

APEX STANDARDS

Domain-specific GPT to Aid Standardization & Patenting via Question Answering

Fact Sheet
Domain-specific GPT
1 April 2023

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GPT (Generative Pre-trained Transformer) is the most recent and cutting-edge artificial intelligence (AI) technology that has transformed the human-AI interaction. It goes beyond traditional keyword search and supports semantic reasoning by enabling organic question-answering that aligns with the researcher's thinking process and pursuing objective.

Although currently available GPT is trained with the majority of general knowledge, it lacks domain-specific information. Apex Standards has therefore trained new GPT language models to enhance the R&D, standardization, and patenting procedures of our clients. **Table 1** illustrates how **Apex Standards Domain-specific GPT** solutions may aid the telecom industry and related industries seeking to boost productivity.

In addition to the capabilities available on the GPT market, **Apex Standards Domain-specific GPT** offers solutions for:

- Idea creation, blindspot identification, multi-perspective balancing
- Hypothesis validation, clarification and iterative strategy formulation

- Competitive landscape understanding
- Difference highlighting, commonground detection, and impact analysis
- Inclusion of references and technical sources to support responses
- Delegating time-consuming tasks such as data collection and organization to GPT

Table 2 & Page 2-7 provide the use case scenarios and sample questions/answers.

To request a test trial, email support@apexstandards.com.

Caution: GPT is technology in progress. It may occasionally generate incorrect responses. At this point, we view it as a tool for gathering second opinions and advise against using it directly for decisions with significant risks.

References

- [1] Apex Standards Website www.apexstandards.com
- [2] Product Matrix www.apexstandards.com/ApexStandards.SaaS.Product.Matrix%202022-04.pdf
- [3] Strategic Service Matrix www.apexstandards.com/ApexStandards.Strategic.SEP.Service.Matrix%202022-04.pdf

Apex Standards Domain-specific GPT	tdocGPT	tstrGPT	sepGPT	Wifi6GPT	codecGPT
Training data	3GPP TDoc contribution 3GPP email reflectors (Listserv) TDoc proposals Chairman Notes CR Feature Lead Reports	ETSI TS Publications ETSI TR Publications Technical section clauses	ETSI declared and relevant SEP IEEE SA declared and relevant SEP ITU-T declared and relevant SEP SEP claim elements and technical descriptions	IEEE 802.11ax (Wi-Fi 6/6E) Technical section clauses	ITU-T H.266 (VVC) / ISO-IEC 23090 ITU-T H.265 (HEVC) / ISO-IEC 23008 AOM (AV1, VP9) Technical section clauses
Date range	1999 - present	1999 - present	2005 - present	2020 - present	2018 - present
Model parameters	66 billion	30 billion	66 billion	11 billion	20 billion
Max # CL Tokens	8191 tokens / 6143 words	4095 tokens / 3071 words	8191 tokens / 6143 words	4095 tokens / 3071 words	4095 tokens / 3071 words

Table 1 Apex Standards Domain-specific GPT products. Abbreviations: **3GPP:** The 3rd Generation Partnership Project. **ETSI:** European Telecommunications Standards Institute. **TS:** Technical Specification. **TR:** Technical Report. **CR:** Change Request. **IEEE SA:** Institute of Electrical and Electronics Engineers Standards Association. **ISO:** International Organization for Standardization. **IEC:** International Electrotechnical Commission. **ITU-T:** ITU Telecommunication Standardization. **AOM:** Alliance for Open Media. **SEP:** Standard Essential Patent. **CL Tokens:** GPT measures Context Length in tokens for a single process, with a limit on tokens for input and output combined. On average, 1 token = ¾ words. For example, tdocGPT can process 6143 words; if a query used 2000 words, an answer with up to 4143 words may be returned.

Scenario	Intent	Instruction	Question / Prompt	GPT Answer (as of Mar 24, 2023, * answers may evolve according to model updates)	GPT elapsed time (seconds)														
Essentiality search; state-of-the-art (SOTA) search, prior art search	Blindspot identification	Suggest	Suggest synonym search terms to "UE"	user device; mobile device; handset; subscriber device; wireless terminal	7														
Fact check	Disambiguation	What is	What is SNPN?	Standalone Non-Public Network (SNPN)	6														
Technical writing, claim element drafting	Idea discovery and creation, iterative polishing	Continue	Continue the sentence: LTE sounding reference symbols (SRS) is a reference signal sent by the UE, which is used by the corresponding	... UE to determine the corresponding UE's position in the spectrum.	9														
SEP translation	Cross-domain interpretation, subject matter identification	Rewrite in a style of TS	Rewrite a claim element in a style of Technical Specification: a method, comprising receiving data in at least one transmission time interval on certain allocated resource elements of a wireless communication system; at least partially blanking a transmission time interval	... a SSW slot is a period of time within the A-BFT that can be used by a responder to transmit at least one SSW frame	41														
SEP development	Cross-domain interpretation, reverse subject matter identification	Rewrite in a style of claim element	Rewrite a Technical Specification clause in a style of the patent claims: Advanced MIMO systems with many antenna ports, such as Full Dimension (FD)-MIMO or massive MIMO systems, need fast and efficient feedback mechanisms to characterize the radio channel between base station (eNB) and UE.	... wherein the transceiver is configured to receive data using a data signal comprising a plurality of frames, each frame comprising a plurality of subframes, and each subframe comprising a number of symbols in the time domain and a number of sub-carriers in the frequency domain	48														
SEP exploration	Opportunity identification	Examples of	Examples of singular value decomposition (SVD) usage in Wi-Fi 6 standards	IEEE 802.11ax (2020) Section 20.3.8 Common LDPC parity matrices / 20.3.8.1: Four low-density parity check (LDPC) codes are specified, each of a different rate but with a common codeword size of 672 bits. Each of the parity-check matrices H is partitioned into square submatrices of size Z x Z . The submatrices are either cyclic-permutations of the identity matrix, or null submatrices with all zero entries.	53														
Summary	Idea refinement	Generate	Generate a title for: Embodiments provide a transceiver, wherein the transceiver is configured to transmit or receive data in at least one transmission time interval on certain allocated resource elements of a wireless communication system...	Candidate 1: Transceiver for wireless communication system Candidate 2: Wireless Transceiver for Efficient Data Transmission and Reception Candidate 3: Transceiver with Efficient Resource Allocation	24														
Portfolio development	Cross jurisdiction patenting	Translate a claim element	Translate to German and French: The transceiver of claim 1, configured to transmit or receive data using a data signal, the data signal comprising a plurality of frames.	German: Die Transceiver des genannten 1 gemäß der genannten Anlage, die Daten über einen Datensignal übertragen oder erworben wird, der Datensignal enthält eine Vielzahl von Rahmen; French: Le transceiver de la clé selon laquelle il est conçu pour transmettre ou recevoir des données en utilisant un signal de données, le signal de données compris une pluralité de matrices.	29														
3GPP meeting preparation	Understanding enhancement	Summarize	Summarize Ericsson's view regarding unlicensed spectrum	Ericsson supports the proposal to include unlicensed spectrum for SL positioning in the study for R18, as mentioned in the email communication. They acknowledge the draft version 0.1.0 of TS 38.521-5 which has been marked for email approval from RAN5#98 meeting. No comments were received on this draft version after the review deadline passed.	35														
3GPP meeting: Intelligence gathering, strategic collaboration	Difference highlighting, common ground identification, conflict resolution	Compare companies' positions	Compare companies' views regarding unlicensed spectrum during the 2022/Q3-Q4 meetings	<table><tr><th>Company</th><th>Proposal/Study</th></tr><tr><td>Nokia/Nokia Shanghai Bell</td><td>R1-2210323, also, Chairman Note FL summary #2 of power domain enhancements (AI 9.14.2) Moderator (Nokia/Nokia Shanghai Bell) - Transparent schemes, such as FDSS Frequency domain spectrum shaping w/o spectrum extension</td></tr><tr><td>Ericsson</td><td>RP-230493 Follow-on work item related to efficient utilization of licensed spectrum not aligned with existing NR channel bandwidths</td></tr><tr><td>NEC</td><td>R1-2206469 Type 2A channel access procedure can be used for at least PSBCH and PSFCH; proposals regarding mode 1 in SL-U and identifying DCI for sidelink scheduling in the licensed spectrum or the unlicensed spectrum</td></tr><tr><td>Vivo</td><td>RP-223093 Study licensed TDD/FDD spectrum and unlicensed spectrum for Ambient IoT use cases; proposals regarding co-existing Ambient IoT with NR in-band</td></tr><tr><td>Qualcomm</td><td>RP-230382, also, Email Reflector follow-up from Qualcomm Valentin Gheorghiu dated Mar. 15, 2023 - Study on efficient utilization of licensed spectrum not aligned with existing NR channel BWs</td></tr><tr><td>NEC</td><td>R1-2300816 Proposals regarding identifying DCI for sidelink scheduling in the unlicensed spectrum and considering potential improvements to mode 2 procedure for SL-U</td></tr></table>	Company	Proposal/Study	Nokia/Nokia Shanghai Bell	R1-2210323, also, Chairman Note FL summary #2 of power domain enhancements (AI 9.14.2) Moderator (Nokia/Nokia Shanghai Bell) - Transparent schemes, such as FDSS Frequency domain spectrum shaping w/o spectrum extension	Ericsson	RP-230493 Follow-on work item related to efficient utilization of licensed spectrum not aligned with existing NR channel bandwidths	NEC	R1-2206469 Type 2A channel access procedure can be used for at least PSBCH and PSFCH; proposals regarding mode 1 in SL-U and identifying DCI for sidelink scheduling in the licensed spectrum or the unlicensed spectrum	Vivo	RP-223093 Study licensed TDD/FDD spectrum and unlicensed spectrum for Ambient IoT use cases; proposals regarding co-existing Ambient IoT with NR in-band	Qualcomm	RP-230382, also, Email Reflector follow-up from Qualcomm Valentin Gheorghiu dated Mar. 15, 2023 - Study on efficient utilization of licensed spectrum not aligned with existing NR channel BWs	NEC	R1-2300816 Proposals regarding identifying DCI for sidelink scheduling in the unlicensed spectrum and considering potential improvements to mode 2 procedure for SL-U	51
Company	Proposal/Study																		
Nokia/Nokia Shanghai Bell	R1-2210323, also, Chairman Note FL summary #2 of power domain enhancements (AI 9.14.2) Moderator (Nokia/Nokia Shanghai Bell) - Transparent schemes, such as FDSS Frequency domain spectrum shaping w/o spectrum extension																		
Ericsson	RP-230493 Follow-on work item related to efficient utilization of licensed spectrum not aligned with existing NR channel bandwidths																		
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Table 2 Use case scenarios, intents, question-prompt samples, and GPT-generated answers. See Page 2-7 for more sophisticated scenarios and automated GPT-analyses.

Scenario: 3GPP Meeting Preparation - Viewpoint Comparison

[Input: compare company positions regarding "unlicensed spectrum" in the 3GPP 2023-Q1 meetings](#)

Apex Standards tdocGPT automatically scans key Doc documents, extracts relevant paragraphs, analyzes their commonalities and differences, and then presents the results in an organized fashion, allowing 3GPP meeting delegates and followers to quickly identify and keep track of relevant insight.

Source	Viewpoint	Consensus	Difference	Benefit	Risk	Date	References
T-Mobile USA	Approve two follow-on Work Items for efficient utilization of licensed spectrum not aligned with existing NR channel bandwidths	Efficient utilization of licensed spectrum not aligned with existing NR channel BWs	Adding 6 and 7 MHz channel bandwidths	Optimization of spectrum usage	Potential complexity in implementation	2023-03-13	Ref 24: RP-230682
LG Electronics Finland	Maximize reuse of already specified NRU requirements for single carrier SideLink		Single carrier SideLink in unlicensed band; maximizing reuse of specified NRU requirements			2023-02-17	Ref 26: R4-2300974
Ericsson	Motivation for a follow-on work item based on selected methods studied in the SI		Spectrum-related selected methods			2023-03-13	Ref 5: RP-230493
NEC	Proposals for multiple CPE lengths, S-SSB, scheduling, DCI identification, and mode 2 procedure improvement		Various aspects in licensed and unlicensed spectrum resources supporting multiple CPE lengths			2023-02-17	Ref 25: R1-2300816
Huawei, HiSilicon	Study directional beam-based transmission and reception, and initial beam alignment in R18 SL	Efficient utilization of licensed spectrum	Enhanced sidelink operation on FR2 licensed spectrum; beam-based transmission, SL FR2 initial beam alignment			2023-02-17	Ref 19: R1-2300127
TSG WG RAN5	Test Aspects - NR-based access to unlicensed spectrum		NR_unlic-UEConTest			2023-03-16	Ref 2: RP-230200
Qualcomm Incorporated	Study on efficient utilization of licensed spectrum that is not aligned with existing NR channel BWs		N/A			2023-03-15	Ref 6: RP-230382
Ericsson	Study on efficient utilization of licensed spectrum that is not aligned with existing NR channel BWs		N/A			2023-03-10	Ref 11: RP-230579
Nokia, Nokia Shanghai Bell	Study on efficient utilization of licensed spectrum that is not aligned with existing NR channel BWs		N/A			2023-03-13	Ref 15: RP-230187
LG Electronics	Study TX spatial setting of SL transmission		Enhanced sidelink operation on FR2 licensed spectrum; TX spatial settings for SL transmission			2023-02-17	Ref 12: R1-2301535

Result: a detailed, GPT due diligence comparison of various companies' viewpoints during the 3GPP 2023-Q1 meetings. GPT elapsed time: 131 seconds.

References

- [1](#) 2023-03-13 14:58:28 tdoc RP-230095 (RP) by RAN5
SR - UE Conformance Test Aspects for NR-based Access to Unlicensed Spectrum :
Paragraph: Test Aspects - NR-based access to unlicensed spectrum [RAN5 WI: NR_unlic-UEConTest]
Keywords: Test Aspects - NR-based
- [2](#) 2023-03-16 00:57:07 tdoc RP-230200 (RP) by TSG WG RAN5
RAN5 agreed non TTCC CRs) WI UE Conformance - NR-based access to unlicensed spectrum (NR_unlic-UEConTest)
Paragraph: Test Aspects - NR-based access to unlicensed spectrum [RAN5 WI: NR_unlic-UEConTest]
- [3](#) 2023-03-13 12:29:49 tdoc RP-230494 (RP) by Ericsson
New WID: Efficient utilization of licensed spectrum that is not aligned with existing NR channel bandwidths A proposed follow-on (spectrum related) work item to the SI on Efficient utilization of licensed spectrum that is not aligned with existing NR channel bandwidths
Paragraph: A proposed follow-on (spectrum related) work item to the SI on Efficient utilization of licensed spectrum that is not aligned with existing NR channel bandwidths
Keywords: utilization of licensed spectrum that is not aligned with existing NR channel bandwidths
- [4](#) 2023-02-17 04:54:44 tdoc R1-230300 (R1) by OPED
Sidelink beam management on FR2 licensed spectrum :
Paragraph: Enhanced sidelink operation on FR2 licensed spectrum Proposal 1: Both TX beam and RX beam are supported for SL operation on FR2.
Keywords: FR2 licensed spectrum
- [5](#) 2023-03-13 12:28:27 tdoc RP-230493 (RP) by Ericsson
Motivation for a new WID: efficient utilization of licensed spectrum that is not aligned with existing NR channel bandwidths A motivation for a follow-on (spectrum related) work item to the SI on Efficient utilization of licensed spectrum that is not aligned with existing NR channel bandwidths based on selected methods studied therein:
Paragraph: A motivation for a follow-on (spectrum related) work item to the SI on Efficient utilization of licensed spectrum that is not aligned with existing NR channel bandwidths based on selected methods studied therein
Keywords: utilization of licensed spectrum that is not aligned with existing
- [6](#) 2023-03-15 06:49:02 tdoc RP-230382 (RP) by Qualcomm Incorporated
Views on WI for efficient utilization of licensed spectrum that is not aligned with existing NR channel bandwidths :
Paragraph: Study on efficient utilization of licensed spectrum that is not aligned with existing NR channel BWs [RAN4 SI: FS_NR_eff_BW_ull]
Keywords: licensed spectrum that is not aligned with existing
- [7](#) 2023-02-17 15:47:59 tdoc R4-2300291 (R4) by Apple
On NR Synchronization Raster for Dedicated Spectrum less than 5MHz :
Paragraph: Keep the legacy channel raster of 100kHz for UEs supporting dedicated spectrum less than 5MHz for FR1 to support maximum spectrum deployment flexibility
Proposal2: RAN4 to discuss whether the spectrum for this new less than 5MHz channel bandwidth will be accessible to legacy UEs
- [8](#) 2023-02-17 15:47:59 tdoc R4-2300291 (R4) by Apple
On NR Synchronization Raster for Dedicated Spectrum less than 5MHz :
Paragraph: Keep the legacy channel raster of 100kHz for UEs supporting dedicated spectrum less than 5MHz for FR1 to support maximum spectrum deployment flexibility
Proposal2: RAN4 to discuss whether the spectrum for this new less than 5MHz channel bandwidth will be accessible to legacy UEs
- [9](#) 2023-02-20 09:23:04 tdoc R1-2301784 (R1) by MediaTek Inc.
On dedicated spectrum less than 5 MHz :
Paragraph: Enhancements to operate NR on dedicated spectrum less than 5 MHz Proposal 1: Support PBCH puncturing in the RB level granularity for SSB transmission in spectrum with less than 20RBs.
- [10](#) 2023-02-17 04:26:23 tdoc R4-2300974 (R4) by LG Electronics Finland
Discussion on support of NR sidelink on unlicensed spectrum Proposals made on way forward linked with UE Tx and Rx RF requirement for supporting new features introduced in the NR SL evolution WI:
Paragraph: Inter- and intra-band combinations for Uu unlicensed and SL unlicensed (both carriers on unlicensed band) to be studied as 2nd priority only as these would require development of new TX CA or DC band-combinations
Proposal 3: Several proposal for way forward in defining the requirements for single carrier SideLink operation in unlicensed bands n46, n96 and n102 are made in the sections 3.1, 3.2 and 3.3
- [11](#) 2023-03-10 07:26:31 tdoc RP-230579 (RP) by Ericsson
SR of Study on efficient utilization of licensed spectrum that is not aligned with existing NR channel bandwidths :
Paragraph: Study on efficient utilization of licensed spectrum that is not aligned with existing NR channel BWs [RAN4 SI: FS_NR_eff_BW_ull]
Keywords: licensed spectrum that is not aligned with existing
- [12](#) 2023-02-17 09:10:05 tdoc R1-2301535 (R1) by LG Electronics
Discussion on enhanced sidelink operation on FR2 licensed spectrum :
Paragraph: Enhanced sidelink operation on FR2 licensed spectrum Proposal 1: For TX spatial setting of SL transmission, study following cases
Keywords: sidelink operation on FR2 licensed spectrum
- [13](#) 2023-02-21 09:36:55 email (S1) by gongyubing@xiaomi.com
Revision of S1-230241 and S1-230242 for new use case on Ambient IoT:
Paragraph: For S1-230242, I added more introductions about Unlicensed spectrum.
- [14](#) 2023-02-17 04:26:23 tdoc R4-2300974 (R4) by LG Electronics Finland
Discussion on support of NR sidelink on unlicensed spectrum Proposals made on way forward linked with UE Tx and Rx RF requirement for supporting new features introduced in the NR SL evolution WI:
Paragraph: Inter- and intra-band combinations for Uu unlicensed and SL unlicensed (both carriers on unlicensed band) to be studied as 2nd priority only as these would require development of new TX CA or DC band-combinations
Proposal 3: Several proposal for way forward in defining the requirements for single carrier SideLink operation in unlicensed bands n46, n96 and n102 are made in the sections 3.1, 3.2 and 3.3 (see details from these sections).
Keywords: proposal for way forward in defining the requirements for single carrier
- [15](#) 2023-03-13 10:43:53 tdoc R1-230187 (RP) by Nokia, Nokia Shanghai Bell
Study on spectrum that is not aligned with existing NR channel bandwidths :
Paragraph: Study on efficient utilization of licensed spectrum that is not aligned with existing NR channel BWs [RAN4 SI: FS_NR_eff_BW_ull]
- [16](#) 2023-02-17 09:17:52 tdoc R1-2300059 (R1) by FUTUREWEI
Discussion on enhancements for less than 5 MHz dedicated spectrum :
Paragraph: Enhancements to operate NR on dedicated spectrum less than 5 MHz Proposal 1.
- [17](#) 2023-03-13 13:07:31 tdoc RP-230688 (RP) by CableLabs
Discussion on UAV BRID/DAA Objective :
Paragraph: For UAV BRID/DAA WID, consider only dedicated licensed spectrum for UAV/UAS operation.
Proposal 2: If unlicensed spectrum is considered for UAS BRID/DAA in future release, task RAN1 to perform necessary coexistence evaluation including channel modeling to cover UAV scenarios and provide necessary, if any, enhancements for fair coexistence with NR-U and WIF technologies.
Proposal 2: If unlicensed spectrum is considered for UAS BRID/DAA in future release, task RAN1 to perform necessary coexistence evaluation including channel modeling to cover UAV scenarios and provide necessary, if any, enhancements for fair coexistence with NR-U and WIF technologies.
Keywords: Proposal 1: For UAV BRID/DAA WID
- [18](#) 2023-02-17 16:19:04 tdoc R1-2300949 (R1) by Intel Corporation
On the Physical Layer Enhancements for SL Operating in Unlicensed Spectrum :
Paragraph: Proposal 6: For contiguous RB-based PSCCH/PSSCH transmission, regarding mapping between sub-channel and PRBs, similarly as Rel. 16.
Keywords: Proposal 6: For contiguous RB-based PSCCH/PSSCH transmission,
- [19](#) 2023-02-17 10:33:41 tdoc R1-2300127 (R1) by Huawei, HiSilicon
Enhanced sidelink operation on FR2 licensed spectrum :
Paragraph: Enhanced sidelink operation on FR2 licensed spectrum Proposal 1: Study directional beam-based transmission and reception in R18 SL.
Proposal 2: For SL FR2 initial beam alignment.
Keywords: sidelink operation on FR2 licensed spectrum
- [20](#) 2023-02-17 13:28:14 tdoc R1-2301267 (R1) by Samsung
On enhanced SL Operation in FR2 :
Paragraph: Enhanced sidelink operation on FR2 licensed spectrum Proposal 1: For enhanced SL operation on FR2 licensed spectrum, study beam pairing before sidelink establishment procedure.
Proposal 2: For enhanced SL operation on FR2 licensed spectrum, study beam pairing during sidelink establishment procedure.
Proposal 5: For enhanced SL operation on FR2 licensed spectrum, study the design of the reference signal used for beam management and reporting including aspects such as:
Keywords: FR2 licensed spectrum
- [21](#) 2023-03-03 10:24:45 email (R5) by Mursalin Habib, mhabib@QTI.QUALCOMM.COM
[RANS98] WP and SR of WI - NR_unlic-UEConTest:
SR-231334 WP - UE Conformance Test Aspects for NR-based Access to Unlicensed Spectrum R5-231335 SR - UE Conformance Test Aspects for NR-based Access to Unlicensed Spectrum This WI has reached 33% (+5%) Regards, Mursalin Habib From 1755426770804781888@xox Thu Jan 19 05:17:05 +0000 2023 X-GM-THRID: 175426770804781888
- [22](#) 2023-02-17 14:57:48 tdoc R1-2301413 (R1) by Qualcomm Incorporated
Channel Access Mechanism for Sidelink on Unlicensed Spectrum :
Paragraph: The COT-SD schedules at least one time/frequency information of the shared COT, CAPC, and legacy IDs to determine eligibility of the response.
Proposal 21: SCI is considered as baseline for the container.
- [23](#) 2023-02-20 12:53:10 email (R1) by w.hsiao@MEDIATEK.COM
[RAN#112] Tdoc:revisions (8.6, 9.6.1, and 9.16.1)
Paragraph: On dedicated spectrum less than 5 MHz MediaTek Inc. Patrick Merias 522- 92 discussion 105 9.16.1 Enhancements to operate NR - on dedicated spectrum less than 5 MHz- 9 reserved 2023/03/10 10:32:02 AM R1-2301610 Rel-18 NR, FR1, Jeasthan, 5MHz, BW-Cover
- [24](#) 2023-03-13 13:51:04 tdoc RP-230682 (RP) by T-Mobile USA
Motivation for 6 and 7 MHz channel BWs This is a follow on WI to the FS_NR_eff_BW_ull Study Item:
Paragraph: This is a follow on WI to the FS_NR_eff_BW_ull Study Item Study on efficient utilization of licensed spectrum that is not aligned with existing NR channel BWs [RAN4 SI: FS_NR_eff_BW_ull] Proposal: Approve two follow-on Work Items for the Study on Efficient utilization of licensed spectrum that is not aligned with existing NR channel bandwidth: one for adding 6 and 7 MHz channel bandwidths
Keywords: one for adding 6 and 7 MHz channel bandwidths
- [25](#) 2023-02-17 01:14:17 tdoc R1-2300816 (R1) by NEC
Channel Access of Sidelink on Unlicensed Spectrum :
Paragraph: Proposal 8: If multiple CPE lengths (starting positions) are supported, the different CPE lengths should be configured per priority.
Proposal 9: Support only one CPE starting position for S-SSB.
Proposal 10: For mode 1 in SL-U, no assistant information related to the scheduling in the unlicensed spectrum needs to be exchanged between UE and gNB.
Proposal 11: The gNB schedules UEs in an intended SL CO which is to be initiated by a sidelink UE, and the SL CO may be shared by other scheduled UEs.
Proposal 12: In the case that both licensed and unlicensed spectrum resources are configured for sidelink mode 1, it needs to be considered how to identify DCI for sidelink scheduling on the licensed spectrum or the unlicensed spectrum.
Proposal 13: Considering the potential improvement of mode 2 procedure to make it more appropriate for SL-U, the following factors may be considered:
Keywords: no assistant information related to the scheduling in the unlicensed spectrum needs to be exchanged between UE and gNB.
- [26](#) 2023-02-17 04:26:23 tdoc R4-2300974 (R4) by LG Electronics Finland
Discussion on support of NR sidelink on unlicensed spectrum Proposals made on way forward linked with UE Tx and Rx RF requirement for supporting new features introduced in the NR SL evolution WI:
Paragraph: General and work plan Proposal 1: For single carrier SideLink operating in unlicensed band it is proposed that the work is carried out by maximizing the reuse of already specified NRU requirements.
Proposal 2: Inter-band combinations for concurrent operation for Uu Licensed and SL Unlicensed are to be studied based on company inputs.
Keywords: unlicensed band
- [27](#) 2023-02-17 01:36:26 tdoc R1-2301544 (R1) by Sharp
Discussion on physical channel design framework for NR sidelink evolution on unlicensed spectrum :
Paragraph: If temporary exemption of OCB requirement for S-SSB transmission is concluded to be supported, regarding how to meet the minimum of 2 MHz requirement under 15 kHz SCS, the following option is supported:
Keywords: temporary exemption of OCB requirement for S-SSB transmission
- [28](#) 2023-02-20 09:23:04 tdoc R1-2301784 (R1) by MediaTek Inc.
On dedicated spectrum less than 5 MHz :
Paragraph: FFS: 4 symbols
Proposal 1: Support PBCH puncturing in the RB level granularity for SSB transmission in spectrum with less than 20RBs.
- [29](#) 2023-02-20 09:23:04 tdoc R1-2301784 (R1) by MediaTek Inc.
On dedicated spectrum less than 5 MHz :
Paragraph: Proposal 4: For dedicated spectrum less than 5MHz, support CORESET#0 with 1, 2, and 3 symbols.
- [30](#) 2023-02-20 09:23:04 tdoc R1-2301784 (R1) by MediaTek Inc.
On dedicated spectrum less than 5 MHz :
Paragraph: Proposal 4: For dedicated spectrum less than 5MHz, support CORESET#0 with 1, 2, and 3 symbols.
- [31](#) 2023-02-17 14:57:49 tdoc R1-2301414 (R1) by Qualcomm Incorporated
Physical Channel Design for Sidelink on Unlicensed Spectrum :
Paragraph: If configured, the receiver monitors two PSCCH occasions in each (full) slot by default
- [32](#) 2023-03-17 22:12:57 email (RP) by Wanshi Chen wanshi@QTI.QUALCOMM.COM
Re: RANS98: Updated time plan - List of topics:
Paragraph: The following contributions will be handled in = the ITU AH Tuesday morning (8-9am): ITU RP-230015, RP-230030, 0031, 0032 (related documents x0b2, x0b23) RP-230034, 0021, 0022, 0029 NTN vs. ITU- RP-230618, 0629, 0630, 0643, 0667 BR, -Wanshi

Scenario: 3GPP Meeting Preparation - Historical Construction

Ask Apex Standards tdocGPT for a chronological analysis to examine what's been going on recently in order to better predict what will happen next. Also, 3GPP delegates and meeting followers often seek to effectively distinguish new areas of focus that require fresh attention from previously discussed, incremental topics, in order to save time.

Input: Summarize Qualcomm's technical contribution to the enhancement of AI/ML-based CSI feedback within the past year.

The technical focus shifts in Qualcomm's TDoc contributions for AI/ML-based CSI feedback enhancement, ordered by time, can be summarized as follows:

- (2022-08-12, Ref 6: **R1-2207225**) **Focus on** the sub-use-case of spatial-frequency domain CSI compression and reconstruction using a two-sided AI model. Other sub-use-cases can be studied with lower priority.
- (2022-08-12, Ref 13: **R1-2207224**) **New focus:** Adopt the chordal distance and numerical spectral efficiency gap metrics as intermediate KPIs for rank 1.
- (2022-09-30, Ref 1: **R1-2209976**) **Focus on** offline training as a starting point for AI ML-based CSI feedback enhancement use-case and generalization of AI model to variable configurations in data set generation.
- (2022-11-05, Ref 4: **R1-2212109**) **Different focus:** Model development and training options considering device-specific optimization, engineering isolation, and feasibility of disclosing proprietary model information.
- (2023-02-17, Ref 7: **R1-2301404**) **New focus:** Quantization method should be considered a part of the UE-side model and dequantization method should be considered a part of the NW-side model.
- (2023-02-17, Ref 17: **R1-2301405**) **Similar focus:** Allow UE implementation flexibility when processing down-link measurements and deriving input to the UE-side model during inference, and deriving target CSI by the UE side while generating the training dataset.
- (2023-02-17, Ref 8: **R1-2301405**) **Different focus:** Concentrating on data collection for model training, specifying that RAN1 should focus on what data should be collected.

In the beginning, Qualcomm's focus changes from emphasizing the sub-use-case of spatial-frequency domain CSI compression (Ref 6) to incorporating specific KPIs for evaluation (Ref 13).

Later, the focus shifts towards offline training and generalization of the AI model (Ref 1), followed by considerations of model development and training options (Ref 4).

Subsequently, the focus moves to quantization and dequantization methods in UE and NW-side models (Ref 7), and the flexibility of UE implementation (Ref 17).

Lastly, the focus turns to data collection for model training (Ref 8).

Result: GPT historical construction, identification of pivotal TDoc and tracking of topic evolution. GPT elapsed time: 59 seconds.

Scenario: 3GPP Meeting Preparation - Historical Construction

Ask Apex Standards tdocGPT for a visualization of topic and sub-topic hierarchy, where company roles are highlighted.

Input: Summarize key contributor's positions relating to a latest hot topic "Enhancement of AI/ML-based CSI feedback".

```
AI/ML for CSI Feedback Enhancement
|
|-- CSI Compression Use Case
|   |-- High-resolution CSI Data Collection [Ericsson, Ref 28: R1-2300153]
|   |   |-- Training Types & Methods for Single Decoder [Ericsson, Ref 29: R1-2300153]
|   |   |   |-- Quantization & Dequantization Methods [Qualcomm, Ref 9: R1-2301404]
|   |   |   |   |-- Synthetic Datasets based on TR 38.901 [Ericsson, Ref 23: R1-2203282]
|   |   |   |   |   |-- Per-sample Loss Function
|   |   |   |   |   |-- Loss Function
|   |   |-- Temporal-Spatial-Frequency Domain CSI Compression [Huawei, Ref 3: R1-2205891]
|   |   |-- Two-sided AI/ML Model [Huawei, Ref 1: R1-2205891]
|   |       |-- UE-side Model Input Processing [Qualcomm, Ref 21: R1-2301405]
|   |       |   |-- Downlink Measurements & Inference
|   |       |   |-- Target CSI Generation for Training Dataset
|   |       |-- Data Collection for Model Training [Qualcomm, Ref 11: R1-2301405]
|   |       |   |-- NW Data Collection [Ericsson, Ref 27: R1-2300153]
|   |       |   |   |-- Measurement Occasion Interval & Duration
|   |       |   |   |-- UE Logging of Measurements
|   |       |   |-- UE-side Data Collection [Ericsson, Ref 13: R1-2210955]
|   |       |       |-- One-sided (UE-side) Model
|   |       |       |-- RRC-message Based Data Collection Framework
|   |
|   |-- Model Monitoring and Evaluation
|       |-- Intermediate KPIs [Qualcomm, Ref 35: R1-2209977]
|       |   |-- Chordal Distance [Qualcomm, Ref 31: R1-2207224]
|       |   |-- Numerical Spectral Efficiency Gap [Qualcomm, Ref 31: R1-2207224]
|       |   |-- Tradeoff between Feedback Overhead and ML Model Output Accuracy [Qualcomm, Ref 34: R1-2205024]
|       |-- Model Performance Monitoring [Qualcomm, Ref 19: R1-2301405]
|           |-- Input-based Model Monitoring on UE-side
|           |-- Specification Impact for Reporting Target CSI with High Resolution
```

Result: GPT visualization of topic and sub-topic hierarchy with company roles highlighted. With regards to the recent advancement of AI and ML for CSI feedback enhancement, companies such as **Ericsson**, **Qualcomm**, and **Huawei** have overlapping and distinctive focuses. Both **Ericsson** and **Qualcomm** are keen on CSI compression use cases, emphasizing standardized procedures, data formats, and UE implementation. **Ericsson** highlights the importance of a single decoder implementation, while **Qualcomm** focuses on quantization methods and the UE-side model. Temporal-spatial-frequency (TSF) domain compression is another area of shared interest among **Ericsson** and **Huawei**. **Ericsson** proposes TSF domain compression as an optional variant of the two-sided model-based spatial-frequency (SF) compression, while **Huawei** suggests studying temporal-spatial-frequency domain CSI compression using a two-sided AI/ML model. Furthermore, there is a common emphasis on KPIs and evaluation methods for AI/ML-based CSI feedback enhancement. **Qualcomm** discusses using metrics like chordal distance and numerical spectral efficiency gap for rank 1. While **Huawei** focuses on co-existence between AI/ML and non-AI/ML modes, **Ericsson** and **Qualcomm** concentrate on model monitoring, training, and inference. They share concerns about the overhead and UE-side complexity of monitoring two-sided models and discuss the potential impacts of input-based model monitoring on UE-side implementation. In conclusion, these companies exhibit both overlapping and unique focuses, driving innovation in AI/ML for CSI feedback enhancement. **GPT elapsed time: 62 seconds.**

Scenario: 3GPP Meeting Preparation - Sub-topic Technical Comparison

Ask Apex Standards tdocGPT for a detailed comparison of company positions across important sub-topics.

Input: Compare Qualcomm, Huawei, Ericsson, and Nokia's technical focuses on the sub-topics under the topic "AI/ML for positioning accuracy enhancement."

Aspect	Ericsson	Qualcomm Incorporated	Huawei, HiSilicon	Nokia, Nokia Shanghai Bell	Reference TDoc
AI ML for CSI feedback	Temporal-spatial-frequency (TSF) domain compression as an optional variant of two-sided model-based SF compression	Full-buffer traffic model as baseline traffic model for evaluation of AI ML-based CSI feedback enhancement	Temporal-spatial-frequency domain CSI compression using two-sided AI ML model	Prefer Method 1 over Method 3 for intermediate KPI for rank 1	Ref 6: R1-2208728, Ref 7: R1-2206884, Ref 8: R1-2207224
Evaluation and monitoring	Study NW data collection for model training, parameter values, and standardized procedures for high-resolution CSI	Share evaluation results on standalone ML model performance and end-to-end performance using LLS SLS	Study specification impact for co-existence between AI ML mode and legacy non-AI ML mode	Include generalization tests from scenarios or configurations outside the training data set	Ref 4: R1-2208729, Ref 34: R1-2205024, Ref 38: R1-2209367
Training methods and data	Study further training types and methods that enable a single decoder implementation in the network side	Data collection for model training should focus on what data should be collected	Discuss use case specific procedures for life cycle management, including data collection, training, inference, monitoring, and UE capability	N/A	Ref 5: R1-2210954, Ref 10: R1-2210886, Ref 11: R1-2301405
Quantization and compression	Study quantization methods for UCI, including quantization-aware training and complex-valued activation functions	Quantization method should be aligned for good performance; no need for separate specification support	N/A	N/A	Ref 18: R1-2206884, Ref 22: R1-2301405
UE-side model and implementation	Proposal to leave the input to the UE-side model during inference to UE implementation	Procedure to process downlink measurements and derive the input to the UE-side model during inference should be left to UE implementation	N/A	N/A	Ref 21: R1-2301405, Ref 19: R1-2301405

Result: GPT contribution comparison. Based on the above table, tdocGPT further identifies **Similarities**: All companies discuss the use of AI/ML for CSI feedback enhancement. Both Ericsson and Qualcomm focus on evaluation and monitoring aspects of the AI/ML models. Three companies, Ericsson, Qualcomm and Huawei, HiSilicon, address training methods and data collection. **Differences**: Ericsson focuses on temporal-spatial-frequency (TSF) domain compression as an optional variant, while Qualcomm Incorporated emphasizes the full-buffer traffic model as a baseline. Huawei, HiSilicon, proposes studying the co-existence between AI/ML mode and legacy non-AI/ML mode. Nokia, Nokia Shanghai Bell, discusses the inclusion of generalization tests from scenarios or configurations outside the training data set. **Pros**: Exploring different AI/ML models for CSI feedback enhancement provides various options for improving system performance. Sharing evaluation results and focusing on data collection will help refine the ML models and ensure better end-to-end performance. **Cons**: Different approaches to AI/ML models for CSI feedback enhancement may lead to challenges in standardizing the technology. Ensuring compatibility between AI/ML mode and legacy non-AI/ML mode may be complex and time-consuming. **GPT elapsed time: 116 seconds.**

APEX STANDARDS

Domain-specific GPT to Aid Standardization & Patenting via Question Answering

Scenario: Given a half-baked claim element, complete it so that it has a chance to become standard essential.

Apex Standards sepGPT evaluates the input claim elements and compares them to the existing Standard Essential Patents. On the basis of these details, it then suggests multiple variants of claim element fulfillment for a researcher to analyze and fine-tune with, thereby pointing to promising directions and maximizing his or her innovative potential.

Input: Incomplete Claim Element

A method for data backup and recovery by a processor based on linked file repositories with each of the linked file repositories representing an individual file system capable of storing at least one version of a file and being connected to at least one server system, wherein the method includes: placing each of the linked file repositories in one of a plurality of positions for storing the at least one version of the file; continuously numbering each of the plurality of positions of each of the linked file repositories; determining a number of the at least one version of the file by the one of a plurality of positions of the one of the linked file repositories;

Version	Incomplete claim element input (in gray) and GPT-generated fulfillment
1	A method for data backup and recovery by a processor based on linked file repositories with each of the linked file repositories representing an individual file system capable of storing at least one version of a file and being connected to at least one server system, wherein the method includes: placing each of the linked file repositories in one of a plurality of positions for storing the at least one version of the file; continuously numbering each of the plurality of positions of each of the linked file repositories; determining a number of the at least one version of the file by the one of a plurality of positions of the one of the linked file repositories; and storing the number of a particular version of file in the one linked file repository at the determined number of position of the particular linked file. A first file system includes a first number of positions to store a first version of data, a second number of files in the first number, a third number of links between the first and second number files, and a fourth number of file system locations for storing a second version of at least a portion of the first version, the third number, and the fourth number. A second file system is connected to the first file server. The second file server includes a second file number and a second set of file locations, where the second number is greater than the first.
2	A method for data backup and recovery by a processor based on linked file repositories with each of the linked file repositories representing an individual file system capable of storing at least one version of a file and being connected to at least one server system, wherein the method includes: placing each of the linked file repositories in one of a plurality of positions for storing the at least one version of the file; continuously numbering each of the plurality of positions of each of the linked file repositories; determining a number of the at least one version of the file by the one of a plurality of positions of the one of the linked file repositories; selecting the at most one of at least two of the positions of said one of said linked file repository that stores the at least number of versions of the file with the determined number of at most the at least number in accordance with a predetermined priority order of said at least the number of said version of said file; and placing the selected position of the selected linked file into one of another of the other positions of another one of the of the links of the another one of one of linked file; continuing to place each of another linked file in the one position selected by the at last selected linked files, wherein, after a number selected by said at last linked file has been placed in a position selected in accordance to a predetermined order, another number selected from the at number of another position of another at the linked files of the a number that is the next to the number selected in the predetermined order is placed in the selected at last position of said the selected one linked file.
3	A method for data backup and recovery by a processor based on linked file repositories with each of the linked file repositories representing an individual file system capable of storing at least one version of a file and being connected to at least one server system, wherein the method includes: placing each of the linked file repositories in one of a plurality of positions for storing the at least one version of the file; continuously numbering each of the plurality of positions of each of the linked file repositories; determining a number of the at least one version of the file by the one of a plurality of positions of the one of the linked file repositories; and storing the determined number of file in a file repository corresponding to the determined one of positions. A method is provided for distributing data between a server and a client. The method includes receiving the data from the server, the data including a version number, determining whether the version number is less than the version count of the data and if so, distributing the data to the client. If the version is less than the version of data, then the data is distributed to the server. The version number of data is determined by a network manager. Further, the version counts of the server and the client are determined by the network manager, and the version numbers of the client and the server are compared. In one embodiment, the server is a server on a network, and a file is a database in the server on the network. The version count is a count of file versions of the database.
4	A method for data backup and recovery by a processor based on linked file repositories with each of the linked file repositories representing an individual file system capable of storing at least one version of a file and being connected to at least one server system, wherein the method includes: placing each of the linked file repositories in one of a plurality of positions for storing the at least one version of the file; continuously numbering each of the plurality of positions of each of the linked file repositories; determining a number of the at least one version of the file by the one of a plurality of positions of the one of the linked file repositories; and storing the determined number of at least the one version, wherein each of said linked file repository has the at most one version, providing range shift rate control for CDMA cellular communications system. The method comprises determining a signal strength of a received signal and adjusting a rate of a first signal based on a signal quality of the received signal. In another aspect of the invention, the method further comprises determining, based on said signal strength, a signal power of the first signal. In yet another aspect, the rate of the signal is further reduced based on an amount of said signal power. Further, the invention relates to a method of controlling transmission power in a radio network.

Result: GPT-suggestions to complete the claim element. GPT elapsed time: 72 seconds.

Scenario: Based on a draft claim element, discover standard essentiality opportunities.

Apex Standards tstrGPT detects potential standard section clauses and evaluates their semantic similarities and differences. It delivers a thorough analysis of your patent claims, allowing you to swiftly uncover SEP prospects and make educated decisions on your intellectual property portfolio, such as whether or not to file a provisional patent application.

Input: Claim Element

User entity for communicating via communication resources, on which a client (40) is operative, wherein the user entity is configured to determine a received media content throughput or a fill level of a buffer of the client for buffering a media content retrieved by the client from a server (42), derive a set of parameters from a media presentation description received from the server, the set of parameters describing versions of different bandwidths of the media content, and inform a resource manager (30) responsible for assigning the communication resources to a plurality of user entities to which the user entity belongs, on the determined media content throughput or fill level and the set of parameters.

	Claim Element	3GPP TS 36.420 version 13.0.0 5.2.1.2 Control of user plane transport bearers between source eNB and target eNB	3GPP TS 36.300 version 11.14.0 16.1.3 Connection Mobility Control (CMC)	3GPP TS 38.133 version 15.20.0 8.5.8.2 Scheduling availability of UE performing L1-RSRP measurement with a different subcarrier spacing than PDSCH/PDCCH on FR1
Topic	User entity	Control of user plane transport bearers	Connection Mobility Control	UE scheduling availability
Restriction	N/A	At most one user plane transport bearer per E-RAB allocated to the UE	N/A	Scheduling restrictions on serving cells for UEs that do not support simultaneousRxDataSSB-DiffNumerology and L1-RSRP measurement based on SSB configured as link recovery detection resource
Similar feature 1	Communicating via communication resources	Control of user plane transport bearers	Management of radio resources	No scheduling restrictions due to L1-RSRP measurement based on SSB
Similar feature 2	User entity is operative	Allow establishing and releasing transport bearers	Radio connections mobility has to be supported	The UE is not expected to transmit or receive certain signals on eSSB
Similar feature 3	Determine received media content throughput or fill level	One user plane transport bearer per E-RAB allocated	Cell reselection algorithms controlled by setting parameters	Intra-band carrier aggregation has scheduling restrictions
Similar feature 4	Derive a set of parameters from a media presentation description	Relaying DL and UL data from source eNB to target eNB	Handover decisions based on UE and eNB measurements	No scheduling restrictions on FR1 serving cell(s) configured in other bands
Similar feature 5	Inform a resource manager responsible for assigning resources	N/A	Other inputs, such as neighbour cell load and transport resources	N/A
Difference in focuses	Concerned with media content communication	Concerned with user plane transport bearers	Concerned with radio resource management	Concerned with scheduling restrictions due to L1-RSRP measurement based on SSB
Difference in functions	Informs resource manager about media content and buffer status	Establishes and releases user plane transport bearers	Controls cell reselection algorithms and handover decisions	Specifies restrictions for UEs that do not support simultaneousRxDataSSB-DiffNumerology
Difference in data types	Derives parameters from media presentation description	Relays data between source and target eNB	Broadcasts parameters for UE measurement and reporting procedures	Specifies scheduling restrictions for intra-band carrier aggregation
Differences in conditions	Operates on user entity for media content communication	Relays DL and UL data between source and target eNB	Supports radio connections mobility and takes various inputs into account	Specifies no scheduling restrictions for inter-band carrier aggregation

Result: a detailed comparison between the input claim element texts and candidate technical clauses of selected standards. GPT elapsed time: 66 seconds.