

LOFAR Pulsar Modes [All Combinations Listed]

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Key: IS == IncoherentStokes [data type results are: [I, IQUV]
 CS == CoherentStokes [equivalent to TA = TiedArray] [data type results are: [I, IQUV]
 FE == Fly's Eye [data type results are: w/CS+ [I, IQUV]; w/BF+ raw voltages
 BF = BeamFormed [Complex Voltage/RAW after 2nd polyphase filter, after 2nd transpose] [data type results are: BF] [BF - CS without Stokes parameters]
 FD = Filtered Data [RAW Voltage data, after 2nd polyphase filter, before the superstation beam former, before the 2nd transpose] [data type results are: FD, raw voltages]
 OCD == Online Coherent De-Dispersion [performed on BG/P, currently for only 1 Dispersion Measure (DM)]
 IM == Imaging
 NYS = Not Yet Supported (will be supported in the future)
 Gray'ed out row = indicates mode/switch-combination is not possible

MODES (data rate may exclude some of these possibilities)	modes based on switch settings:					OCD (+)	Number of Station Beams: N SubArrayPointings	Number of (TA) beams: M Beams
	IS (T/F)	CS (T/F)	FE (T/F)	BF (T/F)	FD (T/F)			
--- 1 main mode combinations ---								
IS	T						1	
CS		T					1	1
FE			T				1	
BF				T			1	1
FD					T		1	
IS [+ OCD]	T					+	1	
CS [+ OCD]		T				+	1	1
FE [+OCD]			T			+	1	
BF [+OCD]				T		+	1	1
FD [+ OCD]					T	+	1	
IS [xN]	T						N	
CS [xN]		T					N	1
CS [xM]		T					1	M
CS [xN xM]		T					N	M
*Note FE [xN]			T				N	
BF [xN]				T			N	1
BF [xM]				T			1	M
*Note BF [xM xN]				T			N	M
FD [xN]					T		N	
IS [xN] [+OCD]	T					+	N	
CS [xN] [+OCD]		T				+	N	1
CS [xM] [+OCD]		T				+	1	M
*Note CS [xN xM] [+OCD]		T				+	N	M
FE [xN] [+OCD]			T			+	N	
BF [xN] [+OCD]				T		+	N	1
BF [xM] [+OCD]				T		+	1	M
*Note BF [xM xN] [+OCD]				T		+	N	M
FD [xN] [+OCD]					T	+	N	
--- 2 main mode combinations ---								
IS + CS	T	T					1	1
IS + FE	T		T				1	
IS + BF	T			T			1	1
IS + FD	T				T		1	
CS + FE		T	T				1	
CS + BF		T		T			1	1
CS + FD		T			T		1	1
FE + BF			T	T			1	1
FE + FD			T		T		1	
BF + FD				T	T		1	1
IS + CS [+ OCD]	T	T				+	1	1
IS + FE [+OCD]	T		T			+	1	
IS + BF [+ OCD]	T			T		+	1	1
IS + FD [+ OCD]	T				T	+	1	
CS + FE [+ OCD]		T	T			+	1	
CS + BF [+ OCD]		T		T		+	1	1
CS + FD [+ OCD]		T			T	+	1	1
FE + BF [+OCD]			T	T		+	1	1
FE + FD [+OCD]			T		T	+	1	
BF + FD [+ OCD]				T	T	+	1	1
IS + CS [xN]	T	T					N	1
IS + CS [xM]	T	T					1	M
IS + CS [xN xM]	T	T					N	M
IS + FE [xN]	T		T				N	
IS + BF [xN]	T			T			N	1
IS + BF [xM]	T			T			1	M
IS + BF [xM xN]	T			T			N	M
IS + FD [xN]	T				T		N	
NYS CS + FE [xN]		T	T				N	
NYS CS + FE [xM]		T	T				1	M
NYS CS + FE [xN xM]		T	T				N	M
CS + BF [xN]		T		T			N	1
CS + BF [xM]		T		T			1	M
CS + BF [xN xM]		T		T			N	M
CS + FD [xN]		T			T		N	1
CS + FD [xM]		T			T		1	M
CS + FD [xN xM]		T			T		N	M
NYS FE + BF [xN]			T	T			N	
NYS FE + BF [xM]			T	T			1	M
NYS FE + BF [xN xM]			T	T			N	M
FE + FD [xN]			T		T		N	
BF + FD [xN]				T	T		N	1
BF + FD [xM]				T	T		1	M
BF + FD [xM xN]				T	T		N	M
IS + CS [xN] [+OCD]	T	T				+	N	1
IS + CS [xM] [+OCD]	T	T				+	1	M
IS + CS [xN xM] [+OCD]	T	T				+	N	M
IS + FE [xN] [+OCD]	T		T			+	N	
IS + BF [xN] [+OCD]	T			T		+	N	1
IS + BF [xM] [+OCD]	T			T		+	1	M

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	IS + BF [xM xN] [+OCD]	T			T			+	N	M
	IS + FD [xN] [+OCD]	T					T		N	
NYS	CS + FE [xN] [+OCD]		T	T				+	N	
NYS	CS + FE [xM] [+OCD]		T	T				+	1	M
NYS	CS + FE [xM xN] [+OCD]		T	T				+	N	M
	CS + BF [xN] [+OCD]		T		T			+	N	1
	CS + BF [xM] [+OCD]		T		T			+	1	M
	CS + BF [xN xM] [+OCD]		T		T			+	N	M
	CS + FD [xN] [+OCD]		T				T		N	1
	CS + FD [xM] [+OCD]		T				T		1	M
	CS + FD [xN xM] [+OCD]		T				T		N	M
NYS	FE + BF [xN] [+OCD]			T	T			+	N	
NYS	FE + BF [xM] [+OCD]			T	T			+	1	M
NYS	FE + BF [xN xM] [+OCD]			T	T			+	N	M
	FE + FD [xN] [+OCD]			T		T		+	N	
	BF + FD [xN] [+OCD]				T	T		+	N	1
	BF + FD [xM] [+OCD]				T	T		+	1	M
	BF + FD [xM xN] [+OCD]				T	T		+	N	M
	--- 3 main mode combinations ---									
	IS + CS + FE	T	T	T					1	
	IS + CS + BF	T	T		T				1	1
	IS + CS + FD	T	T			T			1	1
	IS + BF + FD	T			T	T			1	1
	CS + FE + BF		T	T	T				1	
	CS + FE + FD		T	T		T			1	
	CS + BF + FD		T		T	T			1	1
	FE + BF + FD			T	T	T			1	1
	IS + CS + FE [+OCD]	T	T	T				+	1	
	IS + CS + BF [+OCD]	T	T		T			+	1	1
	IS + CS + FD [+OCD]	T	T			T		+	1	1
	IS + BF + FD [+OCD]	T			T	T		+	1	1
	CS + FE + BF [+OCD]		T	T	T			+	1	
	CS + FE + FD [+OCD]		T	T		T		+	1	
	CS + BF + FD [+OCD]		T		T	T		+	1	1
	FE + BF + FD [+OCD]			T	T	T		+	1	1
NYS	IS + CS + FE [xN]	T	T	T					N	
NYS	IS + CS + FE [xM]	T	T	T					1	M
NYS	IS + CS + FE [xM xN]	T	T	T					N	M
	IS + CS + BF [xN]	T	T		T				N	1
	IS + CS + BF [xM]	T	T		T				1	M
	IS + CS + BF [xN xM]	T	T		T				N	M
	IS + CS + FD [xN]	T	T			T			N	1
	IS + CS + FD [xM]	T	T			T			1	M
	IS + CS + FD [xN xM]	T	T			T			N	M
	IS + BF + FD [xN]	T			T	T			N	1
	IS + BF + FD [xM]	T			T	T			1	M
	IS + BF + FD [xM xN]	T			T	T			N	M
	CS + FE + BF [xN]		T	T	T				N	1
	CS + FE + BF [xM]		T	T	T				1	
	CS + FE + BF [xN xM]		T	T	T				N	
	CS + FE + FD [xN]		T	T		T			N	
	CS + BF + FD [xN]		T		T	T			N	1
	CS + BF + FD [xM]		T		T	T			1	M
	CS + BF + FD [xN xM]		T		T	T			N	M
	FE + BF + FD [xN]			T	T	T			N	
NYS	FE + BF + FD [xM]			T	T	T			1	M
NYS	FE + BF + FD [xM xN]			T	T	T			N	M
NYS	IS + CS + FE [xN] [+OCD]	T	T	T				+	N	
NYS	IS + CS + FE [xM] [+OCD]	T	T	T				+	1	M
NYS	IS + CS + FE [xM xN] [+OCD]	T	T	T				+	N	M
	IS + CS + BF [xN] [+OCD]	T	T		T			+	N	1
	IS + CS + BF [xM] [+OCD]	T	T		T			+	1	M
	IS + CS + BF [xN xM] [+OCD]	T	T		T			+	N	M
	IS + CS + FD [xN] [+OCD]	T	T			T		+	N	1
	IS + CS + FD [xM] [+OCD]	T	T			T		+	1	M
	IS + CS + FD [xN xM] [+OCD]	T	T			T		+	N	M
	IS + BF + FD [xN] [+OCD]	T			T	T		+	N	1
	IS + BF + FD [xM] [+OCD]	T			T	T		+	1	M
	IS + BF + FD [xM xN] [+OCD]	T			T	T		+	N	M
	CS + FE + BF [xN] [+OCD]		T	T	T			+	N	1
	CS + FE + BF [xM] [+OCD]		T	T	T			+	1	
	CS + FE + BF [xN xM] [+OCD]		T	T	T			+	N	
NYS	CS + FE + FD [xN] [+OCD]		T	T		T		+	N	
NYS	CS + FE + FD [xM] [+OCD]		T	T		T		+	1	M
NYS	CS + FE + FD [xN xM] [+OCD]		T	T		T		+	N	M
	CS + BF + FD [xN] [+OCD]		T		T	T		+	N	1
	CS + BF + FD [xM] [+OCD]		T		T	T		+	1	M
	CS + BF + FD [xN xM] [+OCD]		T		T	T		+	N	M
NYS	FE + BF + FD [xN] [+OCD]			T	T	T		+	N	1
NYS	FE + BF + FD [xM] [+OCD]			T	T	T		+	1	M
NYS	FE + BF + FD [xM xN] [+OCD]			T	T	T		+	N	M
	--- 4 main mode combinations ---									
	IS + CS + FE + BF	T	T	T	T				1	
	IS + CS + FE + FD	T	T	T		T			1	
	IS + FE + BF + FD	T		T	T	T			1	1
	IS + CS + BF + FD	T	T		T	T			1	1
	CS + FE + BF + FD		T	T	T	T			1	
	IS + CS + FE + BF [+OCD]	T	T	T	T			+	1	
	IS + CS + FE + FD [+OCD]	T	T	T		T		+	1	
	IS + FE + BF + FD [+OCD]	T		T	T	T		+	1	1
	IS + CS + BF + FD [+OCD]	T	T		T	T		+	1	1

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	CS + FE + BF + FD [+OCD]			T	T	T	T	T			+		1	
	IS + CS + FE + BF [xN]		T	T	T	T	T						N	
	IS + CS + FE + BF [xM]		T	T	T	T							1	
	IS + CS + FE + BF [xN xM]		T	T	T	T							N	
NYS	IS + CS + FE + FD [xN]		T	T	T			T					N	
NYS	IS + CS + FE + FD [xM]		T	T	T			T					1	M
NYS	IS + CS + FE + FD [xM xN]		T	T	T			T					N	M
NYS	IS + FE + BF + FD [xN]						T	T	T				N	1
NYS	IS + FE + BF + FD [xM]						T	T	T				1	M
NYS	IS + FE + BF + FD [xM xN]					T	T	T					N	M
	IS + CS + BF + FD [xN]		T	T			T	T					N	1
	IS + CS + BF + FD [xM]		T	T			T	T					1	M
	IS + CS + BF + FD [xN xM]		T	T			T	T					N	M
	CS + FE + BF + FD [xN]				T	T	T	T					N	
	CS + FE + BF + FD [xM]				T	T	T	T					1	
	CS + FE + BF + FD [xN xM]				T	T	T	T					N	
	IS + CS + FE + BF [xN][+OCD]		T	T	T	T					+		N	
	IS + CS + FE + BF [xM] [+OCD]		T	T	T	T					+		1	
	IS + CS + FE + BF [xN xM] [+OCD]		T	T	T	T					+		N	
NYS	IS + CS + FE + FD [xN] [+OCD]		T	T	T			T			+		N	
NYS	IS + CS + FE + FD [xM] [+OCD]		T	T	T			T			+		1	M
NYS	IS + CS + FE + FD [xM xN] [+OCD]		T	T	T			T			+		N	M
NYS	IS + FE + BF + FD [xN] [+OCD]						T	T	T		+		N	1
NYS	IS + FE + BF + FD [xM] [+OCD]						T	T	T		+		1	M
NYS	IS + FE + BF + FD [xM xN] [+OCD]						T	T	T		+		N	M
	IS + CS + BF + FD [xN] [+OCD]		T	T			T	T			+		N	1
	IS + CS + BF + FD [xM] [+OCD]		T	T			T	T			+		1	M
	IS + CS + BF + FD [xN xM] [+OCD]		T	T			T	T			+		N	M
	CS + FE + BF + FD [xN] [+OCD]				T	T	T	T			+		N	
	CS + FE + BF + FD [xM] [+OCD]				T	T	T	T			+		1	
	CS + FE + BF + FD [xN xM] [+OCD]				T	T	T	T			+		N	
--- 5 main mode combinations ---														
	IS + CS + FE + BF + FD		T	T	T	T	T						1	
	IS + CS + FE + BF + FD [+OCD]		T	T	T	T	T				+		1	
	IS + CS + FE + BF + FD [xN]		T	T	T	T	T						N	
	IS + CS + FE + BF + FD [xM]		T	T	T	T	T						1	
	IS + CS + FE + BF + FD [xN xM]		T	T	T	T	T						N	
	IS + CS + FE + BF + FD [xN] [+OCD]		T	T	T	T	T				+		N	
	IS + CS + FE + BF + FD [xM] [+OCD]		T	T	T	T	T				+		1	
	IS + CS + FE + BF + FD [xN xM] [+OCD]		T	T	T	T	T				+		N	

NOTE: IM can be added to most mode combinations above

*Note: CS [xN xM] [+/- OCD] [Stokes I/IQ/UV] and BF [xN xM] [+/- OCD]: There is currently no way to specify this configuration, therefore all the same offsets will be used for all TA beams and therefore

General rule to determine which modes not possible:

FE (Fly's Eye cannot be switched on without CS or BF also being turned on)

IS + FE

FE + FD

CS + BF is never possible together; any combination which includes these two modes together makes it an impossible combination

FD [+OCD] (it is not possible to turn on OCD with FD mode; if multiple modes, the OCD refers to the other mode setting and not FD)