

## Consultation comments and responses

**Document Title:** Guidance on Train Rooftop Antenna Positioning.

**Document number:** GKGN0602

**Consultation closing date:** 17 January 2023

### 1. Responders to consultation

No	Name	Company
1	Justin Monk	Network Rail
2	David Smith	Gemini
3	Stephen Reynolds	RDG
4		
5		

### 2. Summary of comments

Code	Description	Total
-	Consulted	340
CE	Critical errors	
ED	Editorial errors	
TY	Typographical errors	
OB	Observations	
-	Total comments returned	

Classification codes for a way forward:

- DC – Document change
- NC – No change

### 3. Collated consultation comments and responses

No	Page	Clause	Comment	Suggestion	By	Way forward	Page	Clause	Response
1	9	2.4	makes clear what type of train it relates to but what would be helpful would to make clear that this would not apply to freight vehicles as they remain not mentioned in this document.		1	NC			<p>Clause 2.4 of the review paper refers that guidance in GEGN0602 issue one applies to passenger trains, locomotives and on-track machines. This is extracted from the existing scope set out in 1.2 of GEGN0602 issue one.</p> <p>The scope of GEGN0602 issue one includes freight train locomotives. For example, section 5.3.6 of GEGN0602 provides guidance on 'sunken roof' - most of the example of this type of rooftop are locomotives of freight trains.</p>
2			The page marking at the bottom in the footer shows a document of 5 pages but there are in fact 8 pages to this document.		1	DC			The footer of the review paper has been corrected.

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3	56		Definitions	Include all acronyms and abbreviations that are used in the document. Acronyms are explained where first used but including them in with Definitions would make it easier to refer to and absorb the content of the document.	2	DC			Agreed, all acronyms and abbreviations will be included in the definition in the updated version of the document.
4	0	0	It is noted that there is a suggestion in the review paper of some alignment with the Key Train Requirements (KTR) document. This suggests only some sections will be considered.	Confirm KTR issue number being referenced. Consider alignment of all relevant sections of the KTR and feed back to KTR author where conflict occurs.	3	DC			The Key Train Requirements (KTR) issue number (v7 draft) was included in the "reference" section (page 6) of the paper. The latest version of KTR will be reviewed when updating the document, with all relevant sections aligned and any conflicts fed back to the KTR author. The relevant part of the review paper has been updated.
5	7	2.1	Noting the considerations about CSR & NRN in the review paper, this section currently refers to GSM-R voice and data radio in future tense.	The whole of section 2.1 requires updating to be more GSM-R centric.	3	DC			Section 2.1 will be updated to reflect current use of GSM-R and the introduction of Future Railway Mobile Communication Systems (FRMCS).

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6	7	2.2	A dual GSM-R / GNSS Antenna is now the preferred standard	Update section 2.2 to reflect this	3	DC			Section 2.2 will be updated to reflect the current implementations. The guidance in section 2.2 is for antennas used for "non-safety related applications". If the dual GSM-R/GNSS antenna is only used for safety related application, then relevant guidance will be provided in section 2.1 'Technical introduction - radio technologies for operational safety applications'.
7	8	Table 1	Noting that the review paper does not mention consideration of implementation of ETCS - Second line of Table 1 contains a reference to ETCS in future tense.	Update table 1 to take into account current and future intended use of ETCS data radios	3	DC			Table 1 will be updated to reflect the current and future intended use of ETCS data radios.
8	8	Table 1	The wording of the notes in the second line of Table 1 appears to be incorrect. ' <i>...use two separate antennas dedicated to one of two data radios</i> ' (See 2.4.2.1)	Review wording	3	DC			The wording will be revised to align with 2.4.2.1 "...This antenna group usually comprises two antennas, each one connected to a dedicated train data radio."

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9	8	Table 1	The classifications can be considered subjective because they are not defined anywhere in the document.	Provide definitions for the classifications. This will provide clarity for GPS (GNSS) which is listed in all 5 classifications.	3	DC			Definitions and further guidance will be provided in the next version of the document. GPS (GNSS) is used for location dependent applications which may be included with all groups of antennas. As the location information could be needed for safety related, or non-safety related applications.
10	8	2.4.1.1	Does statement regarding historic use to avoid approvals apply to passive GNSS?		3	DC			The statement "Each of these systems should use its own independent, approved antenna that has been used historically, in order to avoid new approvals for these systems." as it stands, does not preclude passive GNSS antenna.  However, it is expected that in general an active GNSS antenna would be selected for rooftop antennas, as G 4.4.2.1 of GEGN8578 recommends the use of an active antenna whenever the antenna receiver distance is greater than 0.1 m.  Further guidance or reference to GEGN8578 will be included in the updated GKGNO602.

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11	8	2.4.1.1	Statements ' <i>possibly GPS</i> ' - ' <i>if the GPS receiver is located close by</i> ' require clarification.	Use of term ' <i>possibly</i> ' is not guidance. Define 'close by'	3	DC			The wording of the guidance will be reviewed and clarified. 2.3.5 of GKGNO602 states "GPS as a location application may be included within all groups of antennas, with trains having one or more GPS antennas." Therefore, the use of "possibly GPS" in this clause 2.4.1.1, means GPS antenna is included within the group, if there is a need to support a GPS receiver.
12	8	2.4.1.2	Paragraph refers to ' <i>group A Antennas</i> ' but provides position information related to train radios only. Omits GPS	Include GPS (GNSS) positioning in statement	3	DC			Clause 2.4.1.2 refers to locating Group A antennas close to the train radio unit. The wording will be reviewed and clarified. Guidance relating to GPS (GNSS) antenna positioning will be added or referenced to GEGN8578.

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13	9	Table 2	The review paper states that CSR and NRN terms will be replaced with ' <i>obsolete heritage communication systems</i> '. This may not be appropriate for this table which requires significant change. Or will removal of 0.5m GSM-R to GPS rule thus render Table 2 empty?	If necessary, consider retaining NRN & CSR terms where applicable in tables.  As these are now non-functional then perhaps ex-NRN & ex-CSR may be a better alternative.	3	DC			Table 2 is to be removed because: <ul style="list-style-type: none"> <li>a. the physical separation of 0.5 m between Global System for Mobile communications – Railways (GSM-R) voice and Global Positioning System (GPS) antennas, is not necessary, because of the improved internal filtering of GPS technology.</li> <li>b. Cab Secure Radio (CSR) and National Radio Network (NRN) are now obsolete and should not be an issue from electrical interference perspective.</li> </ul> The proposed replacement of CSR and NRN with obsolete heritage communication systems', will be limited to new guidance added that these obsolete heritage communication systems, if still present, to be removed and space reused. The review paper (2.6) has been updated to clarify this.
14	10	2.4.1.10	The intention of this paragraph does not appear to extend to retrospective changes after systems have been installed correctly. i.e. if non-simultaneous installations are changed to simultaneous ones without moving antennas.	Ensure retrospective operational changes are considered.	3	DC			Guidance will be updated to consider retrospective operational changes after systems have been installed correctly.
15	10	2.4.3.4	This paragraph is worded as a requirement not guidance	Revise wording	3	DC			The wording will be revised.
16	10	2.4.3.5	This paragraph is worded as a requirement not guidance	Revise wording	3	DC			The wording will be revised.

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17	11	2.4.3.7	This requirement seems to assume that filtering will not be present. Should it not consider that equipment designed to operate with a matched GPS (GNSS) antenna will already be adequately protected?		3	DC			The wording will be reviewed and updated to consider antennas that already are adequately protected.
18	13	Figure 2	It is not clear from the review paper how the term ' <i>obsolete heritage communication systems</i> ' will be applied to labelling on Figs. such as this.	Consider suggestion given in comment 10 above for use in Figs.	3	DC			Figure 2 will be revised removing reference to CSR and NRN, and to consider FRMCS. The proposed replacement of CSR and NRN with <i>obsolete heritage communication systems</i> , will be limited to new guidance added that these obsolete heritage communication systems, if still present, to be removed and space reused. 2.6 of the review paper has been updated to clarify this.
19	14	3.1.2	This paragraph appears to be an introduction to section 3.1	Review section 3.1 purpose and validity	3	DC			Section 3.1 will be restructured, and the title changed to reflect the content.
20	14	3.1.3	It is not clear what this paragraph is trying to achieve. It says to consider future radio installation. Then suggests that space above the driver's cab has good access. For antenna positioning methodology, this is not valid guidance if this ' <i>accessible</i> ' space is occupied by equipment as most cab roofs are now.	Review section 3.1 purpose and validity	3	DC			The guidance in section 3.1 will be reviewed and revised. Clause 3.1.3 will be clarified and updated.

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21	14	3.1.4	This paragraph further confuses by implying previous guidance was for new trains.	Review section 3.1 purpose and validity	3	DC			The guidance in section 3.1 will be reviewed and revised.
22	14	3.1.4	This paragraph is worded as a requirement not guidance	Revise wording	3	DC			The guidance in section 3.1 will be reviewed and revised, including those worded as requirements.
23	14	3.1	This is generally confusing regarding new or retrofit Antenna installations	Consider splitting the Positioning Methodology section into two sections. One for new train design and one for retrofit.	3	DC			Part 3 of GKGNO602 sets out a positioning methodology which could be of use if the minimum separation distances in Part 2 are unable to be achieved. The guidance in section 3.1 will be reviewed and revised, which includes potential splitting into subsections.
24	16	3.1.2.4 C iii	The term Azimuth Direction is not explained or defined	Add information in definitions and consider reference to Fig B6	3	DC			The term "azimuth" in 3.1.2.4 C ii "Select locations which have a good 360 degrees azimuth view around the antenna" intended to refer to horizontal view around the antenna. Guidance will be updated in the next version.
25	17	3.2	This section is slightly confusing because it adds on further information after the positioning assessment has taken place in 3.1	Consider placing this as an early part of section 3.1	3	DC			3.2 provides some additional guidance for positioning of GPS antenna. Part 3 of GKGNO602 will be reviewed and re-structured for clarity. Section 3.2 could be placed at an early part of section 3.1 and referenced from positioning assessments steps for all antenna groups in later sections.

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26	18	4.1.3.2	The term Passive is not explained or defined	Add information in definitions	3	DC			The term "passive" has multiple occurrences through the document, mostly relates to passive antennas. The term "passive" also appears as part of "passive components" and "passive devices". Definition for passive antenna and active antenna will be considered and the use of "passive" in other occurrences will be reviewed and clarified.
27	22	4.7.4	This paragraph is worded as a requirement not guidance	Revise wording	3	DC			The guidance in this paragraph will be revised.
28	22	4.8.4	This paragraph is worded as a requirement not guidance	Revise wording	3	DC			The guidance in this paragraph will be revised.
29	23	4.8.5	Typo – 'Where manufactures specify..'	Revise wording	3	DC			Typo will be corrected.
30	24	5.1.1	Is the statement 'The normal desire to position an antenna as high as possible...' actually true? Is this a normal desire or is it driven by standards? See 5.3.3.2	Review wording	3	DC			This sentence will be reworded.
31	24	5.1.2	Paragraph does not make clear that an antenna below the roof can also be inside the vehicle.	Review wording	3	DC			Clause 5.1.2 intends to convey that antennas may be installed underneath non-metallic train roofs an approach to resolving the gauge limitation issue. This paragraph will be review and reworded if needed.
32	24	5.1.3	This paragraph is worded as a requirement not guidance	Revise wording	3	DC			This paragraph will be reworded.
33	24	5.1.3	This paragraph is incorrect. Mounting an antenna at the same height as others will not confirm gauge clearance, unless the additional antenna is exactly the same dimensions as the existing.	Revise wording	3	DC			This paragraph will be reworded.

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34	24	5.3	This section is not clear about which antennas it is referring to. Appears generic but one paragraph is specific.	Review intent and ensure all groups are considered and made clear.	3	DC			<p>The intention of this section was to set out the challenges and impact of the various types of obstructions on the train rooftop to the siting of antennas.</p> <p>The wording of this section will be updated to be made clearer.</p>
35	25	5.3.3.2	Is this in conflict with 5.1?	Review wording	3	DC			<p>This paragraph (5.3.3.2) refers to the elevation of antenna to be above any local obstruction (within a few meters) in ideal situations. Next paragraph (5.3.3.3) describes that it is not always practical to do so. Clause 5.3.3.5 refers gauging clearance constraints.</p> <p>Section 5.1 gives guidance on gauging consideration. 5.3.3.2 is not in direct conflict with 5.1.</p> <p>Wording will be reviewed and revised to be clear that the elevation of antenna is to be constrained by factors including gauging. The updating will consider combining 5.3.3.2 with 5.3.3.5.</p>
36	25	5.3.3.3	Mention gauge clearance as well as signal degradation?	Review wording	3	DC			<p>Clause 5.3.3.3 describes the impact on signal level from the height of other rooftop items. 5.3.3.5 covers gauge clearance.</p> <p>Clause 5.3.3.3 will be reviewed with 5.3.3.2 and 5.3.3.5 and updated to be clearer.</p>
37	25	5.3.3.5	Is this not in conflict with 5.3.3.2 & 5.3.3.3 ?	Review wording	3	DC			<p>Clause 5.3.3.5 refers to the antenna elevation being constrained by gauge of the train.</p> <p>Clause 5.3.3.5 will be reviewed with 5.3.3.2 &amp; 5.3.3.3 and updated to be clearer.</p>

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38	26	5.3.4.1	This section can be misinterpreted and loosely suggests – mount antenna between two cabs possibly close to the pantograph and switchgear.	Review wording	3	DC			The guidance was based on RSSB research T739 "Train Rooftop Antenna Positioning – Issues Study". Clause 5.3.4.1 refers to a specific type of roof (sunken roof) where rooftop space suitable for antennas installation are limited. For example, Class 90 has a raised area above the cab which is limited and cannot support an array of antennas. This paragraph will be reviewed and reworded.
39	28	5.3.5.2	The GSM-R design illustrated may be a very early design or prototype for this type of roof. There was an improved design fitted to vehicles with similar roof arrangements later in the project which raised the antenna on a bolt-through spacer mounted and shaped between the corrugations, which removed the requirement for rivetted plates.	Review this because possibly not best practice See designs for later units e.g. Class 455 Class 458	3	DC			The GSM-R design for later units will be reviewed and best practice incorporated into the next version.
40	29	5.3.5.3	This seems to contradict my comments for 5.3.5.2	Review wording against response to 5.3.5.2	3	DC			The GSM-R design for later units will be reviewed and good practice incorporated into the next version.
41	30	5.3.6.6	This paragraph is worded as a requirement not guidance	Revise wording	3	DC			The wording will be revised.
42	30	5.3.6.6	This is example is perhaps not appropriate now. The subsequent GSM-R design for class 43 was installed at the rear of the vehicle some distance from the cab, due to the lack of space available and the problems mounting the antenna.	Review this because possibly not best example to provide now.	3	DC			Subsequent GSM-R design for class 43 will be reviewed and guidance updated.

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43	30	5.3.7.2	This paragraph is worded as a requirement not guidance	Revise wording	3	DC			All guidance worded as requirement will be revised throughout the document.
44	30	5.3.7.2	Some clarity is required regarding the datum point for the dimension given in this paragraph. Is this with pantograph raised or lowered? Which part of the switchgear or pantograph base is considered the correct datum to measure from?	Provide guidance about datum points. Consider diagram.	3	DC			This paragraph refers to specific distances from pantograph (and associated switchgear) when raised, for GPS antenna and other antenna. The intention is to try and achieve 5 m (for GPS antenna) from any high voltage part of the system as that is the source of potential EMC noise during arcing. It is proposed to make it clear that these values (4 or 5 m) are guidance only. If the separations cannot be achieved in practice, it is possible to do further testing and accept a reduced separation. This will also give flexibility of antenna positioning due to, for example improved GPS internal filtering technology .
45	30	5.3.7.3	This appears to contradict 5.3.7.2 by reducing the separation to 4m, confusing because it does not make clear which antenna it is referring to.	Provide guidance about datum points. Consider diagram.	3	DC			Clause 5.3.7.2 refers to at least 5m from the pantograph and associated switchgear, for GPS antenna, and 4m for other antennae. This clause (5.3.7.3) refers to the at least 4 m between the antenna and the <i>extended</i> pantograph. The wording will be updated to make it clear to which antenna it is referring. Further guidance on the specific value (of 4m) is to be provided and consideration given to include a diagram.
46	32	6.1	Several paragraphs of this section are worded as a requirements rather than guidance.	Review and revise wording	3	DC			All guidance worded as requirement will be revised throughout the document.

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47	32	6.2	Several paragraphs of this section are worded as a requirements rather than guidance.	Review and revise wording	3	DC			All guidance worded as requirement will be revised throughout the document.
48	33	6.3	Several paragraphs of this section are worded as a requirements rather than guidance.	Review and revise wording	3	DC			All guidance worded as requirement will be revised throughout the document.
49	33	6.3.1.1	This paragraph is incorrect. The Antenna should be installed according to the system design. Who is the target audience here? Rules for designer are to follow manufacturer instructions. The rules for installer are to follow the system installation design.	Review wording	3	DC			Clause 6.3.1.1 is correct that manufacturer's instructions need to be followed in the installation (albeit through both system design and installation design). The wording of this paragraph will be reviewed to make it clearer. The audience for the guidance is infrastructure managers, railway undertakings and other organisations required to fit antennas on train rooftops.
50	33	6.3.1.2	Uses the term ' <i>normal desire</i> ' again. See comment 27 for 5.1.1	Review wording	3	DC			The wording of this sentence will be reviewed and changed.
51	33	6.3.1.8	This paragraph does not make sense? - Consider design for ease of access to underside of Antenna if you cannot maintain antenna from above? What is this trying to achieve?	Review wording and intent	3	DC			The intent of clause 6.3.1.8 is about the installation design in such a way to minimise the need to access the roof. The need and intent of this paragraph will be reviewed with industry stakeholders.
52	34	6.3.2.1	Is there current evidence to support the claim about feeder cable connection? Is this outdated evidence?	Review wording and evidence to support	3	DC			It is plausible that with GSM-R this paragraph has become outdated as the need to swap radio is reduced compare to CSR/NRN, so wear on feeder cables/connectors is consequently reduced. The wording will be reviewed and revised.

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53	34	6.3.2.1	Items should be installed within the roof of trains in accordance to the system design. Not the manufacturer's instructions.	Review wording	3	DC			The wording will be reviewed and revised.
54	34	6.4	This paragraph is worded as a requirement not guidance	Revise wording	3	DC			All guidance worded as requirement will be revised throughout the document.
55	34	6.4.1	The antennas should be maintained and cleaned in accordance with the manufacturers' and designers instructions. The designer specifies the mount and fixings which need to be maintained.  There is also a requirement for periodic visual inspections for mechanical damage.	Review and revise wording	3	DC			The paragraph will be reviewed and reworded.
56	34	6.5	Several paragraphs of this section are worded as a requirements rather than guidance.	Review and revise wording	3	DC			All guidance worded as requirement will be revised throughout the document.
57	34	6.5.3	To test the feeder cable, replace the feeder cable with a 50 ohm load? Connected how?  Is this correct?	Should this be: '...the antenna should be disconnected and replaced with a good quality RF 50 ohm load.' ?	3	DC			The existing text will be reviewed and replaced to align with the proposed wording.
58	Various	Appendices A-F	Note about content implies that rest of document is mandatory	Remove note and ensure this is clear in the document introduction.	3	DC			The next version of GKG0602 will be in accordance with the current RSSB template.

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59		General	Does the guidance need to consider distances between antenna on vehicles of adjacent units or locomotives that are coupled together? This document provides guidance to mount antenna close to the cab, if two cabs are coupled when radio systems are operational should this also be a consideration? See Fig 4	Open question for consideration	3	DC			The existing GKGN0602 does not consider this scenario. Noting that if two locomotives are coupled together, normally the radio system is inactive for the second cab. This does not preclude future possible scenarios where both radio systems are operational. This will be reviewed when the document is updated.
60		General	Is the current title of the document correct? The content is significantly more than just guidance on train rooftop antenna positioning. It provides a lot of information towards system design as well.	Open question for consideration e.g. Train rooftop Antenna positioning and system design	3	DC			Agreed that this guidance provides more than positioning. Consideration will be given to change of the title for the next version, to reflect the scope of the guidance.
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