

## 5G Tools for RF Wireless

Tools from engineers for engineers

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# 5G NR TBS (Transport Block size) Calculator

This Page provides information about 5G NR TBS (Transport Block size) Calculator. Calculator is based on 3GPP 38.214 communication standards and allows you to calculate TBS depends on MCS (Modulation order, code rate), number of used PRB etc. Modulation Order and Code Rate are determined by tables: 38.214 Table 5.1.3.1-1 and Table 5.1.3.1-2. (depends on DCI, C-RNTI, MCS indexes).

Approximately TBS can be calculated using the formulas from 3GPP 38.214 chapter 5.1.3.2, where  $N_{info}$  – number of information bits:

$$N_{info} = N_{RE} \cdot R \cdot Q_m \cdot v, \quad N'_{RE} = N_{sc}^{RB} \cdot N_{symb}^{sh} - N_{DMRS}^{PRB} - N_{oh}^{PRB}, \quad N_{RE} = \min(156, N'_{RE}) \cdot n_{PRB}$$

$$\text{If } N_{info} \leq 3824, N'_{info} = \max\left(24, 2^n \cdot \left\lfloor \frac{N_{info}}{2^n} \right\rfloor\right), \text{ where } n = \max(3, \lfloor \log_2(N_{info}) \rfloor - 6)$$

$$\text{If } N_{info} > 3824, N'_{info} = \max\left(3840, 2^n \times \text{round}\left(\frac{N_{info} - 24}{2^n}\right)\right), \text{ where } n = \lfloor \log_2(N_{info} - 24) \rfloor - 5$$

$$\text{if } R \leq 1/4, TBS = 8 \cdot C \cdot \left\lceil \frac{N'_{info} + 24}{8 \cdot C} \right\rceil - 24, \text{ where } C = \left\lceil \frac{N'_{info} + 24}{3816} \right\rceil$$

$$\text{else if } N'_{info} > 8424, TBS = 8 \cdot C \cdot \left\lceil \frac{N'_{info} + 24}{8 \cdot C} \right\rceil - 24, \text{ where } C = \left\lceil \frac{N'_{info} + 24}{8424} \right\rceil \text{ else } TBS = 8 \cdot \left\lceil \frac{N'_{info} + 24}{8} \right\rceil - 24$$

## 5G NR TBS CALCULATOR

5G NR TBS (Transport block size): **344376**



# Calculated Throughput Max (Mbps):

**688.752**

## INPUT DATA

Enter the MCS index

9

v(j)Layers

4

(maximum

number of

MIMO layers)

Nprb

273

Total number

of allocated

PRBs for the

UE

Numerology - Subcarrier

Spacing ( $\mu$ ) configuration☐ 0:  $\mu$ :15kHz ☒ 1:  $\mu$ :30kHz ☐ 2:  $\mu$ :60kHz☐ 3:  $\mu$ :120kHz ☐ 4:  $\mu$ :240kHz

Select a 5G NR table from

38.214

(depends on DCI, C-RNTI, etc)

38.214-Table 5.1.3.1-2



Modulation Order Qm

4

Target code Rate R x [1024]

616

Number of scheduled OFDM

symbols

(N sh symb)

13

Number of RE for DM-RS per

PRB

(N prb dmrs)

24

Overhead configured by

higher layer

(N prb oh)

0

## RESULT

N(RE)

36036



Ninfo

(Number of information bits)

346846.5

5G NR TBS (Transport block size)

344376

Calculated Throughput Max (Mbps)

688.752

5G NR TBS (Transport block size): **344376**

Calculated Throughput Max (Mbps):

**688.752**

**Update1: UPDATE to 3GPP Release**

**Update2: FIX Calculated Throughput (Added Numerology  $\mu$  parameter)**

**Update3: FIX Ninfo calculation (thx Michael and Yusuf)**

Found a mistake? [Contact us!](#)

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## Comments

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**abhilash** July 23, 2020 at 19:14

Nre value seems to ambiguous for values, for 12 and 11 ofdm symbols i see  $N(RE)=720$ , when the number of symbols are increased number of RE should be increased accordingly

REPLY

**OlegV@5GTools** July 28, 2020 at 18:29

Dear, Abhilash!

I think it happend, because Calculator use Table 5.1.3.2-1: Quantized number of REs allocated for PDSCH within a PRB

from 3GPP 38.214 rel 15.0.0 ( it was deleted in later releases)

I will fix it soon

Regards, Oleg

REPLY

**OlegV@5GTools** August 5, 2020 at 23:02

Dear, Abhilash!

Fixed! Please Check!

Regards, Oleg

REPLY

**Manoj** September 17, 2020 at 19:58

If I use 30 KHz sub carrier spacing for 100 MHz BW ( 273 PRBs), I can schedule all 273 PRBs in 0.5 ms slot.

So for this perspective, the max throughput should be twice the TBS. Please share your view.

REPLY

**OlegV@5GTools** September 26, 2020 at 19:39

Dear, Manoj!

You are right. Max throughput should be twice the TBS.

(if Numerology =2, 30 KHz)



Fixed it! I added Numerology  $\mu$  parameter  
Regards, Oleg

[REPLY](#)

**Yusuf** October 6, 2020 at 23:37

Hello! Could you explain why Ninfo, in the results, is always floored to an integer value?

[REPLY](#)

**OlegV@5GTools** December 1, 2022 at 17:26

Dear, Yusuf  
It was mistake. Fixed, thank you  
Regards, Oleg

[REPLY](#)

**alex** November 14, 2020 at 18:20

The UE may skip decoding a transport block in an initial transmission if the effective channel code rate is higher than 0.95, where the effective channel code rate is defined as the number of downlink information bits (including CRC bits) divided by the number of physical channel bits on PDSCH.

[REPLY](#)

**Anonymous** November 23, 2020 at 10:52

Hi , thank U for your tool. But when N\_info is less than 3824, TBS should be selected from the table, but it does not seem to be the case here.

[REPLY](#)

**OlegV@5GTools** January 5, 2021 at 20:59

Fixed, Can you check it?  
Regards, Oleg

[REPLY](#)

**马飞** October 31, 2022 at 12:37

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[REPLY](#)

**Grzegorz** January 28, 2021 at 16:36

The spec says: use Table 5.1.3.2-1 find the closest TBS that is not less than N'info. So why for Ninfo=556 the calculator selects 552, not 576?

[REPLY](#)

**Anonymous** September 28, 2021 at 12:25

Hello,Are there any formulas in 3Gpp to calculate Calculated Throughput Max depends on 5G NR TBS (Transport block size)?

[REPLY](#)

**irem** November 9, 2021 at 08:17

Hi, when I compare the results between TBS calculator and Throughput calculator, the result of the TBS calculator is the same with throughput calculated using Throughput calculator for just FDD system. Is TBS calculator just use in FDD system?

[REPLY](#)

**Jean** July 26, 2023 at 18:09

whether this mean the TBS of CSI-RS slot is the same with the TBS of a slot without CSI-RS ?

REPLY

**SC** May 17, 2024 at 19:01

Number of scheduled OFDM symbols  
no of ofdm symbol per slot is 14 in NR  
is it asking same or some different value ?

REPLY

**D. Werth** May 28, 2024 at 18:06

Could anyone explain why this is defined in TS 38.214 section 5.3.1.2:  
"A UE determines the total number of REs allocated for PDSCH ( $N_{RE}$ ) by  $N_{RE} = \min(156, N'_{RE}) * n_{prb}$ ."

Is the number "156" means that only 13 symbols can be allocated for PDSCH within a single slot?

If yes, why? and WHO use the remaining one symbol in this slot?

Much thanks in advance and wait for anyone's reply.

REPLY

**Anonymous** August 9, 2024 at 21:18

As far as I know, the reason might be that when PDSCH mapped into the resource grid, DM-RS at least one symbol should be allocated. So that the number of PDSCH symbols can be up to 13.

REPLY

**Anonymous** January 21, 2025 at 12:44

Calculated Throughput Max (Mbps) for TDD is not corrected, should take time slot format into consideration

REPLY

**Anonymous** January 23, 2025 at 13:53

Hi , one basic question this calculated transport-block-size is in bits or bytes ?

REPLY

**Anonymous** May 27, 2025 at 14:40

Hi,

This same calculator applies to UL also in all cases?

REPLY

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