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Spectrum Management and Telecommunications

Standard Radio System Plan

Technical Requirements for Fixed Line-of-Sight Radio Systems Operating in the Band 6425-6930 MHz

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Canada

Preface

Standard Radio System Plan SRSP-306.4, issue 7, *Technical Requirements for Fixed Line-of-Sight Radio Systems Operating in the Band 6425-6930 MHz* replaces *Technical Requirements for Fixed Line-of-Sight Radio Systems Operating in the Band 6425-6930 MHz, issue* 6.

The following are the main changes:

1. The antenna radiation pattern requirement prescribed by envelope B was modified in figure 1 and table 3 of section 6.
2. The radio frequency (RF) channel arrangement was updated to add RF channel bandwidths of 60 MHz and to remove RF channel bandwidths of less than 2.5 MHz. Consequential changes were made through the rest of this document.
3. Provisions already included in SRSP-300-GEN, which prescribes requirements to be applied in conjunction with this SRSP, were removed.
4. Other editorial changes and clarifications have been made throughout the document.

Issued under the authority of

the Minister of Innovation, Science and Industry

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Martin Proulx

Director General

Engineering, Planning and Standards Branch

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1. Intent

This Standard Radio System Plan (SRSP) states the minimum technical requirements for the efficient use of the band 6425-6930 MHz by point-to-point radio systems in the fixed service. These systems are:

- Point-to-point digital radio systems; and
- Unidirectional radio systems used for television studio transmitter link (STL) services.

This SRSP is intended to be employed in the design and specification of radio systems and equipment and in the evaluation of technical applications for new radio facilities or modification to radio systems submitted in accordance with the current issue of Radio Standards Procedure RSP-113, *Application Procedures for Planned Radio Stations above 960 MHz in the Fixed Service*.

This SRSP must be used in conjunction with SRSP-300-Gen, *General Technical Requirements for Fixed Point-to-Point Radio Systems Operating in Frequency Bands above 960 MHz*, for assessing compliance with Innovation, Science and Economic Development Canada (ISED) requirements. Except where otherwise specified in this SRSP, fixed point-to-point radio systems in the frequency band 6425-6930 MHz shall comply with both the requirements of this SRSP as well as those prescribed in SRSP-300-Gen.

Notwithstanding the exclusions in section 3.2 of SRSP-300-Gen, unidirectional radio systems used for STL services and operating in the frequency band 6425-6930 MHz shall comply with all relevant provisions of SRSP-300-Gen, other than those that are not applicable to unidirectional systems.

This SRSP specifies equipment characteristics relating to efficient spectrum usage only and is not to be regarded as a comprehensive specification for equipment design and/or selection.

2. General

This Standard replaces SRSP-306.4, Issue 6. Further revision of this SRSP will be made as required. Existing radio systems that were licensed as standard prior to the issuance of this SRSP may continue to operate as standard. Extension, expansion, or modification of these systems will be considered by ISED on a case-by-case basis. New systems shall conform to the requirements of this standard.

It should be noted that the radio astronomy service operates in the band 6650-6675.2 MHz solely under the provision of International Telecommunication Union *Radio Regulation* No. 5.149. Applicants for channels which overlap this band, proposing to operate within the vicinity of the Dominion Radio Astrophysical Observatory (DRAO) near Penticton, B.C. (49 deg. 19' 18" N and 119 deg. 37' 08" W), are encouraged to take steps, where practicable, to avoid causing harmful interference to the DRAO.

It should also be noted that licence-exempt radio local area network (RLAN) devices can operate in the frequency band 5925-7125 MHz, but must follow the established spectrum policy and technical framework, and must not cause harmful interference to, or claim protection from, licensed systems operating in the frequency band. The policy and technical framework is described in the *Decision on the Technical and Policy Framework for Licence-Exempt Use in the 6 GHz Band*.

3. Related Documents

The current issues of the following documents are applicable and available on the Spectrum Management and Telecommunications website:

SRSP-300-Gen	*General Technical Requirements for Fixed Point-to-Point Radio Systems Operating in Frequency Bands above 960 MHz*
SP 3-30 GHz	*Revisions to Spectrum Utilization Policies in the 3-30 GHz Frequency Range and Further Consultation*
SP Gen	*General Information Related to Spectrum Utilization and Radio Systems Policies*
SP 1-20 GHz	*Revisions to Microwave Spectrum Utilization Policies in the Range of 1-20 GHz*
SMSE-022-14	*Decisions on Spectrum Utilization Policies and Technical Requirements Related to Backhaul*
RSP-113	*Application Procedures for Planned Radio Stations Above 960 MHz in the Fixed Service*
TRC-43	*Designation of Emissions, Class of Station and Nature of Service*
CTFA	*Canadian Table of Frequency Allocations*
CPC-2-0-03	*Radiocommunication and Broadcasting Antenna Systems*

CPC – Client Procedures Circular
RSP – Radio Standards Procedure
SRSP – Standard Radio System Plan
SP – Spectrum Utilization Policy
TRC – Telecommunications Regulation Circular

4. Radio Frequency Channel Arrangement Description

The channel plans defined in this standard provide for five different RF channel spacings. Channel pairs are provided with transmit/receive separations of 90, 100, 250, or 340 MHz. Unidirectional radio systems used for television STL services are specifically addressed under section 4.3 c. Moreover, table A.1 in annex A provides the RF channel frequencies.

4.1 60 MHz channel spacing

a. The centre frequencies of the 4 paired channels that allow RF channel bandwidths greater than 30 MHz and less than or equal to 60 MHz and a transmit/receive separation of 250 MHz are expressed by the following relationships:

Lower half of the band	G_n	= 6400 + 60n	for n = 1 to 4
Upper half of the band	G'_n	= 6650 + 60n	for n = 1 to 4

where n is the channel number and G_n and G'_n are the centre frequencies in MHz of the paired channels.

4.2 30 MHz channel spacing

a. The centre frequencies of the 5 paired channels that allow RF channel bandwidths greater than 20 MHz and less than or equal to 30 MHz and a transmit/receive separation of 340 MHz are expressed by the following relationships:

Lower half of the band	A_n	= 6415 + 30n	for n = 1 to 5
Upper half of the band	A'_n	= 6755 + 30n	for n = 1 to 5

where n is the channel number and A_n and A'_n are the centre frequencies in MHz of the paired channels.

b. The centre frequencies of the 3 paired channels which allow RF channel bandwidths greater than 20 MHz and less than or equal to 30 MHz and a transmit/receive separation of 100 MHz are expressed by the following relationships:

Lower half of the band	A_n	= 6415 + 30n	for n = 6 to 8
Upper half of the band	A'_n	= 6515 + 30n	for n = 6 to 8

where n is the channel number and A_n and A'_n are the centre frequencies in MHz of the paired channels.

4.3 20 MHz channel spacing

a. The centre frequencies of the 8 paired channels that allow RF channel bandwidths greater than 10 MHz and less than or equal to 20 MHz and a transmit/receive separation of 340 MHz are expressed by the following relationships:

Lower half of the band	B_n	= 6420 + 20n	for n = 1 to 8
Upper half of the band	B'_n	= 6760 + 20n	for n = 1 to 8

where n is the channel number and B_n and B'_n are the centre frequencies in MHz of the paired channels.

b. The centre frequencies of the 4 paired channels which allow RF channel bandwidths greater than 10 MHz and less than or equal to 20 MHz and a transmit/receive separation of 100 MHz are expressed by the following relationships:

Lower half of the band	B_n	= 6420 + 20n	for n = 9 to 12
Upper half of the band	B'_n	= 6520 + 20n	for n = 9 to 12

where n is the channel number and B_n and B'_n are the centre frequencies in MHz of the paired channels.

c. Existing unidirectional radio systems authorized before December 2006 using analog modulation and used for television STL services must use channels B9 to B12 and channels B'9 to B'12 and may also use channel B13, centred at 6680 MHz. New radio systems used for television STL services may also use these same channels provided their operation conforms with the requirements established for bi-directional point-to-point digital radio systems in this SRSP. Channel B13 is not included in the channel arrangement descriptions in sections 4.3 a and 4.3.b because it is an unpaired channel.

4.4 10 MHz channel spacing

a. The centre frequencies of the 16 paired channels that allow RF channel bandwidths greater than 5 MHz and less than or equal to 10 MHz and a transmit/receive separation of 340 MHz are expressed by the following relationships:

Lower half of the band	C_n	= 6425 + 10n	for n = 1 to 16
Upper half of the band	C'_n	= 6765 + 10n	for n = 1 to 16

where n is the channel number and C_n and C'_n are the centre frequencies in MHz of the paired channels.

b. The centre frequencies of the 9 paired channels which allow RF channel bandwidths greater than 5 MHz and less than or equal to 10 MHz and a transmit/receive separation of 90 MHz are expressed by the following relationships:

Lower half of the band	C_n	= 6425 + 10n	for n = 17 to 25
Upper half of the band	C'_n	= 6515 + 10n	for n = 17 to 25

where n is the channel number and C_n and C'_n are the centre frequencies in MHz of the paired channels.

4.5 5 MHz channel spacing

The centre frequencies of the 20 paired channels that allow RF channel bandwidths less than or equal to 5 MHz and a transmit/receive separation of 250 MHz are expressed by the following relationships:

Lower half of the band	D_n	= 6521.25 + 5n	for n = 1 to 20
Upper half of the band	D'_n	= 6771.25 + 5n	for n = 1 to 20

where n is the channel number and D_n and D'_n are the centre frequencies in MHz of the paired channels.

4.6 Closed Loop

Systems must be designed so that any closed loop will consist of an even number of hops.

4.7 Assignment of Frequencies

New bi-directional systems using the 5 or 10 MHz channel plans should use the lowest available frequency pair that can be successfully coordinated, starting with channel 1. New systems using the 20, 30, or 60 MHz channel plans should use the highest available frequency pair that can be successfully coordinated, starting at channel 9 for the 20 MHz channel plan, channel 6 for the 30 MHz channel plan, and channel 3 for the 60 MHz channel plan.

New unidirectional systems using the 5 or 10 MHz channel plans should use a frequency from the lowest available frequency pair that can be successfully coordinated, starting with channel 1. Such systems using the 20, 30, or 60 MHz channel plans should use a frequency from the highest available frequency pair, starting with channel 13 for 20 MHz channel plan, channel 8 for 30 MHz channel plan, and channel 4 for 60 MHz channel plan. It should be noted that channel B13 of the 20 MHz channel plan is an unpaired channel.

For multi-channel systems, channels should be chosen to minimize the number of wider bandwidth channels that may be blocked.

4.8 Spectral Efficiency

Digital systems submitted for licensing shall meet a minimum spectral efficiency of 4.4 bits/s/Hz on a single polarization in a bandwidth corresponding to the channel spacing.

4.9 Protection Channels

Protection channels are not permitted in this band.

5. Transmitter Characteristics

The transmitter power delivered to the antenna input shall not exceed the limits per RF channel shown in Table 1 below.

Table 1 – Maximum allowed transmitter power delivered to the antenna input

Bandwidth (BW) (MHz)	Power Limit	
	(watts)	(dBW)
$10 < BW \leq 60$	10	10
$5 < BW \leq 10$	7.5	8.8
$BW \leq 5$	5	7

An increase in transmitter power over the above specified limit may be permitted if technical justification is provided. In no event will the power delivered to the antenna input be permitted to exceed 20 watts (+13 dBW) per channel.

The centre frequency of the emission shall be maintained within ±0.005% of the assigned frequency.

6. Antenna Characteristics

The co-polarized radiation pattern envelope in the horizontal plane of the antenna must remain within Envelope A defined in Table 2 and shown in Figure 1, for both vertical and horizontal polarizations.

In uncongested areas, the co-polarized radiation pattern envelope in the horizontal plane of the antenna must remain within Envelope B defined in Table 3 and shown in Figure 1, for both vertical and horizontal polarizations. Levels of congestion are described in the Geographical Differences Policy guideline found in part B, section 1.6 of Spectrum Utilization Policy SP 1-20 GHz, *Revisions to Microwave Spectrum Utilization Policies in the Range of 1-20 GHz*.

Table 2 - Minimum antenna characteristics for point-to-point digital radio systems operating in the band 6425-6930 MHz – Envelope A

Azimuth in degrees from main lobe	Antenna directivity in dB down from main lobe
0 to 1.1	0
1.1 to 5	3
5 to 10	25
10 to 15	29
15 to 20	33
20 to 30	36
30 to 100	42
100 to 140	55
140 to 180	55

Table 3: Minimum antenna characteristics for point-to-point digital radio systems operating in the band 6425-6930 MHz – Envelope B

Azimuth in degrees from main lobe	Antenna directivity in dB down from main lobe
0 to 1.7	0
1.7 to 5.8	2.6
5.8 to 8.0	17
8.0 to 11	21
11 to 15	23
15 to 20	28
20 to 30	30
30 to 35	33
35 to 100	35
100 to 140	39
140 to 180	45

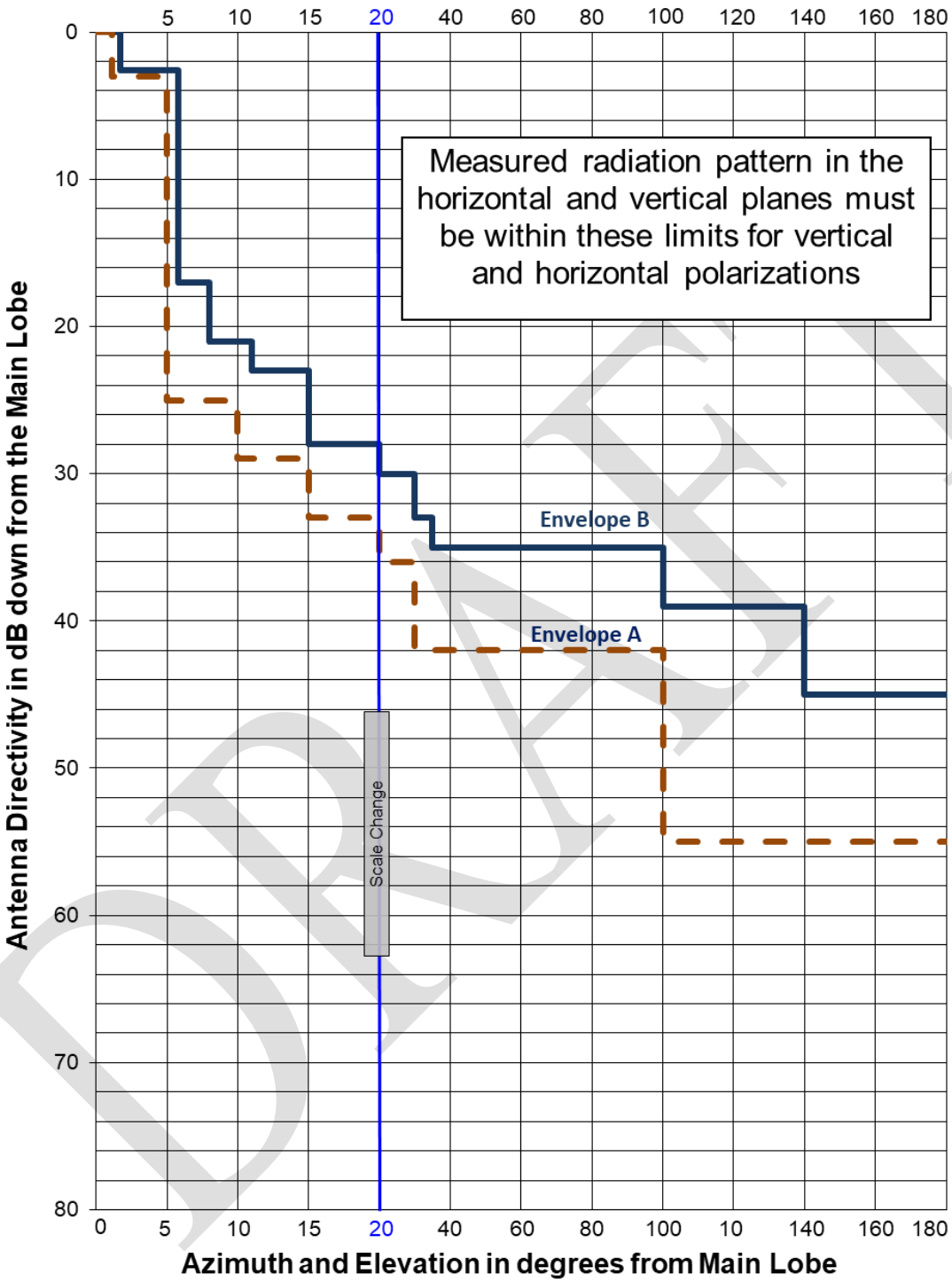

Figure 1: Minimum antenna characteristics for point-to-point digital radio systems operating in the band 6425-6930 MHz

7. Maximum Equivalent Isotropically Radiated Power

The maximum equivalent isotropically radiated power (e.i.r.p.) from the antenna must not, in any case, exceed +55 dBW per RF channel.

8. Avoidance of the Geostationary-satellite Orbit

Where practicable, sites for transmitting terrestrial stations operating in the fixed service, and employing maximum values of e.i.r.p. exceeding +35 dBW in the frequency band 6425-6930 MHz should be selected so that the direction of maximum radiation of the antenna will be pointed at least 2 degrees away from the geostationary-satellite orbit, taking into account the effect of atmospheric refraction.

Where compliance with the above paragraph is impracticable, the maximum e.i.r.p. of the station in the fixed service shall not exceed:

- +47 dBW in any direction within 0.5 degrees of the geostationary-satellite orbit; or
- +47 dBW to +55 dBW, on a linear decibel scale (8 dB per degree), in any direction between 0.5 and 1.5 degrees of the geostationary-satellite orbit taking into account the effect of atmospheric refraction.

Annex A: RF Channel Centre Frequencies

The channel arrangement center frequencies specified in section 4 of this SRSP are listed in the table below.

Table A.1: Channel Identification and Carrier Frequencies for Radio Systems in the Band 6425-6930 MHz Associated with the Equations from Sections 4.1 to 4.7

Channel Frequency	GO (RETURN) Channels					Channel Frequency	RETURN (GO) Channels				
	60 MHz	30 MHz	20 MHz	10 MHz	5 MHz		60 MHz	30 MHz	20 MHz	10 MHz	5 MHz
6430.00						6680.00					
6431.25						6681.25					
6432.50						6682.50					
6433.75						6683.75					
6435.00				C1		6685.00				C'17	
6436.25						6686.25					
6437.50						6687.50					
6438.75						6688.75					
6440.00			B1			6690.00					
6441.25						6691.25					
6442.50						6692.50					
6443.75						6693.75					
6445.00		A1		C2		6695.00		A'6		C'18	
6446.25						6696.25					
6447.50						6697.50					

6448.75						6698.75					
6450.00						6700.00			B'9		
6451.25						6701.25					
6452.50						6702.50					
6453.75						6703.75					
6455.00				C3		6705.00				C'19	
6456.25						6706.25					
6457.50						6707.50					
6458.75						6708.75					
6460.00	G1		B2			6710.00	G'1				
6461.25						6711.25					
6462.50						6712.50					
6463.75						6713.75					
6465.00				C4		6715.00				C'20	
6466.25						6716.25					
6467.50						6717.50					
6468.75						6718.75					
6470.00						6720.00			B'10		
6471.25						6721.25					
6472.50						6722.50					
6473.75						6723.75					
6475.00		A2		C5		6725.00		A'7		C'21	
6476.25						6726.25					
6477.50						6727.50					
6478.75						6728.75					
6480.00			B3			6730.00					
6481.25						6731.25					
6482.50						6732.50					
6483.75						6733.75					
6485.00				C6		6735.00				C'22	
6486.25						6736.25					
6487.50						6737.50					
6488.75						6738.75					
6490.00						6740.00			B'11		
6491.25						6741.25					
6492.50						6742.50					
6493.75						6743.75					
6495.00				C7		6745.00				C'23	
6496.25						6746.25					
6497.50						6747.50					
6498.75						6748.75					
6500.00			B4			6750.00					
6501.25						6751.25					
6502.50						6752.50					
6503.75						6753.75					
6505.00		A3		C8		6755.00		A'8		C'24	
6506.25						6756.25					
6507.50						6757.50					
6508.75						6758.75					
6510.00						6760.00			B'12		
6511.25						6761.25					
6512.50						6762.50					
6513.75						6763.75					
6515.00				C9		6765.00				C'25	
6516.25						6766.25					

6517.50						6767.50					
6518.75						6768.75					
6520.00	G2		B5			6770.00	G'2				
6521.25						6771.25					
6522.50						6772.50					
6523.75						6773.75					
6525.00				C10		6775.00				C'1	
6526.25					D1	6776.25					D'1
6527.50						6777.50					
6528.75						6778.75					
6530.00						6780.00			B'1		
6531.25					D2	6781.25					D'2
6532.50						6782.50					
6533.75						6783.75					
6535.00		A4		C11		6785.00		A'1		C'2	
6536.25					D3	6786.25					D'3
6537.50						6787.50					
6538.75						6788.75					
6540.00			B6			6790.00					
6541.25					D4	6791.25					D'4
6542.50						6792.50					
6543.75						6793.75					
6545.00				C12		6795.00				C'3	
6546.25					D5	6796.25					D'5
6547.50						6797.50					
6548.75						6798.75					
6550.00						6800.00			B'2		
6551.25					D6	6801.25					D'6
6552.50						6802.50					
6553.75						6803.75					
6555.00				C13		6805.00				C'4	
6556.25					D7	6806.25					D'7
6557.50						6807.50					
6558.75						6808.75					
6560.00			B7			6810.00					
6561.25					D8	6811.25					D'8
6562.50						6812.50					
6563.75						6813.75					
6565.00		A5		C14		6815.00		A'2		C'5	
6566.25					D9	6816.25					D'9
6567.50						6817.50					
6568.75						6818.75					
6570.00						6820.00			B'3		
6571.25					D10	6821.25					D'10
6572.50						6822.50					
6573.75						6823.75					
6575.00				C15		6825.00				C'6	
6576.25					D11	6826.25					D'11
6577.50						6827.50					
6578.75						6828.75					
6580.00	G3		B8			6830.00	G'3				
6581.25					D12	6831.25					D'12
6582.50						6832.50					
6583.75						6833.75					
6585.00				C16		6835.00				C'7	

6586.25					D13	6836.25					D'13
6587.50						6837.50					
6588.75						6838.75					
6590.00						6840.00			B'4		
6591.25					D14	6841.25					D'14
6592.50						6842.50					
6593.75						6843.75					
6595.00		A6		C17		6845.00		A'3		C'8	
6596.25					D15	6846.25					D'15
6597.50						6847.50					
6598.75						6848.75					
6600.00			B9			6850.00					
6601.25					D16	6851.25					D'16
6602.50						6852.50					
6603.75						6853.75					
6605.00				C18		6855.00				C'9	
6606.25					D17	6856.25					D'17
6607.50						6857.50					
6608.75						6858.75					
6610.00						6860.00			B'5		
6611.25					D18	6861.25					D'18
6612.50						6862.50					
6613.75						6863.75					
6615.00				C19		6865.00				C'10	
6616.25					D19	6866.25					D'19
6617.50						6867.50					
6618.75						6868.75					
6620.00			B10			6870.00					
6621.25					D20	6871.25					D'20
6622.50						6872.50					
6623.75						6873.75					
6625.00		A7		C20		6875.00		A'4		C'11	
6626.25						6876.25					
6627.50						6877.50					
6628.75						6878.75					
6630.00						6880.00			B'6		
6631.25						6881.25					
6632.50						6882.50					
6633.75						6883.75					
6635.00				C21		6885.00				C'12	
6636.25						6886.25					
6637.50						6887.50					
6638.75						6888.75					
6640.00	G4		B11			6890.00	G'4				
6641.25						6891.25					
6642.50						6892.50					
6643.75						6893.75					
6645.00				C22		6895.00				C'13	
6646.25						6896.25					
6647.50						6897.50					
6648.75						6898.75					
6650.00						6900.00			B'7		
6651.25						6901.25					
6652.50						6902.50					
6653.75						6903.75					

6655.00		A8		C23		6905.00		A'5		C'14	
6656.25						6906.25					
6657.50						6907.50					
6658.75						6908.75					
6660.00			B12			6910.00					
6661.25						6911.25					
6662.50						6912.50					
6663.75						6913.75					
6665.00				C24		6915.00				C'15	
6666.25						6916.25					
6667.50						6917.50					
6668.75						6918.75					
6670.00						6920.00			B'8		
6671.25						6921.25					
6672.50						6922.50					
6673.75						6923.75					
6675.00				C25		6925.00				C'16	
6676.25						6926.25					
6677.50						6927.50					
6678.75						6928.75					
6680.00			B13			6930.00					