding up the RRC connection state measurement or Cell reselection measurement.  7 There is note to say that the UE can continue idle measurement even T331 expiry. 5.7.8.3         T331 expiry or stop The UE shall:  1> if T331 expires or is stopped:  2> release the *VarMeasIdleConfig*.  NOTE:      It is up to UE implementation whether to continue idle/inactive measurements according to SIB11 and SIB4 configurations or according to E-UTRA SIB5 and E-UTRA SIB24 configurations as specified in TS 36.331 [10] upon inter-RAT cell reselection to E-UTRA, after T331 has expired or stopped. |
| **Nokia** | Some questions for clarification:   * Based on what requirements UE measures EPS fallback frequencies? And does UE measure those all the time while in IDLE/INACTIVE? * Once UE starts to respond to paging does NW need to provide measurement gaps or how is UE able to do inter-RAT measurements? * Is the intention of these measurements to speed up blind redirection to EUTRA or what is the intention? |
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* 1. **CRs on compromise solution**

There are two CRs for compromise proposal, one is TS 38.331 another is TS 38.300.

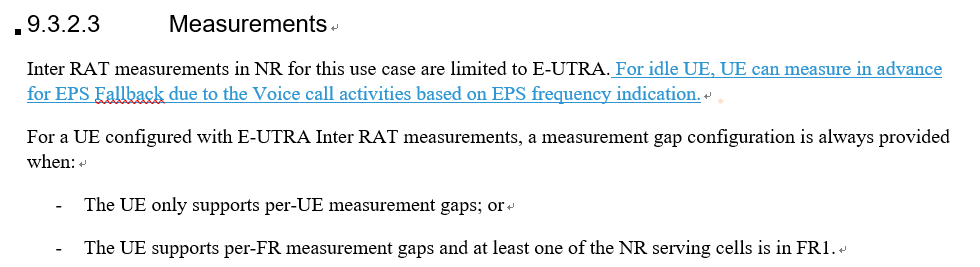
For TS 38.331, we suggest the below change, i.e. only add measVoiceFallbackcarrierList-r17 in MeasIdleConfig which

is in SIB. The field description is as following.

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| **Company** | **Do you agree the change in TS 38.331? And any comments?** |
| **BT** | **No.**  **There are open questions that needs to be discussed before we can agree this option (see Q2.2). At least, 38.331 needs to clarify that UEs supporting VoNR are not required to do this if network also supports VoNR. With current text, this is not clear.**  **There should be possible to introduce priorities similar to FreqPriorityEUTRA as legacy and also, it is important to consider to add this to RRC Release message.**  **If network does not inform the UE with EPS fallback frequencies, does it mean the UE is not allowed to do early measurements?**  **Offline Rapporteur: if the network does not broadcast the indication, all are legacy behaviour.** |
| **vivo** | **Yes, the network can just provide the assistance information. The measurement it is left UE implementation, the network can control the reporting of measurement, if the network want it.** |
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For TS 38.300, We suggest the below change

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| **Company** | **Do you agree the change in TS 38.300? And any comments?** |
| **BT** | **No, it is required to agree on 38.331 first.**  **We don’t see the point to introduce this sentence if there is not a clear action afterwards. What is the reasoning to capture this sentence if there are no formal actions to be performed by the UE.**  **Do we need to consider INACTIVE mode?** |
| **vivo** | **Yes, it is better to have the stage 2 guidance. And I also agree with BT for adding inactive state.** |
| **LGE** | **Text in Stage-2 is also normative. Given that we are mainly considering to add a NOTE, rather than normative requirements in stage-3, we do not think any normative text in 38.300 should be introduced.** |

**After some offline discussions the summary is below**

**Part one discussion to confirm the compromise solution understanding:**

1 The NW could broadcast some **candidate EPS fallback target frequencies** in SIB (as assistance information)

2 The UE could measure the target frequencies **by implementation**. It means that no procedure text for whether or when UE measure the **candidate EPS fallback target frequencies. FFS whether a Note in Stage3 or stage2 is allowed.**

3 After the UE goes to connect mode

**Case 1 If the network wants to have measurement report. It can configure normal connected mode measurement on the target frequency.**

     - **If the UE has performed measurement on the same target frequency based on SIB configuration. The required time for UE to send the report may be reduced.**

     - However, there is no UE requirement to speed up the process.

**Case 2 If the network wants to use blind redirection. It can just redirect the UE to the target frequency.**

**-  If the UE has performed measurement on the same target frequency based on SIB configuration. The required time for UE to camp on a cell on that frequency could be reduced.**

     - However, there is no UE requirement to speed up the process.

**Case 3 it is up to UE implementation whether reuse EMR reporting framework for early EPS fallback measurement reporting, However one note is added in TS 38.331.**

  NOTE: It is up to UE implementation whether to measure and report idle/inactive measurements for EUTRA carrier frequencies even if it does not support NE-DC between the serving carrier and the EUTRA carrier frequencies or if T331 is not running.

**Part two discussion on the below issues**

**1 Whether can Case 3 work just with note?**

**Yes:** there no procedure to block it, because the specification just specifies the period when T331 is running. After T331 stops, measurement, store and reporting are UE implementation. There is also a note in TS 38.331 **“It is up to UE implementation whether to continue idle/inactive measurements according to SIB11 and SIB4 configurations or according to E-UTRA SIB5 and E-UTRA SIB24 configurations as specified in TS 36.331 [10] upon inter-RAT cell reselection to E-UTRA, after T331 has expired or stopped.”**

**No:** Existing procedure have to be changed to support EMR reporting, e.g remove some restrictions.

**2 Whether is candidate EPS fallback target frequencies in SIB needed or not?**

**Yes:** assistance information for the UE for the below cases

1 UE can know the supporting from core network. However why the gNB is final decision node for EPS fallback,   For some cases the gNB will give EPS fallback even the VONR is supported, e.g., coverage issue for UE mobility to avoid handover frequently.

2  the UE knows that only some frequencies are used for EPS fallback, some operators do no use all frequencies for EPS fallback due to deployment. it can help the UE to reduce the useless measurement. And I also assume that if there is no clear indication from network, less UE will do early measurement for EPS fallback.

**3 indicate the network may use the early EPS fall measurement, otherwise the network will would like to just use RRC connection measurement. The UE will do useless measurement.**

**No:**  1 the UE can know the VONR is supported from corenetwork

2 almost all LTE frequencies can support EPS fallback

3 blind redirection is dangerous

**The company are invited to give the comment on the below issues**

**Q1: Can Case 3 work just with note?**

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| **Company** | **Comments?** |
| **Nokia** | I guess all the cases work similarly well as the intention seems to be not to define any UE requirements. |
| **LGE** | I understand the intention of the NOTE based on offline discussion.  #1. Can the NOTE work well?  I am not fully convinced if the NOTE can work well, because there could be possibly contradiction between existing normative text and the NOTE. Normally for UL message, specification strictly specifies when to send the message and what to include in the message for every single field, so that UE’ behaviors are consistent and controlled. But the Note seems to have the issue that existing normative behaviors are overridden by the NOTE in following two aspects:  - a) Storing of early measurement: For EMR, network configures a frequency list in *MeasIdleConfig* to indicate target measurement frequencies. If the frequency list is configured, UE is required to perform early measuremnets of those frequencies, and UE stores measurements results of ONLY those frequencies, as captured below. Since the frequency list is restrictive by its nature (because the list is intended by network), UE is not allowed to include other frequencies not in the frequency list, i.e., the frequency list indicated by *MeasIdleConfig* is *restrictive*, as shown in 38.331 clause 5.7.8.2a below. But now, the NOTE intends to change the way UE considers the frequency list so that the NOTE allows UE to consider the frequency list indicated by *MeasIdleConfig* no longer strictly restrictive but merely informative.  - b) Reporting of early measurement: the NOTE says that there is some room for UE implementation for reporting. However, we think there should be no room for UE implementation for reporting of early measurements; UE is only allowed to report only if it has non-empty EMR reporting variable and network explicitly request the reporting.  #2. Which SIB is the right place to convey the EPS fallback frequency list?  I already have commented this over email offline: If the NOTE can work with existing EMR framework as intended by the NOTE, then the frequency list must be in SIB11. But if not, it would better to place it out of SIB11, and SIB5 would be the right place.  38.331 clause 5.7.8.2a  While in RRC\_IDLE or RRC\_INACTIVE, and T331 is running and and T319a is not running, the UE shall:  1> perform the measurements in accordance with the following:  2> if the *VarMeasIdleConfig* includes the *measIdleCarrierListEUTRA* and the *SIB1* contains *idleModeMeasurementsEUTRA*:  3> for each entry in *measIdleCarrierListEUTRA* within *VarMeasIdleConfig*:  4> if UE supports NE-DC between the serving carrier and the carrier frequency indicated by *carrierFreqEUTRA* within the corresponding entry:  5> perform measurements in the carrier frequency and bandwidth indicated by *carrierFreqEUTRA* and *allowedMeasBandwidth* within the corresponding entry;  […]  5> store the derived measurement results as indicated by *reportQuantitiesEUTRA* within the *measReportIdleEUTRA* in *VarMeasIdleReport* in decreasing order of the sorting quantity, i.e. the best cell is included first, as follows:  6> if *qualityThresholdEUTRA* is configured:  7> include the measurement results from the cells applicable for idle/inactive measurement reporting whose RSRP/RSRQ measurement results are above the value(s) provided in *qualityThresholdEUTRA;*  6> else:  7> include the measurement results from all cells applicable for idle/inactive measurement reporting; |
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**Q2: Is candidate EPS fallback target frequencies in SIB needed or not?**

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| **Company** | **Comments?** |
| **Nokia** | Of course nothing prevents already from release 15 the UE from using camped PLMN information to derive internally in the UE which carriers for this PLMN provide EPS – anyway those carriers do not change frequently and this kind static information would help them if UE would actually be interested to implement more strict measurement requirements.  Now the solution seems to be just explicit indication of this without no UE requirements which naturally will not be testable and verifiable by anyone that it actually would provide any gains.  If RAN2 progresses the “solution” we have some technical comments about the details:  I guess all the frequencies are likely already listed in SIB5. So it does not make sense to try to use SIB11 for this purpose and especially measIdleConfig IE as the usage of that is tied to T331 provision in the procedural text. And as the usage is multifold i.e. blind redirection, HO, connected mode measuremetns etc.. it seems better to place (if anywhere) the list in SIB5 as an extension of *CarrierFreqEUTRA* similarly to *highSpeedEUTRACarrier* indication.  Then regarding field description of the field – in the CR it seems it is written bit of opposite way. In RAN2 we describe UE behaviour not NW behaviour. So field description could say something like this about UE behaviour “*Indicates E-UTRA carriers which the UE may use for measurements to assist EPS voice fallback.*“  And regarding the NOTE – it seems totally unnecessary. If we do not specify any requirements in RAN4 for usage of this field there are no UE requirements specfieid and thus the NOTE is totally unnecessary. So we should not have the NOTE. Or what is the reason for the NOTE? And definitely NOTE is wrong and too generic – we do not allow reporting of measurements unless NW indicates reporting is allowed. And NTOE should not allow to change UE behaviour for already existing features. NOTE should be strictly limited to EPS fallback indication related frequencies nothing else.  SUMMARY: we can consider having indications in SIB5 and we doubt the need for note. It should be sufficient to say in meeting minutes explicitly that no requirements will be defined for UE or NW. Then it is clear no UE or NW requirements are defined in standardization. |
| **LGE** |  |
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1. Conclusion

Summary about the compromise solution