REVIEW ON THE ITALIAN RADIO TELESCOPE RECEIVERS

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HEAD of SECTION II

Receivers at the Italian Radio Telescopes
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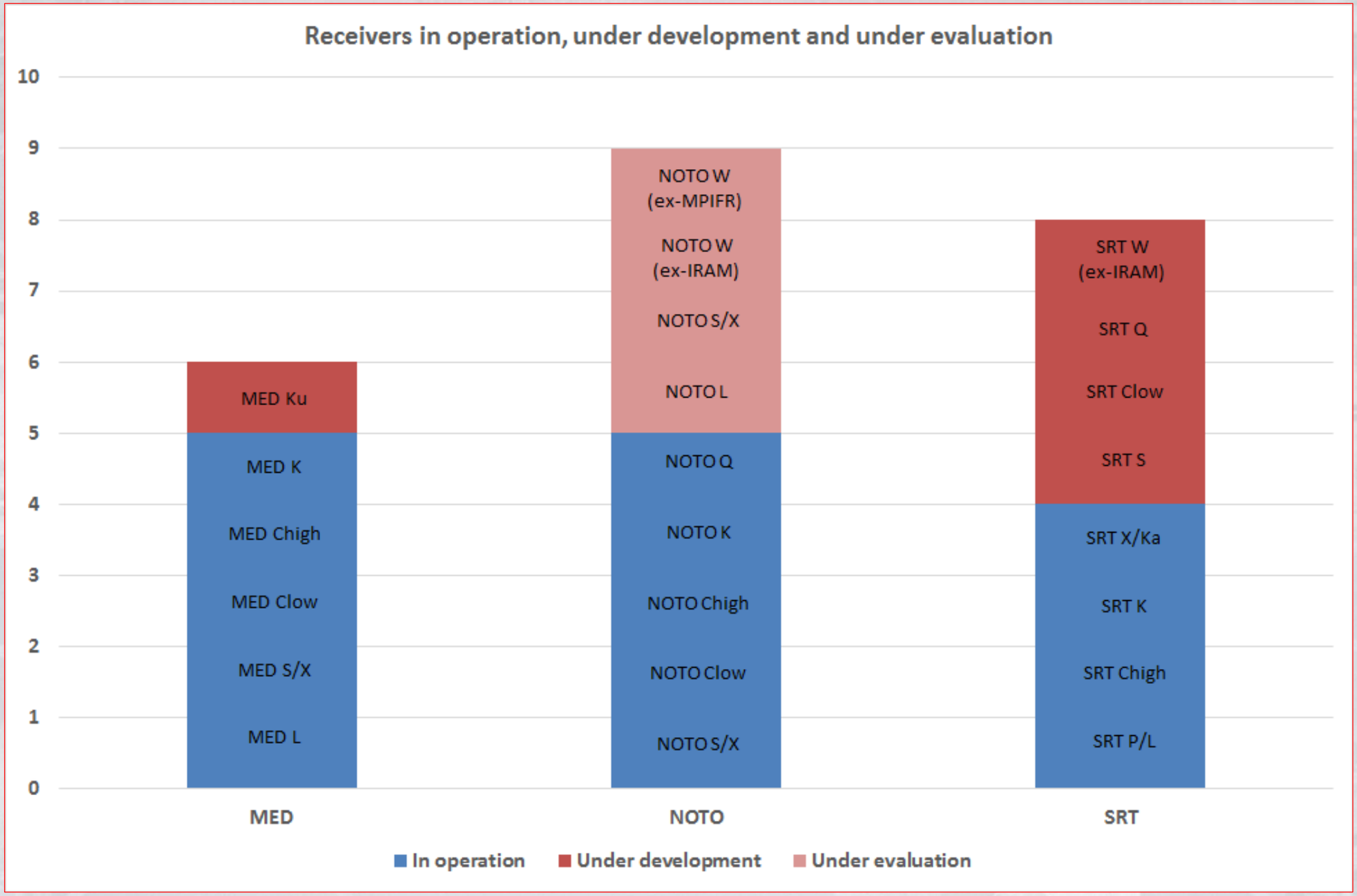
Receivers at the Italian radio telescopes (MED, Noto, SRT)

- Technical data analysis
- Scientific data analysis
- Management data analysis
- Status of the receivers in operation and under development

TECHNICAL DATA	Radio Telescope
	Feed system
	Focus (F/D)
	Frequency coverage [GHz]
	Instantaneous BW per polarization per feed [GHz]
	Pixels per polarization (Linear / Circular)
	HPBW at mid band [arcmin]
	Cryo-cooled
	Down-conversion & IF band [GHz]
	Frequency agility
	Expected or measured Trx [K]
	Expected or measured Tsys at zenith [K]
	Expected or measured maximum gain [K/Jy]
	Allocated RAS bands and status of protection [GHz]
	RFI in the receiver band
	Back-End connected to the receiver
	Technological pubblications (since 2010)
SCIENTIFIC DATA	Main scientific applications
	Percentage of the RT observing time allocated to the Rx (since 2010)
	Scientific pubblications (since 2012)
	Participation to International network or projects (since 2012)
MANAGEMENT	In operation since or expected to be installed
	Real or expected cost (k€) for receivers developed after 2010
	Real or expected duration of the development (year)
	Technlogical team involved in the Rx development: Management, Mechanics and cooling, FE passive components, FE active components, IF section, Integration and test
	Contact person
	Maintance and upgrade required to the existing receiver and remaining parts of the under-development receivers
	Constraints posed to the RT / infrastructure

Technical data analysis



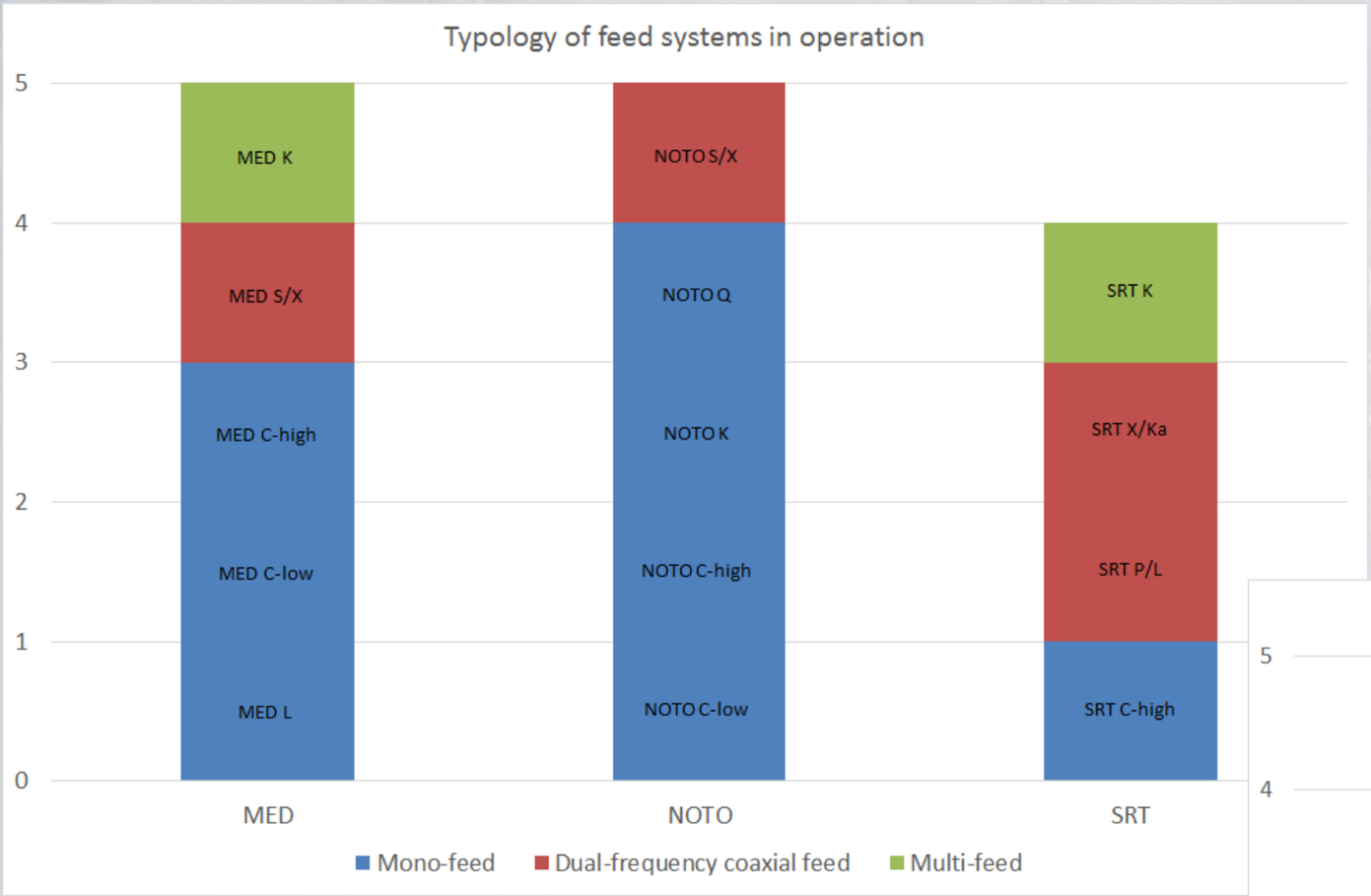
Technical data analysis

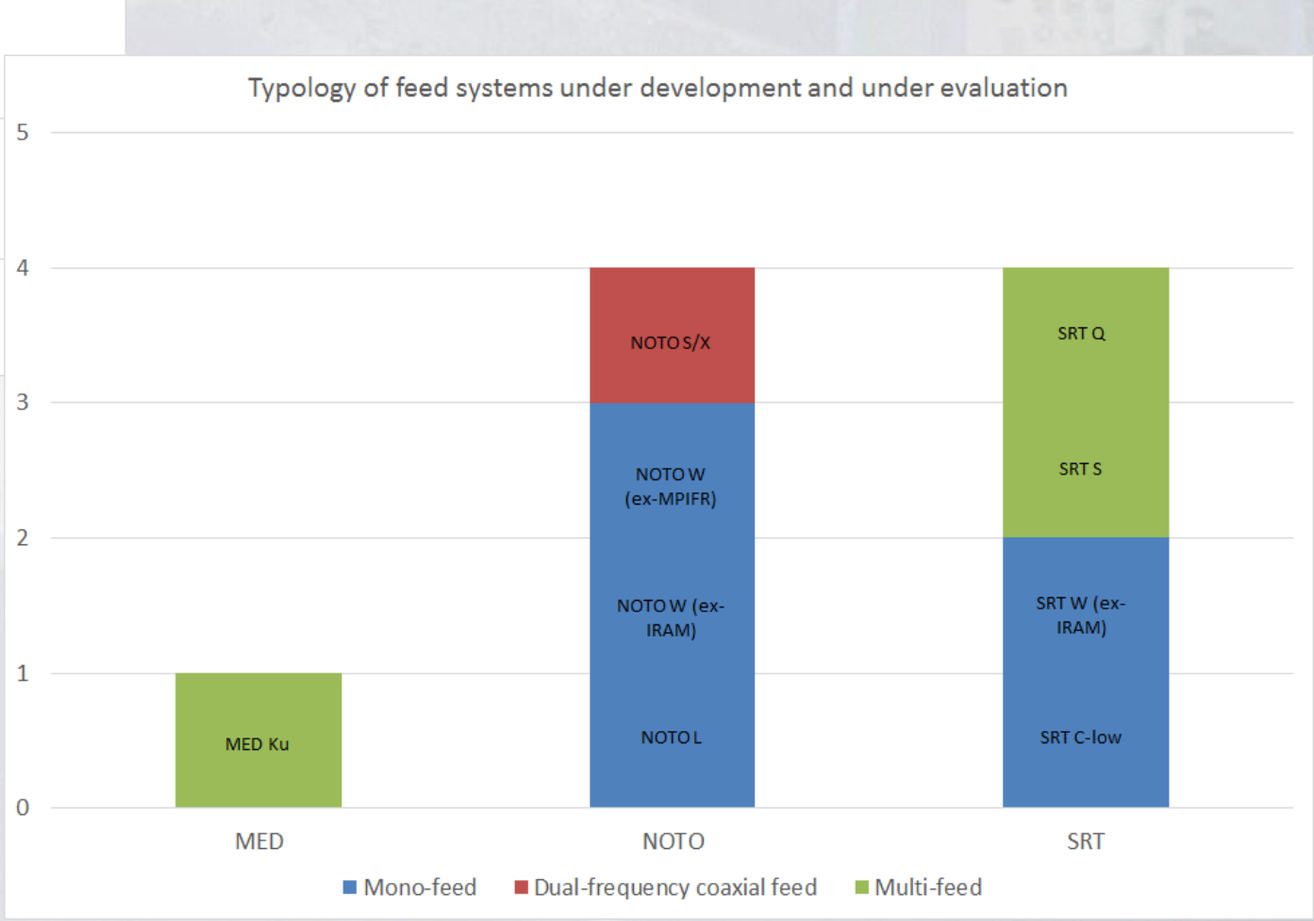
Receivers in operation		
Receiver ID	Frequency coverage [GHz]	
	Min	Max
MED L	1,35	1,45
	1,595	1,715
MED S/X	2,2	2,36
	8,18	8,98
MED Clow	4,3	5,8
MED Chigh	5,9	7,1
MED K	18	26,5
NOTO S/X	2,2	2,36
	8,18	8,58
NOTO Clow	4,62	5,02
NOTO Chigh	5,1	7,25
NOTO K	21,5	23
NOTO Q	39	43,5
SRT P/L	0,305	0,410
	1,3	1,8
SRT Chigh	5,7	7,7
SRT K	18,0	26,5
SRT X/Ka	8,2	8,6
	31,85	32,25

Receivers under development / under evaluation		
Receiver ID	Frequency coverage [GHz]	
	Min	Max
MED Ku	13,5	18
NOTO L	1,3	1,8
NOTO S/X	2,2	2,36
	8,18	8,98
NOTO W (ex-MPIFR)	85,945	86,545
NOTO W (ex-IRAM)	84	116
SRT S	3	4,5
SRT Clow	4,2	5,6
SRT Q	33	50
SRT W (ex-IRAM)	84	116

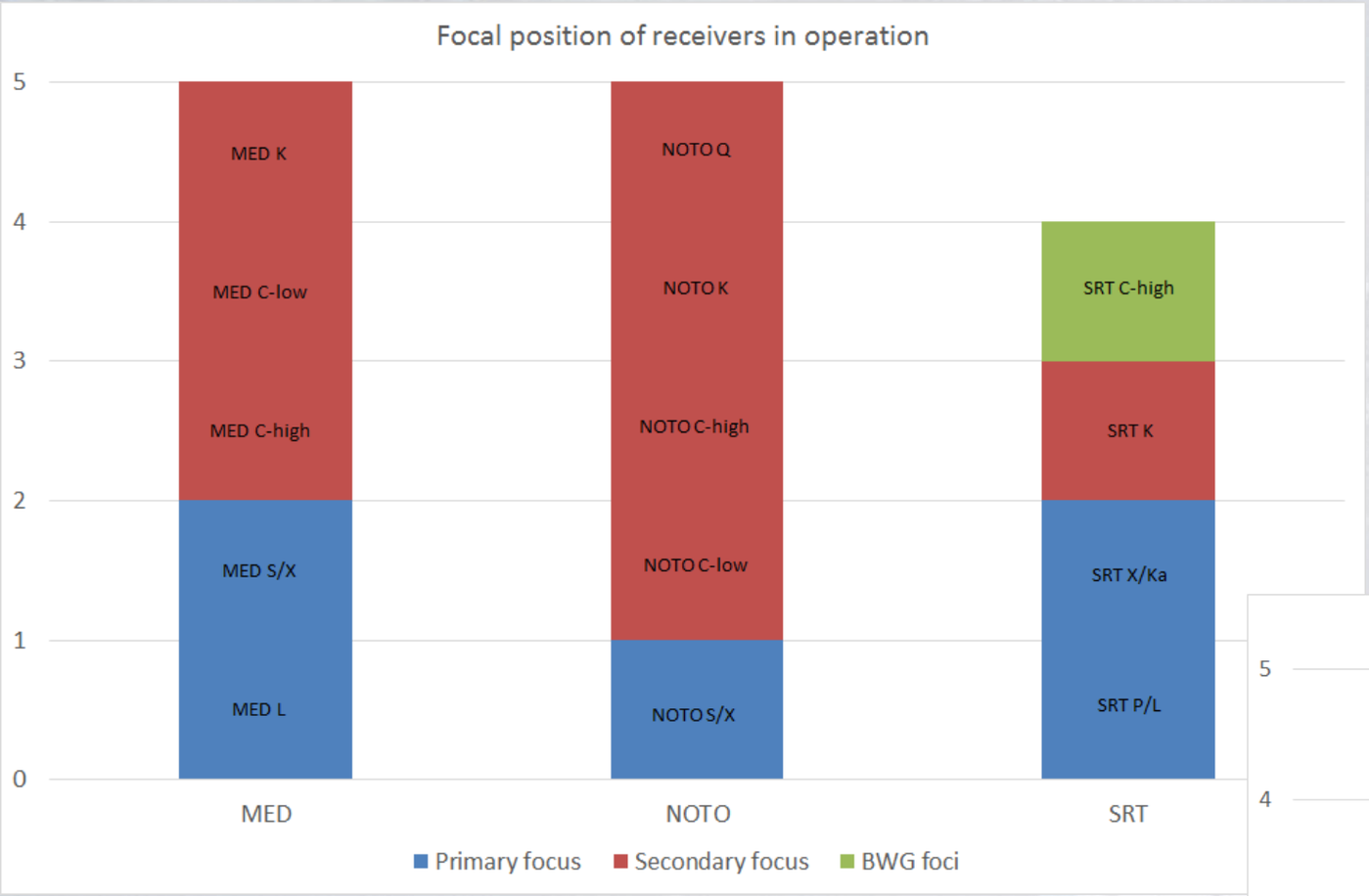
Receivers dismantled		
Receiver ID	Frequency coverage [GHz]	
	Min	Max
MED L	1,363	1,443
	1,622	1,702
MED Clow	4,65	5,15
MED Chigh	6	7
MED K	21,86	24,14
NOTO L	1,363	1,443
	1,622	1,702

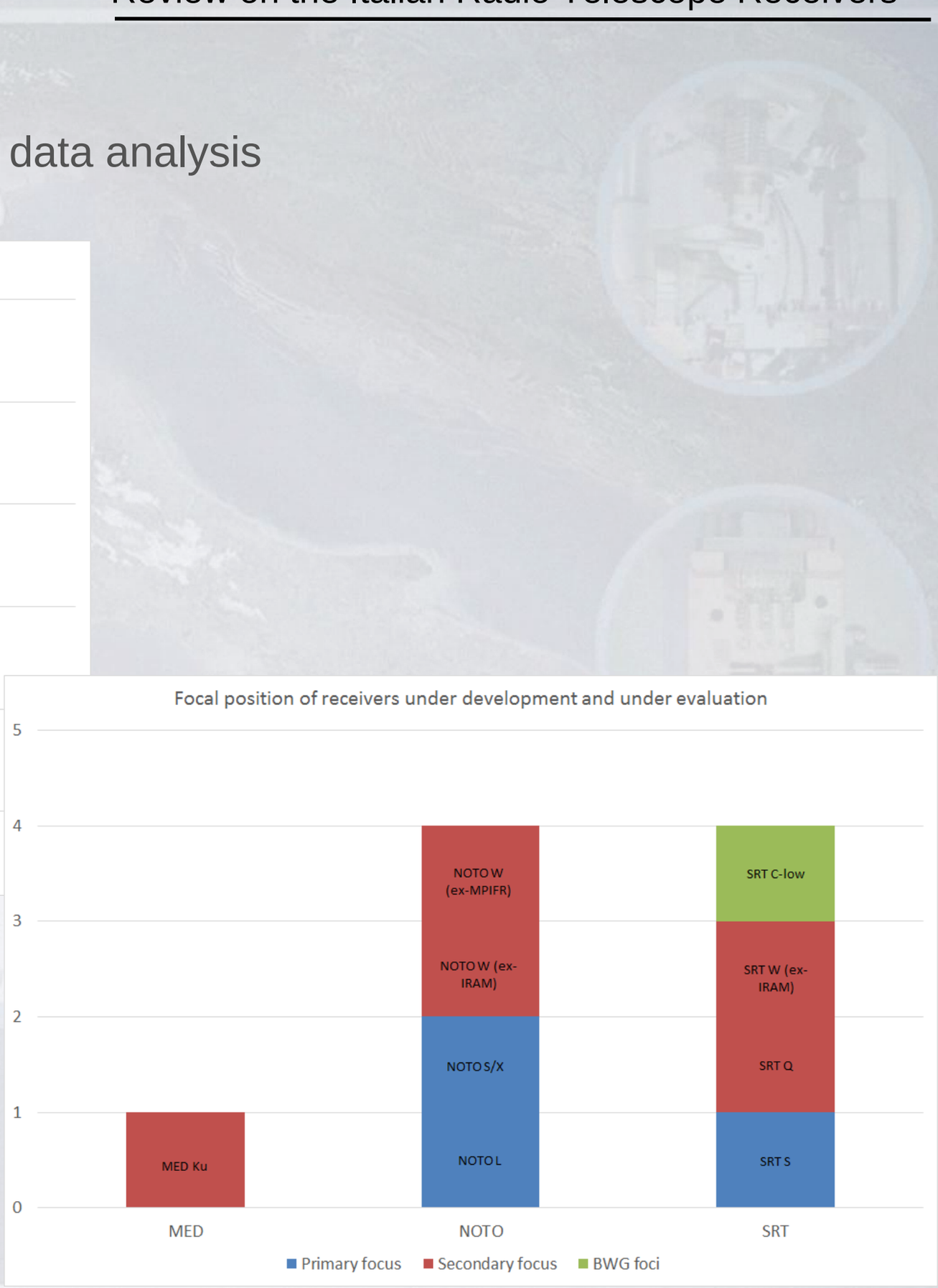
Technical data analysis





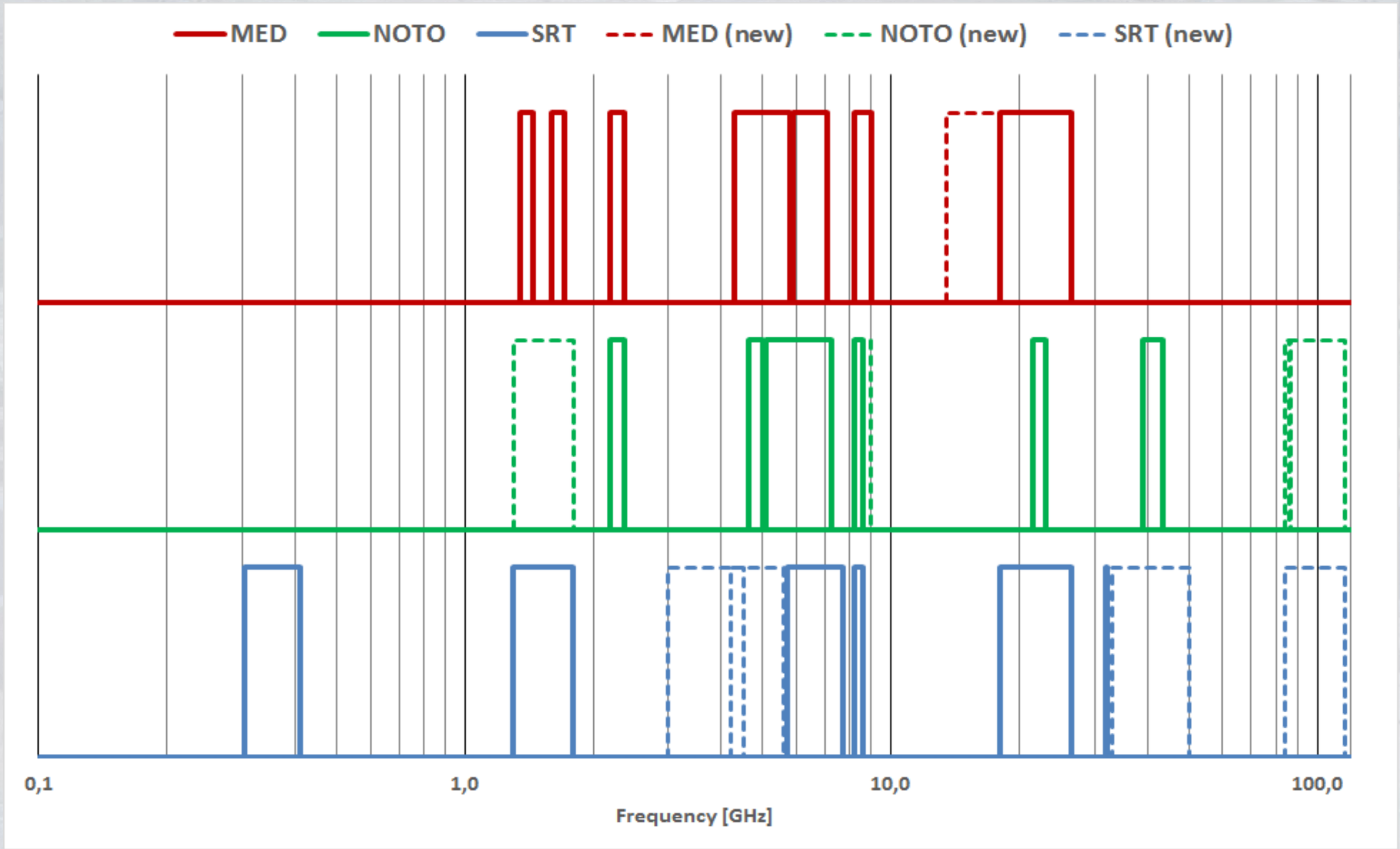
Technical data analysis





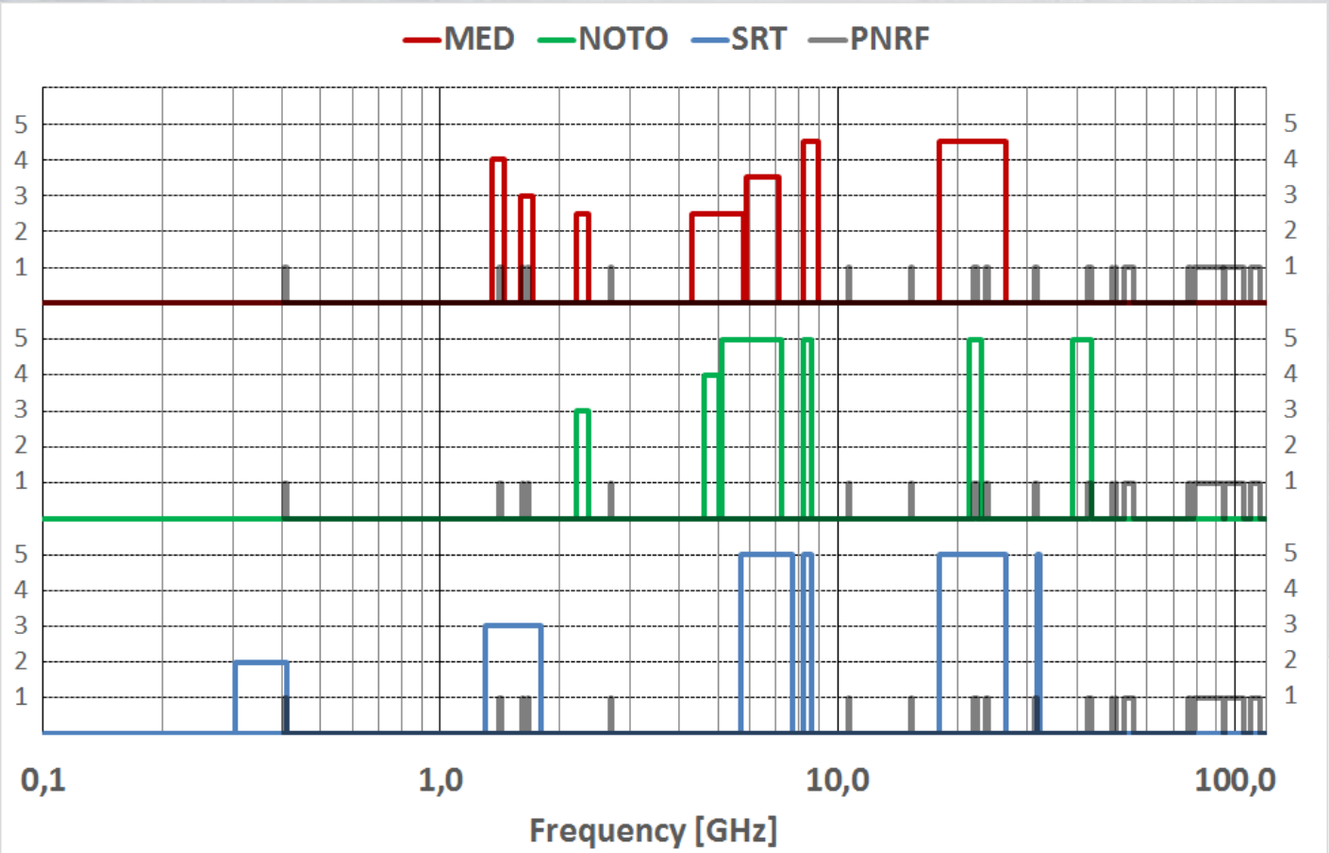
Technical data analysis

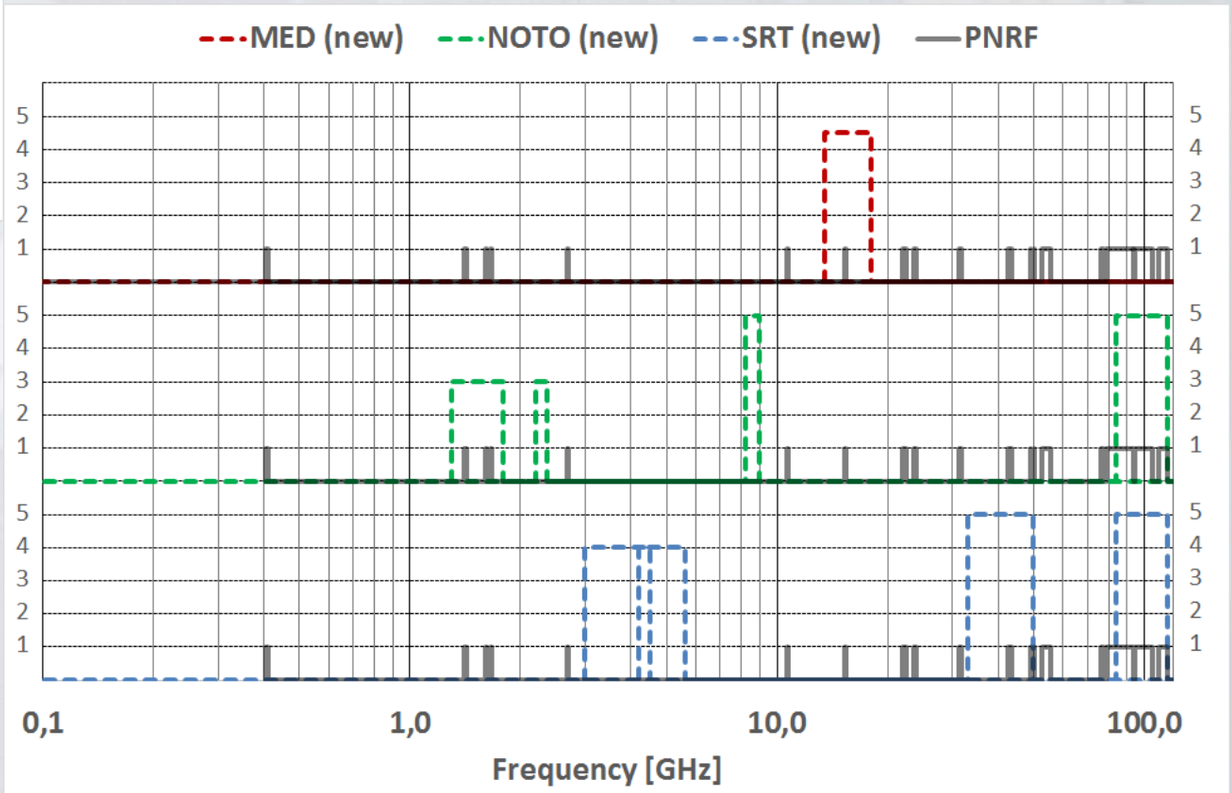
Frequency band coverage of receivers



Technical data analysis

Quality of frequency bands in terms of RFI for receivers in operation





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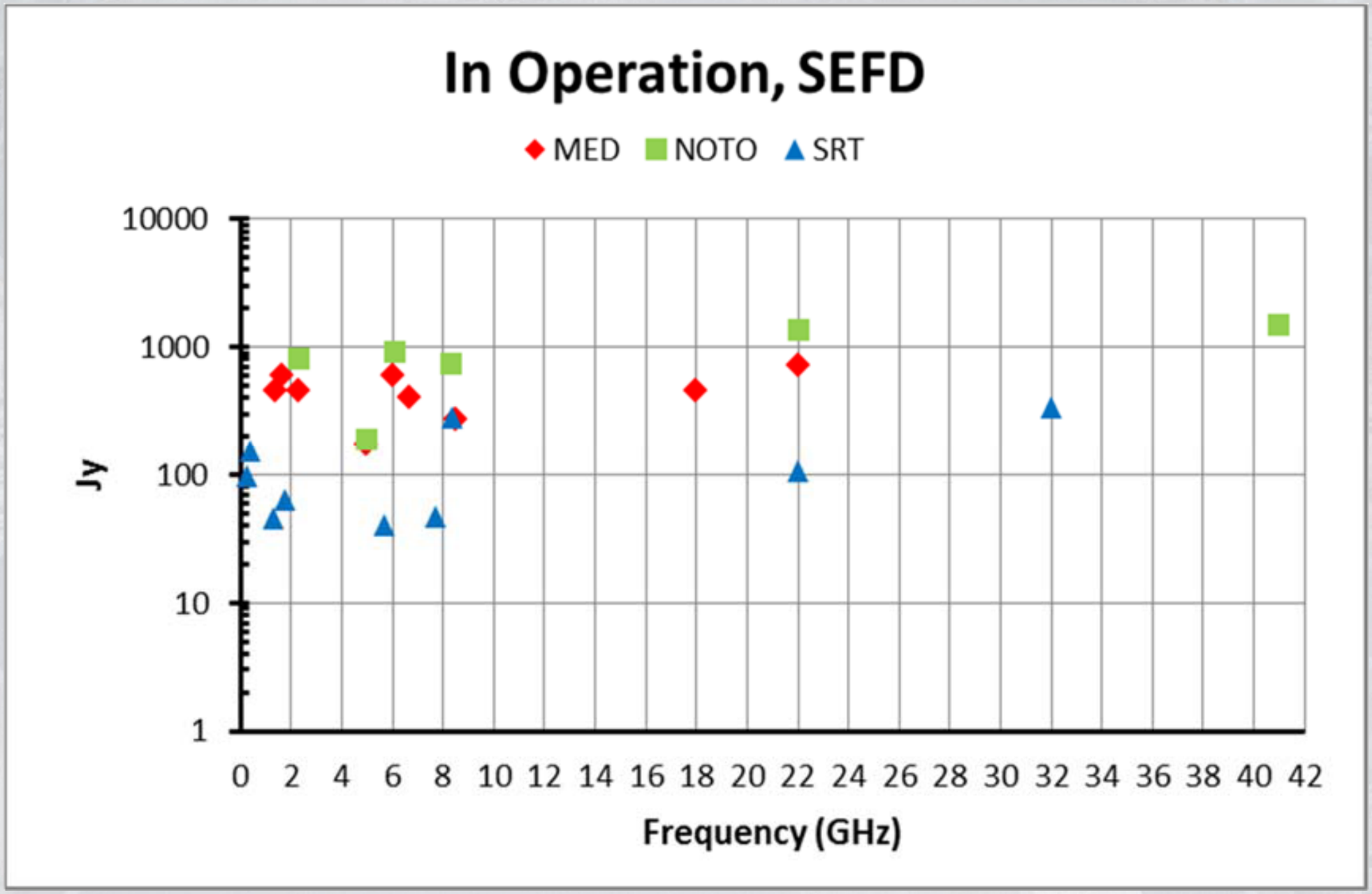
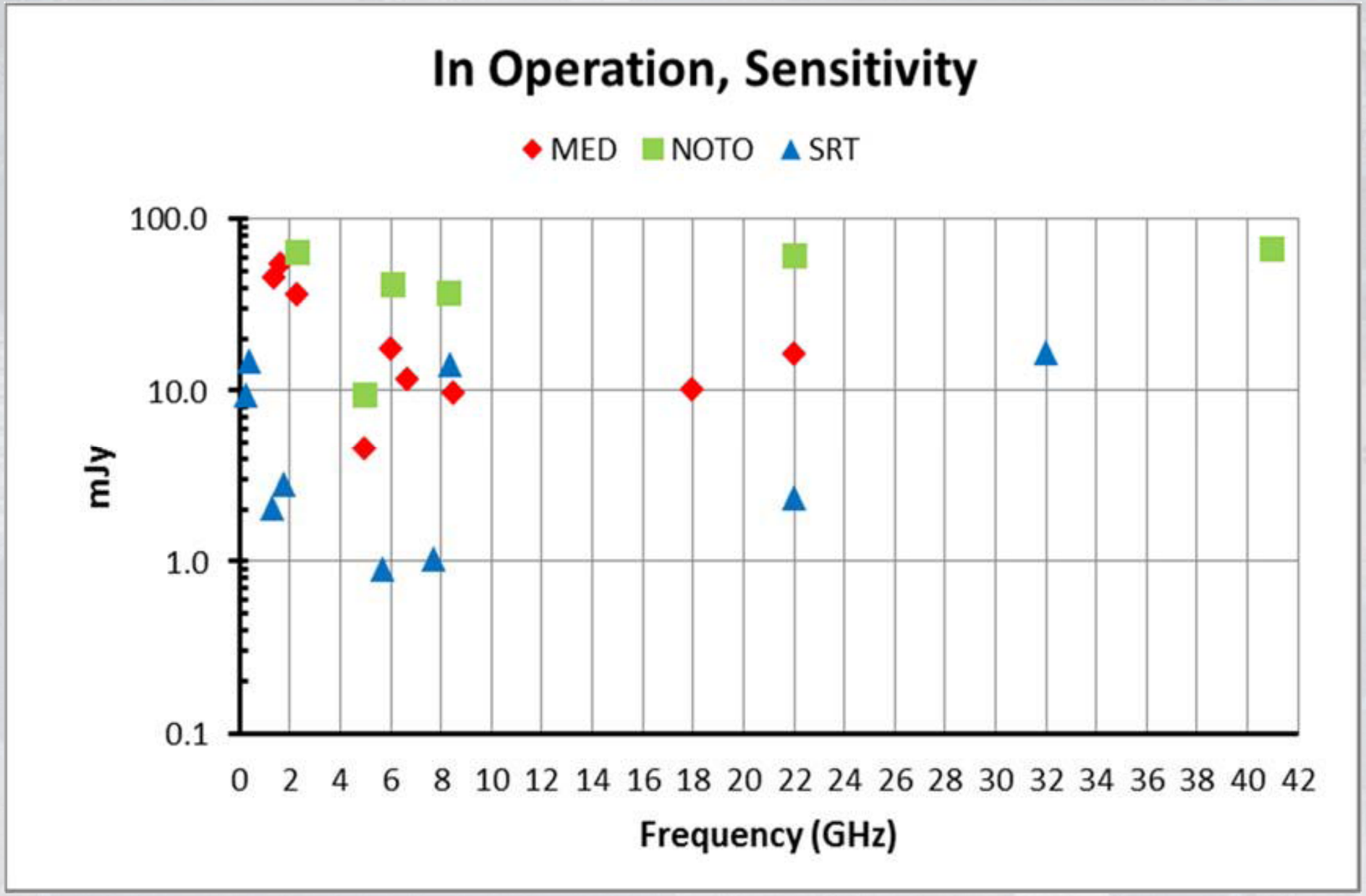


Thechnical data analysis



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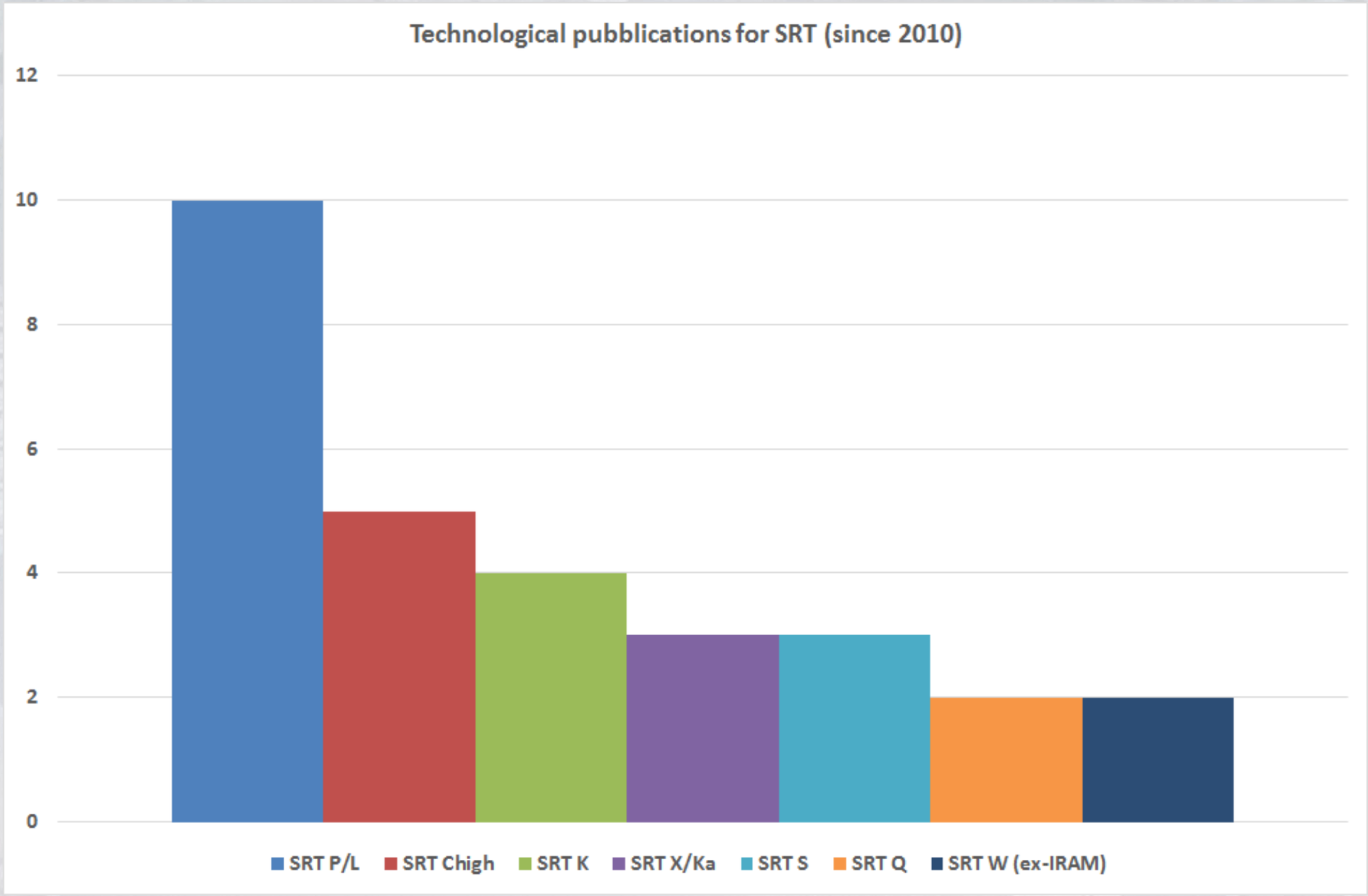
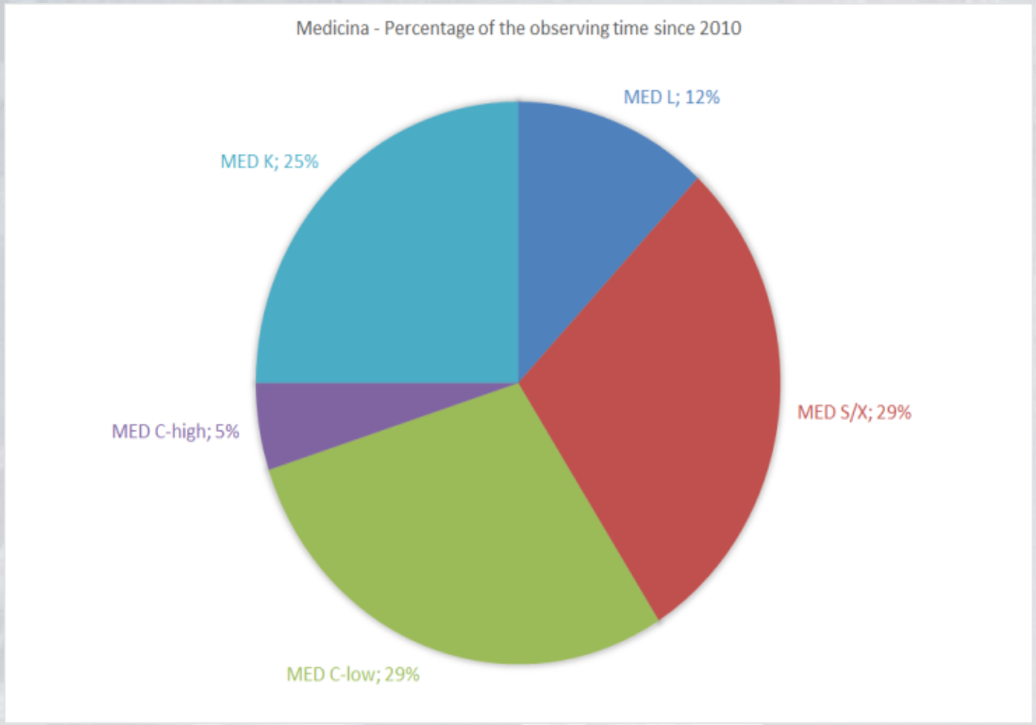
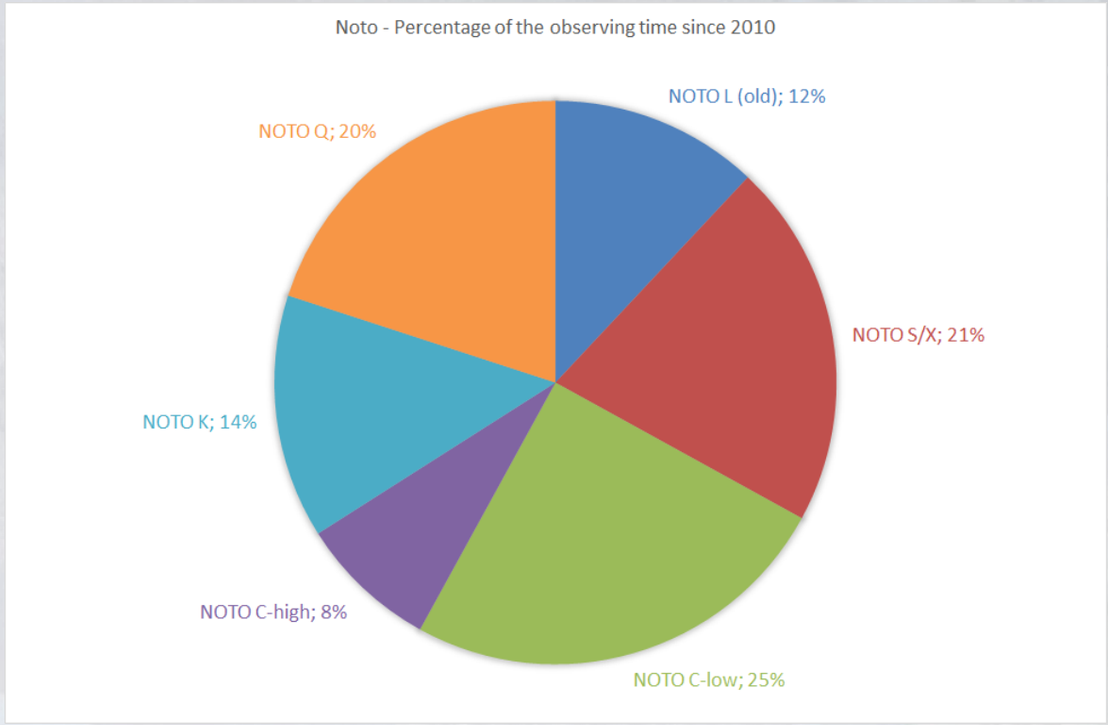
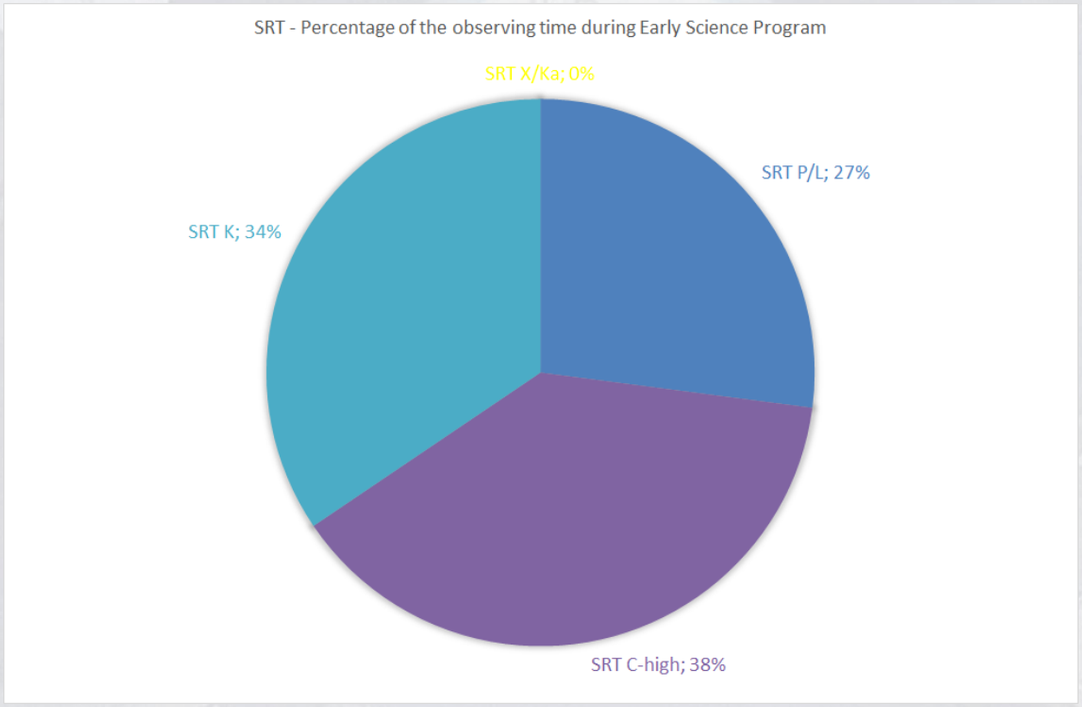


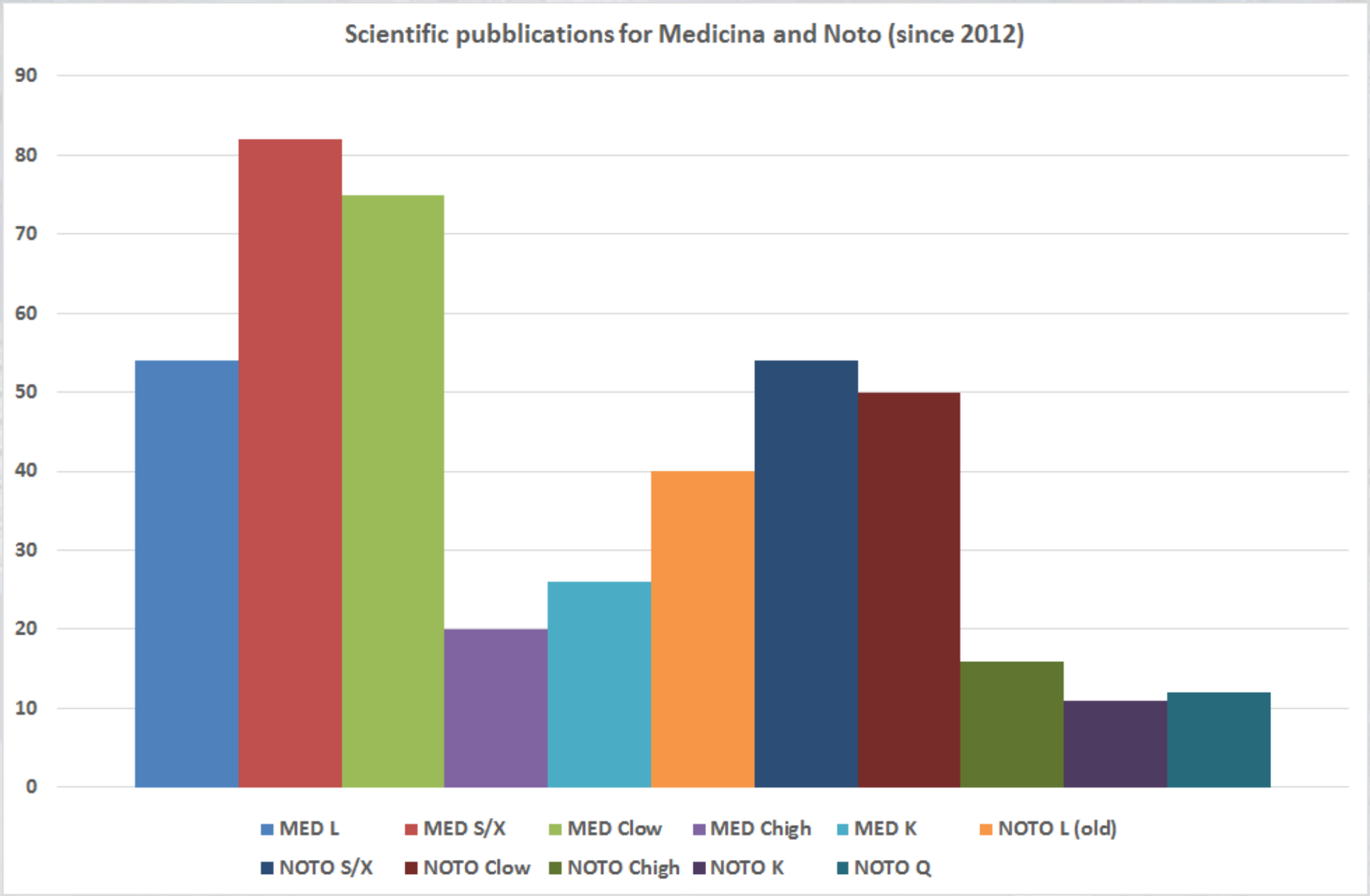
Scientific data analysis



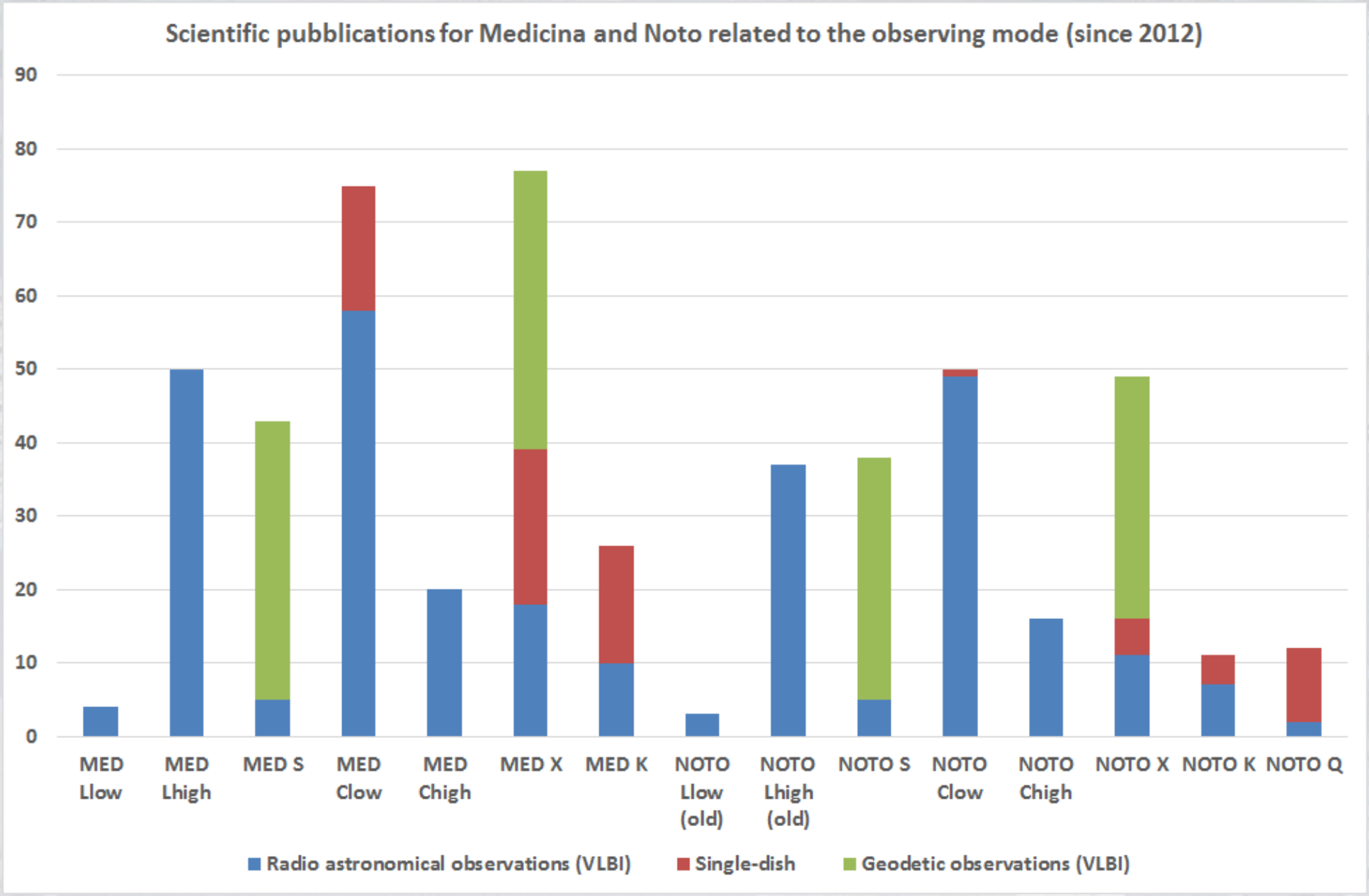




Scientific data analysis



Scientific data analysis



Scientific data analysis

	RECEIVER	AGN	Galaxy formation and evolution	Galaxy structure	HI (parallaxes and proper motions)	Pulsar	X-ray binaries	Supernovae	Masers	Star formation and evolution	Radio line emission	Physics of radio sources	Gravitational lensing	Astrometry	Extragalactic surveys	Variability monitoring	Geodesy	Radar astronomy	Magnetic fields and polarization	Comets	ISM	Space ccience	SZ effect in clusters clusters	Magnetars
MED	L low	X	X	X	X																			
	L high	X	X			X	X	X	X	X	X	X	X								X			
	S	X	X					X				X	X	X	X	X	X				X			
	C low	X	X			X	X	X				X			X	X		X	X		X			
	C high			X					X	X	X			X					X		X			
	X	X	X					X				X	X	X	X	X	X				X			
	K	X	X	X					X	X	X			X	X	X			X	X	X			
	Ku	X	X									X			X	X								
NOTO	L low	X	X	X	X																			
	L-high	X	X			X	X	X	X	X											X			
	S	X	X					X				X	X	X			X				X			
	C low	X	X			X	X	X				X							X		X			
	C high			X					X	X				X					X		X			
	X	X	X					X				X	X	X			X				X			
	K	X	X	X					X	X	X			X							X			
	Q	X	X						X														X	
	W						X	X		X	X	X				X				X	X		X	
SRT	P	X	X	X		X	X	X							X	X								
	L	X	X	X	X	X	X	X	X		X	X	X		X	X			X		X			X
	S	X	X			X	X	X			X	X	X	X	X	X			X					X
	C high	X	X	X		X	X	X	X	X	X	X		X	X	X			X		X			X
	C low	X	X			X	X	X			X	X			X	X			X		X			X
	X/Ka	X	X				X	X				X	X	X		X						X		X
	K	X	X	X			X	X	X	X	X	X		X	X	X			X	X	X			X
	W	X	X				X	X		X	X	X				X				X	X		X	
	Q	X	X				X	X	X	X	X	X				X				X	X		X	

Management data analysis

- Mean production time of 0,8 receiver per year
- New receivers with an higher production time due to larger bandwidth and complexity

Dismissed (old), in operation and under development (new) receivers

Year	SRT P/L	SRT S (new)	SRT Clow (new)	SRT Chigh	SRT K	SRT X/Ka	SRT Q (new)	SRT W (new)	MED L	*MED L (old)*	MED S/X	MED Clow	*MED Clow (old)*	MED Chigh	*MED Chigh (old)*	MED K	*MED K (old)*	MED Ku (new)	*NOTO L (old)*	NOTO S/X	NOTO Clow	NOTO Chigh	NOTO K	NOTO Q	Year
1983																									1983
1984																									1984
1985																				MED					1985
1986																									1986
1987																									1987
1988																									1988
1989																									1989
1990																									1990
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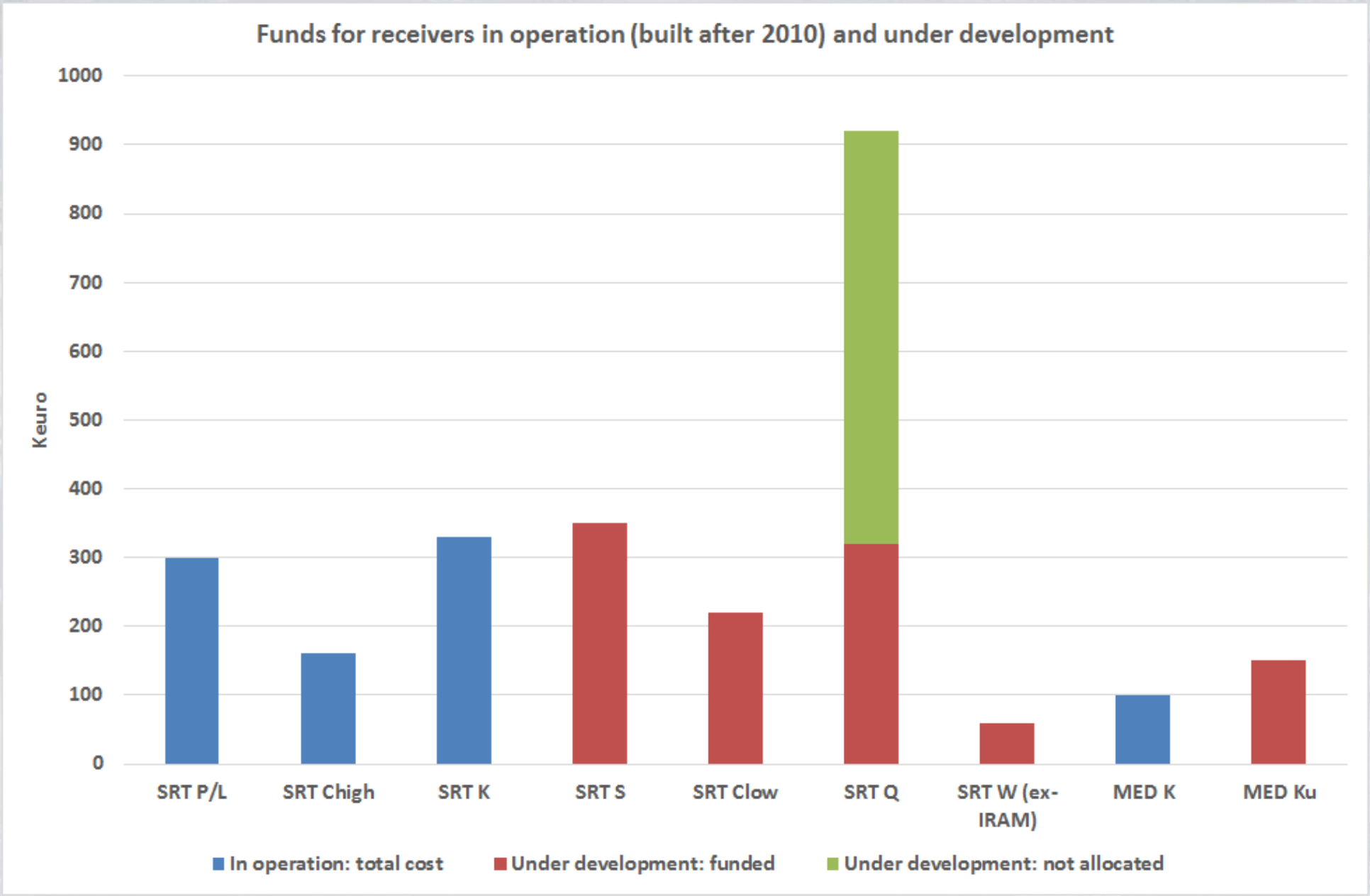
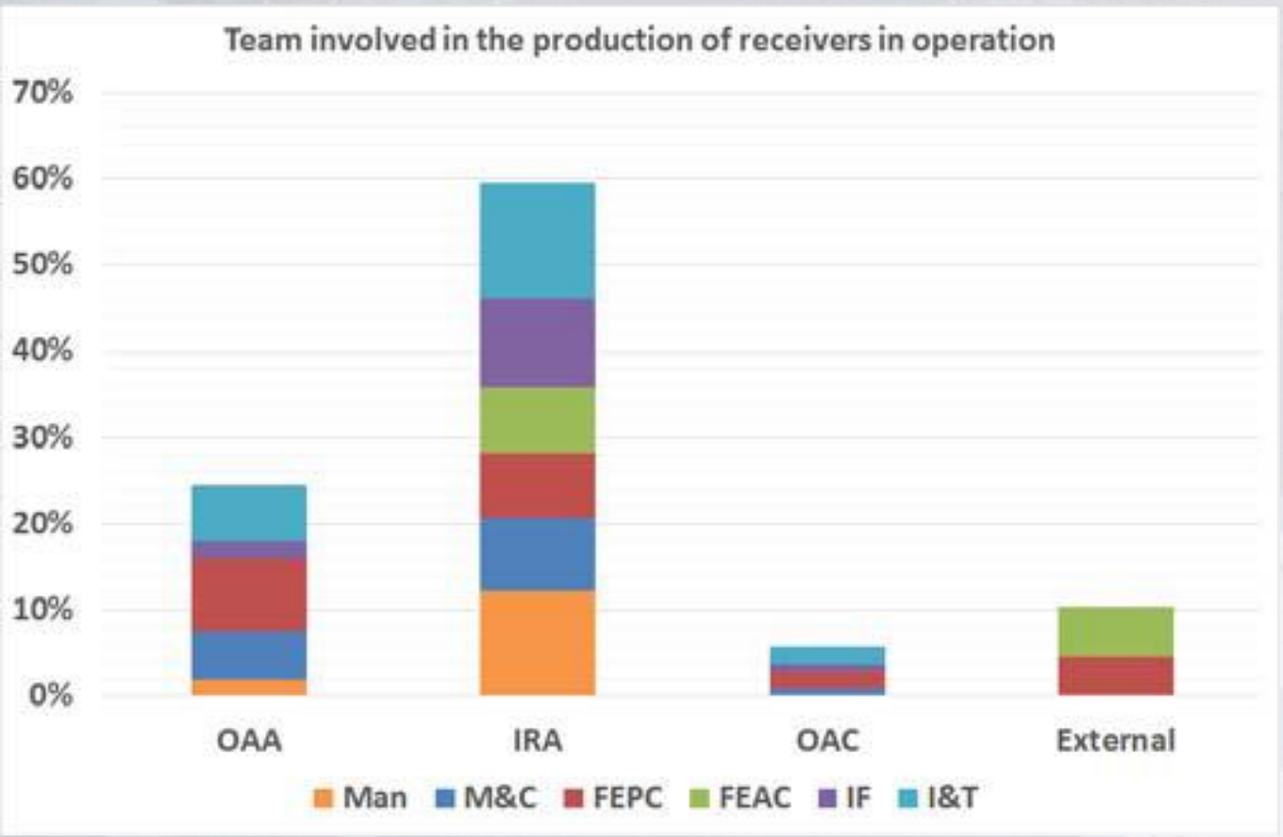
2001																									2001
2002						NOTO																			2002
2003																									2003
2004																									2004
2005																									2005
2006																									2006
2007																									2007
2008					MED																				2008
2009																									2009
2010																									2010
2011																									2011
2012																									2012
2013																									2013
2014																									2014
2015																									2015
2016																									2016

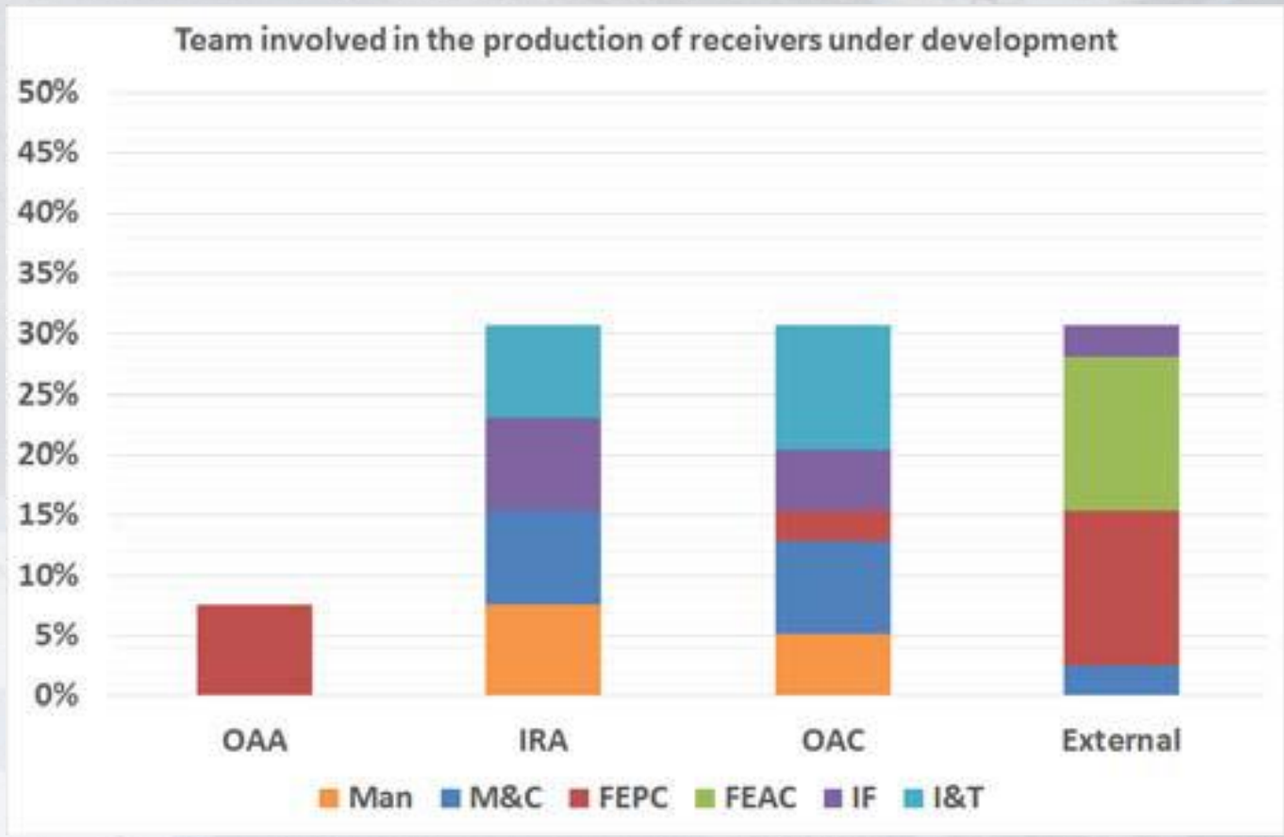
Management data analysis

- SRT C_low with superconductors;
- New receivers with an higher production time due to larger bandwidth and complexity



Management data analysis





Status of the receivers in operation and under development

SRT
- L/P vacuum and helium losses repair
- K LNA repair and possible upgrade

NOTO
- Frequency agility completion

UPGRADE
- K band up to 8 GHz in MED and SRT and 1,5 GHz in Noto
- S-band
- C_low
- Q band
- W band @ SRT ex-IRAM
- MED Ku in development
- NOTO SX + L band
- W band in NOTO