

GNSS Measurement Types

1 Single-frequency measurements

GNSS	Freq Band	Track Code	ODTK Type		ODTK Internal Meas Type		RINEX 2 Code		RINEX 3 Code	
			Range	Phase	Range	Phase	Range	Phase	Range	Phase
GPS & QZSS	L1	C/A	CA Pseudo-range	LA Phase	eMTGPSC1	eMTGPSLA	C1 (2.11) CA (2.12)	LA	C1C	L1C
	L1	P	P1 Pseudo-range	L1 Phase	eMTGPSP1	eMTGPSL1	P1	L1	C1P C1Y	L1P L1Y
	L1	C	L1C Pseudo-range	L1C Phase	eMTGPSCB	eMTGPSLB	CB	LB	C1S C1L C1X	L1S L1L L1X
	L1	M	L1C Pseudo-range	L1C Phase	eMTGPSCB	eMTGPSLB	CB	LB	C1M	L1M
	L2	C/A	TBD	TBD	eMTGPSCD	eMTGPSLD	CD	LD	C2C	L2C
	L2	P	P2 Pseudo-range	L2 Phase	eMTGPSP2	eMTGPSL2	P2	L2	C2P C2Y	L21P L2Y
	L2	C	L2C Pseudo-range	L2C Phase	eMTGPSCC	eMTGPSLC	CC	LC	C2 C2L C2W C2X	L2S L2L L2W L2X
	L2	M	L2C Pseudo-range	L2C Phase	eMTGPSCC	eMTGPSLC	CC	LC	C2M	L2M
	L5		L5 Pseudo-range	L5 Phase	eMTGPSC5	eMTGPSL5	C5	L5	C5I C5Q C5X	L5I L5Q L5X
	QZSS (Only)	LEX		LEX Pseudo-range	LEX Phase	eMTGPSC6	eMTGPSL6	C6	L6	C6S C6L C6X
Galileo	E1/ L1		E1 Pseudo-range	E1 Phase	eMTGalE1PR	eMTGalE1Phase	C1	L1	C1A C1B C1C C1X C1Z	L1A L1B L1C L1X L1Z
	E5a/ L5		E5a Pseudo-range	E5a Phase	eMTGalE5aPR	eMTGalE5aPhase	C5	L5	C5I C5Q C5X	L5I L5Q L5X

	E5b		E5b Pseudo-range	E5b Phase	eMTGalE5bPR	eMTGalE5bPhase	C7	L7	C7I C7Q C7X	L7I L7Q L7X
	E5		E5ab Pseudo-range	E5ab Phase	eMTGalE5abPR	eMTGalE5abPhase	C8	L8	C8I C8Q C8X	L8I L8Q L8X
	E6		E6 Pseudo-range	E6 Phase	eMTGalE6PR	eMTGalE6Phase	C6	L6	C6A C6B C6C C6X	L6A L6B L6C L6X
GLONASS	G1	SA	RCA Pseudo-range	RLA Phase	eMTGloCA	eMTGloLA	C1 (2.11) CA (2.12)	LA	C1C	L1C
	G1	HA	RP1 Pseudo-range	RL1 Phase	eMTGloP1	eMTGloL1	P1	L1	C1P	L1P
	G2	SA	RCB Pseudo-range	RLB Phase	eMTGloCB	eMTGloLB	CD	LD	C2C	L2C
	G2	HA	RP2 Pseudo-range	RL2 Phase	eMTGloP2	eMTGloL2	P2	L2	C2P	L2P
Beidou	B1		B1 Pseudo-range	B1 Phase	eMTBeiDouB1_PR	eMTBeiDouB1_Phase	C1	L1	C1I, C1Q C1X	L1I L1Q L1X
	B2= E5b		E5b Pseudo-range	E5b Phase	eMTGalE5bPR	eMTGalE5bPhase	C7	L7	C7I C7Q C7X	L7I L7Q L7X
	B3= E6		E6 Pseudo-range	E6 Phase	eMTGalE6PR	eMTGalE6Phase	C6	L6	C6I C6Q C6X	L6I L6Q L6X

2 Dual-frequency measurements

ODTK supports combining the following single-frequency combinations into a dual-frequency (DF) measurement that is independent of first-order ionospheric effects.

GNSS	Freq	Track	Freq	Track	ODTK Measurement Types		ODTK Internal DF Measurement Type	
	Band 1	Code 1	Band 2	Code 2	Range	Phase	Range	Phase
GPS/ QZSS	L1	C/A	L2	C	L2C_L1CA DF Pseudo-range	L2C_L1CA DF Phase	eMTGPSDF_L2C_L1CA_PR	eMTGPSDF_L2C_L1CA_Phase
	L1	C/A	L5		L5_L1CA DF Pseudo-range	L5_L1CA DF Phase	eMTGPSDF_L5_L1CA_PR	eMTGPSDF_L5_L1CA_Phase
	L1	C	L2	C	L2C_L1C DF Pseudo-range	L2C_L1C DF Phase	eMTGPSDF_L2C_L1C_PR	eMTGPSDF_L2C_L1C_Phase
	L1	C/A	L2	W	L2C_L1CA DF Pseudo-range	L2C_L1CA DF Phase	eMTGPSDF_L2C_L1CA_PR	eMTGPSDF_L2C_L1CA_Phase
	L1	C	L5				eMTGPSDF_L5_L1C_PR	eMTGPSDF_L5_L1C_Phase
	L1	P	L2	P	DF Pseudo- range	DF Phase	eMTGPSDF	eMTGPSLDF
	L2	C	L5		L5_L2C DF Pseudo-range	L5_L2C DF Phase	eMTGPSDF_L5_L2C_PR	eMTGPSDF_L5_L2C_Phase
Galileo	E5a		E1		E1_E5a DF Pseudo-range	E1_E5a DF Phase	eMTGalDF_E1_E5a_PR	eMTGalDF_E1_E5a_Phase
	E5b		E1		E1_E5b DF Pseudo-range	E1_E5b DF Phase	eMTGalDF_E1_E5b_PR	eMTGalDF_E1_E5b_Phase
Glonass	G1	P	G2	P	RDF Pseudo- range	RDF Phase	eMTGloPDF	eMTGloLDF

3 Single-differenced measurements

ODTK supports combining two single-frequency measurements of the same type, same receiver, but different SVs. These measurements remove the receiver clock error.

Single-differenced Single-frequency Measurements

GNSS	Freq Band	Track Code	ODTK Type		ODTK Internal Meas Type	
			Range	Phase	Range	Phase
GPS/ QZSS	L1	C/A	CA SD Pseudo-range	LA SD Phase	eMTGPSC1_SD	eMTGPSLA_SD
	L1	C	L1C SD Pseudo-range	L1C SD Phase	eMTGPSCB_SD	eMTGPSLB_SD
	L2	C	L2C SD Pseudo-range	L2C SD Phase	eMTGPSCC_SD	eMTGPSLC_SD
	L5		L5 SD Pseudo-range	L5 SD Phase	eMTGPSC5_SD	eMTGPSL5_SD
Galileo	E1/ L1		E1 SD Pseudo-range	E1 SD Phase	eMTGalE1PR_SD	eMTGalE1Phase_SD
	E5a/ L5		E5a SD Pseudo-range	E5a SD Phase	eMTGalE5aPR_SD	eMTGalE5aPhase_SD
	E5b		E5b SD Pseudo-range	E5b SD Phase	eMTGalE5bPR_SD	eMTGalE5bPhase_SD
	E5		E5ab SD Pseudo-range	E5ab SD Phase	eMTGalE5abPR_SD	eMTGalE5abPhase_SD
	E6		E6 SD Pseudo-range	E6 SD Phase	eMTGalE6PR_SD	eMTGalE6Phase_SD
Glonass	G1	SA	RCA SD Pseudo-range	RLA SD Phase	eMTGloCA_SD	eMTGloLA_SD
	G1	HA	RP1 SD Pseudo-range	RL1 SD Phase	eMTGloP1_SD	eMTGloL1_SD
	G2	SA	RCB SD Pseudo-range	RLB SD Phase	eMTGloCB_SD	eMTGloLB_SD
	G2	HA	RP2 SD Pseudo-range	RL2 SD Phase	eMTGloP2_SD	eMTGloL2_SD
Beidou	B1		B1 SD Pseudo-range	B1 SD Phase	eMTBeiDouB1_PR_SD	eMTBeiDouB1_Phase_SD
	B2= E5b		E5b SD Pseudo-range	E5b SD Phase	eMTGalE5bPR_SD	eMTGalE5bPhase_SD
	B3= E6		E6 SD Pseudo-range	E6 SD Phase	eMTGalE6PR_SD	eMTGalE6Phase_SD

Single-differenced Dual-frequency Measurements

GNSS	Freq	Track	Freq	Track	ODTK Measurement Types		ODTK Internal DF Measurement Type	
	Band 1	Code 1	Band 2	Code 2	Range	Phase	Range	Phase
GPS/ QZSS	L1	C/A	L2	C	L2C_L1CA DF SD Pseudo-range	L2C_L1CA DF SD Phase	eMTGPSDF_L2C_L1CA_PR_SD	eMTGPSDF_L2C_L1CA_Phase_SD
	L1	C/A	L5		L5_L1CA DF SD Pseudo-range	L5_L1CA DF SD Phase	eMTGPSDF_L5_L1CA_PR_SD	eMTGPSDF_L5_L1CA_Phase_SD
	L1	C	L2	C	L2C_L1C DF SD Pseudo-range	L2C_L1C DF Phase SD	eMTGPSDF_L2C_L1C_PR_SD	eMTGPSDF_L2C_L1C_Phase_SD
	L1	C/A	L2	C	L2C_L1CA DF SD Pseudo-range	L2C_L1CA DF Phase SD	eMTGPSDF_L2C_L1CA_PR_SD	eMTGPSDF_L2C_L1CA_Phase_SD
	L1	C	L5				eMTGPSDF_L5_L1C_PR_SD	eMTGPSDF_L5_L1C_Phase_SD
	L1	P	L2	P	DF SD Pseudo-range	DF Phase SD	eMTGPSDF_SD	eMTGPSLDF_SD
	L2	C	L5		L5_L2C DF SD Pseudo-range	L5_L2C DF SD Phase	eMTGPSDF_L5_L2C_PR_SD	eMTGPSDF_L5_L2C_Phase_SD
Galileo	E5a		E1		E1_E5a DF SD Pseudo-range	E1_E5a DF SD Phase	eMTGalDF_E1_E5a_PR_SD	eMTGalDF_E1_E5a_Phase_SD
	E5b		E1		E1_E5b DF SD Pseudo-range	E1_E5b DF SD Phase	eMTGalDF_E1_E5b_PR_SD	eMTGalDF_E1_E5b_Phase_SD
Glonass	G1	P	G2	P	RDF SD Pseudo-range	RDF SD Phase	eMTGloPDF_SD_SD	eMTGloLDF_SD

ODTK also supports combining two dual-frequency measurements of the same type, same receiver, but different SVs. These measurements remove the receiver clock error and mitigate the ionospheric error.

4 Double-differenced measurements

Double-differenced measurements combine two single-differenced measurements for a specific receiver pair to remove both receiver and SV clock error. ODTK only supports double differencing of these measurement types:

- CA DD Pseudo-range
- DF DD Pseudo-range
- L1 DD Phase
- L2 DD Phase
- LA DD Phase
- DF DD Phase

5 Triple-frequency measurements

ODTK supports combining the following single-frequency combinations into a triple-frequency (DF) measurement that is independent of first- and second-order ionospheric effects.

	Freq	Track	Freq	Track	Freq	ODTK Measurement Types		ODTK Internal DF Measurement Type	
GNSS	Band 1	Code 1	Band 2	Code 2	Band 3	Range	Phase	Range	Phase
GPS/ QZSS	L1	C/A	L2	C	L5	L1CA TF Pseudo-range	L1CA TF Phase	eMTGPSTF_C1A_PR	eMTGPSTF_C1A_Phase
	L1	C	L2	C	L5	L1C TF Pseudo-range	L1CA TF Phase	eMTGPSTF_C1_PR	eMTGPSTF_C1_Phase