

Status Report for WI to TSG

Work Item Name: FDD Enhanced Uplink (All building blocks)

Building Block	Acronym	WG
FDD Enhanced Uplink - Stage 2	EDCH-Stage2	R2
FDD Enhanced Uplink - Physical Layer	EDCH-Phys	R1
FDD Enhanced Uplink - Layer 2 and 3 Protocol Aspects	EDCH-L23	R2
FDD Enhanced Uplink - UTRAN Iub/Iur Protocol Aspects	EDCH-IurIub	R3
FDD Enhanced Uplink - RF Radio Transmission/ Reception, System Performance Requirements and Conformance Testing	EDCH-RF	R4

SOURCE: Rapporteurs, 3GPP Support

TSG: RAN **WG:** RAN1, RAN2, RAN3, RAN4

Rapporteurs:

WG1 : Karri Ranta-aho, Nokia

Karri.Ranta-aho@nokia.com

WG2 : Joakim Bergstrom, Ericsson

joakim.ko.bergstrom@ericsson.com

WG3 : Sašo Stojanovski, Nortel Networks

sasos@nortelnetworks.com

WG4 : Thomas Unshelm, Ericsson

Thomas.Unshelm@ericsson.com

Ref. to WI sheet: ftp://ftp.3gpp.org/tsg_ran/TSG_RAN/Work_Item_sheets/

WG1 Progress Report since the last TSG:

Since last TSG RAN plenary, one TSG RAN WG1 meeting was held:

TSG RAN WG1 #40 in Scottsdale, Arizona, USA, 14th - 18th of February 2005

The meeting spent more than three days on the FDD Enhanced Uplink work item. ~100 contributions were submitted for the WI, ~90 of those treated. 9 CRs were agreed to RAN1 FDD specifications.

A joint RAN1/RAN2/RAN3/RAN4 session was also held during the meeting addressing measurements for RRM support.

One open point left without final decision was on the UE categories on which RAN1 could not come to an agreement. Current status as minuted on screen in RAN1#40:

Cat	Maximum E-DPCH set	Support for 2 ms TTI – EDCH	Maximum transport block size for 10 ms TTI [bits]	Maximum transport block size for 2 ms TTI [bits]
1	SF4	No	7296	-
2	SF4	Yes	7296	1460
3	2xSF4	Yes	14592	2919
4	2xSF4	No	14592	-
5	2xSF2	Yes	20000	5837
6	2xSF2	No	20000	-
7	2xSF2 + 2xSF4	Yes	20000	8756
8	2xSF2 + 2xSF4	Yes	20000	11520

Conclusion: UE categories will be a subset of the categories/parameter combinations listed in the table. Agreement on Cat 1,3,4,5,8. No agreement whether cat 2,6,7 are in or out, the most controversial issues being cat 2 and 6. The total number of categories should not exceed 6.

Status: Cat. 2 and 7 could be removed, no agreement on whether or not to have cat 6.

WG2 Progress Report since the last TSG:

Since last TSG RAN plenary there were 2 regular TSG RAN WG2 meetings held:
TSG RAN WG2 #45bis in Sophia Antipolis, France, 10th - 14th of January 2005 and
TSG RAN WG2 #46 in Scottsdale, USA, 14th - 18th of February 2005.

At RAN2#45bis 1.5 days were spent on enhanced uplink in a separate session.

At RAN2#46 2.5 day was spent on enhanced uplink. In addition there was an evening session held jointly with RAN1, RAN3 and RAN4 on E-DCH RRM aspects.

RAN2

RAN2 decided to use the last undefined bit on E-DPCCH as a 'happy bit', to be utilised for Node B scheduling. The happy bit is always present in E-DPCCH and this decision implies that 7 bits will be used to indicate E-TFC.

RAN2 made agreements on the content of scheduling information to be sent in MAC-e PDUs:

- The UE will report an estimate of available power ratio vs. DPCCH (taking into account HS-DPCCH) averaged over the past. The power estimate discussion is requested to continue in RAN4.
- Indication for the highest priority channel with data in the UE buffer
- Buffer status for the highest priority logical channel with data in buffer
- Total buffer status

RAN2 also made agreements on the trigger mechanisms and reliability schemes for scheduling information. Scheduling information can be sent both by itself and together with data. The transmission method differs between the two cases.

When scheduling information is sent depends on whether or not the UE has a scheduling grant.

Possibility to have grants per H-ARQ process and relative grant details were concluded.

- For Absolute Grants and in case of 2ms TTI, a SingleProcess flag is included to indicate if the grant is valid for only one hybrid ARQ process.
- Detailed interpretation and reference for UP/DTX/DOWN transmitted from the serving RLS and the DOWN/DTX from the non serving RLS was concluded.

Maximum number of logical channels on E-DCH was concluded to be 16.

RAN2 concluded on the inter-relation between scheduled and non-scheduled transmission:

- Scheduled grants are in addition to the non-scheduled grants
- Logical channels with non-scheduled grants can not use/consume the scheduling grant and vice versa
- Logical channels are served based on priority until non-scheduled and scheduled grants are consumed or the maximum UE transmit power is reached.
- Non-scheduled MAC-d flows use a non-scheduled granted rate given by SRNC
 - For 2ms such a MAC-d flow can be restricted to a list of H-ARQ processes and a H-ARQ process can be reserved for only non-scheduled data.
 - Non-scheduled grants can be supported on multiple MAC-d flows in parallel

The 7 bits on the E-DPCCH that are used to signal the TB size will be used to indicate a TB size from one (out of currently 4) pre-defined TB size table. RAN2 agreed that there should be a TB size table with:

- Exponentially distributed values over the corresponding dynamic range for both 2 and 10ms TTI.
- Values that are aligned with a 336-bit RLC PDU size, for both 2 and 10 ms TTI.

RAN2 agreed to simplify the E-TFC selection in comparison to the R99 TFC selection:

- E-TFC states are managed per MAC-d flow and are independent of TFC states
- Excess power state is not used in the E-TFC selection
- Elimination criteria should be specified by RAN4

On UE capability most of the discussion have been held in RAN1. However, RAN2 have concluded that it is assumed that a UE implementing Enhanced Uplink shall also support HSDPA. Also it is assumed that for all categories the RLC buffer is shared between Enhanced Uplink and HSDPA.

The ASN.1 to incorporate Enhanced Uplink in RRC TS 25.331 was agreed.

At RAN2#46 meeting it was commented that there might be some company inputs to simplify/modify the Enhanced Uplink solution to RAN.

RAN2 joint meetings with RAN1, RAN3 and RAN4

The Scheduler in the Node-B is limited by and should target a certain total interference level. It could be RTWP or relative interference (e.g. RoT).

For explicit details on the agreements, these are captured in CRs to concerned specifications.

WG3 Progress Report since the last TSG:

FDD Enhanced Uplink WI received about one and a half day of meeting time in RAN3#46 (Phoenix). Following RAN3#46, document R3-050263 captures the latest version of the RAN3-internal TR (R3.015 v0.3.0).

Significant progress has been made in reaching common understanding on the lub/lur congestion control framework, although no CRs were agreed in this meeting.

The E-DCH Data Frame format was updated and in principle agreed. The new format includes bundling support for data received in up to 5 TTIs.

During RAN3#46 a joint meeting was held with RAN1, RAN2 and RAN4 groups on the issue of lub/lur measurement reporting for support of RRM for FDD Enhanced Uplink. Initial discussions have been triggered.

The agreements made in this meeting will be captured in the next version of R3.015.

WG4 Progress Report since the last TSG:

An official email reflector for Enhanced Uplink work dedicated for the RAN4 work was set up by MCC; 3GPP_TSG_RAN_WG4_EDCH@LIST.ETSI.ORG.

In order to speed up the work in RAN4 coming to early agreements on both DL and UL testing and simulation assumptions, three telephone conferences on 2nd December 2004, 15th December 2004, and 21st January 2005 were held. The summary of the conclusions and agreements can be found in R4-050022. 18 technical contributions were presented in total during the three phone conferences.

During RAN4#34, 30 documents on simulation assumptions, simulation results for E-DPCCH, E-DPDCH, and E-HICH, discussion on E-TFC selection, impact of PA power back off on cell throughput and user throughput, proposal for FRC DPCCH/E-DPDCH amplitude/power ratios, UE transmitter performance requirements, and discussion on the maximum size of active set for HSUPA were presented. An offline meeting during RAN4#34 worked out the agreements and the next steps needed in order to progress the work until the RAN4#34bis meeting in April. The summary can be found in R4-050270.

It was agreed to have a phone conference around mid of March and a physical AdHoc (EUL & MBMS) on the 4th – 6th April in Sophia-Antipolis (RAN4#34bis).

A joint session between RAN1/RAN2/RAN3/RAN4 on RRM aspects of the Enhanced Uplink was held during the week. Regarding the Node B & inaccuracy requirements for the scheduler, RAN4 is asked to look into the issue of interference estimation with respect to accuracy for absolute and relative measurements (RTWP or relative interference rise).

List of Completed elements (for complex work items):

WG1

December 2004

- Physical channel structures
- Uplink code mapping
- Channel processing
- HARQ functionality and derivation and mapping of the HARQ incremental redundancy versions
- Applicability of Tx diversity and phase references to E-channels

March 2005

- Channel timings & number of HARQ processes (effectively defining the minimum processing times available for the UE and the Node B)
- Computation of the E-TFC power offsets and number of reference E-TFCs for the computation
- Fixed, UE category dependent puncturing limit
- Signature hopping for E-HICH/E-RGCH
- Maximum rate for simultaneous uplink DCH when E-DCH is configured (64 kbps)

WG2

Stage 2 TS 25.309 was already approved at RAN#25, September 2004.

CRs to the following impacted RAN2 specifications were already approved at RAN#26, December 2004:

- TS 25.301
- TS 25.302
- TS 25.321
- TS 25.331

WG3

WG4

- None

List of open issues:

WG1:

- UE capabilities (Category candidates agreed, final choice still not made)
- Compressed mode with 10 ms TTI
- Need for new UTRAN/UE measurements or modifications to the existing ones.
- Possibility to do slot-by-slot power scaling of E-DPDCH only in case the UE runs out of transmission power within a TTI.
- The exact contents of E-AGCH are not yet defined (number of bits, inclusion of time duration, etc.). The exact number of bits may also have an impact to the E-AGCH coding and spreading factor
- E-DPxCH gain factor quantisation.

WG2

- Signaling
 - Layer 2 based cell change
 - Optimisation of procedures for different scenarios
 - TTI reconfiguration
 - E-DCH to DCH reconfiguration.
- Details of E-TFC selection. Especially compressed mode interactions, remaining power vs. HS-DPCCH power and back-off.
- Some remaining scheduler details. E.g.
 - Detailed absolute grant content and value ranges.
 - Priority based scheduling
 - Non-serving RLS RG in non-RG based mode (hysteresis)
- Further details of RRM.
- Refinements of UE capability.
- Testing aspects. I.e. testing methodology and Radio bearers.
- Transport block size tables

WG3

- The reported object for lub/lur measurements: is it UL interference or Rise over Thermal (RoT)
- Feasibility of measurements allowing to discriminate the UL interference (or RoT) due to E-DCH traffic from the total UL interference (or RoT)
- Measurements for support of GBR traffic
- Completion of the overall lub/lur congestion control framework,
- Additional flexibility for packaging data into E-DCH FP frames

WG4

- Beta factors for requirements and testing on E-DPDCH and E-DPCCH
- RAN4 assumptions on FRC, RV index sequence, Switching between different TTI, and Number of HARQ processes needs to be revisited after RAN1/RAN2 decision
- Working points per FRC
- Requirements and testcases for E-RGCH and E-AGCH
- False alarm rate for E-RGCH
- False alarm rate and miss-detection for E-DPCCH

- E-HICH, False alarm ACK rate for serving and non-serving cell
- Requirements and tests for E-RGCH/E-AGCH
- PAR/CM
- E-TFC
- Active Set Size
- Implementation Margin
- Finalize ideal simulation results for all channels (DL & UL)
- How accurate can the scheduler follow the targets set by the RNC in x% of the time

Estimates of the level of completion (when possible):

Stage 2: 100%

Physical Layer: 95%

Layer 2 and 3 Protocol Aspects: 80%

UTRAN Iub/Iur Protocol Aspects: ???

RF Radio Transmission/ Reception: 35%

WI completion date review resulting from the discussion at the working group:

Stage 2: December 2004

Physical Layer: March 2005

Layer 2 and 3 Protocol Aspects: March 2005

UTRAN Iub/Iur Protocol Aspects: March 2005

RF Radio Transmission/ Reception: June 2005

References to WG's internal documentation and/or TRs:

R3-050263 R3.015 v0.3.0 FDD Enhanced Uplink: UTRAN Iub/Iur Protocol Aspects

RAN4#34:

R4-050018 EUL UL Simulation Assumptions; Ericsson
R4-050019 E-DPDCH simulation results; Ericsson
R4-050020 E-DPCCH simulation results; Ericsson
R4-050021 EUL testcases for Node B uplink; Ericsson
R4-050022 Summary of Agreements after Phone Conferences on EUL; Ericsson
R4-050023 E-HICH Simulation Results; Ericsson
R4-050024 EUL DL Simulation Assumptions; Ericsson
R4-050076 E-DPDCH Simulation Assumptions; Motorola
R4-050077 E-DPDCH Simulation Results; Motorola
R4-050078 E-DPCCH Simulation Results; Motorola
R4-050080 E-TFC selection and reporting of UE power situation; NEC
R4-050088 E-DPDCH simulation results; Samsung
R4-050089 E-DPCCH simulation results; Samsung
R4-050090 E-HICH simulation results; Samsung
R4-050091 E-DCH FRC throughput results; Nokia
R4-050137 Performance Simulation Results for E-DCH; NEC
R4-050144 HSUPA UE transmitter performance requirements; Agilent
R4-050151 Enhanced Uplink E-DPDCH simulation results; Siemens
R4-050152 Enhanced Uplink E-DPCCH simulation results; Siemens
R4-050170 E-TFC selection requirements; Nokia
R4-050195 Impact of PA power back-off on cell throughput and user throughput for EUL; Qualcomm
R4-050196 Simulation results on E-DPDCH; Lucent
R4-050201 Maximum size of active set for HSUPA; Motorola
R4-050202 W-TFC selection in the UE
R4-050212 Discussion on E-DCH DL signalling requirements; Nokia
R4-050213 Ideal simulation results for E-HICH; Nokia
R4-050215 E-TFC Selection and Transmit power; Motorola
R4-050218 Proposal for FRC DPCCH/E-DPDCH amplitude / power ratios; Nokia

R4-050227 Simulation results on E-DPCCH; Lucent
R4-050270 EDCH Simulation assumptions and way forward; AdHoc group

RAN4#33:

R4-040588 FDD Enhanced UL Uplink simulation assumptions and requirements; Ericsson
R4-040508 FDD Enhanced UL Node B Receiver Performance Simulation Results; Ericsson
R4-040601 FDD Enhanced UL Downlink simulation assumptions and requirements; Ericsson
R4-040603 Impact of UE power requirement on end-user perceived performance for Enhanced Uplink; Ericsson
R4-040615 E-DCH Performance Requirements; Nokia
R4-040639 Enhanced Uplink Performance Simulation Results; Motorola
R4-040645 Enhanced Uplink Simulation Assumptions; Motorola
R4-040659 FDD Enhanced Uplink, simulation requirements for performance evaluation; NEC
R4-040713 On E-DCH TFC selection; NEC
R4-040721 Mapping of cubic metric to additional PA headroom; Qualcomm
R4-040733 Enhanced Uplink Agreements and Open Points; Enhanced Uplink Offline Discussion Group