

# **[RAN1-led] Study on Channel Modeling for Integrated sensing and communication**

[SI]

# Motivation

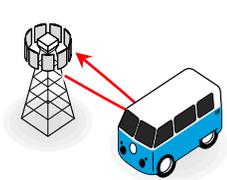
- Increasing interest for Integrated Sensing and Communication (e.g. see ongoing TR22.837)
- The ISAC promise lies in the processing of *existing* radio communication signals<sup>1</sup> to deliver **value-adding sensing information** e.g. for radio network self-optimization; object detection; contact-free health monitoring etc.
  - subject to implementation complexity
- Prior designing technology for ISAC using 3GPP radio, understanding how to model channels for sensing is **fundamental**
  - Existing 3GPP channel models are defined only for radio communication
  - There is no existing 3GPP channel model considering the characteristics of communication and sensing

NOTE 1: e.g. reflected, refracted, diffracted, scattered

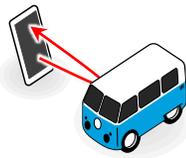
# Proposal

[1/2]

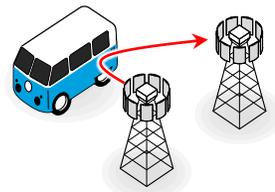
- Key target use case(s) for ISAC will first need to be identified i.e. use case and associated sensing mode and sensing type
- Misc. sensing modes can be distinguished depending on the transmitter and receiver
  - **Monostatic**: the receiver and transmitter are the same node
  - **Bi-static**: the receiver and transmitter are different nodes
- Two sensing types can be identified: active, passive
  - **Active**: radio signals are intentionally emitted *for* sensing
  - **Passive**: existing “ambient” communication signals are exploited for sensing
- The impact of sensing mode and sensing type on channel modeling should be investigated
- ISAC channel modeling depends on the use case e.g.
  - For object detection/tracking case, **stochastic-based** method is preferred, e.g., existing TR38.901
  - For gesture recognition case, the **deterministic-based** method is preferred, e.g., **ray-tracing** based method
    - However, the ray-tracing method needs more effort than reusing the existing TR38.901 channel model, e.g., how to calibrate and evaluate the ray-tracing outcome
- An **Evaluation Methodology** will also need to be defined



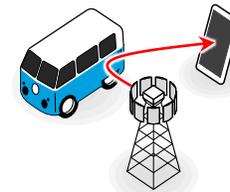
gNB monostatic



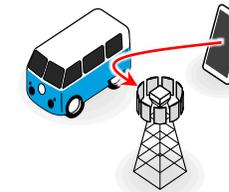
UE monostatic



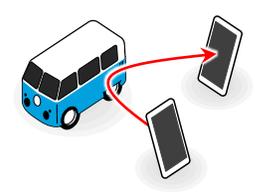
gNB-gNB bistatic



gNB-UE bistatic



UE-gNB bistatic



UE-UE bistatic

SA/CT Dependency: No

## Study use cases and corresponding channel modeling for NR-based Integrated Sensing and Communication

### Objective: Study and evaluate channel modeling for ISAC [RAN1]

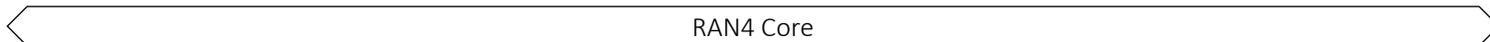
- Identify the use cases for ISAC channel modeling
  - TR 22.837 to be used as a starting point
  - Study the relationship between the use case and channel modeling, e.g., statistical, deterministic or hybrid channel modeling
- Study the impact of sensing mode and sensing type on ISAC channel modeling
  - If necessary, prioritize the sensing mode(s) and sensing type(s) of interest
  - NOTE 1: the sensing mode includes gNB mono-static, UE mono-static, gNB-UE bistatic, gNB1-gNB2 bistatic, UE-gNB bistatic, UE1-UE2 bistatic
  - NOTE 2: sensing type includes passive, and active sensing
- Study whether and how on the TR38.901 channel modeling could be enhanced to support ISAC channel model
  - Study and identify the gap between the ISAC and existing TR38.901 channel modeling
  - Characterize the parameterization for target radar cross-section (RCS)
- Verify suitability of the channel model via appropriate agreed methodology

NOTE 3: The study applies to both FR1 and FR2

# Expected TU

	2024												2025 [Calendar TBC at the time of writing]												2026		
	Q1			Q2			Q3			Q4			Q1			Q2			Q3			Q4			Q1		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
<b>RAN</b>	<b>103</b>			<b>104</b>			<b>105</b>			<b>106</b>			<b>107</b>			<b>108</b>			<b>109</b>			<b>110</b>			<b>111</b>		
R1	115b	116		116b	117			118		118b	119		119b	120		120b	121			122		122b	123		123b	124	
R2	124b	125		125b	126			127		127b	128		128b	129		129b	130			131		131b	132				
R3	122b	123		123b	124			125		125b	126		126b	127		127b	128			129		129b	130				
R4	109b	110		110b	111			112		112b	113		113b	114		114b	115			116		116b	117		117b	118	
R1		1		1	1			1		1	1			1		1	1										
R2				N/A	N/A			N/A		N/A	N/A			N/A		N/A	N/A			N/A							
R3				N/A	N/A			N/A		N/A	N/A			N/A		N/A	N/A			N/A							
R4 RD				N/A	N/A			N/A		N/A	N/A			N/A		N/A	N/A			N/A							
R4 RF				N/A	N/A			N/A		N/A	N/A			N/A		N/A	N/A			N/A							

Study TU  
Feature TU



**Thank you!**